South Park Landfill

Cleanup Action Plan

Draft for Public Review

Issued by

Washington State Department of Ecology
Toxics Cleanup Program
Southwest Regional office
Olympia, Washington

October 2017

South Park Landfill

Cleanup Action Plan

Appendix A
Landfill Post-Closure Operations, Maintenance, and Monitoring Plan

South Park Landfill

Landfill Post-Closure Operations, Maintenance, and Monitoring Plan

Prepared for

City of Seattle
South Park Property Development, LLC

October 2017

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Table of Contents

1.0 Introduction A-1
2.0 Implementation of the OMMP A-3
2.1 SITE AND PARCEL DESIGNATION A-3
2.2 PROJECT CONTACTS AND RESPONSIBILITIES A-3
2.2.1 Parcel Owners A-4
2.2.2 Subject Potentially Liable Persons A-4
2.2.3 Site Coordinator A-4
2.3 OMMP UPDATES AND REVISIONS A-4
3.0 General Health and Safety Requirements A-5
4.0 Reporting and Record Keeping A-7
4.1 RECORD KEEPING A-7
4.2 ANNUAL OPERATION, MAINTENANCE, AND MONITORING REPORT A-7
4.3 CONTINGENCY REPORTING A-8

List of Tables

Table A.1 Contact List

List of Figures

Figure A.1 Site Vicinity Map
Figure A.2 Site Plan and Parcel Map

List of Attachments

Attachment A.1 Landfill Cap Inspection and Maintenance Plan
Attachment A.2 Landfill Gas Monitoring and Contingency Plan
Attachment A.3 Groundwater Monitoring and Contingency Plan
Attachment A.4 Annual Report Checklist

List of Acronyms and Abbreviations

Acronym/ Abbreviation	Definition
CAP	Cleanup Action Plan
CIMP	Cap Inspection and Maintenance Plan
Ecology	Washington State Department of Ecology
GWMCP	Groundwater Monitoring and Contingency Plan
LFG	Landfill gas
LFGMCP	Landfill Gas Monitoring and Contingency Plan
MTCA	Model Toxics Control Act
OMM	Operations, maintenance, and monitoring
OMMP	Operations, Maintenance, and Monitoring Plan
PLP	Potentially liable person
SR	State Route
WAC	Washington Administrative Code

1.0 Introduction

This Landfill Post-Closure Operations, Maintenance, and Monitoring Plan (OMMP) is an appendix to, and an integral and enforceable part of, the Cleanup Action Plan (CAP) for the two largest parcels within the "Landfill Property" (defined below) and certain adjacent City of Seattle and Washington State right-of-ways (collectively defined as the "Settlement Area" that form a portion of the South Park Landfill Site (discussed in Section 2.1). The South Park Landfill Site is a former municipal solid waste landfill in the South Park neighborhood of Seattle, Washington (Figure A.1). It is located in the Lower Duwamish Valley near the western valley wall between State Route (SR) 509 and SR 99. The Settlement Area is within the Landfill Property, defined as the area of the Site where wastes were placed as part of South Park Landfill Operations. Details regarding the Site, environmental conditions, and specific components of the remedy are documented in the CAP.

This OMMP is composed of several plans that describe required components of the CAP in detail. These plans include the following:

- **Attachment A.1 – Landfill Cap Inspection and Maintenance Plan (Landfill CIMP):** This plan addresses the inspection and maintenance of the landfill cap, including pavement, roadways, surficial stormwater features, and vegetated areas.
- **Attachment A.2 – Landfill Gas Monitoring and Contingency Plan (LFGMCP):** This plan includes requirements for perimeter probe monitoring and building monitoring along with necessary contingencies necessary to document the effectiveness of the landfill gas (LFG) system(s) at the Settlement Area.
- **Attachment A.3 – Groundwater Monitoring and Contingency Plan (GWMCP):** This plan includes long-term groundwater monitoring requirements to evaluate the effectiveness of cleanup actions on groundwater quality for the Settlement Area and describes associated contingency actions.

An Annual Report Checklist is also provided, as Attachment A.4.

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2.0 Implementation of the OMMP

Because the Settlement Area contains two parcels with different owners and operating facilities, implementation of OMMP requirements may be performed parcel by parcel, and the potentially liable person (PLP) who has signed onto the Consent Decree (referred to as a "Subject PLP") who is also the owner of a parcel may work with the Washington State Department of Ecology (Ecology) on adjusting the OMMP requirements to address the needs of that parcel. The OMMP attachments set out in detail what is required for a parcel to meet the CAP requirements. While each Parcel Owner who is a Subject PLP may coordinate with Ecology to determine OMMP requirements needed for their parcel, it is the responsibility of all the Subject PLPs (collectively or individually) to ensure the requirements in the CAP and OMMP are met throughout the Settlement Area, regardless of ownership of a parcel. Ecology may institute legal or administrative action against the Subject PLPs for failure to meet the requirements of the Consent Decree, which includes a failure to implement any requirement of this OMMP. The Model Toxics Control Act (MTCA) establishes that the Subject PLPs are strictly, jointly, and severally liable for the remediation of the Settlement Area as detailed in the CAP.

2.1 SITE AND PARCEL DESIGNATION

The Landfill Property covers approximately 39 acres and is roughly bounded to the north by South Kenyon Street, to the east by SR 99 and 5th Avenue South, to the south by South Sullivan Street, and to the west by Occidental Avenue South. The Landfill boundary, which is consistent with the limits of solid waste, is depicted as the red-dashed line on Figure A.2. The Landfill comprises several industrial-zoned parcels, owned and operated by different parties, as described in the following sections. The King County tax assessor parcels and relevant parcel information are included on Figure A.2. The parcels that make up the Landfill Property are as follows:

- South Park Property Development Parcel
- The South Recycling and Disposal Station
- Portion of the Kenyon Industrial Park
- The 7901 2nd Avenue South Parcel

However, the scope of this OMMP is limited to the Settlement Area: the South Park Property Development Parcel, the South Recycling and Disposal Station parcel, and certain adjacent right-of-ways.

2.2 PROJECT CONTACTS AND RESPONSIBILITIES

To accomplish the work to be performed under this OMMP in the most efficient manner, certain parties have elected to take the lead in performing various aspects of the work required. Language in this OMMP reflects this agreement. However, the Subject PLPs remain strictly, jointly, and severally liable for the performance of any and all obligations under this OMMP. In the event the party identified as a lead should fail to timely and properly complete performance

of all or any portion of its work, the other party or parties must perform that remaining work, if any.

This section provides relevant contact information and associated responsibilities for individuals or groups of individuals who are leading long-term operations, maintenance, and monitoring (OMM) at their parcel. A list of current contacts and their contact information is provided in Table A.1. An updated copy of this table will be provided to Ecology by the Site Coordinator on an annual basis.

2.2.1 Parcel Owners

The Parcel Owner is responsible for filing an Environmental (Restrictive) Covenant on their property and for compliance with the Environmental (Restrictive) Covenant.

2.2.2 Subject Potentially Liable Persons

The PLPs who have signed onto the Consent Decree (referred to as "Subject PLPs") are responsible for compliance with the CAP including the OMMP, communications with Washington State Department of Ecology (Ecology), and for reporting of on-parcel activities.

Subject PLPs who are also Parcel Owners will be responsible for implementing the CAP requirements at the parcel for which they are the owner.

2.2.3 Site Coordinator

The Site Coordinator will be designated by the Subject PLPs to perform the long-term monitoring and reporting required under the CAP and this OMMP. The Site Coordinator will conduct the work as detailed in Section 6.2.6 of the CAP and includes carrying out the responsibilities specific to Attachments A.1 (Landfill CIMP), A.2 (LFGMCP), and A.3 (GWMCP) of this OMMP.

The Site Coordinator is responsible for compiling, reporting, and record retention for all OMM activities that are associated with the cleanup action in accordance with this OMMP.

2.3 OMMP UPDATES AND REVISIONS

This OMMP is an exhibit to, and an integral and enforceable part of, the Consent Decree. Any amendment of the OMMP is considered an amendment of the Consent Decree and must be approved as detailed in the Consent Decree, Section XV (Amendment of Decree).

The individual plans identify plan-specific aspects that may need to change or evolve over time, such as monitoring schedule and locations, analytical schedule, and the specific analytical methods. These changes are typically considered to be minor and can be approved by the Ecology project manager. Ecology will inform the Subject PLPs if any suggested change is considered a major amendment.

3.0 General Health and Safety Requirements

Worker health and safety measures will be implemented by all parties performing work outlined in this OMMP per Washington Administrative Code (WAC) 173-340-810, Worker Safety and Health, which provides general provisions and requirements for health and safety plans for work at MTCA sites. General provisions are based on requirements under the Occupational Safety and Health Act of 1970 and the Washington Industrial Safety and Health Act. General Occupational Health Standards for the State of Washington, as established in WAC 296-62, are applicable to work associated with OMM activities at the Landfill, and provide rules designed to protect the health of employees by establishing requirements to control health hazards.

Specific health and safety requirements are included in the individual plans, identified in Section 1.0 and included as attachments to this OMMP.

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4.0 Reporting and Record Keeping

Record keeping and annual reporting are the responsibility of the Site Coordinator and are a critical component of this OMMP. Contingency reporting responsibility depends on the contingency action that is triggered and is discussed in the individual plans. In general, contingency reporting may be done by the Site Coordinator, the Parcel Owner (who is a Subject PLP), the parcel operator (who is a Subject PLP), or a member of the Subject PLPs.

4.1 RECORD KEEPING

To document compliance with the OMMP and its individual plans, copies of all OMM records (for OMM not completed by the Site Coordinator) must be provided to the Site Coordinator within 60 days of completion of an OMM event. Specific documentation necessary for compliance with each individual plan are provided in the reporting and record keeping section of each plan and may include copies of field notes, monitoring forms, analytical reports, photographic documentation, and the like. All records, reports, documents, and underlying data relevant to the implementation of this OMMP shall be maintained by the Site Coordinator during the pendency of the Consent Decree and for a period of no less than 10 years after the date the Consent Decree is no longer in effect.

4.2 ANNUAL OPERATION, MAINTENANCE, AND MONITORING REPORT

Annual OMM Reports will be prepared and submitted to Ecology by March 31 of each calendar year to document OMM activities at the Settlement Area over the course of each previous calendar year. Unless otherwise directed by Ecology, the Consent Decree requires monthly progress reports of the remedial actions at the Settlement Area; that reporting is independent of the annual reporting required by this OMMP. The content of OMM Reports will include routine monitoring results from landfill cap annual inspections (per the Landfill CIMP, Attachment A.1), LFG collection system monitoring (per the LFGMCP, Attachment A.2), and groundwater monitoring (per the GWMCP, Attachment A.3). Documentation of non-routine subsurface work, such as construction or utility repair that results in exposure of material beneath the cap, will also be included if completed within the previous calendar year. The OMM Annual Reports will summarize OMM activities, data, and mitigation measures (if necessary), and will include, at a minimum, field forms, copies of analytical laboratory reports, updated trend plots for vinyl chloride, cis-1,2-dichloroethene, benzene, iron, manganese, and arsenic in groundwater, and groundwater contour maps.

The Site Coordinator is responsible for compiling the necessary site-wide OMM documentation and submittal of the OMM Annual Report. An Annual Report Checklist (included in Attachment A.4) should be completed and submitted with each Annual Report to facilitate preparation and to ensure that the minimum contents are included for each year.

4.3 CONTINGENCY REPORTING

Contingency actions for LFG and groundwater are included in the LFGMCP (Attachment A.2) and the GWMCP (Attachment A.3), respectively. There are additional reporting requirements associated with each of these plans that must be followed if a contingency action is implemented.

South Park Landfill

Landfill Post-Closure Operations, Maintenance, and Monitoring Plan

Table

Table A.1
Contact List[1]
Last Updated: October 2017

Contact Title	Name	Affiliation	Mailing Address	Email Address	Primary Phone
Site Coordinator					
Parcel Owner					

Note:
1 This list is to be reviewed and updated by the Site Coordinator (or other designee) as needed at a minimum on a yearly basis, or if there is a personnel change or change in contact information for any of the above contacts.

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Landfill Post-Closure Operations, Maintenance, and Monitoring Plan

Figures

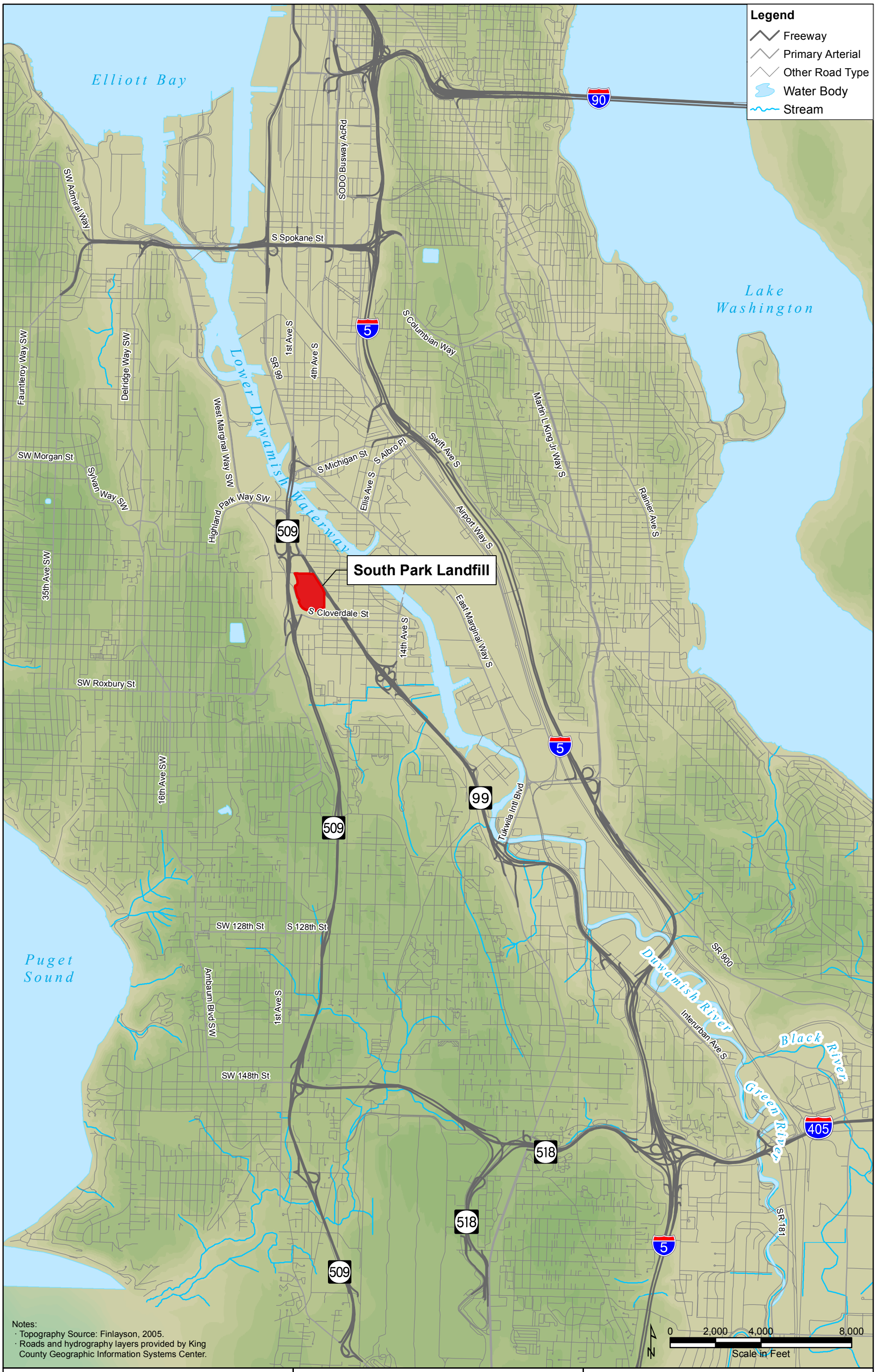

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Figure A.1
Site Vicinity Map

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9/26/2017

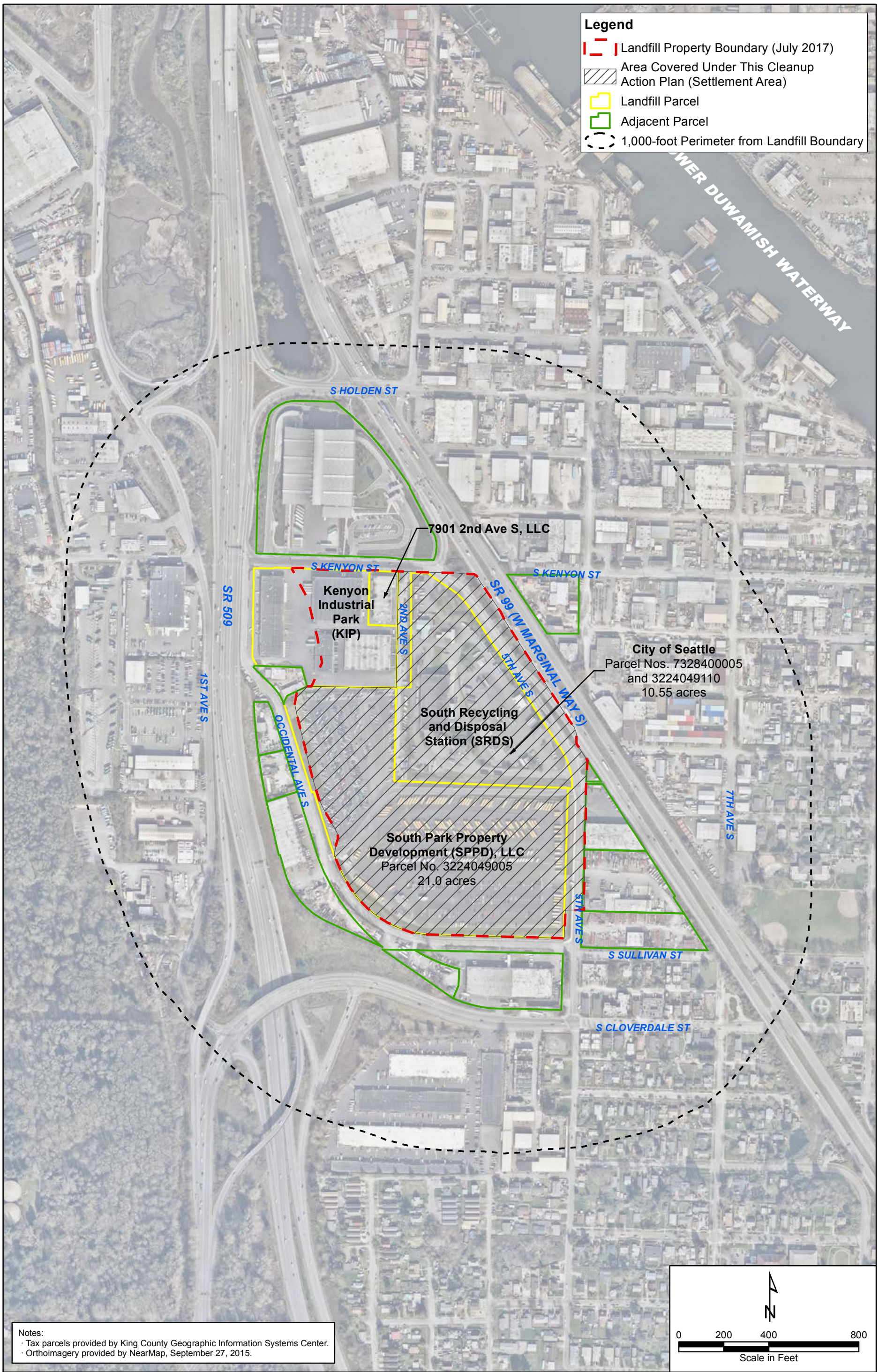

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Figure A.2
Site Plan and Parcel Map

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9/29/2017

South Park Landfill

Landfill Post-Closure Operations, Maintenance, and Monitoring Plan

Attachment A.1
Landfill Cap Inspection and Maintenance Plan

Table of Contents

1.0 Introduction A.1-1
2.0 Landfill Parcels and Coordination A.1-3
2.1 COORDINATION AND RESPONSIBILITIES A.1-4
2.1.1 Parcel Owners A.1-4
2.1.2 Subject Potentially Liable Persons A.1-5
2.1.3 Site Coordinator A.1-5
3.0 Description of Landfill Cap Requirements A.1-7
4.0 Landfill Cap Inspection and Maintenance Requirements A.1-9
4.1 BASELINE CAP CONDITIONS AT THE SETTLEMENT AREA A.1-9
4.2 LANDFILL CAP INSPECTIONS A.1-9
4.3 LANDFILL CAP MAINTENANCE A.1-10
4.4 STORMWATER INFRASTRUCTURE MAINTENANCE A.1-11
4.5 FENCING A.1-11
4.6 UNFORESEEN EVENTS A.1-11
5.0 Health and Safety A.1-13
6.0 Reporting and Record Keeping A.1-15

List of Figures

Figure A.1.1 Landfill Cap Requirements by Parcel
Figure A.1.1a Landfill Cap Boundary–SPPD Parcel
Figure A.1.1b Landfill Cap Boundary–SRDS Parcel
Figure A.1.1.c Landfill Cap Boundary–Right-of-Ways

List of Exhibits

Exhibit A.1.1 Cap Inspection and Maintenance Field Form

List of Acronyms and Abbreviations

Acronym/ Abbreviation	Definition
CAP	Cleanup Action Plan
CIMP	Cap Inspection and Maintenance Plan
City	City of Seattle
Ecology	Washington State Department of Ecology
IA	Interim Action
IAWP	Interim Action Work Plan
LFG	Landfill gas
OMM	Operations, Maintenance, and Monitoring
OMMP	Operations, Maintenance, and Monitoring Plan
PPE	Personal protective equipment
PLP	Potentially liable person
ROW	Right-of-way
SPPD	South Park Property Development
SR	State Route
SRDS	South Recycling and Disposal Station

1.0 Introduction

This Landfill Cap Inspection and Maintenance Plan (CIMP) is an attachment to the Landfill Post-Closure Operations, Maintenance, and Monitoring Plan (OMMP), which is an appendix to, and integral and enforceable part of, the Cleanup Action Plan (CAP) for the two largest parcels within the "Landfill Property" (defined below) and certain adjacent City of Seattle and Washington State right-of-ways (collectively defined as the "Settlement Area" that form a portion of the South Park Landfill Site. The South Park Landfill Site is a former municipal solid waste landfill in the South Park neighborhood of Seattle, Washington (Figure A.1 of the OMMP). It is located in the Lower Duwamish Valley near the western valley wall between State Route (SR) 509 and SR 99. The Settlement Area is within the Landfill Property, defined as the area of the Site where wastes were placed as part of South Park Landfill Operations. Details regarding the Site, environmental conditions, and specific components of the remedy are documented in the CAP.

The monitoring and maintenance requirements for the landfill cap are provided in this Landfill CIMP. The Landfill CIMP implementation will begin 180 days after the effective date of the Consent Decree in accordance with the schedule in the CAP.

The purpose of this Landfill CIMP is to confirm that the landfill cap remedy is performing in a manner that protects human health and the environment. The landfill cap consists of pavement, buildings, and geomembrane/soil layers and must be maintained in such a manner to prevent contact with the solid waste/soil beneath the cap, prevent "short-circuiting" of the landfill gas (LFG) controls, and prevent interference with the stormwater controls; the cap is not required to entirely block the infiltration of stormwater. The cap must be inspected annually, and it must be repaired if it is damaged or becomes worn.

Environmental (Restrictive) Covenants on the individual parcels allow continued access for the Washington State Department of Ecology (Ecology) and the Subject potentially liable persons (PLPs) to inspect the remedy, as well as restrictions on future changes which may disturb the landfill cap. Because the Settlement Area consists of two parcels with different owners and operating industrial facilities, the primary responsibility for maintenance of the landfill cap is with the Parcel Owner who is also a PLP who has signed onto the Consent Decree (referred to as a "Subject PLP").

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2.0 Landfill Parcels and Coordination

The landfill cap is a low permeability surface (i.e., asphalt and concrete) that is present at the Settlement Area above areas containing solid waste. The landfill cap prevents direct contact with solid waste by humans, plants, and animals. The limits of the cap are consistent with the landfill boundary and the extent of solid waste at the landfill, as shown as the red dashed line on Figure A.1.1, with parcel-specific details shown in Figures A.1.1a through A.1.1.c. A summary of the parcels and right-of-ways (ROWs) that make up the Settlement Area are included below:

- **South Park Property Development (SPPD) Parcel.** This parcel includes 21.0 acres of land and a single small office building. In 2014 and 2015, SPPD performed an Interim Action (IA) for cleanup at the parcel per the 2013 Ecology-approved Interim Action Work Plan (IAWP) under Amendment No. 1 of Agreed Order No. DE 6706 for the Site (Farallon 2013). The IA was performed simultaneously with the redevelopment of the property. The property redevelopment includes a modular building for employees and paved parking for employees and visitors. The IA work included regrading and capping the landfill surface, installing and operating a LFG control system, and implementing institutional controls.
- **South Recycling and Disposal Station (SRDS) parcel.**[1] The SRDS parcel is defined by King County tax parcel 7328400005, encompassing 10.55 acres. Two additional strips of land, 60 feet wide on the west of the SRDS parcel and 30 feet wide on the south, were incorporated into the property in 2003 by the City of Seattle (the City) Ordinance 121306. This additional land is in the process of being recorded by King County and brings the site area to approximately 11 acres. Until 2016, the parcel served as one of the City's solid waste transfer station. That use has now ceased. Under Amendment No. 2 of Agreed Order No. DE 6706, an IA will take place on this property as detailed in the 2015 Ecology-approved IAWP (Herrera and Aspect 2015). The IA includes installation of asphalt, concrete, or membrane caps, and LFG and surface water controls; implementation of institutional controls; and compliance monitoring.
- **Transportation Corridors.** The landfill is surrounded by City streets and State highways. The Settlement Area extends beneath sections of the following roads and/or ROWs, as shown in Figure A.1.1:
  - 5th Avenue South, where the landfill is present, has complex ownership as shown on Figure 2.2 of the CAP.

[1] The City's landfill parcel is known as the SRDS in this CAP, to be consistent with other landfill-related documents. It is called the South Transfer Station Phase II in other City documents, as it is being redeveloped to provide services that complement the new South Transfer Station across the street.

- The section adjacent to the City's SRDS parcel is deeded by quitclaim deed (King County Record No. 9012260159 dated December 14, 1990, Blocks 6, 7, 17, & 18 of plat – 1st Add to River Park, Vol. 8, p. 65) to the City from the State, as a turn back ROW of SR 99. The quitclaim deed conveys all right, title, and interest for road purposes only.
- On the section adjacent to the SPPD parcel, the western 20-foot-wide strip is held by the City through accepted deeds from King County, for street and general corporate purposes under Ordinance 96099; while the western 30-foot-wide strip is held as easement by the City (through the original platting).

- South Sullivan Street, where the landfill is present, was accepted under Ordinance 96099, for street and general corporate purposes by the City.
- Southbound lanes of SR 99 (West Marginal Way S.) were originally part of US Route 99 (1926 to 1972) and part of Primary State Highway 1 (1937 to 1964), then became SR 99 in 1972. The landfill extends to the near edge of pavement of the southbound lanes (i.e., under the right shoulder of the southbound lanes).

2.1 COORDINATION AND RESPONSIBILITIES

To accomplish the work to be performed under this CIMP in the most efficient manner, certain parties have elected to take the lead in performing various aspects of the work required. Language in this CIMP reflects this agreement. However, the PLPs who signed the Consent Decree remain strictly, jointly, and severally liable for the performance of any and all obligations under this CIMP. In the event the party identified as a lead should fail to timely and properly complete performance of all or any portion of its work, the other party or parties must perform that remaining work, if any.

The following sections define the roles required for compliance with this Landfill CIMP; one person may perform more than one role.

2.1.1 Parcel Owners

The Parcel Owners own the parcels and are responsible for filing an Environmental (Restrictive) Covenant and then compliance with their parcel's Environmental (Restrictive) Covenant, which includes inspection and maintenance of the landfill cap. As regards activities in this CIMP, the Parcel Owner, who is also a Subject PLP, is expected to perform the following:

- Perform on-going inspection and maintenance of the pavement, soil caps, and geomembranes that cover the landfill surface consistent with this plan, with the exception of the annual inspection and reporting performed by the Site Coordinator. For Parcels that do not meet the requirements in Section 6.2.1.1 of the CAP, the parcel owner will perform quarterly inspections of the landfill cap and report the results to the Site Coordinator.

- Submit information on repairs per Section 4.3 to the Site Coordinator for their annual reporting to Ecology.
- Grant access, as needed, for cap inspection by the Site Coordinator and/or Ecology.

2.1.2 Subject Potentially Liable Persons

The Subject PLPs are responsible for compliance with the CAP including the OMMP, communications with Washington State Department of Ecology (Ecology), and for reporting of on-parcel activities. The Subject PLPs are responsible for annual inspection and reporting to Ecology, through the Site Coordinator. In addition, in the event that Ecology becomes aware that a Parcel Owner who is not a Subject PLP is unable to maintain the cap on their parcel, Ecology shall provide written notice to the Subject PLPs that the Parcel Owner is unable to complete the work. Upon the receipt of such notice, the Subject PLPs will repair the parcel's cap to meet minimum standards consistent with Section 6.2.1 of the CAP.

2.1.3 Site Coordinator

The Site Coordinator is responsible for site-wide monitoring, including the annual Settlement Area-wide cap inspections, and for annual reporting. Additional clarification of his or her duties exists in the CAP, OMMP, and in later sections of this Landfill CIMP.

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3.0 Description of Landfill Cap Requirements

The cleanup action requires a landfill cap covering all areas at the Settlement Area that contain solid waste. The primary goal of the landfill cap is to block access or exposure to the solid waste and soil; secondary goals are to limit stormwater infiltration and to facilitate the performance of the LFG systems. Minimum standards for the landfill cap and requirements for continued monitoring and maintenance of the cap are discussed in Section 6.2.1 of the CAP.

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4.0 Landfill Cap Inspection and Maintenance Requirements

This Landfill CIMP establishes an inspection and maintenance program to identify damaged cap systems, provide for timely repair and replacement needed to restore damaged or intruded cap systems, specify measures to minimize the potential for disturbances of solid waste, and specify requirements for record-keeping of inspections, repairs and reporting.

4.1 BASELINE CAP CONDITIONS AT THE SETTLEMENT AREA

The first inspection conducted under this plan will occur during the first spring following the effective date of the Consent Decree, and it will be considered a "baseline" event. The baseline inspection will gather additional information that is needed beyond what was collected under the Remedial Investigation/Feasibility Study, for each parcel within the Settlement Area. Specifically, the inspection will review:

- Available as-built plans from the individual Parcel Owners, including building foundations, pavement sections, and stormwater system(s).
- A field survey that identifies the location of the different pavements, buildings, and landscaped features (for the ROWs, this will include the location of vegetated strips, surficial stormwater features, and sidewalks) and the generation of a scaled plan set to document the features.
- A publically available aerial photograph taken within the prior 2 years showing the parcel. This aerial will be available electronically as a georeferenced document.

This information will be maintained by the Site Coordinator and submitted to Ecology in the Year 1 Annual Report.

4.2 LANDFILL CAP INSPECTIONS

A complete inspection of the Settlement Area cap, including the ROWs, must be conducted on an annual basis in late spring to allow for repairs in the dry season. Inspections will be conducted by the Site Coordinator. Routine cap inspections for all parcels will consist of a visual survey of the entire cap surface exterior to buildings, including drainage features and surface components of stormwater conveyance (i.e., catch basins, swales). The integrity of the cap across the entire Settlement Area must be documented via notes, sketches, and photographs. The main objective of the annual inspection is to document areas of the cap that are compromised and require maintenance. To facilitate the inspection, a field inspection form must be completed during each routine annual inspection; a blank field inspection and maintenance form is included in Exhibit A.1.1.

If the following disturbances to the cap are identified, they must be noted on the field inspection form and documented via sketches (for location) and photographs.

- Cracking
- Uneven settlement or potholes
- Pooling or ponding of stormwater
- Separation of pavement from curbs, gutters, or catch basins
- Sloughing or crumbling of edge materials
- Erosion
- Any other signs of cap damage, failure, deterioration, or disturbance

If any of the above are identified during an inspection, a recommendation for repairs should be included on the field inspection and maintenance form.

4.3 LANDFILL CAP MAINTENANCE

If the results of the annual inspection indicate that an area of the cap requires maintenance, the following procedures should be followed.

- Notify Ecology of the repair needed and the intent to follow the procedure below within a timeframe specified in the notice, unless additional planning and approval are required by Ecology.
- Repair the cap with similar materials and construction procedures; refer to the CAP Section 6.2.1 for specifications.
- Make all cuts into the cap with neat continuous lines (i.e., saw cut).
- Make sure there is a complete and effective bond between the newly placed surface and the existing surface.
    - In the case of the asphaltic concrete cap, seams and seals must be properly constructed per standard paving practices and in such a way that no cracks or weak seams occur after repair that would be conduits for transmitting infiltrating stormwater or short-circuiting the LFG collection system, or that would present an exposure pathway to the soil beneath.
    - In the case of the low-permeability membrane cap, seams and seals must be properly constructed per manufacturer directives and in such a way that cracks that could be conduits for transmitting infiltrating stormwater or short-circuiting the LFG collection system, or that would present an exposure pathway to the soil beneath do not occur.
- Use a seal coat to seal cracks.

The following scheduling guidelines should be followed if cap inspection indicates that cap maintenance is necessary.

- If a crack, depression, or pothole is identified that exposes the underlying material, maintenance and repair activities should be scheduled as soon as practical (within 60 days).
- Minor surface cracks or ponding (not temporary puddles that form during rainstorms) that reduces the pavements ability to transport rainfall/stormwater to catch basins, but does not expose underlying material, will require a follow-up inspection within 3 to 6 months. If the follow-up inspection indicates that differential settlement in these areas is worsening (i.e., deeper, larger footprint, or cracking), then maintenance or repair must be completed within 6 months of the follow-up inspection. If there is no change to the area during the follow-up inspection, then monitoring of the area should continue at a frequency of every 6 months.
- Repairs of minor cracks, potholes, or otherwise damaged or deteriorated cap surfaces that do not expose underlying material should be made within the calendar year before they can get worse or provide a direct conduit for infiltration.

All maintenance activities should be documented on an inspection and maintenance form, with supporting sketches, figures, and/or photographs attached. An example form is provided in Exhibit A.1.1.

4.4 STORMWATER INFRASTRUCTURE MAINTENANCE

A visual inspection of all surface components of stormwater conveyance and management facilities that are within the cap boundaries shall be performed during each annual cap inspection to document any disturbance, erosion, or penetration concerns. Field observations must be documented on the inspection and maintenance form, along with documentation of any necessary maintenance or repairs.

4.5 FENCING

Several of the parcels contain security fencing isolating some or all of the parcel from public access. Security fencing that does not penetrate the cap may be repaired as needed. Fencing that does penetrate the cap and contacts refuse will need Ecology notification and approval for repairs.

4.6 UNFORESEEN EVENTS

An unforeseen emergency or extreme weather event, such as earthquakes, fires, or floods, or other natural or man-made disaster would trigger an out of sequence cap inspection to ensure that the cap integrity is maintained. Such unforeseen events could cause a sudden differential settlement of the cap that could affect the integrity of the cap, which may result in exposure to

the underlying material or methane gas, or could affect safe operation of the LFG control system. The following criteria for unforeseen events would trigger an inspection of the landfill cap.

- An earthquake along the Seattle fault that registers 4.0 or greater on the Richter scale.
- An earthquake within 100 miles of Seattle that registers 5.0 or greater on the Richter scale.
- A flood or major storm that produces greater than 3.0 inches of rainfall within a 24-hour period.
- Any fire that occurs on or below the cap.
- Any other damage in the area of the Landfill observed by the Parcel Owners and facility workers or the public, such as damage sustained by high winds, facility or vehicular accidents.

If any of the above unforeseen events occur, then the Site Coordinator should schedule a cap inspection with the appropriate personnel as soon as safe and practical (generally within 48 hours). Inspection and maintenance activities must be documented on an inspection and maintenance form, with any supporting sketches, figures, and photographs attached. If the integrity of the cap is significantly compromised as a result of an unforeseen event, Ecology must be notified within 1 business day of the discovery of the event and repairs initiated as soon as practicable.

5.0 Health and Safety

Maintenance personnel and contractors must follow general health and safety procedures while performing cap inspection and maintenance activities at the Settlement Area. Each facility that comprises the Settlement Area will have vehicular traffic and other potential hazards associated with active operation. Maintenance personnel and contractors must be aware of these hazards and take appropriate precautions while performing the work outlined in this Landfill CIMP. At a minimum, personnel preforming routine inspections and maintenance must wear a high visibility safety vest at all times and should be aware of traffic patterns and facility operations. If work on a specific parcel/facility requires other specific personal protective equipment (PPE), such as a hard hat or steel-toed boots, then the additional PPE requirements must be met to complete the inspection and maintenance work.

The work associated with this Landfill CIMP would not typically involve exposure to contaminated media beneath the cap; therefore, a site-specific health and safety plan is not necessary for this work.

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6.0 Reporting and Record Keeping

To document compliance with the Landfill CIMP, the Site Coordinator must keep the following records to document the completion of an operations, maintenance, and monitoring (OMM) event.

Inspection Records. These should include a completed Annual Cap Inspection and Maintenance Form and associated sketches and photographic documentation. These should also include any recommendations for maintenance.

In addition, the maintenance contractor must document the following and provide copies to the Site Coordinator within 60 days of the completion of a maintenance event.

Maintenance Records. These should include a description of the maintenance area and type of repair. These should also include photographic documentation and a field sketch and/or figure documenting the location.

In accordance with the OMMP, the results of the cap inspections and any necessary maintenance will be reported to Ecology annually in the OMM Annual Report. The Site Coordinator is responsible for compiling the necessary site-wide OMM documentation and submittal of the OMM Annual Report.

South Park Landfill

Landfill Post-Closure Operations, Maintenance, and Monitoring Plan

Attachment A.1
Landfill Cap Inspection and Maintenance Plan

Figures

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HERRERA

Cleanup Action Plan
OMMP
South Park Landfill
Seattle, Washington

Attachment A.1: Landfill Cap Inspection and Maintenance Plan
Figure A.1.1
Landfill Cap Requirements by Parcel

I:\GIS\Projects\COS-SPARK\MXD\CAP\2017 CAP-OCT\OMMP\LCMP\Figure A.1.1 Landfill Cap Requirements.mxd
9/28/2017

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Cleanup Action Plan
OMMP
South Park Landfill
Seattle, Washington

Attachment A.1: Landfill Cap Inspection and Maintenance Plan
Figure A.1.1a
Landfill Cap Boundary–SPPD Parcel

I:\GIS\Projects\COS-SPARK\MXD\CAP\2017 CAP-OCT\OMMP\LCMP\Figure A.1.1a Landfill Cap Boundary - SPPD Parcel.mxd
9/28/2017

RESERVED-TO BE UPDATED AFTER DEVELOPMENT

Legend

- Landfill Property Boundary (July 2017)
- Landfill Parcel
- Adjacent Parcel

S KENYON ST

SR 99 (W MARGINAL WAY S)

2ND AVE S

5TH AVE S

South Recycling and Disposal Station (SRDS)

Notes:
· This figure was current as of June 2016.
· Tax parcels provided by King County Geographic Information Systems Center.
· Orthoimagery provided by NearMap, September 27, 2015.

Abbreviation:
OMMP = Operation, Maintenance, and Monitoring Plan

N

0 50 100 200

Scale in Feet

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Cleanup Action Plan
OMMP
South Park Landfill
Seattle, Washington

Attachment A.1: Landfill Cap Inspection and Maintenance Plan
Figure A.1.1b
Landfill Cap Boundary–SRDS Parcel

I:\GIS\Projects\COS-SPARK\MXD\CAP\2017 CAP-OCT\OMMP\LCMP\Figure A.1.1b Landfill Cap Boundary - SRDS Parcel.mxd
9/28/2017

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Cleanup Action Plan
OMMP
South Park Landfill
Seattle, Washington

Attachment A.1: Landfill Cap Inspection and Maintenance Plan
Figure A.1.1c
Landfill Cap Boundary–Right-of-Ways

I:\GIS\Projects\COS-SPARK\MXD\CAP\2017 CAP-OCT\OMMP\LCMP\Figure A.1.1c Landfill Cap Boundary - ROW.mxd
9/28/2017

South Park Landfill

Landfill Post-Closure Operations, Maintenance, and Monitoring Plan

Attachment A.1
Landfill Cap Inspection and Maintenance Plan

Exhibit A.1.1
Cap Inspection and Maintenance Field Form

South Park Landfill

Cap Inspection and Maintenance Form

Date: _____ Location: _____

Inspector: _____ Owner: _____

☐**Annual Inspection** ☐**Non-Routine Inspection**

Annual Inspection must include a visual survey of the entire cap surface, including drainage features on surface components for stormwater systems. Complete the checklist (Form A) and attach to this form for documentation.

For Non-Routine Inspections, provide reason:

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Attach documentation as necessary (photographs, sketches, notes).

☐**Maintenance Event, provide reason:**

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Complete Maintenance Documentation (Form B) and attach for documentation.

South Park Landfill

Cap Inspection Form A

Date: _____ Location: _____

Inspector: _____ Owner: _____

☐ **Annual Inspection** ☐ **Non-Routine Inspection**

Reason: _____

VISUAL INSPECTION CHECKLIST

Asphaltic Concrete

	Yes	No	Needs Repair	If Yes, Describe:
Minor Cracking	☐	☐	☐	_____
Open Cracks/Ruts	☐	☐	☐	_____
Differential Settlement	☐	☐	☐	_____
Pot Holes	☐	☐	☐	_____
Pooling or Ponding	☐	☐	☐	_____
Separation of Pavement from Curbs, Gutters, or Catch Basins	☐	☐	☐	_____
Sloughing or Crumbling of Edge Materials	☐	☐	☐	_____
Erosion	☐	☐	☐	_____
Other Signs of Cap Damage, Failure, Disturbance	☐	☐	☐	_____

Recommended Maintenance or Repair Type/Location:

_____

_____

Low-Permeability Membrane

	Yes	No	Needs Repair	If Yes, Describe:
Erosion of Cover Soil	☐	☐	☐	_____
Exposed Geotextile Barrier	☐	☐	☐	_____
Holes/Signs of Unauthorized Digging	☐	☐	☐	_____

Recommended Maintenance or Repair Type/Location: _____

_____

Stormwater Management Facilities

	Yes	No	Needs Repair	If Yes, Describe:
Signs of Water Infiltration below Structures	☐	☐	☐	_____
Erosion of Soil	☐	☐	☐	_____
Exposed Geotextile Membrane	☐	☐	☐	_____
Holes/Signs of Unauthorized Digging	☐	☐	☐	_____
Invasive/Deep-Rooted Plants	☐	☐	☐	_____

Recommended Maintenance or Repair Type/Location: _____

_____

Attach necessary documentation such as photographs, sketches, and additional notes.

South Park Landfill

Cap Maintenance Form B

Date: _____ Location: _____ Owner: _____

Maintenance Contractor: _____

Reason for Maintenance: _____

_____

Describe maintenance location (attach sketch, photographs).

_____

_____

_____

Describe maintenance or repair performed (attach photos and additional documentation as necessary).

_____

_____

_____

_____

_____

_____

_____

Is the maintenance activity complete? ☐ Yes ☐ No

If no, explain:

_____

_____

_____

_____

Approval/inspection of maintenance/repair:

_____ _____

SITE COORDINATOR DATE

All maintenance and repair documentation must be provided to the Site Coordinator within 60 days of the completion of the maintenance/repair OR by March 1 if the activity is completed within 60 days prior to March 1.

South Park Landfill

Landfill Post-Closure Operations, Maintenance, and Monitoring Plan

Attachment A.2
Landfill Gas Monitoring and Contingency Plan

Table of Contents

1.0 Introduction A.2-1
1.1 PURPOSE AND APPLICABILITY A.2-1
1.2 LANDFILL GAS CONTROL SYSTEMS A.2-2
1.3 COORDINATION AND RESPONSIBILITIES A.2-2
1.3.1 Parcel Owners A.2-3
1.3.2 Subject Potentially Liable Persons A.2-3
1.3.3 Site Coordinator A.2-3
2.0 Landfill Gas Controls A.2-5
2.1 SPPD PARCEL LANDFILL GAS SYSTEM A.2-5
2.2 SRDS PARCEL LANDFILL GAS SYSTEM A.2-5
3.0 Landfill Gas Monitoring Plan A.2-7
3.1 PERIMETER PROBE MONITORING A.2-7
3.1.1 General Procedures for Perimeter Probe Monitoring A.2-7
3.1.2 Criteria for Reduction of Monitoring Locations and Frequency A.2-8
3.2 BUILDING MONITORING A.2-9
3.2.1 Contingency Actions A.2-10
3.3 PARCEL-SPECIFIC MONITORING REQUIREMENTS A.2-10
3.4 UNFORESEEN EVENTS A.2-10
4.0 Health and Safety A.2-11
5.0 Reporting and Record Keeping A.2-13
6.0 References A.2-15

List of Tables

Table A.2.1 Perimeter Gas Probe Locations
Table A.2.2 Perimeter Gas Probe Purge Times

List of Figures

Figure A.2.1 Landfill Gas Controls

Figure A.2.2 Buildings within the Landfill and within 100 Feet of the Landfill Boundary

Figure A.2.3 Perimeter Gas Probe Network

Figure A.2.4 Flow Chart for Triggers and Contingent Actions for Perimeter Probe Monitoring

Figure A.2.5 Flow Chart for Triggers and Contingent Actions for LFG Monitoring in On-Site Buildings

Figure A.2.6 Flow Chart for Triggers and Contingent Actions for LFG Monitoring in Off-Site Buildings

List of Exhibits

Exhibit A.2.1 Perimeter Probe and Building Monitoring Field Forms

List of Acronyms and Abbreviations

Acronym/ Abbreviation	Definition
CAP	Cleanup Action Plan
City	City of Seattle
Ecology	Washington State Department of Ecology
HASP	Health and Safety Plan
KIP	Kenyon Industrial Park
LEL	Lower explosive limit
LFG	Landfill gas
LFGMCP	Landfill Gas Monitoring and Contingency Plan
mL	Milliliters
OMM	Operations, maintenance, and monitoring
OMMP	Operations, Maintenance, and Monitoring Plan
PLP	Potentially liable person
PPE	Personal protective equipment
ppmv	Parts per million by volume
PVC	Polyvinyl chloride
SPPD	South Park Property Development, LLC
SR	State Route
SRDS	South Recycling and Disposal Station

1.0 Introduction

This Landfill Gas Monitoring and Contingency Plan (LFGMCP) is an attachment to the Landfill Post-Closure Operations, Maintenance, and Monitoring Plan (OMMP), which is an appendix to, and integral and enforceable part of, the Cleanup Action Plan (CAP) for the two largest parcels within the "Landfill Property" (defined below) and certain adjacent City of Seattle and Washington State right-of-ways (collectively defined as the "Settlement Area" that form a portion of the South Park Landfill Site. The South Park Landfill Site is a former municipal solid waste landfill in the South Park neighborhood of Seattle, Washington (Figure A.1 of the OMMP). It is located in the Lower Duwamish Valley near the western valley wall between State Route (SR) 509 and SR 99. The Settlement Area is within the Landfill Property, defined as the area of the Site where wastes were placed as part of South Park Landfill Operations. Details regarding the Site, environmental conditions, and specific components of the remedy are documented in the CAP.

The operations, maintenance, and monitoring (OMM) requirements related to landfill gas (LFG) are provided in this LFGMCP. The LFGMCP implementation will begin 180 days after the effective date of the Consent Decree in accordance with the schedule in the CAP.

1.1 PURPOSE AND APPLICABILITY

The goal of LFG control system OMM is to confirm that the landfill remedy is performing in a manner that protects human health and the environment. Specifically, this requires meeting the following LFG criteria under the Minimum Functional Standards (MFS) as defined in Washington Administrative Code (WAC) 173-304-460 and King County Board of Health Title 10 regulations:

- **On-Site Structures.** Methane concentrations inside buildings and structures within the landfill boundary must not exceed 1.25 percent by volume, or 25 percent of the lower explosive limit (LEL). This criterion is typically measured in the buildings/structures with either calibrated hand-held monitors or installed building monitors/alarms.
- **Perimeter Gas Probes.** Methane concentrations in soil at the landfill boundary must not exceed 5 percent by volume, the LEL for methane. This criterion is typically measured by LFG probes along the landfill boundary.
- **Off-Site Structures.** Methane concentrations inside buildings and structures outside the landfill boundary must not exceed 100 parts per million by volume (ppmv). This criterion is typically measured in the buildings/structures with either calibrated hand-held monitors or installed building monitors/alarms.

1.2 LANDFILL GAS CONTROL SYSTEMS

The LFG control system consists of parcel-specific solutions designed to operate separately, but be compatible and synergistic in how they control LFG Settlement Area-wide. Those parcels with engineered systems include a network of piping under the landfill cap and associated conveyance and venting components that can operate either passively or actively. LFG controls depend on the specific layout (location of buildings, pavement, utilities, etc.) of each parcel. Other parcels may not have LFG generation and do not, therefore, require LFG systems; yet others may rely on passive venting as sufficient means for meeting perimeter probe and on-site building compliance. Routine OMM of the systems and monitoring in buildings requires long-term coordinated access with the owners/operators of the buildings. For this reason, separate solutions were selected for remedy implementation and are shown in aerial extent on Figure A.2.1; descriptions of the remedies follow:

- **South Park Property Development, LLC (SPPD) Parcel.** The SPPD parcel has been designed to protect buildings on the SPPD parcel and to control gas migration along the southern, western, and eastern perimeter of the Settlement Area. This includes sections of 5th Avenue South, Occidental Avenue South, and South Sullivan Street that are adjacent to the SPPD parcel.
- **South Recycling and Disposal Station (SRDS) Parcel.** The LFG system for the SRDS parcel has been designed to protect buildings on the SRDS parcel and to control gas migration along parts of the northern and eastern perimeter of the Settlement Area. This includes the sections of 5th Avenue South and South Kenyon Street that are adjacent to the SRDS parcel.
- **Street Right-of-Ways.** As discussed above, the LFG systems at SPPD and SRDS are designed to control methane in the adjacent right-of-ways.

1.3 COORDINATION AND RESPONSIBILITIES

To accomplish the work to be performed under this LFGMCP in the most efficient manner, certain parties have elected to take the lead in performing various aspects of the work required. Language in this LFGMCP reflects this agreement. However, the PLPs who signed the Consent Decree remain strictly, jointly, and severally liable for the performance of any and all obligations under this LFGMCP. In the event the party identified as a lead should fail to timely and properly complete performance of all or any portion of its work, the other party or parties must perform that remaining work, if any.

LFG monitoring is conducted Settlement Area-wide by the Site Coordinator. To effectively and efficiently protect on-site building and off-site migration, the three LFG control systems need to operate separately, but in such a way as to supply LFG controls to the whole Settlement Area. The following sections define the roles required for compliance with this LFGMCP; one person may perform more than one role.

1.3.1 Parcel Owners

The Parcel Owners own the parcels and are responsible for compliance with their respective Environmental (Restrictive) Covenant, which includes requirements on landfill gas controls, monitoring, and mitigation, specific to the parcel's environmental covenant. As regards activities in this LFGMCP, the LFG system operator for each parcel reports to the Parcel Owner and is responsible for the day-to-day operations and maintenance of the parcel's LFG system, including building methane detectors and alarms, and the Parcel Owners or their assigned representatives report to the Site Coordinator quarterly.

The responsibilities in this document do not supersede or exclude other relevant regulations for owners of properties located on landfills, such as Seattle Building Code 1811.2 for protection of structures from methane intrusion.

1.3.2 Subject Potentially Liable Persons

The potentially liable persons (PLPs) who have signed onto the Consent Decree (referred to as "Subject PLPs") are responsible for compliance with the CAP including the OMMP, communications with Washington State Department of Ecology (Ecology), and for reporting of on-parcel activities. For the LFG system monitoring program, the Subject PLP who is a property owner/operator will maintain their on-parcel building methane detectors and alarms, will report quarterly to the Site Coordinator, will provide notifications to Ecology and Public Health – Seattle & King County, and will implement contingent actions affecting the parcel's LFG system and on-parcel buildings.

1.3.3 Site Coordinator

The Site Coordinator is responsible for site-wide monitoring, including the quarterly site-wide LFG perimeter probe monitoring events, and for annual reporting. Additional clarification of his or her duties exists in the CAP, OMMP, and in later sections of this LFGMCP.

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2.0 Landfill Gas Controls

LFG controls depend on the specific layout (location of buildings, pavement, utilities, etc.) of the property, and monitoring in buildings requires long-term coordinated access with the owners/operators of the buildings. A general description of the LFG controls for each parcel is included in the following sections. Refer to Figure A.2.1 for the locations relative to one another. The locations of buildings within the landfill boundary and within 100 feet of the landfill boundary are shown on Figure A.2.2.

2.1 SPPD PARCEL LANDFILL GAS SYSTEM

An active LFG control system was installed at the SPPD parcel as part of the Interim Action redevelopment in 2014 and 2015. The system consists of a network of vertical gas collection wells and horizontal gas collection trenches. LFG is extracted under an applied vacuum (via vacuum blower) and discharged out a vent stack in the surface component equipment enclosure, which is located on the northwest portion of the parcel.

The LFG system is owned by SPPD and was activated in December 2014 as part of the SPPD Interim Action. It will be operated by SPPD or their delegated LFG OMM professional in accordance with a Landfill Gas Collection and Control System OMMP (Farallon 2016), which has been prepared by Farallon Consulting, LLC, approved by Ecology, and is on file at Ecology.

2.2 SRDS PARCEL LANDFILL GAS SYSTEM

The LFG control system proposed for the SRDS parcel (as of November 2015) includes a gas collection network of piping under the landfill cap and conveyance and venting components. The system is being planned to operate passively; however, in the event additional collection control is necessary, the system can be converted to an active collection system. An active manifold will be installed next to the passive manifold at the time the passive system is built. The active manifold could be connected to a blower and a vacuum applied for LFG extraction to allow passive-to-active collection at discrete locations throughout the site.

The LFG system will be owned by the City of Seattle (City) and will likely be constructed and in service starting between 2020 and 2023. It will be operated by the City or their delegated LFG OMM professional in accordance with a LFG Collection and Control System OMMP, which will likely be prepared as part of the Engineering Design Report for the SRDS Interim Action. Once approved by Ecology, it will be on file at Ecology.

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3.0 Landfill Gas Monitoring Plan

Monitoring LFG collection systems serves two purposes: (1) performance monitoring within the system to guide its operation and (2) post-construction compliance monitoring to confirm that the system is controlling LFG emissions as required in the remedial action. Monitoring will be performed on a parcel-by-parcel basis because the LFG controls are parcel-dependent. The primary goal of perimeter probe monitoring is to evaluate potential lateral off-site LFG migration and the primary goal of building monitoring is to protect human health. This monitoring is necessary to document the effectiveness of the LFG system(s) at the Settlement Area.

Throughout this section (and consistent with common terminology in LFG discussions), the term "monitoring" will refer to field measurements using calibrated meters, while the term "sampling" refers to the collection of a LFG, soil vapor, or ambient air sample for analysis at a laboratory. Perimeter gas probes can be monitored with meters or sampled for later analysis at a laboratory.

3.1 PERIMETER PROBE MONITORING

Methane concentrations in soil at the landfill boundary must not exceed 5 percent by volume, the LEL for methane. This criterion will be measured by monitoring LFG probes along the landfill boundary (perimeter probes) on a quarterly basis. The perimeter probes are shown on Figure A.2.3, and are summarized in Table A.2.1.

3.1.1 General Procedures for Perimeter Probe Monitoring

The preferred condition for LFG probe monitoring is low barometric pressure following at least 2 hours of falling barometric pressure, with a drop of at least 0.25 inches mercury. Barometer charts available at the following links will be used to forecast appropriate monitoring conditions. The first link provides a graphical barometric record over the previous 6 days from accessing the link; the second link provides a 10-day forecast map:

- http://www-k12.atmos.washington.edu/k12/grayskies/nw_weather.html (Tillman and Johnson 2015)
- http://www.wunderground.com/weather-forecast/US/WA/Seattle.html (The Weather Channel 2015)

LFG probe and vent monitoring will be conducted according to the general procedures summarized below:

- Calibrate Landtec GEM™ 2000 (Plus) or equivalent meter using a 4 percent oxygen span gas and a 50 percent methane/35 percent carbon dioxide calibration gas according to the instrument's instruction manual.

- Connect the meter to the LFG probe using silicone or polyethylene tubing and filter. Typically the probe will have a labcock or pressure fitting plug with a quick connect.
- Open the labcock or connect the quick connect and measure the barometric and static pressure at each probe with the meter prior to purging.
- If possible, measure the water level in the gas probe to determine the water level and to confirm that static water is not above the top of the probe screen. If the water level is above the probe screen, then the probe cannot be monitored.
- Purge the probe until methane, carbon dioxide, and oxygen percentages stabilize, defined as when readings change by less than 10 percent for three consecutive measurements over 10-second intervals.
- Evacuate a minimum of one probe volume before recording the final instrument readings. Note that 3/4-inch-diameter Schedule 40 polyvinyl chloride (PVC) probe volume is 100 milliliters (mL) per foot and 2-inch-diameter Schedule 40 PVC probe volume is 620 mL per foot. For reference, the GEM flow rate is 300 mL per minute. Table A.2.2 provides a summary of perimeter probe construction details and purging volumes.
- An SKC Inc., pump or equivalent (AirChek Sampler – intrinsically safe) may be used for deeper probes with larger volumes to decrease evacuation time. The pump has the capacity to evacuate at 3,000 mL per minute and would be connected directly to the LFG probe and then the meter with a barbed Tee connector.

Results for each perimeter monitoring event must be recorded on the Gas Probe Monitoring Field Form included in Exhibit A.2.1 (electronic forms, including those that download directly into a database, are also acceptable).

3.1.2 Criteria for Reduction of Monitoring Locations and Frequency

LFG production will continue to decline over time. A reduction of monitoring frequency may be allowed if the LFG systems are stable and perimeter monitoring results are consistently less than criteria thresholds.

As part of the Annual Report, the Subject PLPs may request reductions in sample locations and/or frequency (on a probe-by-probe basis). The request will include supporting data and rationale. The request will become effective once approved by Ecology. Significant changes in individual LFG systems (such as system failure, or a switch from active to passive) may warrant additional sampling as part of their operations.

3.2 BUILDING MONITORING

All occupied buildings on the Settlement Area (on-site buildings) must have continuous (i.e., operate 24 hours per day, 7 days per week) methane detectors with alarms. Methane concentrations inside buildings and structures within the landfill boundary must not exceed 1.25 percent by volume, or 25 percent of the LEL; meters in all buildings will be set with a low alarm warning at 10 percent of the LEL and the high alarm at 25 percent of the LEL. Building monitoring will be conducted based on the flowchart presented in Figure A.2.5. Quarterly inspections of these alarms must be completed in accordance with the manufacturer's recommendations to ensure proper operation and protection of human health. The inspections will also consist of calibrating the detector consistent with the manufacturer's operating manual.

Methane concentrations inside buildings and structures outside the landfill boundary must not exceed 100 ppmv, equivalent to 0.01 percent by volume or 0.2 percent of the LEL. Off-site building monitoring will be conducted by the building owners following notification, as indicated in the flow chart presented in Figure A.2.6. These criteria are typically measured in the buildings/structures with either handheld or mounted equipment. It should be noted that each building is different, so the specific protocol for each building is field-dependent. Monitoring indoor air for methane if needed for off-site buildings will be conducted in accordance with the following general procedures.

- Notify the Parcel Owners and tenants and offer to perform building monitoring.
- Inspect the building to assess construction characteristics, such as heating, ventilation, and air conditioning systems, and for possible sources of volatile contaminants that may influence monitoring results, such as petroleum hydrocarbons and chemical products.
- Monitor interiors of buildings using a detector capable of measuring methane to below 100 ppmv according to manufacturer instructions.
- Complete a walk-through of the building with the monitoring instrument operating continuously; pay particular attention to cracks in concrete slab floors or other features with a potential for LFG flow.
- Record measurements when methane is detected, noting locations and concentrations.

Results for each off-site building monitoring event must be recorded on the Building Monitoring Field Form included in Exhibit A.2.1.

3.2.1 Contingency Actions

If the methane concentrations described in Section 3.2 are exceeded, then additional contingency actions must occur. Refer to the building monitoring flow charts for triggers and contingent actions, included as Figure A.2.5 (on-site) and Figure A.2.6 (off-site).

3.3 PARCEL-SPECIFIC MONITORING REQUIREMENTS

Compliance monitoring for LFG is limited to the perimeter probe monitoring described in Section 3.1; however, each of the active LFG control systems includes operational monitoring requirements in order to maintain efficient operations. This operational monitoring is part of the site-specific LFG system OMMPs referenced in Section 2.0.

3.4 UNFORESEEN EVENTS

An unforeseen emergency or extreme weather event, such as earthquakes, fires, or floods, or other natural or man-made disaster would trigger a requirement for an immediate Settlement Area-wide inspection to ensure the integrity of the LFG control systems and controls are maintained. Such unforeseen events could cause a sudden differential settlement of the landfill contents and/or cap that could affect the integrity of the landfill cap and the infrastructure below, including LFG vent systems, monitoring probes, and electronic controls. This compromise may result in exposure to methane gas or could affect safe operation of the LFG control system. The following criteria for unforeseen events would trigger an inspection of the LFG systems and controls.

- An earthquake along the Seattle fault that registers 4.0 or greater on the Richter scale.
- An earthquake within 100 miles of Seattle that registers 5.0 or greater on the Richter scale.
- A flood or major storm that produces greater than 3.0 inches of rainfall within a 24-hour period.
- Any fire that occurs on or below the cap.
- Any other damage in the area of the Settlement Area observed by the Parcel Owners and facility workers or the public, such as damage sustained by high winds, facility, or vehicular accident(s).

If any of the above unforeseen events occur, then the Site Coordinator should schedule an inspection with the appropriate personnel as soon as safe and practical (generally within 48 hours). If the integrity of the LFG control systems or controls are significantly compromised as a result of an unforeseen event, Ecology must be notified and repairs must be initiated no later than within 24 hours of the discovery of the event or as soon as practicable.

4.0 Health and Safety

Maintenance personnel and contractors must follow general health and safety procedures while performing LFG OMM activities at the Settlement Area. Each facility that comprises the Settlement Area will have vehicular traffic and other potential hazards associated with active operation. Maintenance personnel and contractors must be aware of these hazards and take appropriate precautions while performing the work outlined in this LFGMCP. At a minimum, personnel performing routine OMM must wear a high visibility safety vest at all times and should be aware of traffic patterns and facility operations. If work on a specific parcel or facility requires other specific personal protective equipment (PPE), such as a hard hat or steel toed boots, then the additional PPE requirements must be met to complete the inspection and maintenance work.

A site-specific Health and Safety Plan (HASP) must be prepared for the operation of active LFG systems. A HASP should be included in the parcel-specific OMMP for each parcel (SPPD and SRDS).

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5.0 Reporting and Record Keeping

To document compliance with this LFGMCP, the Site Coordinator must keep the following records to document the completion of an OMM event:

- Routine monitoring, which, at a minimum, should include copies of field OMM forms, direct upload into a database, or a tabular summary of routine monitoring data.
- Maintenance Records, which should include a description of the maintenance performed and reason/type of repair. This should also include photographic documentation if appropriate.

In accordance with the OMMP, the results of the LFG OMM will be reported annually to Ecology in the OMM Annual Report, which is due on March 31 of each year for the previous calendar year's OMM activities. The Site Coordinator is responsible for compiling the necessary site-wide OMM documentation and submittal of the OMM Annual Report. A brief discussion of any important or relevant changes in Settlement Area conditions or personnel changes will be included in the annual monitoring reports. In addition, recommendations for a reduction in frequency or location for the perimeter probe monitoring network will be included, as applicable.

Individual Parcel Owners are responsible for other reporting associated with parcel-specific LFG system OMM outside of CAP requirements. For example, to comply with permit requirements for discharging treated LFG to the atmosphere, separate annual reports providing results of monitoring and information regarding discharge treatment equipment maintenance may be required by the Puget Sound Clean Air Agency.

All records, reports, documents, and underlying data relevant to the implementation of this LFGMCP shall be maintained by the Site Coordinator for a period consistent with requirements in the Consent Decree.

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6.0 References

Farallon Consulting (Farallon). 2013. *South Park Landfill Site Interim Action Work Plan, Appendix C: Interim Action Compliance Monitoring Plan*. Prepared for South Park Property Development, LLC. 22 February.

Farallon Consulting (Farallon). 2016. *South Park Landfill Site Landfill Gas Collection and Control System Operation, Maintenance, and Monitoring Plan*. Prepared for South Park Property Development, LLC. 19 May.

Herrera and Aspect Consulting (Herrera and Aspect). 2015. *Interim Action Work Plan: South Transfer Station Phase II*. 24 July.

Tillman, James E. and Neal C. Johnson. 2015. Live from Earth and Mars. Department of Atmospheric Sciences, University of Washington; supported by NASA IITA Program, Office of Aeronautics; in collaboration with Pathfinder Project, NASA JPL, Office Space Sciences. http://www-k12.atmos.washington.edu/k12/. Last accessed 11/19/2015.

The Weather Channel, LLC. 2015. Weather Underground. http://www.wunderground.com/. Last accessed 11/19/2015.

South Park Landfill

Landfill Post-Closure Operations, Maintenance, and Monitoring Plan

Attachment A.2
Landfill Gas Monitoring and Contingency Plan

Tables

Table A.2.1
Perimeter Gas Probe Locations

Perimeter Probe	Adjacent LFG System	Adjacent Off-Site Buildings[1]
GP-37	SRDS	No
GP-09	SRDS	No
GP-26	SRDS	Yes
GP-23	SRDS	Yes
GP-07	SRDS/SPPD	Yes
GP-27	SPPD	Yes, 5th Avenue South
GP-28	SPPD	Yes, 5th Avenue South
GP-29	SPPD	Yes, 5th Avenue South
GP-16[2]	SPPD	No
GP-31[2]	SPPD	Yes
GP-15	SPPD	Yes, Lenci/Emerson
GP-32[2]	SPPD	Yes
GP-03[2]	SPPD	No
GP-13	SPPD	Yes
GP-11	SPPD	Yes
GP-38	None	No
GP-33	SPPD	Yes

Notes:

1 Adjacent off-site buildings within 100 feet are shown on Figure A.2.2.
2 Due to shallow groundwater, these probes are only measured when the water table is low enough for the probes to function.

Abbreviations:

Lenci Lenci Frank Corporation
LFG Landfill gas
SPPD South Park Property Development, LLC
SRDS South Recycling and Disposal Station

Table A.2.2
Perimeter Gas Probe Purge Times

Gas Probe	Depth (ft)	Stickup (ft)	Total Length (ft)	Probe Diameter (ft)	Probe Radius (ft)	Volume (ft^3)	Volume (cc)	GEM™2000 1 Purge Volume Time 300 cc/min pump (min)	SKC Inc. Pump 1 Purge Volume Time 3,000 cc/min pump (min)
GP-37	10	0	10	0.063	0.031	0.03	868	2.89	0.29
GP-09	9	1.35	10.35	0.063	0.031	0.03	899	3.00	0.30
GP-26	10	0	10	0.063	0.031	0.03	868	2.89	0.29
GP-23	6	2	8	0.167	0.083	0.17	4,940	16.47	1.65
GP-07	4.5	1.48	5.98	0.063	0.031	0.02	519	1.73	0.17
GP-27	14	0	14	0.063	0.031	0.04	1,216	4.05	0.41
GP-28	12	0	12	0.063	0.031	0.04	1,042	3.47	0.35
GP-29	10	0	10	0.063	0.031	0.03	868	2.89	0.29
GP-16	7.5	2	9.5	0.167	0.083	0.21	5,867	19.56	1.96
GP-31	10	0	10	0.063	0.031	0.03	868	2.89	0.29
GP-15	7	2	9	0.167	0.083	0.20	5,558	18.53	1.85
GP-32	10	0	10	0.063	0.031	0.03	868	2.89	0.29
GP-03	7	1.35	8.35	0.063	0.031	0.03	725	2.42	0.24
GP-13	4.5	2	6.5	0.167	0.083	0.14	4,014	13.38	1.34
GP-11	5.5	2	7.5	0.167	0.083	0.16	4,632	15.44	1.54
GP-38	10	0	10	0.063	0.032	0.03	882	2.94	0.29
GP-33	10	3.2	13.2	0.063	0.032	0.04	1,165	3.88	0.39

Abbreviations:

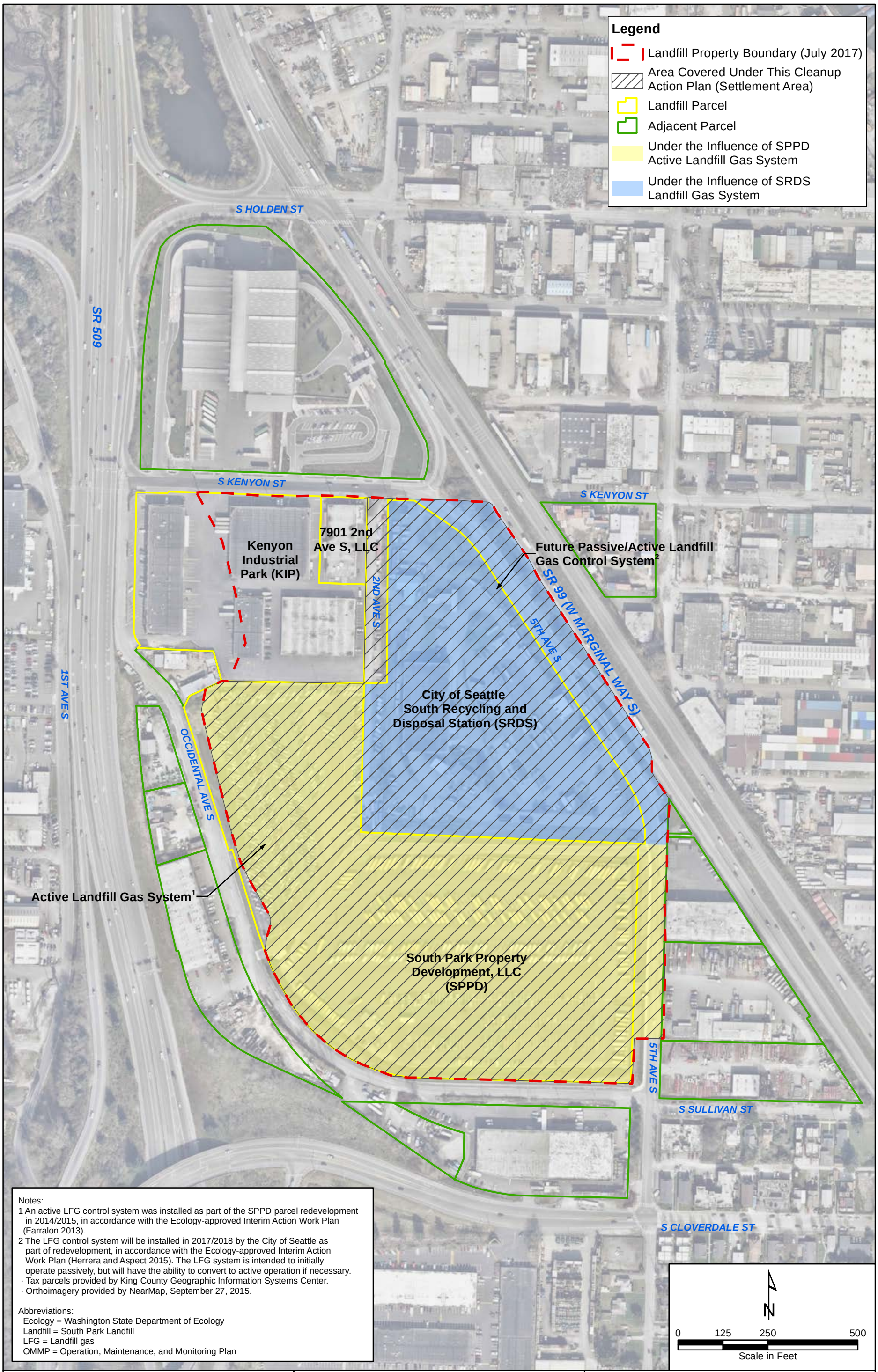
cc Cubic centimeters
ft Feet
ft^3 Cubic foot
min Minutes

South Park Landfill

Landfill Post-Closure Operations, Maintenance, and Monitoring Plan

Attachment A.2
Landfill Gas Monitoring and Contingency Plan

Figures



Notes:
1 An active LFG control system was installed as part of the SPPD parcel redevelopment in 2014/2015, in accordance with the Ecology-approved Interim Action Work Plan (Farralon 2013).
2 The LFG control system will be installed in 2017/2018 by the City of Seattle as part of redevelopment, in accordance with the Ecology-approved Interim Action Work Plan (Herrera and Aspect 2015). The LFG system is intended to initially operate passively, but will have the ability to convert to active operation if necessary.
· Tax parcels provided by King County Geographic Information Systems Center.
· Orthoimagery provided by NearMap, September 27, 2015.

Abbreviations:
Ecology = Washington State Department of Ecology
Landfill = South Park Landfill
LFG = Landfill gas
OMMP = Operation, Maintenance, and Monitoring Plan

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Attachment A.2: Landfill Gas Monitoring and Contingency Plan
Figure A.2.1
Landfill Gas Controls

Notes:
· Tax parcels provided by King County Geographic Information Systems Center.
· Orthoimagery provided by NearMap, September 27, 2015.

Abbreviations:
IA = Interim Action
OMMP = Operation, Maintenance, and Monitoring Plan

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Attachment A.2: Landfill Gas Monitoring and Contingency Plan
Figure A.2.2
Buildings within the Landfill and within 100 Feet of the Landfill Boundary

I:\GIS\Projects\COS-SPARK\MXD\CAP\2017 CAP-OCT\OMMP\LGMCP\Figure A.2.2 Buildings within 100 feet of the Landfill Boundary.mxd
9/28/2017

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Attachment A.2: Landfill Gas Monitoring and Contingency Plan
Figure A.2.3
Perimeter Gas Probe Network

I:\GIS\Projects\COS-SPARK\MXD\CAP\2017 CAP-OCT\OMMP\LGMCP\Figure A.2.3 Perimeter Gas Probe Network.mxd
9/28/2017

START HERE
for Perimeter Probe Monitoring

Measure LFG concentrations at Perimeter Probes
under Site Coordinator (SC) oversight
(locations listed on table below and Figure A.2.3)

Perimeter LFG probes are assessed probe by probe

Is the methane concentration < 1.25% by volume (25% of LEL)

Yes → Record results and return to routine monitoring program.

No

Are methane concentrations < 5% by volume

Yes → Has this LFG level been shown to be protective previously? (see table)

Concentrations are between 1.25 and 5%.

Yes → Review LFG system at adjacent parcel and continue monitoring probe weekly until situation returns to < 1.25% or is demonstrated to be protective in adjacent buildings.

No, new condition

No

Perimeter Probe Locations

Perimeter Probe	Adjacent LFG System	Adjacent Off-site Buildings [1]
GP-37	SRDS	No
GP-09	SRDS	No
GP-26	SRDS	Yes
GP-23	SRDS	Yes
GP-07	SRDS/SPPD	Yes
GP-27	SPPD	Yes, 5th Avenue South
GP-28	SPPD	Yes, 5th Avenue South
GP-29	SPPD	Yes, 5th Avenue South
GP-16 [2]	SPPD	No
GP-31 [2]	SPPD	Yes
GP-15	SPPD	Yes, Lenci/Emerson
GP-32 [2]	SPPD	Yes
GP-03 [2]	SPPD	No
GP-13	SPPD	Yes
GP-11	SPPD	Yes
GP-38	None	No
GP-33	SPPD	Yes

Notes:
1 Adjacent off-site buildings within 100 feet are shown on Figure A.2.2.
2 Due to shallow groundwater, these probes are only measured when the water table is low enough for the probes to function.

Contingent Action Triggered by Exceedance

1. SC notifies the Ecology PM, Public Health – Seattle & King County, and the rest of the PLP Group.
2. Parcel staff adjust adjacent LFG system to increase control on LFG, and continue DAILY monitoring at probe until control is established (using criteria above) then weekly for 4 weeks.
2. SC arranges monitoring of indoor air for LFG in any off-site buildings within 100 feet of the Landfill boundary (Figure A.2.2). Refer to Figure A.2.6 for triggers and actions based on indoor measurements.
3. SC notifies Ecology PM and Public Health – Seattle & King County of the actions taken and their effectiveness. If the adjustments to the adjacent gas system are not effective, then a plan must be prepared and submitted for approval.
4. SC reports exceedances and actions in Annual Report to Ecology.

Abbreviations: Ecology = Washington State Department of Ecology; LEL = Lower Explosive Limit; LFG = Landfill gas; OMMP = Operations, Maintenance, and Monitoring Plan; PLP = Potentially liable person; PM = Project manager; SPPD = South Park Property Development, LLC; SRDS = South Recycling and Disposal Station

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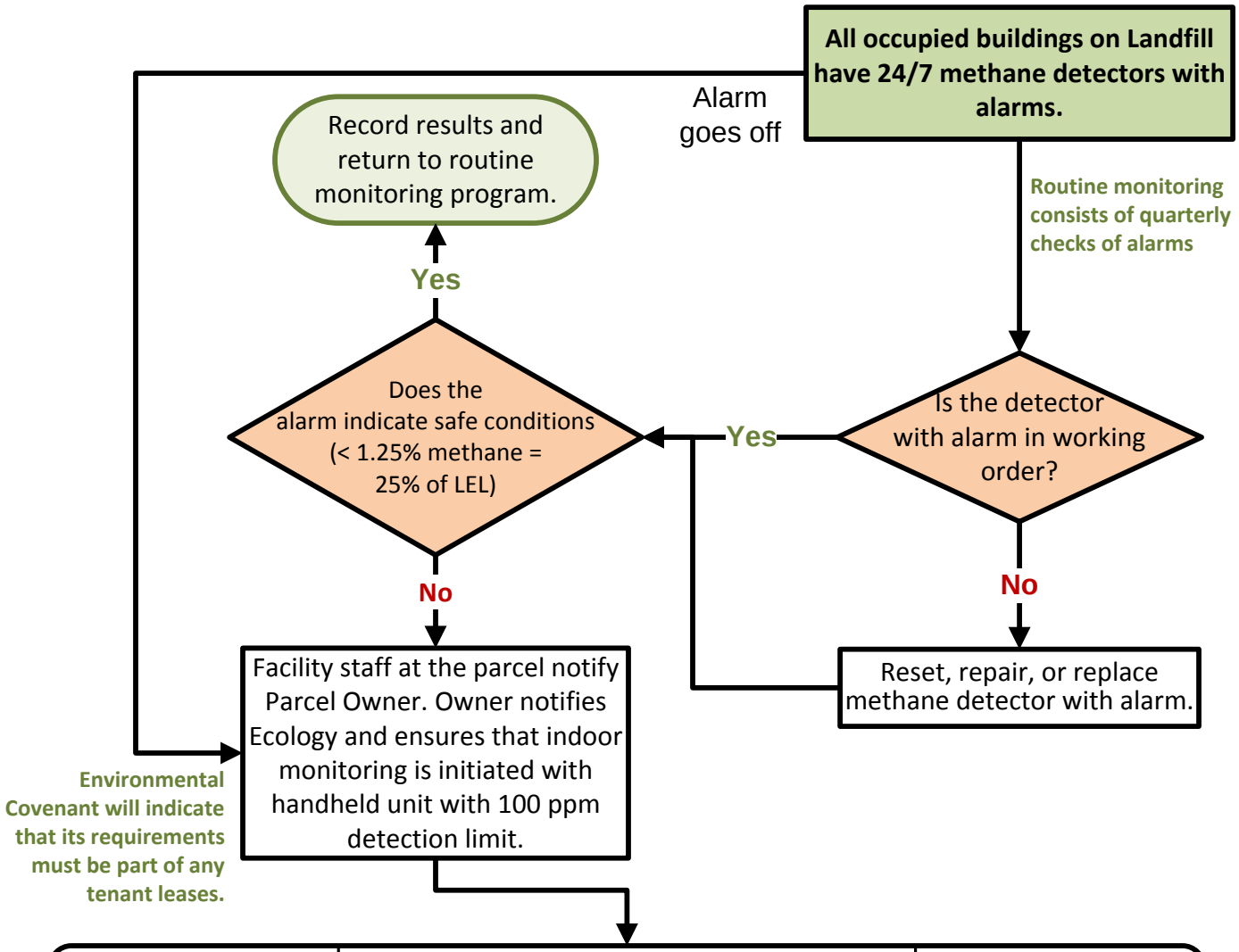
Attachment A.2: Landfill Gas Monitoring and Contingency Plan
Figure A.2.4
Flow Chart for Triggers and Contingent Actions for Perimeter Probe Monitoring

START HERE
for On-Site Building Monitoring



< 100 ppm Methane (by volume)	100 ppm < Methane < 1.25% (by volume)		> 1.25% Methane (by volume)
Record results and return to routine monitoring program.	Methane between 100 and 5,000 ppm	Methane between 5,000 ppm and 1.25%	• Evacuate building • ID source or entry point
	• Monitor daily	• Evacuate building • ID source or entry point	
	Verify methane concentrations with second meter		
	Notifications and Reporting by Owner • PLP Group • Owner already notified • Ecology PM • Public Health – Seattle & King County		
	Potential Corrective Measures • Seal cracks in foundation • Increase building ventilation • Modify LFG system operation, including switching to active, if passive		

Abbreviations: Ecology = Washington State Department of Ecology; Landfill = South Park Landfill; LEL = Lower Explosive Limit; LFG = Landfill gas; OMMP = Operations, Maintenance, and Monitoring Plan; PLP = Potentially liable person; PM = Project manager; ppm = Parts per million

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Attachment A.2: Landfill Gas Monitoring and Contingency Plan
Figure A.2.5
Flow Chart for Triggers and Contingent Actions for LFG Monitoring in On-Site Buildings

F:\projects\COS-SPARK\5000 - CAP\06 SPARK CAP Public Review Final\04 Appendix A OMMP\Attachment A.2 Landfill Gas MCP\03 Figures\Figure A.2.4 thru A.2.6 Flow Chart for Triggers and Perimeter Probe Monitoring_2017-0512.vsd

09/25/2017

START HERE
for Off-Site Building Monitoring

This chart is initiated when an adjacent perimeter probe has methane > 5% (Figure A.2.4). Required notice has been given except to the owner of the off-site building when this chart begins.

Does the building have a methane detector with alarm in working order and an access agreement?

No

Site coordinator (SC) gives notice to off-site building owner(s) and requests permission to come on-site for monitoring.

Was access granted?

No

SC notify Public Health – Seattle & King County of current conditions and lack of access.

Yes

SC initiates monitoring with handheld unit with 100 ppm detection limit.

Yes

Use the chart in Figure A.2.5 for on-site buildings, except the work is initiated by SC in accordance with the access agreement.

< 100 ppm Methane (by volume)	**100 ppm < Methane < 1.25% (by volume)**		**> 1.25% Methane (by volume)**
Record results and return to routine monitoring program.	Methane between 100 and 5,000 ppm	Methane between 5,000 ppm and 1.25%	• Evacuate building • ID source or entry point
	• Monitor daily	• Evacuate building • ID source or entry point	
	Verify methane concentrations with second meter		
	Notifications and Reporting • PLP Group • Owner already notified • Ecology PM • Public Health – Seattle & King County		
	Potential Corrective Measures • Seal cracks • Increase ventilation • Install methane detector with alarm • Perform active collection • Modify adjacent LFG system		

Abbreviations: Ecology = Washington State Department of Ecology; LFG = Landfill gas; OMMP = Operations, Maintenance, and Monitoring Plan; PLP = Potentially liable person; PM = Project Manager; ppm = Parts per million

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Attachment A.2: Landfill Gas Monitoring and Contingency Plan
Figure A.2.6
Flow Chart for Triggers and Contingent Actions for LFG Monitoring in Off-Site Buildings

F:\projects\COS-SPARK\5000 - CAP\06 SPARK CAP Public Review Final\04 Appendix A OMMP\Attachment A.2 Landfill Gas MCP\03 Figures\Figure A.2.4 thru A.2.6 Flow Chart for Triggers and Perimeter Probe Monitoring_2017-0512.vsd

09/25/2017

South Park Landfill

Landfill Post-Closure Operations, Maintenance, and Monitoring Plan

Attachment A.2
Landfill Gas Monitoring and Contingency Plan

Exhibit A.2.1
Perimeter Probe and Building Monitoring Field Forms

South Park Landfill

Gas Probe Monitoring Field Form

Gas Probe ID: _____ **Date and Time:** _____

Casing Volume Purged	Volume Purged (cc)	Purge Rate (ml/min)	Purge Time				CH_4 (% Volume)	CO_2 (% Volume)	O_2 (% Volume)	H_2S (% Volume)
0			0	min	0	sec				
1/4				min		sec				
1/2				min		sec				
3/4				min		sec				
1				min		sec				
1-1/4				min		sec				
1-1/2				min		sec				
1-3/4				min		sec				
2				min		sec				
2-1/4				min		sec				
2-1/2				min		sec				
2-3/4				min		sec				
3				min		sec				

Comments/Special Instructions:

Barometric Pressure: _____ **Well Diameter:** _____

Well Head Pressure: _____ **Water Level/Well Bottom:** _____ **Screen**: _____

Equipment Used: Gem™ 2000 (Plus), Water Level Meter, SKC Pump, Other: _____

Off-Site Building Monitoring

Date: _____ **Location:** _____

Inspector: _____ **Owner:** _____

Reason for Monitoring: _____

_____

_____

_____

_____

Instrument Used: _____

Describe monitoring; include locations, building type, cracks in foundation or floors, etc.:

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

South Park Landfill

Landfill Post-Closure Operations, Maintenance, and Monitoring Plan

Attachment A.3
Groundwater Monitoring and Contingency Plan

Table of Contents

1.0 Introduction A.3-1
1.1 PURPOSE AND APPLICABILITY A.3-1
1.2 GROUNDWATER AT THE LANDFILL A.3-1
1.3 COORDINATION AND RESPONSIBILITIES A.3-2
1.3.1 Parcel Owners A.3-2
1.3.2 Subject Potentially Liable Persons A.3-2
1.3.3 Site Coordinator A.3-3
2.0 Long-Term Groundwater Monitoring A.3-5
2.1 MONITORING WELL NETWORK A.3-5
2.2 SETTLEMENT AREA-WIDE GROUNDWATER MONITORING COMPONENTS A.3-6
2.3 ANALYTICAL SCHEDULE A.3-7
2.4 MONITORING FREQUENCY A.3-8
2.5 UNFORESEEN EVENTS A.3-8
3.0 Groundwater Contingency Action Triggers A.3-11
3.1 TRIGGER CONDITIONS FOR VINYL CHLORIDE A.3-11
3.2 CONTINGENT RESPONSES TO TRIGGER CONDITIONS A.3-12
3.3 CONTINGENT TRIGGERS AND ACTIONS FOR IRON AND MANGANESE A.3-13
3.4 CONTINGENT TRIGGERS AND ACTIONS FOR ARSENIC A.3-13
4.0 Health and Safety A.3-15
5.0 Reporting and Record Keeping A.3-17
6.0 References A.3-19

List of Tables

Table A.3.1 Monitoring Well Network A.3-6
Table A.3.2 Analytical Schedule A.3-7

List of Figures

Figure A.3.1 Perimeter Groundwater Monitoring Well Network

Figure A.3.2 Flow Chart for Triggers and Contingent Actions for Groundwater Monitoring

List of Exhibits

Exhibit A.3.1 Sampling and Analysis Plan and Quality Assurance Project Plan

List of Acronyms and Abbreviations

Acronym/ Abbreviation	Definition
CAP	Cleanup Action Plan
COC	Chemical of concern
CPOC	Conditional point of compliance
CUL	Cleanup level
DCE	Dichloroethene
Ecology	Washington State Department of Ecology
GWMCP	Groundwater Monitoring and Contingency Plan
µg/L	Micrograms per liter
MTCA	Model Toxics Control Act
NAVD 88	North American Vertical Datum of 1988
OMM	Operations, maintenance, and monitoring
OMMP	Operations, Maintenance, and Monitoring Plan
PLP	Potentially liable person
PPE	Personal protective equipment
SAP	Sampling and Analysis Plan
SR	State Route
QAPP	Quality Assurance Project Plan

1.0 Introduction

This Groundwater Monitoring and Contingency Plan (GWMCP) is an attachment to the Landfill Post-Closure Operations, Maintenance, and Monitoring Plan (OMMP), which is an appendix to, and integral and enforceable part of, the Cleanup Action Plan (CAP) for the Settlement Area. The Settlement Area consists of the two largest parcels within the "Landfill Property" (defined below) and certain adjacent City of Seattle and Washington State right-of-ways. The Settlement Area is a portion of the South Park Landfill Site. The South Park Landfill Site is a former municipal solid waste landfill in the South Park neighborhood of Seattle, Washington (Figure 2.1 of the CAP). It is located in the Lower Duwamish Valley near the western valley wall between State Route (SR) 509 and SR 99. The "Landfill Property" is the area of the Site where wastes were placed as part of South Park Landfill Operations, and composes a portion of the South Park Landfill Site. Details regarding the Site, environmental conditions, and specific components of the remedy are documented in the CAP.

The Model Toxics Control Act (MTCA) CAP for the site requires long-term groundwater monitoring to continue until all groundwater chemicals of concern (COCs) are in compliance at the conditional point of compliance (CPOC). This plan presents the framework for that monitoring. The operations, maintenance, and monitoring (OMM) requirements related to groundwater are provided in this GWMCP. The GWMCP implementation will begin at a date in accordance with the schedule in the CAP.

1.1 PURPOSE AND APPLICABILITY

The goal of long-term groundwater monitoring is to confirm that the cleanup action is performing in a manner protective of human health and the environment. This includes assessing current groundwater concentrations and monitoring trends to confirm that vinyl chloride, *cis*-1,2-dichloroethene (DCE), benzene, arsenic, iron, and manganese concentrations continue to decrease over time and in a reasonable restoration timeframe. Long-term monitoring will confirm that trends in the concentrations either remain stable or decrease further, especially after cleanup actions are implemented (landfill cap and landfill gas extraction).

1.2 GROUNDWATER AT THE LANDFILL

The physical conceptual site model for the landfill is discussed in greater detail in Section 3.1 of the CAP. At the Landfill Property, groundwater has been investigated in three zones:

- **The Perched Zone.** A shallow zone of groundwater and infiltrating stormwater, typically less than 1 foot in thickness perched on top of the Silt Overbank Deposit where it is present. This zone reflects very localized conditions.

- **A-Zone Groundwater.** The groundwater in the Duwamish Valley Aquifer beneath the Silt Overbank Deposit, generally located at an elevation from 0 to -15 feet North American Vertical Datum of 1988 (NAVD 88).
- **B-Zone Groundwater.** Groundwater deeper in the Duwamish Valley Aquifer, generally at an elevation from -15 to -35 feet NAVD 88 but above the estuarine/marine deposits. This zone does not exist along the upgradient edge of the landfill near the valley wall because the Shallow Aquifer becomes thinner and only the A-Zone is present.

Groundwater migration through the Duwamish Valley Aquifer is through both the A-Zone and the B-Zone.

1.3 COORDINATION AND RESPONSIBILITIES

Long-term groundwater monitoring is conducted Settlement Area-wide by the Site Coordinator. The following sections define the roles required for compliance with this GWMCP; one person may perform more than one role. Roles are discussed in Section 2.0 of the OMMP and that language governs. The language below is intended to clarify those roles for groundwater monitoring. To accomplish the work to be performed under this GWMCP in the most efficient manner, certain parties have elected to take the lead in performing various aspects of the work required. Language in this GWMCP reflects this agreement. However, the potentially liable persons (PLPs) who signed the Consent Decree remain strictly, jointly, and severally liable for the performance of any and all obligations under this GWMCP. In the event the party identified as a lead should fail to timely and properly complete performance of all or any portion of its work, the other party or parties must perform that remaining work, if any.

1.3.1 Parcel Owners

The Parcel Owner is responsible for filing an Environmental (Restrictive) Covenant on their property and for compliance with the Environmental (Restrictive) Covenant, which includes prohibitions and requirements on groundwater use, groundwater monitoring, access, and noninterference with remedial action.

1.3.2 Subject Potentially Liable Persons

The PLPs who have signed onto the Consent Decree (referred to as “Subject PLPs”) are responsible for compliance with the CAP including the OMMP, communications with Washington State Department of Ecology (Ecology), and for reporting of on-parcel activities.

Subject PLPs who are also Parcel Owners will be responsible for implementing the CAP requirements at the parcel for which they are the owner.

Under the terms of the CAP, if groundwater contingent actions are triggered during monitoring, the Subject PLPs will be responsible for working with Ecology to develop an approach, scope of work, and schedule consistent with the CAP requirements and later sections of this GWMCP.

1.3.3 Site Coordinator

The Site Coordinator is responsible for Settlement Area-wide monitoring, including the quarterly site-wide groundwater monitoring events, and for annual reporting. Additional clarification of his or her duties exists in the CAP, OMMP, and in later sections of this GWMCP.

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2.0 Long-Term Groundwater Monitoring

The discussion in this section is intended to establish expectations regarding the scope of the groundwater monitoring program. A Sampling and Analysis Plan (SAP) with an associated Quality Assurance Project Plan (QAPP) for the GWMCP are provided in Exhibit A.3.1.

With Ecology's written approval, the GWMCP may be modified in the future as needed to support long-term monitoring as detailed in Section 2.3 of the OMMP (OMMP Updates and Revisions). Modifications may include changes in the monitoring well network, analytical requirements, or sampling frequency, and will be conducted in accordance with the OMMP and Consent Decree requirements.

2.1 MONITORING WELL NETWORK

A long-term groundwater monitoring well network at and near the Settlement Area includes 14 wells, as described in this section. The existing monitoring well network will be used to monitor groundwater conditions at, and downgradient of, the Settlement Area. The locations of the wells are shown on Figure A.3.1, and the wells are described in Table A.3.1.

Table A.3.1
Monitoring Well Network

Monitoring Well	Location	Zone	Screened Interval (feet bgs)
Upgradient Wells Representing Quality of Groundwater Entering the Landfill			
MW-12	Upgradient	A-Zone	10–15
MW-14	Upgradient	A-Zone	11.5–21.5
MW-29	Upgradient	A-Zone	20–30
Downgradient Wells Representing Conditions at the Edge-of-Refuse (POC wells)			
MW-18	Edge-of-refuse	B-Zone	30–40
MW-25	Downgradient	A-Zone	22–27
MW-32	Edge-of-refuse	A-Zone	19–24
MW-33	Edge-of-refuse	A-Zone	20–25
MW-26	Downgradient	A-Zone	15–25
MW-27	Downgradient	A-Zone	10–20
MW-10	Downgradient	B-Zone	35–45
MW-24	Downgradient	B-Zone	35–45
MW-08	Downgradient	B-Zone	35.5–45.5
Downgradient Wells Representing Conditions near the Former Glitsa Property			
MW-30	Downgradient	Perched Zone	8–13
MW-31	Downgradient	A-Zone	18–23

Abbreviations:
bgs Below ground surface
Glitsa Glitsa American, Inc.
POC Point of compliance

2.2 SETTLEMENT AREA-WIDE GROUNDWATER MONITORING COMPONENTS

Groundwater monitoring will consist of measuring groundwater levels, sampling groundwater for the site-specific COC (such as vinyl chloride and other relevant chemicals), and reporting the groundwater flow directions and laboratory analytical results for each monitoring event. Refer to the SAP/QAPP included as Exhibit A.3.1 for details regarding the monitoring components, field methods, and associated sampling procedures.

2.3 ANALYTICAL SCHEDULE

Groundwater samples will be analyzed for the COCs (vinyl chloride, iron, manganese, benzene, *cis*-1,2-DCE, and arsenic), and parameters useful for understanding geochemical conditions. These parameters, presented in Table A.3.2, shall be monitored during each routine groundwater monitoring event in accordance with the schedule provided in Section 2.4. After the first 10 years of monitoring, requests can be made by the Subject PLPs to the Ecology to decrease this analytical schedule (including locations and analytes), as appropriate.

Table A.3.2
Analytical Schedule

Chemical/Parameter	Analytical Method[1]	Monitoring Well
Vinyl chloride	SW846 – 8260 Short List	All wells
Iron, total	SW846 –6020 Short List	All wells
Manganese, total	SW846 – 6020 Short List	All wells
Benzene	SW846 – 8260 Short List	MW-25
cis-1,2-DCE	SW846 – 8260 Short List	All wells
Arsenic, dissolved	SW846 – 6020 Short List	MW-12, MW-08, MW-10, MW-18, MW-24, MW-25, MW-26, MW-27, MW-32, and MW-33
Specific conductivity	Field parameter	All wells
pH	Field parameter	All wells

Notes:
1 An equivalent, U.S. Environmental Protection Agency-approved method may be substituted.

2.4 MONITORING FREQUENCY

Long-term monitoring will have the following schedule:

Years 1 through 5: Monitoring will occur quarterly but be reported annually unless a contingency trigger occurs. Long-term groundwater monitoring will include vinyl chloride, iron and manganese, cis-1,2-DCE (the precursor for vinyl chloride) in wells where vinyl chloride is measured, benzene in one well in the northern part of the landfill (MW-25) to track a localized plume that appears to originate in upgradient of the Settlement Area, and arsenic in wells MW-12, MW-08, MW-10, MW-18, MW-24, MW-25, MW-26, MW-27, MW-32, and MW-33. Note that MW-27 is not a CPOC well for arsenic. If benzene remains in compliance in MW-25 for 2 years (eight additional quarters), benzene analysis would be terminated. If iron and manganese concentrations are stable or decreasing for 2 years (eight additional quarters) decreased frequency of monitoring may be requested. If arsenic remains in compliance in MW-08, MW-10, MW-18, MW-24, MW-25, MW-26, MW-32, and MW-33 for 2 years (eight additional quarters), arsenic analysis would be terminated.

Years 6 through 10: Monitoring will occur semi-annually in the wet and dry seasons, but wells that have been in compliance for the previous 2 years would be dropped from the sampling requirements. The list of analyses would also be decreased to field parameters and those COCs that remain out of compliance. Monitoring results would be reported annually unless a contingency trigger occurs.

Year 11 and below: Monitoring would continue on an annual basis, if and only if one or more wells remained out of compliance. Monitoring would be limited to those wells and COCs that are not in compliance. Monitoring results would be reported annually unless a contingency trigger occurs.

2.5 UNFORESEEN EVENTS

An unforeseen emergency or extreme weather event, such as earthquakes, fires, or floods, or other natural or man-made disaster would trigger an inspection of the monitoring well network. Such unforeseen events could cause a sudden differential settlement of the cap that could affect the integrity of the monitoring wells. The following criteria for unforeseen events would trigger an inspection of the monitoring well network.

- An earthquake along the Seattle fault that registers 4.0 or greater on the Richter scale.
- An earthquake within 100 miles of Seattle that registers 5.0 or greater on the Richter scale.

- A flood or major storm that produces greater than 3.0 inches of rainfall within a 24-hour period.
- Any fire that occurs on or below the cap.
- Any other damage in the area of the Settlement Area observed by the parcel owners and facility owners or the public, such as damage sustained by high winds, facility, or vehicular accident.

If any of the above unforeseen events occur, then the Site Coordinator should schedule an inspection of the monitoring well network with the appropriate personnel as soon as safe and practical (generally within a few weeks). If the integrity of critical monitoring wells is significantly compromised as a result of an unforeseen event, Ecology must be notified and repairs or replacement must be initiated as soon as practicable.

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3.0 Groundwater Contingency Action Triggers

The landfill has been closed for almost 50 years, and groundwater conditions over the last decade indicate that only vinyl chloride, arsenic, iron, and manganese exceed the groundwater cleanup levels (CULs) at the CPOC; and that these concentrations are continuing to decrease slowly by means of natural attenuation. A long-term groundwater monitoring well network at and near the Settlement Area includes 14 wells. This existing well network will be used to monitor groundwater conditions at, and downgradient of, the Settlement Area. Contingency action is discussed in Section 6.2.4 of the CAP and that language governs. The language below is intended to repeat the language for ease of use in this document. A flow-chart outlining the contingency plan is included as Figure A.3.2.

3.1 TRIGGER CONDITIONS FOR VINYL CHLORIDE

Two conditions that will trigger contingent actions will be monitored in the existing compliance monitoring well network:

- **Condition 1.** Condition 1 (the concentration trigger) is based on groundwater concentrations. In about half of the downgradient wells, the vinyl chloride concentrations exceed the CUL of 0.29 micrograms per liter (µg/L), with concentrations in one well (MW-25) fairly consistently between 0.7 and 1.4 µg/L. If concentrations in any downgradient well exceed 1.45 µg/L (5 times the CUL) for two consecutive sampling events, this constitutes Condition 1, and a contingent response is triggered. This trigger is not applied to MW-30 and MW-31, whose concentrations are affected by a non-Landfill Property source in addition to the Landfill Property.
- **Condition 2.** Condition 2 (the trend trigger) is based on the trend of groundwater concentrations over time in the monitoring wells. Condition 2 is reported using trend plots supported with simple statistical tools in ProUCL.[1] Condition 2 is designed to capture statistically meaningful increases in groundwater concentrations. The trend identification will use a well-established, non-parametric statistical method for trend analysis available in ProUCL called the Mann-Kendall method and will be applied to downgradient wells where the concentration of vinyl chloride is greater than the CUL. The trend analysis will include MW-31 (which is screened in the alluvial aquifer), but not MW-30 (which is screened in the Silt Overbank Deposit). The trend test will be performed at a 95 percent confidence interval.

[1] ProUCL is currently approved by Ecology for use for this test. Other software may be used in the future but will require approval by Ecology.

3.2 CONTINGENT RESPONSES TO TRIGGER CONDITIONS

If either or both of the trigger conditions occur, the following actions will be implemented:

1. Ecology will be notified within 30 days of data validation to report that a trigger condition has occurred.
2. Within 90 days of the notification, the Subject potentially liable persons (PLPs) will submit a written evaluation that considers the following:
    a. Is the cause of the trigger event (source of the contamination) known?
    b. Does it likely represent a transient condition or a new condition?
    c. Do the data indicate that the most likely source is the Settlement Area?
    d. Does a focused exposure assessment indicate an exposure threat to human health or the environment?
    e. If the source is likely within the Settlement Area, what actions are appropriate at this time? Actions may include, but are not limited to, one or more of the following:
        i. Continued monitoring to confirm that it is a transitory effect. For example, construction that disturbs the Silt Overbank Deposit may cause a short-term increase that may be acceptable to Ecology as part of the construction project.
        ii. Modified sampling to understand the cause or source.
        iii. Changes in operations of landfill gas systems.
        iv. Changes in some site-related activity, if practicable.
        v. Additional investigation at the Site.
        vi. Confirmation that natural attenuation conditions are stable and favorable and possible implementation of in situ modification (such as the addition of a reducing agent or microbial enhancement), if needed.
        vii. Pump and/or treat if determined to be appropriate and effective.
        viii. Other technologies that are appropriate to the situation.
    f. If additional remedial action beyond the above actions is considered, it will be evaluated in a manner consistent with a focused feasibility study under MTCA, leading to a proposed corrective action.

If an increasing trend is observed for MW-31, the following actions will be implemented:

1. Ecology will be notified within 30 days of data validation to report that a trigger condition has occurred.

2. Because monitoring wells MW-25, MW-32, and MW-33 are between the Settlement Area and MW-31, if an increasing trend is observed in MW-31, the concentrations at these wells will be evaluated to determine if the source could be the Settlement Area or if it is another location. If concentrations at the Settlement Area indicate that the probable source is the Settlement Area, the Subject PLPs will proceed with the action in 2e above. If Ecology determines the data at the Settlement Area indicates that the Settlement Area is not the cause of the increasing trend, it is Ecology's expectation that no additional action is required under the Consent Decree.

3.3 CONTINGENT TRIGGERS AND ACTIONS FOR IRON AND MANGANESE

Iron and manganese are elevated at concentrations greater than background in several downgradient CPOC wells, as discussed in Section 4.2 of the CAP. Trend plots shown in Appendix J of the Remedial Investigation/Feasibility Study indicate that concentrations are slowly decreasing and are expected to come into compliance within 10 years (Floyd|Snider et al. 2017). As long as the concentrations are stable or decreasing, no further action is required beyond monitoring. If concentrations are showing an increasing trend, monitoring will continue while the Subject PLPs and Ecology evaluate the situation to determine next steps. Once a dataset of eight quarterly events has been collected for iron and manganese during long-term monitoring, Ecology may approve a decreased frequency of monitoring for iron and manganese.

3.4 CONTINGENT TRIGGERS AND ACTIONS FOR ARSENIC

There are known cement kiln dust deposits upgradient of the Landfill Property on the KIP parcel, and downgradient of the Landfill Property east of 5th Avenue South (see Figure 5.13 of the 2017 Remedial Investigation/Feasibility Study). As long as the concentrations of arsenic are stable or decreasing in downgradient wells MW-08, MW-10, MW-18, MW-24, MW-25, MW-26, MW-32, and MW-33, no further action is required beyond monitoring. If arsenic remains in compliance with the CUL for 2 years (eight additional quarters), arsenic analysis would be terminated.

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4.0 Health and Safety

Groundwater sampling personnel must follow general health and safety procedures while performing groundwater monitoring activities at the Settlement Area. Each facility that comprises the Settlement Area will have vehicular traffic and other potential hazards associated with active operation. Sampling personnel must be aware of these hazards and take appropriate precautions while performing the work outlined in this GWMCP. At a minimum, personnel performing routine groundwater monitoring must wear a high visibility safety vest at all times and should be aware of traffic patterns and facility operations. If work on a specific parcel or facility requires other specific personal protective equipment (PPE), such as a hard hat or steel-toed boots, then the additional PPE requirements must be met to complete the sampling.

Groundwater monitoring will be conducted in accordance with a site-specific Health and Safety Plan, which will be prepared by the Site Coordinator prior to conducting monitoring.

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5.0 Reporting and Record Keeping

To document compliance with the GWMCP, the Site Coordinator must maintain and compile the following records after the completion of the monitoring event:

- Routine monitoring field forms/notes
- Analytical reports
- Updated trend plots for vinyl chloride, benzene, cis-1,2-DCE, arsenic, iron, and manganese.
- Groundwater level measurements and updated groundwater contour maps
- Well maintenance records, if necessary, which should include a description of the maintenance performed and reason/type of repair, as well as photographic documentation, if appropriate

In accordance with the OMMP, the results of the long-term groundwater monitoring will be reported annually, unless a trigger condition occurs, which would require special reporting considerations, discussed in Section 3.0. The OMM Annual Report will be due on March 31 of each year for the previous calendar year's sampling. A brief discussion of any important or relevant changes in the Settlement Area conditions will be included in the annual monitoring reports. The Site Coordinator is responsible for compiling the necessary site-wide OMM documentation and submittal of the OMM Annual Report.

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6.0 References

Floyd|Snider, Aspect Consulting, Herrera, and BHC Consultants. 2017. *Remedial Investigation/ Feasibility Study*. Prepared for City of Seattle and South Park Property Development, LLC. July.

South Park Landfill

Landfill Post-Closure Operations, Maintenance, and Monitoring Plan

Attachment A.3
Groundwater Monitoring and Contingency Plan

Figures

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OMMP
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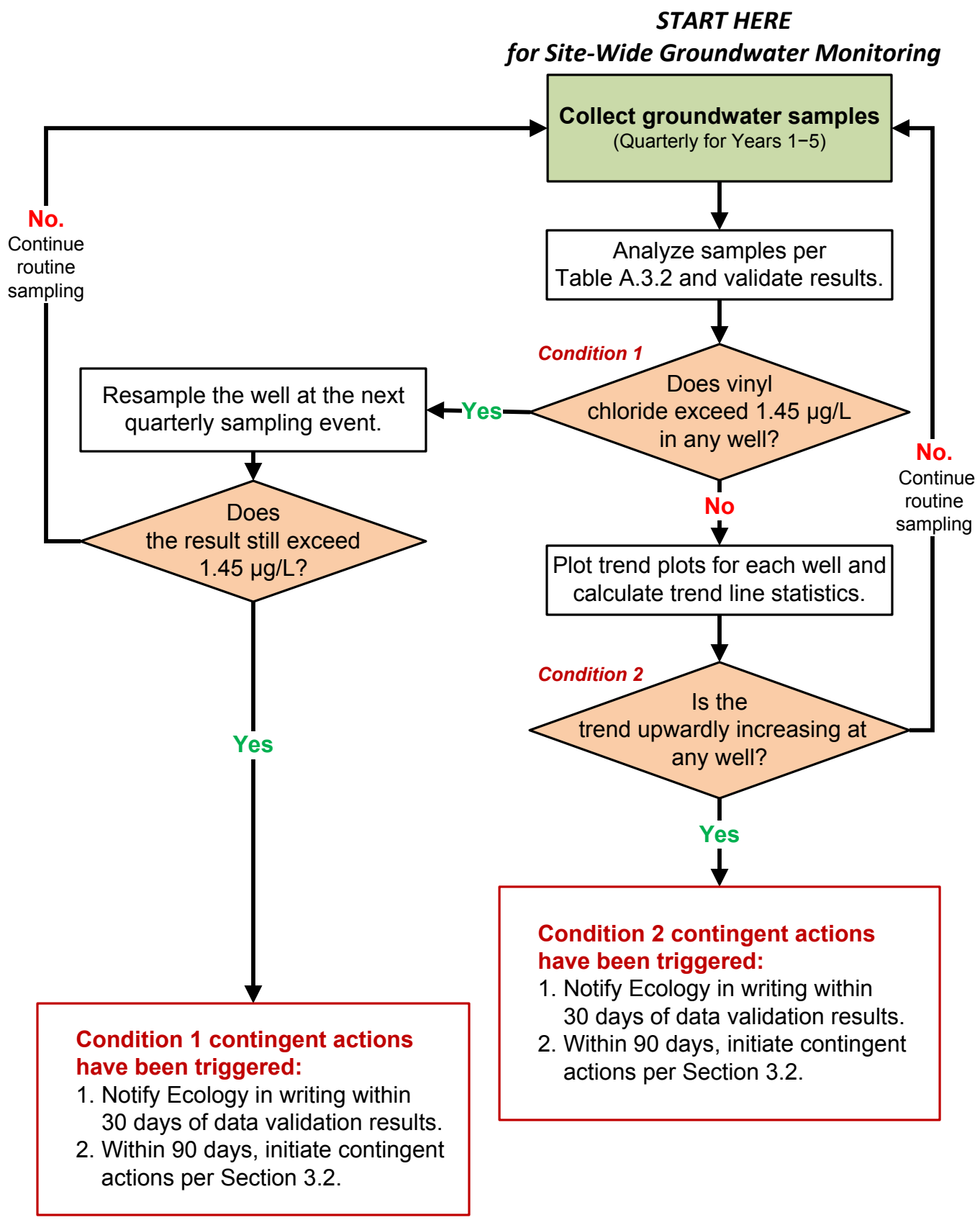
Attachment A.3: Groundwater Monitoring and Contingency Plan
Figure A.3.1
Perimeter Groundwater Monitoring Well Network

I:\GIS\Projects\COS-SPARK\MXD\CAP\2017 CAP-OCT\OMMP\GWMCP\Figure A.3.1 Perimeter Groundwater Monitoring Well Network.mxd
9/28/2017



Abbreviations: Ecology = Washington State Department of Ecology; µg/L = micrograms per liter; OMMP = Operations, Maintenance, and Monitoring Plan

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Attachment A.3: Groundwater Monitoring and Contingency Plan
Figure A.3.2
Flow Chart for Triggers and Contingent Actions for Groundwater Monitoring

F:\projects\COS-SPARK\5000 - CAP\06 SPARK CAP Public Review Final\04 Appendix A OMMP\Attachment A.3 Groundwater MCP\02 Figures\Figure A.3.2 GW Contigency Plan Flowchart 2017-0929.vsd

South Park Landfill

Landfill Post-Closure Operations, Maintenance, and Monitoring Plan

Attachment A.3
Groundwater Monitoring and Contingency Plan

Exhibit A.3.1
Sampling and Analysis Plan and Quality Assurance Project Plan

Table of Contents

1.0 Introduction A.3.1-1
1.1 BACKGROUND A.3.1-1
1.2 CLEANUP LEVELS AND POINTS OF COMPLIANCE A.3.1-1
1.3 PROJECT RESPONSIBILITIES A.3.1-2
1.3.1 Management Responsibilities A.3.1-2
1.3.2 Quality Assurance Responsibilities A.3.1-3
1.3.3 Laboratory Responsibilities A.3.1-3
1.3.4 Field Responsibilities A.3.1-4
2.0 Groundwater Sampling and Analysis Plan A.3.1-5
2.1 MONITORING WELL NETWORK A.3.1-5
2.2 SITE-WIDE GROUNDWATER MONITORING COMPONENTS A.3.1-5
2.2.1 Groundwater Level Measurements A.3.1-5
2.2.2 Sampling Methods A.3.1-6
2.2.3 Analytical Parameters A.3.1-7
2.2.4 Management of Investigation Derived Wastes A.3.1-7
2.3 MONITORING SCHEDULE A.3.1-8
2.4 REPORTING REQUIREMENTS A.3.1-8
3.0 Quality Assurance Project Plan A.3.1-9
3.1 DATA QUALITY OBJECTIVES A.3.1-9
3.2 SAMPLE COLLECTION AND ANALYSIS A.3.1-9
3.3 FIELD DOCUMENTATION A.3.1-11
3.4 DATA MANAGEMENT PROCEDURES A.3.1-11
3.5 DATA QUALITY, VERIFICATION, AND VALIDATION A.3.1-12
4.0 References A.3.1-13

List of Tables

Table 1 Groundwater Monitoring Network
Table 2 Analytical Field Sample Requirements
Table 3 Data Quality Assurance Criteria

List of Figures

Figure 1 Perimeter Groundwater Monitoring Well Network

List of Attachments

Attachment A Monitoring Well Construction Logs
Attachment B Groundwater Sampling Record Template

List of Abbreviations/Acronyms

Acronym/ Abbreviation	Definition
°C	Degrees Celsius
CAP	Cleanup Action Plan
COC	Chemical of concern
CPOC	Conditional point of compliance
CUL	Cleanup level
DCE	Dichloroethene
DQO	Data quality objective
Ecology	Washington State Department of Ecology
EDD	Electronic data deliverable
GWMCP	Groundwater Monitoring and Contingency Plan
LNAPL	Light non-aqueous phase liquid
MTCA	Model Toxics Control Act
PLP	Potentially liable person

Acronym/ Abbreviation	Definition
POC	Point of compliance
QA	Quality assurance
QAPP	Quality Assurance Project Plan
QC	Quality control
redox	Oxidation-reduction (potential)
RI/FS	Remedial Investigation/Feasibility Study
SAP	Sampling and Analysis Plan
USEPA	U.S. Environmental Protection Agency
WAC	Washington Administrative Code

1.0 Introduction

This Sampling and Analysis Plan and Quality Assurance Project Plan (SAP/QAPP) presents the specific quality assurance/quality control (QA/QC) procedures associated with the long-term groundwater monitoring recommended in the Groundwater Monitoring and Contingency Plan (GWMCP), which is Attachment A.3 of the Operations, Maintenance, and Monitoring Plan (OMMP), which is Appendix A of the Cleanup Action Plan (CAP) for the Settlement Area portion of the South Park Landfill Site located in Seattle, Washington (Floyd|Snider et al. 2017).

This SAP/QAPP provides guidance for field personnel regarding sampling, sample handling and storage, chain-of-custody, laboratory and field analyses, and documentation and reporting. It was developed in accordance with guidance from the Washington State Department of Ecology (Ecology; Ecology 2004) and the Washington State Model Toxics Control Act (MTCA), Washington Administrative Code (WAC), Section 173-340.

1.1 BACKGROUND

Based on the historical groundwater quality data and the Remedial Investigation/Feasibility Study (RI/FS; refer to Section 5.6 of the RI/FS [FloydSnider et al. 2017]), vinyl chloride, iron, and manganese are groundwater chemicals of concern (COCs) that are out of compliance at the site because of detected concentrations that exceeded the cleanup levels (CULs). Three other COCs (benzene, arsenic, and *cis*-1,2-dichloroethene [DCE]) will be monitored to confirm that their concentrations are less than their respective groundwater CULs. The evaluation of potential remedial alternatives (refer to Section 13.5 of the RI/FS) resulted in the selection of a preferred remedial action consisting of long-term groundwater monitoring with contingent action if concentrations from the Settlement Area increase in the future.

1.2 CLEANUP LEVELS AND POINTS OF COMPLIANCE

As defined in the MTCA regulations, the cleanup standard for a contaminated site consists of the CULs and the location(s) at which the CULs apply (i.e., the point of compliance [POC]). The POC for groundwater monitoring that is part of the landfill closure is defined as the edge-of-refuse, which under MTCA is considered a conditional POC (CPOC). At the Settlement Area, several downgradient monitoring wells are located at the edge-of-refuse within the Settlement Area boundary. These wells will be used as a CPOC because no other wells are located immediately downgradient beyond the Settlement Area boundary. For further details, refer to Section 5.6.2 of the RI/FS.

The CPOC for groundwater at the Settlement Area is located along the downgradient edge-of-refuse, which includes the following monitoring wells: MW-08, MW-10, MW-18, MW-24, MW-25, MW-26, MW-27 (not CPOC for arsenic), MW-32, and MW-33 (Figure 1).

The site-specific CULs for groundwater at the Settlement Area, which are based on the protection of groundwater as a potential drinking water source, are indicated in the following table.

Chemical	Cleanup Level
Vinyl chloride (COC)	0.29 µg/L
Iron (Total)	27 mg/L (A-Zone) 31 mg/L (B-Zone)
Manganese (Total)	2.1 mg/L (A-Zone) 1.1 mg/L (B-Zone)
cis-1,2-DCE	16 µg/L
Benzene	5.0 µg/L
Arsenic	5.0 µg/L (background)

Abbreviations:
µg/L Micrograms per liter
mg/L Milligrams per liter

1.3 PROJECT RESPONSIBILITIES

Under the authorization of the potentially liable persons (PLPs), the Project Team will perform the field activities described in this SAP/QAPP. An accredited laboratory will be the primary project laboratory, performing all the environmental laboratory analyses. The various management, QA, laboratory, and field responsibilities of key project personnel are defined below.

1.3.1 Management Responsibilities

Team Project Manager

The Project Manager will have overall responsibility for project implementation. The Project Manager will be responsible for the overall QA on this project, ensuring that it meets the technical and contractual requirements. The Project Manager will report directly to the PLPs and is responsible for technical QC and project oversight.

The Project Manager will perform the following:

- Monitor project activity and quality.
- Provide an overview of field activities to the PLPs.
- Provide technical presentations of project activities.

- Communicate with the PLPs and Ecology.
- Approve the SAP/QAPP.

1.3.2 Quality Assurance Responsibilities

Team Data Quality Assurance Manager

The Data QA Manager will report directly to the Team Project Manager and will be responsible for ensuring that the data QA/QC procedures established for this project are followed. The Data QA Manager will be responsible for the data validation of all sample results from the analytical laboratories. Additional responsibilities include the following:

- Providing an oversight and review of field QA/QC.
- Coordinating the supply of performance evaluation samples and review results from performance audits.
- Reviewing laboratory QA/QC data.
- Advising on data corrective action procedures.
- Reviewing lab and data reports and preparing the QA/QC reports.
- Representing QA/QC of project activities.

1.3.3 Laboratory Responsibilities

A qualified laboratory will provide all of the analytical services in support of the site-wide long-term groundwater monitoring activities.

Laboratory Project Manager

The Laboratory Project Manager will report directly to the Data QA Manager and will be responsible for the following:

- Ensuring that all resources of the laboratory are available.
- Advising the Data QA Manager of laboratory status.
- Reviewing and approving final analytical reports.
- Coordinating laboratory analyses.
- Supervising in-house chain-of-custody procedures.
- Scheduling sample analyses.
- Overseeing data review.

1.3.4 Field Responsibilities

Team Field Quality Assurance Officer

The Field QA Officer will be responsible for leading and coordinating the day-to-day activities in the field. The Field QA Officer will report directly to the Team Project Manager.

Specific responsibilities include the following:

- Coordinating day-to-day with the Team Project Manager.
- Developing and implementing work plans and establishing the field schedule.
- Coordinating and managing field staff, including sampling personnel.
- Reviewing technical data provided by the field staff, including field measurement data.
- Adhering to the work schedule.
- Coordinating and overseeing subcontractors.
- Identifying problems, resolving difficulties in consultation with the Team Project Manager, implementing and documenting corrective action procedures, and acting as a liaison for communications between the team and upper management.
- Preparing the data reports.

2.0 Groundwater Sampling and Analysis Plan

The requirements and objectives of long-term groundwater monitoring, described in Section 6.2.4 of the CAP, can be met by means of the groundwater sampling program described the Groundwater Monitoring and Contingency Plan in the OMMP and in this section.

Long-term groundwater monitoring is intended primarily to monitor groundwater quality and water levels. The monitoring locations, sample collection details, and reporting requirements are discussed in the following subsections.

2.1 MONITORING WELL NETWORK

A summary of the monitoring wells to be used for long-term groundwater monitoring is provided in Table 1 and Figure 1. In addition to the POC wells (MW-08, MW-10, MW-18, MW-24, MW-25, MW-26, MW-27, MW-32, and MW-33), the monitoring well network also includes monitoring wells used to monitor upgradient groundwater conditions (MW-12, MW-14, and MW-29) and downgradient monitoring wells used to monitor groundwater conditions adjacent to the former Glitsa American, Inc., property (MW-30 and MW-31).

As discussed in Section 5.1 of the RI/FS, the monitoring wells have been completed primarily in one of three groundwater zones (Perched Zone, A-Zone, or B-Zone), all of which are part of the Shallow Aquifer. The Perched Zone is a thin discontinuous layer of groundwater above the Silt Overbank Deposit, which can often be in contact with solid waste and is, therefore, conceptually equivalent to leachate in those locations. The A-Zone is immediately below the Silt Overbank Deposit and is the critical zone where leachate (and perched water) can enter the groundwater system and move off-site. The B-Zone represents the base of the Shallow Aquifer, overlying finer grained estuarine deposits and is where dense non-aqueous phase liquids would accumulate, if present. Well construction logs for the wells in the monitoring well network are provided in Attachment A.

2.2 SITE-WIDE GROUNDWATER MONITORING COMPONENTS

Groundwater monitoring will consist of measuring groundwater levels, sampling groundwater for the site-specific COC and other relevant chemicals, and reporting the groundwater flow directions and laboratory analytical results for each monitoring event. This section summarizes the monitoring components, the monitoring schedule, and the reporting requirements.

2.2.1 Groundwater Level Measurements

Groundwater levels will be measured to provide an indication of groundwater elevations, flow directions, and gradients. A complete round of applicable groundwater levels will be measured

by hand before groundwater sampling begins. This will include both the monitoring well network in Table 1 and any remaining interior wells.[1] Groundwater levels will be measured with a precision of 0.01 foot using an electric water level indicator. All groundwater level measurements will be made relative to the surveyed top of the polyvinyl chloride (PVC) well casing or other defined measuring point at the wellhead. The water level indicator will be lowered to contact the water in the well casing (contact determined by a light or sonic alarm on the indicator) and the reading will be noted. The indicator will then be immediately withdrawn from the water and the measurement repeated. If the two readings are consistent (i.e., within 0.1 foot of each other), the reading will be recorded on the Groundwater Sampling Record (provided in Attachment B), along with the measurement date and time. If the two readings are not consistent, the measurements will be repeated until a reproducible result is obtained.

After each groundwater level measurement is completed and before the next measurement, the water level indicator will be decontaminated according to the following procedure:

1. Rinse and preclean in potable water.
2. Wash in a solution of laboratory-grade non-phosphate soap (for example, Liquinox) and potable water.
3. Rinse with distilled water.

In instances where light non-aqueous phase liquids (LNAPLs) are present, as historically noted in Well KMW-05, the thickness of the LNAPL will be measured using an oil-water interface probe in accordance with the procedures discussed above.

2.2.2 Sampling Methods

Groundwater samples will be collected according to low-flow sampling procedures using either a dedicated bladder pump or a peristaltic pump with disposable low-density polyethylene and silicon tubing as outlined in Table 1. Using low-flow sampling procedures, the monitoring wells will be purged at a flow rate of 500 milliliters/minute or less to obtain samples that are representative of the groundwater conditions.

During well purging, field parameters, including temperature, pH, specific conductivity, dissolved oxygen, and oxidation-reduction (redox) potential will be monitored at 3- to 5-minute intervals until the readings stabilize, using a calibrated multiparameter probe with a flow-through cell or equivalent. Of these parameters, dissolved oxygen and redox potential are considered the most important because they determine the redox conditions of the groundwater, which plays an important role in the potential natural attenuation of the COCs. Because dissolved oxygen and redox potential are also expected to take the longest to stabilize, stabilization is defined as three

[1] Some interior wells will be decommissioned and abandoned as part of redevelopment and cleanup.

successive readings where dissolved oxygen varies by less than 10 percent, and redox potential varies by less than 10 millivolts. Additional stability criteria include variations of 0.5 degrees Celsius (°C) for temperature, 10 percent for specific conductivity, and 0.1 unit for pH. Flow rate (and depth to water, if possible) will also be measured during well purging. In addition, sampling, a turbidity measurement will be collected to help evaluate the groundwater quality and evaluate the function of the monitoring well. All field measurements will be documented on the Groundwater Sampling Record (provided in Attachment B) for each well (electronic forms, including those that download directly into a database, are also acceptable).

The groundwater samples will be collected directly from the pump discharge line upstream of the flow-through cell by filling the laboratory-provided bottles at the same low-flow purge rate.

Samples will be stored in a cooler with ice in order to maintain the samples at a temperature of approximately 6°C until delivery to a certified Washington State laboratory. A chain-of-custody form will be completed for each sample location, indicating the sample identification, number of bottles collected, date and time of collection, and analysis to be performed at the laboratory. The samples will be labeled as described in Section 3.2.

Field duplicates will be collected at a frequency of approximately 10 percent or fraction thereof of the total number of sample locations per sampling event, exclusive of other QC samples. Field duplicates will be collected under the same conditions as the primary samples. The field duplicates will be labeled as described in Section 3.2.

2.2.3 Analytical Parameters

Groundwater samples will be analyzed for the vinyl chloride, iron, manganese, *cis*-1,2-DCE, benzene, and arsenic (Table 2). The analytical methods, reporting limits, and sample collection and preservation requirements are discussed in Section 3.0.

2.2.4 Management of Investigation Derived Wastes

All water from the well purging and decontamination wash water will be collected and stored in 55-gallon drums, which will be stored on-site at a location indicated by the PLPs. The drums will be clearly labeled with a description of the contents and designated as nonhazardous waste. The water will be characterized based on the analytical results from the quarterly groundwater monitoring events. Periodically, the Project Team will coordinate the disposal of the water at an appropriate facility.

Disposable materials (e.g., nitrile gloves and empty tubing) used during the field work that do not contain significant contaminants may be disposed of as conventional refuse.

2.3 MONITORING SCHEDULE

Long-term groundwater monitoring will initially be conducted quarterly, beginning 180 days after the effective date of the Consent Decree. The groundwater monitoring schedule will continue as described in the main text of the GWMCP.

2.4 REPORTING REQUIREMENTS

The results of the long-term groundwater monitoring will be reported annually, unless a trigger condition occurs, which would require special reporting considerations that are discussed in the GWMCP. The annual report will be due on March 31 of each year for the previous calendar year's sampling. The report will contain the following:

- Groundwater analytical results
- Trend plots for vinyl chloride as required to evaluate the potential for contingent action as discussed in the GWMCP
- Groundwater level data
- Groundwater contour maps

A brief discussion of any important or relevant changes in the site conditions will be included in the annual monitoring event reports.

3.0 Quality Assurance Project Plan

3.1 DATA QUALITY OBJECTIVES

This section describes the data quality objectives (DQOs) to be used during the long-term groundwater monitoring at the Settlement Area, per the requirements in WAC 173-340-820.

The overall goal of the DQOs is to ensure that the data are of known and defensible quality. This section describes the procedures for field sampling, provides the chain-of-custody protocols, indicates the laboratory analyses to be performed, and describes the data verification and validation procedures, and outlines the reporting requirements to ensure that the DQOs are met. The DQOs of the long-term groundwater monitoring plan are the following:

- Collect high quality and verifiable data
- Use resources cost-effectively
- Collect data that are suitable for their intended use by the PLPs and Ecology

To achieve the long-term groundwater monitoring plan objectives, data quality indicators of precision, accuracy (bias), comparability, completeness, representativeness, and sensitivity are used to assess the DQOs.

The Project Team will conduct a technical review of the QA and QC features to ensure compliance with this QAPP and perform an overall assessment of the data collected as part of this project.

3.2 SAMPLE COLLECTION AND ANALYSIS

The groundwater samples (Table 1) including field and QC samples will be collected and analyzed by an accredited laboratory using applicable analytical test methods for monitoring groundwater quality. Samples will be collected from each well using low-flow sampling techniques and placed in new sample bottles beginning with the most sensitive (e.g., volatile) parameters.

The samples will be labeled at the time of sampling, and the labels will include sample name, location, date, time, sampler's initials, analyte, and preservatives if any are used.

Samples will be given unique identifiers according to the following naming structure.

SPL-GW-###-mmyy

Where:

SPL-GW	Identifies the sample as Settlement Area groundwater.
###	Identifies the monitoring well type and number (e.g., KMW05 or MW30).
mmyy	Indicates month and year sample was collected (e.g., 0313 for March 2013).

A fictitious identification identifier will be assigned to the two types of QA/QC samples (field duplicate and trip blank), using the following sample number ranges. Consecutive numbers will be required beginning with the lower limit of the range for each QA/QC sample type.

QA/QC Sample Type	Identifier Range
Field duplicate	MW60 to MW69
Trip blank	MW80 to MW89

Samples will be handled (including containerization and preservation, in accordance with Table 2), temporarily stored, and transported in a manner that preserves the nature and integrity of the sample and complies with chain-of-custody protocols and documentation.

Groundwater samples will be analyzed by SW-846 8260C for a custom list of analytes (Table 2), and by USEPA 6020.

To generate data of sufficient quality, the following approach for groundwater samples will be followed:

- Field and laboratory QC samples (field replicates, trip blanks, and temperature blanks) will be used for assessing data quality.
- Laboratory QA will be implemented and maintained as described in the accredited laboratory's Quality Assurance Plan and Standard Operating Procedures and in Table 3.
- Data summary packages will be generated and the documentation provided will be sufficient to perform a Level I data quality review.
- Data quality review will be performed on the analytical data according to the procedures specified below.

Data quality will be validated in accordance with the U.S. Environmental Protection Agency (USEPA) Contract Laboratory Program guidelines (USEPA 2014, 2004, and 1999).

While a best effort will be made to achieve the project DQOs, there may be instances in which it is not possible to meet the specified objectives. Limitations in data quality due to analytical problems (e.g., elevated detection limits due to matrix effect) will be identified within 48 hours of the initial analysis and brought to the attention of the Team Project Manager. If necessary, corrective measures will be determined and implemented. The accredited laboratory will document the problem, the correction, and the results. In addition, this information will be discussed in the data validation report.

3.3 FIELD DOCUMENTATION

Field event and sample documentation will include the following information on field sampling log sheets or a project-specific field notebook:

- Sampling personnel
- Daily equipment calibration
- Equipment decontamination steps (if not dedicated or single use)
- Weather conditions
- Static water level
- Purging rate and volume
- Field parameters (pH, specific conductivity, turbidity, redox potential, temperature, and dissolved oxygen)
- Sampling times, bottle types, and preservation
- Physical appearance and odor of sample
- Presence of free product

The Project Team will file and maintain field logbooks, subcontractor reports, photographs, and sampling logs, chain-of-custody documents, laboratory reports, data validation reports and supporting documentation, and final versions of monitoring reports.

3.4 DATA MANAGEMENT PROCEDURES

Groundwater sample collection form or notebook requirements will include name of project/location, identities of field personnel, sequence of events, changes to the plan, site and atmospheric conditions, number of samples collected, sample details (date, time, location, sample identification, and description), instrument calibration procedures, field measurement results, identification of QC samples, and unusual circumstances that could affect interpretation of the data.

The groundwater monitoring data will include groundwater elevation measurements and analytical data. Data management will consist of database generation, data receipt, and input of field and analytical data, as well as other data generated during groundwater monitoring activities, and data presentation. The accredited laboratory will provide an electronic data deliverable (EDD) in the format specified by the Project Team. The accredited laboratory will also provide laboratory reports that contain a case narrative, description of any correction actions taken, changes to referenced methods, and an explanation of data qualifiers.

Upon data verification and validation (discussed below), the site data will be submitted to Ecology's Environmental Information Management (EIM) database.

3.5 DATA QUALITY, VERIFICATION, AND VALIDATION

Field and laboratory data results will be verified to ensure the following:

- Proper sample collection and handling protocols are followed.
- Holding times are met and sample receiving conditions documented.
- Laboratory data packages are complete and free of transcription errors or misidentifications.
- Complete EDD is delivered in an appropriate format.
- Chain-of-custody and sample receipt documentation is complete.
- Compound quantification and detection limits are appropriate.
- Method or trip blank results do not adversely affect the data results.
- Surrogate recovery values are within the acceptable range.
- Field and laboratory duplicate analysis is within the acceptable range.
- Laboratory data qualifiers are justified.
- Data results are complete and accurate.
- Established criteria for QA/QC are met.

The data quality review process for this project will follow the procedures in USEPA guidelines (USEPA 1999, 2014), as appropriate, but applicable to Method SW-846, this QAPP, method standard operating procedures, and professional judgment.

4.0 References

Floyd|Snider, Aspect Consulting, Herrera, and BHC Consultants. 2017. *Remedial Investigation/ Feasibility Study*. Prepared for City of Seattle and South Park Property Development, LLC. July.

Washington Department of Ecology (Ecology). 2004. *Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies*. Publication No. 04-03-030. July

U.S. Environmental Protection Agency (USEPA). 1999. *USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review*. EPA 540-R-99-008. Office of Emergency and Remedial Response. October.

_____. 2004. *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review.* OSWER 9240.1-45, EPA 540-R-04-004. Office of Superfund Remediation and Technology Innovation (OSRTI), Washington, D.C. October.

_____. 2014. *USEPA National Functional Guidelines for Superfund Organic Methods Data Review (SOM02.2)*. EPA-540-R-14-002. Office of Superfund Remediation and Technology Innovation. August.

South Park Landfill

Landfill Post-Closure Operations, Maintenance, and Monitoring Plan

Attachment A.3
Groundwater Monitoring and Contingency Plan

Exhibit A.3.1
Sampling and Analysis Plan and Quality Assurance Project Plan

Tables

Table 1
Groundwater Monitoring Network

Well Name	Proposed POC Well	Location	Aquifer Zone	Groundwater Elevation	Chemical Analyses	Sample Collection Method
Groundwater Quality and Elevation Monitoring						
Upgradient Wells Representing Quality of Groundwater Entering the Site						
MW-12	No	Upgradient	A-Zone	Yes	A, Fe, Mn, DCE, VC	Bladder pump
MW-14	No	Upgradient	A-Zone	Yes	Fe, Mn, DCE, VC	Bladder pump
MW-29	No	Upgradient	A-Zone	Yes	Fe, Mn, DCE, VC	Peristaltic pump
Downgradient Wells Representing Conditions at the Edge-of-Refuse						
MW-18	Yes	Edge of waste	B-Zone	Yes	A, Fe, Mn, DCE, VC	Bladder pump
MW-25	Yes	Downgradient	A-Zone	Yes	B, A, Fe, Mn, DCE, VC	Bladder pump
MW-32	Yes	Edge of waste	A-Zone	Yes	A, Fe, Mn, DCE, VC	Bladder pump
MW-33	Yes	Edge of waste	A-Zone	Yes	A, Fe, Mn, DCE, VC	Bladder pump
MW-26	Yes	Downgradient	A-Zone	Yes	A, Fe, Mn, DCE, VC	Bladder pump
MW-27	Yes[1]	Downgradient	A-Zone	Yes	A, Fe, Mn, DCE, VC	Bladder pump
MW-10	Yes	Downgradient	B-Zone	Yes	A, Fe, Mn, DCE, VC	Peristaltic pump
MW-24	Yes	Downgradient	B-Zone	Yes	A, Fe, Mn, DCE, VC	Bladder pump
MW-08	Yes	Downgradient	B-Zone	Yes	A, Fe, Mn, DCE, VC	Bladder pump
Downgradient Wells Representing Conditions near Former Glitsa Property						
MW-30	No	Downgradient	Perched Zone	Yes	Fe, Mn, DCE, VC	Peristaltic pump
MW-31	No	Downgradient	A-Zone	Yes	Fe, Mn, DCE, VC	Bladder pump

Note:

1 MW-27 is not a CPOC well for arsenic.

Abbreviations:

B Benzene
A Arsenic
Fe Iron
Mn Manganese
Fe, Mn, DCE *cis* -1,2-Dichloroethene
Glitsa Glitsa American, Inc.
POC Point of compliance
VC Vinyl chloride

Table 2
Analytical Field Sample Requirements

Analysis	Method	Bottle Type	Preservative	Holding Time
Volatile Organic Compounds				
Benzene	SW-846 8260C	Three 40-mL vials, zero headspace	HCl to pH < 2.0, Cool to ≤ 6 °C	14 days, 7 days[1]
cis -1,2-DCE				
Vinyl chloride	SW-846 8260C SIM			
Metals				
Arsenic	USEPA 6020	One 1-L HDPE	HNO_3 to pH < 2.0	6 months
Iron	USEPA 6020			
Manganese	USEPA 6020			

Note:

1 When unpreserved.

Abbreviations:

°C Degrees Celcius
DCE Dichloroethene
HCl Hydrochloric acid
HDPE High-density polyethylene
HNO_3 Nitric acid
L Liter
mL Milliliter

Table 3
Data Quality Assurance Criteria

Parameter	Matrix	Reporting Limit/PQL	Precision	Accuracy	Completeness	Reference
Volatile Organic Compounds						
Benzene	Groundwater	0.2 µg/L	± 50%	± 50%	95%	SW-846 8260C
cis -1,2-DCE		0.2 µg/L				
Vinyl chloride		0.02 µg/L				
Monitored Natural Attenuation Parameters						
Arsenic	Groundwater	1 µg/L	± 20%	± 20%	95%	USEPA 6020
Iron		1 µg/L	± 20%	± 20%	95%	USEPA 6020
Manganese		1 µg/L	± 20%	± 20%	95%	USEPA 6020

Abbreviations:

DCE Dichloroethene
µg/L Microgram per liter
PQL Practical quantitation limit

South Park Landfill

Landfill Post-Closure Operations, Maintenance, and Monitoring Plan

Attachment A.3
Groundwater Monitoring and Contingency Plan

Exhibit A.3.1
Sampling and Analysis Plan and Quality Assurance Project Plan

Figure

FLOYD | SNIDER
strategy • science • engineering
Aspect CONSULTING
HERRERA

Cleanup Action Plan
OMMP
South Park Landfill
Seattle, Washington

Exhibit A.3.1: SAP/QAPP
Figure 1
Perimeter Groundwater Monitoring Well Network

I:\GIS\Projects\COS-SPARK\MXD\CAP\2017 CAP-OCT\OMMP\GWMCP\Figure 1 SAP QAPP Perimeter Groundwater Monitoring Well Network.mxd
9/28/2017

South Park Landfill

Landfill Post-Closure Operations, Maintenance, and Monitoring Plan

Attachment A.3
Groundwater Monitoring and Contingency Plan

Exhibit A.3.1
Sampling and Analysis Plan and Quality Assurance Project Plan

Attachment A
Monitoring Well Construction Logs

ASSOCIATED EARTH SCIENCES, INC

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
BV97041	MW-8 AKA MW-08	1 of 3

Project Name	South Park Custodial Landfill	Surface Elevation	12.88' NAVD 88
Location	King County	Water Depth (ft bgs)	4.5
Drilling Method	Hollow Stem Auger, 10.5" OD/6" ID	Start Date	December 7, 1998
Sampling Method	3" diameter, Split Spoon Sampler, 140 lb hammer	Finish Date	December 8, 1998

Depth feet	Well Construction	Methane	ST	Blows/ 6"	Sample ID	Mtl. Graphic	Description
	Locking 8" steel monument						FILL
	Concrete seal						GRAVEL; gray; angular (GP)
							SILTY SANDY GRAVEL; brown-gray; subrounded to 1-inch diameter; moist, medium dense; no odors or discolorations (GM)
		0%		16 16 15			
	Bentonite chips						
	4.5 ft. bgs ATD 12/8/98, casing at 47.5 ft. bgs 5.02 ft. bgs 12/10/98						
5				3 2 6			SILTY SANDY GRAVEL; brown; wet, very loose; no odors or discoloration (GM)
				3 2 5			SAND; dark brown; some silt and gravel; wet, very loose to loose; no odors or discoloration (SP)
		0%					
10				4 4 6			
							RECENT ALLUVIUM
							SILTY SAND; gray; fine-grained; wet, loose; no odors or discoloration (SM)
	2" ID SCH 40 PVC Riser			5 8 10			
		0%					
15				7 5 18			
	Bentonite slurry 30% by weight						
				5 14 19			
		0%					SAND; black; fine to medium grained, trace silt and wood; wet, medium dense; no odors or discolorations (SP)

Sampler Type (ST):
- 3" Split Spoon Sampler
- No Recovery

Lab Tests:
- C - Chemical Properties
- P - Permeability
- M - Moisture Content
- ▽ ▼ Water Level (Date of Measurement)

Logged by: RSB
Approved by: JJS
Figure No. A-3

SPARKMW SPARKMW.GPJ August 18, 1999

ASSOCIATED EARTH SCIENCES, INC

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
BV97041	MW-8 AKA MW-08	2 of 3

Project Name	South Park Custodial Landfill	Surface Elevation	12.88' NAVD 88
Location	King County	Water Depth (ft bgs)	4.5
Drilling Method	Hollow Stem Auger, 10.5" OD/6" ID	Start Date	December 7, 1998
Sampling Method	3" diameter, Split Spoon Sampler, 140 lb hammer	Finish Date	December 8, 1998

Depth feet	Well Construction	Methane	ST	Blows/ 6"	Sample ID	Mtl. Graphic	Description
				12 22 24			SAND; black; fine to medium grained, trace silt and wood; wet, medium dense; no odors or discolorations (SP)
		0%		7 10 14			
25	Bentonite slurry, 30% by weight						
		0%		11 17 21			
30							
		0%		14 24 33			
35	Well screen 2" ID SCH 40 PVC, 0.01" slot size						
	Filter pack, 10 x 20 Colorado silica sand	0%		12 17 14			

Sampler Type (ST):
- 3" Split Spoon Sampler
- No Recovery

Lab Tests:
- C - Chemical Properties
- P - Permeability
- M - Moisture Content
- ▽ ▼ Water Level (Date of Measurement)

Logged by: RSB
Approved by: JJS
Figure No. A-3

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SPARKMW SPARKMW.C

ASSOCIATED EARTH SCIENCES, INC

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
BV97041	MW-8 AKA MW1-08	3 of 3

Project Name	South Park Custodial Landfill	Surface Elevation	12.88' NAVD 88
Location	King County	Water Depth (ft bgs)	4.5
Drilling Method	Hollow Stem Auger, 10.5" OD/6" ID	Start Date	December 7, 1998
Sampling Method	3" diameter, Split Spoon Sampler, 140 lb hammer	Finish Date	December 8, 1998

Depth feet	Well Construction	Methane	ST	Blows/ 6"	Sample ID	Mll. Graphic	Description
							SILTY SAND; black; fine grained; wet, medium dense; no odors or discolorations (SM)
	Well screen 2" ID SCH 40 PVC, 0.01" slot size	0%		5 12 24			
45	Threaded end cap, 2" ID SCH 40 PVC						
	Bentonite chips						SAND; black; some silt; wet, medium dense (SP)
		0%		5 11 39			
50							Bottom of boring at depth 49 feet. Monitoring well installed to depth 45.59 feet. Soil sampler driven using 140-pound hammer falling 30-inches.
55							

Sampler Type (ST):

- 3" Split Spoon Sampler
- No Recovery

Lab Tests:

- C - Chemical Properties
- P - Permeability
- M - Moisture Content
- ▽ ▼ Water Level (Date of Measurement)

Logged by: RSB

Approved by: JJS

Figure No. A-3

SPARKMW SPARKMW.GPJ August 18, 1999

ASSOCIATED EARTH SCIENCES, INC

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
BV97041	MW-10	1 of 3

Project Name: South Park Custodial Landfill
Location: King County
Drilling Method: Hollow Stem Auger, 10.5" OD, 6" ID
Sampling Method: 3" diameter, Split Spoon Sampler, 140 lb hammer

Surface Elevation: 17.7' NAVD 88
Water Depth (ft bgs): 9
Start Date: December 9, 1998
Finish Date: December 9, 1998

Depth feet	Well Construction	Methane	ST	Blows/ 6"	Sample ID	Description
	Locking 8" steel monument					FILL
	Concrete seal					SAND; fine to medium grained, trace silt; moist, loose; no odors or discolorations (SP)
		0%		5 10 11		
	Bentonite chips					
5				4 3 10		5
						RECENT ALLUVIUM SILT; gray; with wood debris with roots; moist, firm, low plasticity; no odors or discolorations (ML)
						7 SAND; fine to medium grained, trace silt; moist, medium dense; no odors or discolorations (SP)
		0%		10 12 12		
	9 ft. bgs ATD 12/9/98					
	9.64 ft. bgs 12/10/98					
10				3 4 8		10 SILT; gray-brown; with burnt woody debris; moist, firm (ML)
	2" ID SCH 40 PVC Riser			3 6 8		12 SILTY SAND; gray; fine grained, with wood debris; wet, loose to medium dense (SM)
		0%				
15				24		
	Bentonite slurry, 30% by weight					
				7 8 18		13
		0%				SAND; black; fine to medium grained; wet, loose to medium dense (SP)

Sampler Type (ST):
- 3" Split Spoon Sampler
- No Recovery

Lab Tests:
- C - Chemical Properties
- P - Permeability
- M - Moisture Content
- Water Level (Date of Measurement)

Logged by: RSB
Approved by: JJS
Figure No. A-4

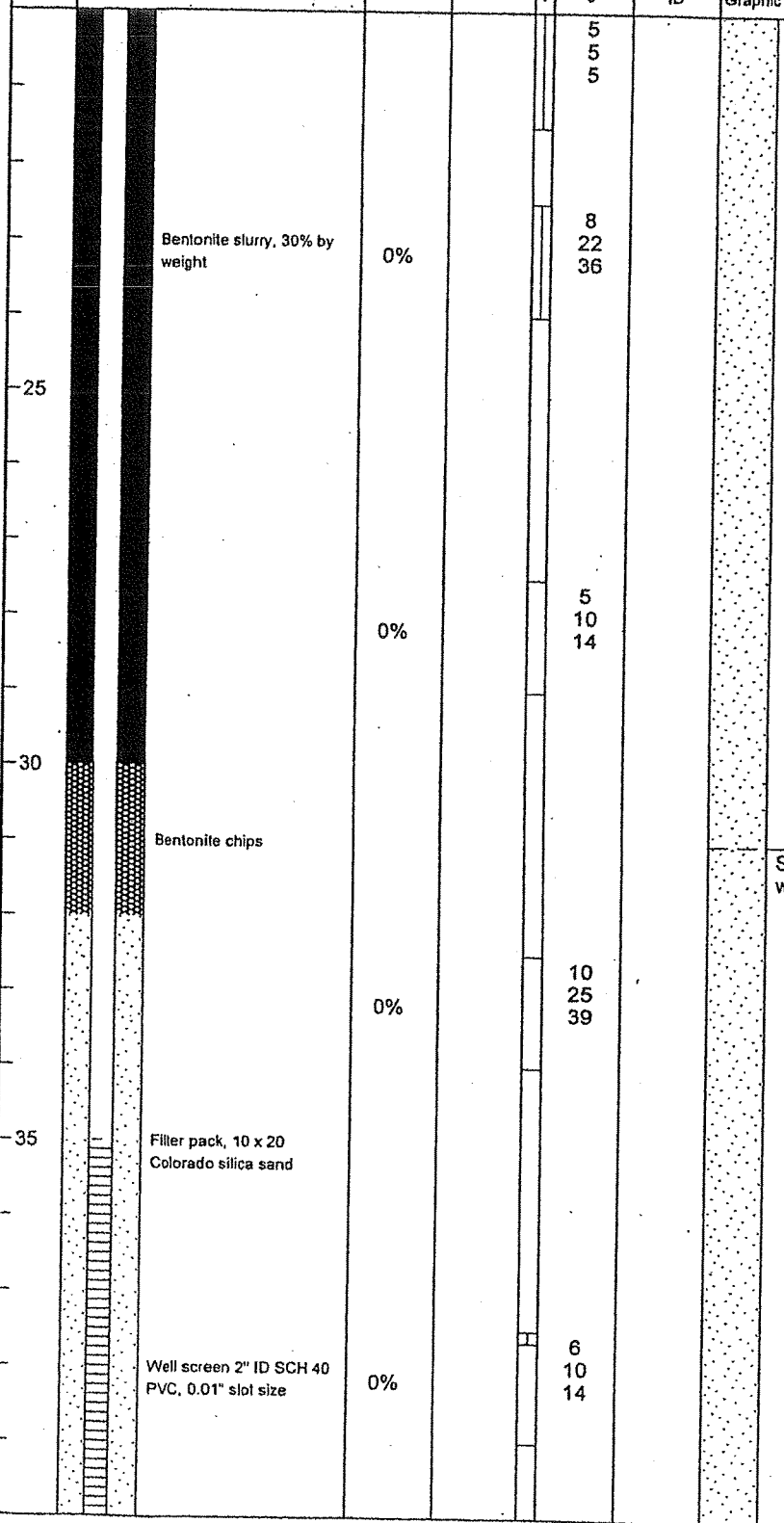
SPARKMW SPARKMW.GI gust 18, 1999

ASSOCIATED EARTH SCIENCES, INC

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
BV97041	MW-10	2 of 3

Project Name	South Park Custodial Landfill	Surface Elevation	17.7' NAVD 88
Location	King County	Water Depth (ft bgs)	9
Drilling Method	Hollow Stem Auger, 10.5" OD, 6" ID	Start Date	December 9, 1998
Sampling Method	3" diameter, Split Spoon Sampler, 140 lb hammer	Finish Date	December 9, 1998



Sampler Type (ST):

- 3" Split Spoon Sampler
- No Recovery

Lab Tests:

- C - Chemical Properties
- P - Permeability
- M - Moisture Content
- Water Level (Date of Measurement)

Logged by: RSB

Approved by: JJS

Figure No. A-4

SPARKMW SPARKMW.GPJ August 18, 1999

ASSOCIATED EARTH SCIENCES, INC

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
BV97041	MW-10	3 of 3

Project Name	South Park Custodial Landfill	Surface Elevation	17.7' NAVD 88
Location	King County	Water Depth (ft bgs)	9
Drilling Method	Hollow Stem Auger, 10.5" OD, 6" ID	Start Date	December 9, 1998
Sampling Method	3" diameter, Split Spoon Sampler, 140 lb hammer	Finish Date	December 9, 1998

Depth feet	Well Construction	Methane	ST	Blows/ 6"	Sample ID	Mtl. Graphic	Description
							SAND; black; trace silt; wet, medium dense (SP)
	Well screen 2" ID SCH 40 PVC, 0.01" slot size	0%		7 8 36			
45	Threaded end cap, 2" ID SCH 40 PVC						SANDY SILT; dark gray; very moist, stiff, low plasticity (ML)
	Filter pack, 10 x 20 Colorado silica sand	0%		7 12 31			
50							Bottom of boring at depth 49 feet. Monitoring well installed to depth 45 feet. Soil sampler driven using 140-pound hammer falling 30-inches.
55							

Sampler Type (ST):

- 3" Split Spoon Sampler
- No Recovery

Lab Tests:

- C - Chemical Properties
- P - Permeability
- M - Moisture Content
- Water Level (Date of Measurement)

Logged by: RSB

Approved by: JJS

Figure No. A-4

ust 18, 1999 SPARKMW SPARKMW.GF

ASSOCIATED EARTH SCIENCES, INC

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
BV97041	MW-12	1 of 1

Project Name: South Park Custodial Landfill
Location: Seattle, Washington
Drilling Method: Hollow Stem Auger 10.5" OD/6" ID
Sampling Method: 2" diameter, Split Spoon Sampler, 140 lb hammer, 30-inch drop

Surface Elevation: 19.11
Water Depth (ft bgs): 7.34
Start Date: September 20, 1999
Finish Date: September 20, 1999

Depth feet	Well Construction	Methane %	ST	Blows/ 6"	Sample ID	Mtl. Graphic	Description
	Locking, 8" Steel Monument						FILL
	Concrete seal						Firm, moist; brown and tan mottled SILT
		0		3 4 4	S-1		
	Bentonite chips						
5		0		4 4 3	S-2		RECENT ALLUVIUM Loose, moist; red-brown SAND; silty interbeds, sand fine to coarse, red grains angular
	6.5 ft bgs ATD, 9/20/99, casing at 7.5 ft bgs						
	7.34 ft bgs, 10/14/99						
		0		2 6 7	S-3		-grades medium dense, wet, with fine sand bedding
10	Filter pack, 10x20 Colorado silica sand						
	Well screen 2" ID SCH 40 PVC, 0.01" slot size						
		0		5 11 17	S-4		- grades black
15	Threaded end cap, 2" ID SCH 40 PVC						
							Medium dense, wet; gray-brown SAND; some silt, sand fine, trace organics
		0		4 5 6	S-5		
	Bentonite chips						
20							ESTUARINE DEPOSITS - shell fragments in cuttings
							GLACIAL SEDIMENT
		0		27 50/4"	S-6		Very dense, moist; gray SAND with GRAVEL; little silt
							Bottom of boring at 22.5 feet. Monitoring well installed to depth of 15.3 feet.

Sampler Type (ST):
- 3.25" OD D&M Split-Spoon Ring Sampler
- No Recovery
- 2" OD Split-Spoon Sampler

Lab Tests:
C - Chemical Properties
P - Permeability
M - Moisture Content

Water Level (ATD) ▽ Static Water Level

Logged by: RRH
Approved by: JJS

Figure No. A-5

SPARKMW SPRK9_99.GPJ January 3, 2000

ASSOCIATED EARTH SCIENCES, INC

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
BV97041	MW-14	1 of 2

Project Name	South Park Custodial Landfill	Surface Elevation	19.05
Location	Seattle, Washington	Water Depth (ft bgs)	3.96
Drilling Method	Hollow Stem Auger 10.5" OD/6" ID	Start Date	September 14, 1999
Sampling Method	2" diameter, Split Spoon Sampler, 140 lb hammer, 30-inch drop	Finish Date	September 14, 1999

Depth feet	Well Construction	Methane %	S T	Blows/ 6"	Sample ID	Description
	Locking, 8" Steel Monument					TOPSOIL
	Concrete seal					Loose, moist; dark brown SAND with SILT and ORGANICS; concrete and bricks in cuttings
	Bentonite chips	0		14 10 6	S-1	FILL Medium dense, damp; brown SAND with SILT and GRAVEL; with brick
	3.96 ft bgs, 10/14/99					
5	4.5 ft bgs ATD, 9/14/99, casing at 5 ft bgs	0		4 3 5	S-2	Loose, wet; brown SILT; trace gravel, trace sand, trace wood
		0		4 8 9	S-3	RECENT ALLUVIUM Medium dense, wet; black SAND; silt interbeds to 1.5", sand fine to medium
10						
	Filter pack, 10x20 Colorado silica sand	0		4 9 9	S-4	- wood in auger
15						
	Well screen 2" ID SCH 40 PVC, 0.01" slot size					Stiff, wet; brown SILT; trace sand laminae, low plasticity
		0		2 5 5	S-5	
20						
	Threaded end cap, 2" ID SCH 40 PVC					- heaving at 21 feet
	Pea gravel					ESTUARINE DEPOSIT
		0		2 7 6	S-6	Medium dense, wet; brown SAND; few silt, trace shell framents
	Bentonite chips					

Sampler Type (ST):
- 3.25" OD D&M Split-Spoon Ring Sampler
- No Recovery
- 2" OD Split-Spoon Sampler

Lab Tests:
- C - Chemical Properties
- P - Permeability
- M - Moisture Content

Water Level (ATD) ▽ Static Water Level

Logged by: RRH
Approved by: JJS
Figure No. A -6

ary 3, 2000
SPARKMW SPRK9_99.GP

ASSOCIATED EARTH SCIENCES, INC

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
BV97041	MW-14	2 of 2

Project Name: South Park Custodial Landfill
Location: Seattle, Washington
Drilling Method: Hollow Stem Auger 10.5" OD/6" ID
Sampling Method: 2" diameter, Split Spoon Sampler, 140 lb hammer, 30-inch drop

Surface Elevation: 19.05
Water Depth (ft bgs): 3.96
Start Date: September 14, 1999
Finish Date: September 14, 1999

Depth feet	Well Construction	Methane %	ST	Blows/ 6"	Sample ID	Mtl. Graphic	Description
	Bentonite chips	0		4 7 23	S-7		GLACIAL SEDIMENT Hard, wet; brown and gray mottled SILT; trace sand lenses, gravel in shoe
30		0		3 16 37	S-8		Hard, moist to wet; gray and tan mottled SILT; few sand
35							Bottom of boring at 34 feet. Monitoring well installed to depth of 21.8 feet.
40							
45							

Sampler Type (ST):
- 3.25" OD D&M Split-Spoon Ring Sampler
- No Recovery
- 2" OD Split-Spoon Sampler

Lab Tests:
- C - Chemical Properties
- P - Permeability
- M - Moisture Content

Water Level (ATD) ▽ Static Water Level

Logged by: RRH
Approved by: JJS

Figure No. A-6

SPARKMW SPRK9_99.GPJ January 3, 2000

ASSOCIATED EARTH SCIENCES, INC

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
BV97041	MW-18	1 of 2

Project Name: South Park Custodial Landfill
Location: Seattle, Washington
Drilling Method: Hollow Stem Auger 10.5" OD/6" ID
Sampling Method: 2" diameter, Split Spoon Sampler, 140 lb hammer, 30-inch drop

Surface Elevation: 20.78
Water Depth (ft bgs): 15.3
Start Date: September 17, 1999
Finish Date: September 17, 1999

Depth feet	Well Construction	Methane %	ST	Blows/ 6"	Sample ID	Mtl Graphic	Description
	Locking, 8" Steel Monument; Concrete seal						FILL
		0		6 9 8	S-1		Medium dense, damp; brown SAND with GRAVEL; trace silt, trace organics, 1 piece of glass
	Bentonite chips						REFUSE
5		0		7 7 7	S-2		Medium dense, damp; brown SAND, few gravels, trace silt, trace wood; plastic debris noted in shoe
		0.1		26 27 31	S-3		-very dense, damp; gray concrete cinder block
10		0		14 15 7	S-4		
	Bentonite slurry, 30% by weight						
		0		2 3 2	S-5A		Firm, moist to wet; gray grading to brown SILT some ORGANICS
					S-5B		RECENT ALLUVIUM
	14.5 ft bgs ATD, 9/17/99, casing at 17.5 ft bgs						Medium dense, moist; dark brown to black SAND; sand fine to medium, angular red grains visible of volcanic origin
15	15.30 ft bgs, 10/14/99						
		0		1 2 3	S-6A		- grades firm, wet, brown silt, some organics
					S-6B		Medium dense, wet; black SAND; sand fine to medium, angular red grains visible of volcanic origin
20							
		0		3 8 10	S-7		- trace silt interbeds

Sampler Type (ST):
- 3.25" OD D&M Split-Spoon Ring Sampler
- No Recovery
- 2" OD Split-Spoon Sampler

Lab Tests:
- C - Chemical Properties
- P - Permeability
- M - Moisture Content

▼ Water Level (ATD) ▽ Static Water Level

Logged by: RRH
Approved by: JJS
Figure No. A -7

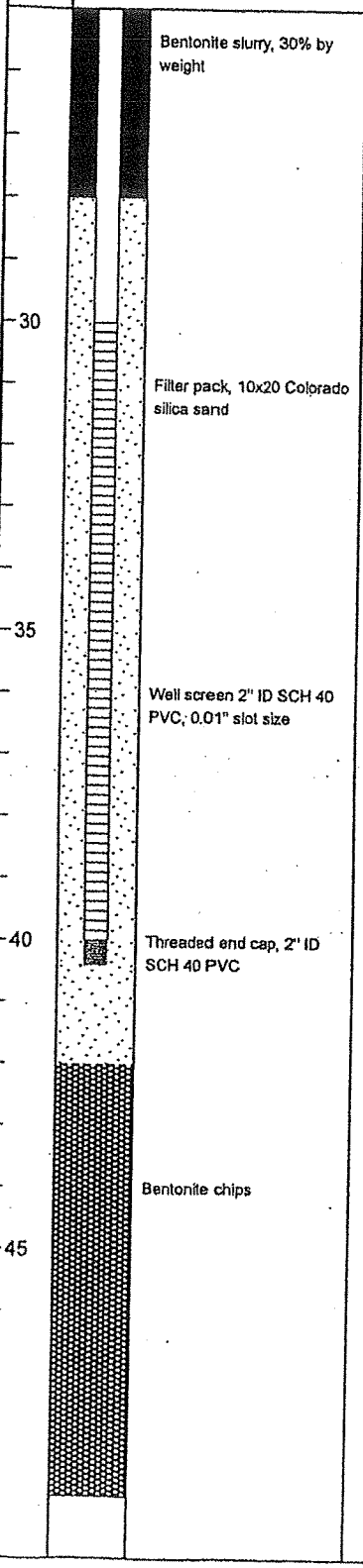
ary 3, 2000
SPARKMW SPRK9_99.GP

ASSOCIATED EARTH SCIENCES, INC

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
BV97041	MW-18	2 of 2

Project Name	South Park Custodial Landfill	Surface Elevation	20.78
Location	Seattle, Washington	Water Depth (ft bgs)	15.3
Drilling Method	Hollow Stem Auger 10.5" OD/6" ID	Start Date	September 17, 1999
Sampling Method	2" diameter, Split Spoon Sampler, 140 lb hammer, 30-inch drop	Finish Date	September 17, 1999



Depth feet	Methane %	ST	Blows/ 6"	Sample ID	Mil. Graphic	Description
	0		3 10 14	S-8		Medium dense, wet; black SAND; sand fine to medium, angular red grains visible of volcanic origin
	0		11 16 12	S-9		- sand fine to coarse
	0		7 8 16	S-10		- silt content increases
						Firm, wet; brown SILT few SAND; trace organics
	0		12 13 15	S-11		Medium dense, wet; black SAND; sand fine to medium, red grained and angular
	0		6 19 27	S-12		- grades dense, brown sand, trace silt, visible bedding
						Bottom of Boring at 49 feet. Monitoring well installed to depth of 40.4 feet.

Sampler Type (ST):
- 3.25" OD D&M Split-Spoon Ring Sampler
- No Recovery
- 2" OD Split-Spoon Sampler

Lab Tests:
- C - Chemical Properties
- P - Permeability
- M - Moisture Content

▼ Water Level (ATD) ▽ Static Water Level

Logged by: RRH
Approved by: JJS
Figure No. A -7

SPARKMW SPRK9_99.GPJ January 3, 2000

ASSOCIATED EARTH SCIENCES, INC

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
BV97041	MW-24	1 of 2

Project Name: South Park Custodial Landfill
Location: Seattle, Washington
Drilling Method: Hollow Stem Auger 10.5" OD/6" ID
Sampling Method: 2" diameter, Split Spoon Sampler, 140 lb hammer, 30-inch drop

Surface Elevation: 13.57
Water Depth (ft bgs): 8.35
Start Date: September 21, 1999
Finish Date: September 21, 1999

Depth feet	Well Construction	Methane %	ST	Blows/ 6"	Sample ID	Mtl. Graphic	Description
	Locking, 8" Steel Monument						FILL
	Concrete seal						Medium dense, damp; dark red-brown SAND; sand fine to medium, sand angular
	Bentonite chips	0					
5							- grades moist to wet, dark brown to black
	6.0 ft bgs ATD, 9/21/99, casing at 7.5 ft bgs						
		0		1 3 6	S-1		Firm, wet to moist; brown SILT; mostly organics, peat-like
	8.35 ft bgs, 10/14/99						
10							- grades wet, gray and brown, trace sand
							RECENT ALLUVIUM
		0		3 2 9	S-2		Medium dense, wet; black SAND; some brown organic silt interbeds, sand fine to medium
15	Bentonite slurry, 30% by weight						
		0		5 11 14	S-3		- sand grades angular
20							
		0		2 15 37	S-4		- grades very dense

Sampler Type (ST):
- 3.25" OD D&M Split-Spoon Ring Sampler
- No Recovery
- 2" OD Split-Spoon Sampler

Lab Tests:
- C - Chemical Properties
- P - Permeability
- M - Moisture Content

Water Level (ATD) ▽ Static Water Level

Logged by: RRH
Approved by: JJS
Figure No. A -8

I:\PARKMW SPRK9_99.GPJ January 3, 2000

ASSOCIATED EARTH SCIENCES, INC

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
BV97041	MW-24	2 of 2

Project Name	South Park Custodial Landfill	Surface Elevation	13.57
Location	Seattle, Washington	Water Depth (ft bgs)	8.35
Drilling Method	Hollow Stem Auger 10.5" OD/6" ID	Start Date	September 21, 1999
Sampling Method	2" diameter, Split Spoon Sampler, 140 lb hammer, 30-inch drop	Finish Date	September 21, 1999

Depth feet	Well Construction	Methane %	ST	Blows/ 6"	Sample ID	Mtl. Graphic	Description
	Bentonite slurry, 30% by weight						Very dense, wet; black SAND; some brown organic silt interbeds, sand fine to medium
		0		9 28 32	S-5		
30							
		0		9 24 33	S-6		
35	Filter pack, 10x20 Colorado silica sand						
		0		4 2 2	S-7		Firm, wet; dark brown SILT with SAND; organics present
40	Well screen 2" ID SCH 40 PVC, 0.01" slot size						Medium dense, wet; black SAND; sand fine to medium and angular
		0		4 8 10	S-8		
45	PVC slip cap, 55 screws						- grades siltier
	Pea gravel						
	Bentonite chips	0		3 9 14	S-9		- grades few silt, trace wood and organics
							Bottom of Boring at 49 feet. Monitoring well installed to depth of 45.3 feet.

Sampler Type (ST):

- 3.25" OD D&M Split-Spoon Ring Sampler
- No Recovery
- 2" OD Split-Spoon Sampler

Lab Tests:

- C - Chemical Properties
- P - Permeability
- M - Moisture Content

▼ Water Level (ATD) ▽ Static Water Level

Logged by: RRH

Approved by: JJS

Figure No. A-8

SPARKMW SPRK9_99.GPJ January 3, 2000

Aspect consulting
IN-DEPTH PERSPECTIVE

Monitoring Well Construction Log

Project Number	Well Number	Sheet
970041	MW-25	1 of 1

Project Name	South Park Custodial Landfill	Ground Surface Elev (NAVD88)	17.30
Location	Seattle, Washington	Top of Casing Elev. (NAVD88)	20.09
Driller/Method	Holt / Hollow Stem Auger	Depth to Water (BTOC)	12.54
Sampling Method	3.25" OD D&M Split-Spoon; 300 lbs Hammer	Start/Finish Date	2/23/2006

Depth / Elevation (feet)	Well Completion	Sample Type/ID	Tests / PID	Blows/ 6"	Material Type	Description
15	Above ground locking monument with bollards and slip cap; Concrete surface seal	S-1		3 3 3		FILL Loose, damp, brown, slightly silty fine SAND
5	Bentonite chip seal	S-2		3 3 4		RECENT ALLUVIUM Medium stiff, moist, gray SILT; scattered organics, wood debris
	▽ 2/23/2006					5.5
10		S-3		4 4 5		Loose, wet, black, fine to medium SAND
						7
10	2-inch PVC blank casing	S-4		1 0 1		Very soft, wet, gray SILT; abundant wood debris
						10
5	▽ 2/27/2006	S-5		1 1 1		
15		S-6		1 1 1		Very soft, wet, gray, sandy SILT; sand fine
						15
0	Bentonite pellet plug	S-7		2 2 1		
20		S-8		4 6 7		Medium dense, wet, black, slightly silty, fine to medium SAND
						20
-5	10-20 filter pack	S-9	DS25060223-	6 10 12		
25	2-inch, 20-slot, PVC well screen					Bottom of Boring at 26'
-10						Coordinates N: 197657.49 E: 1270566.75

Set pump intake ~ 24 ft BTOC

Sampler Type:
- No Recovery
- 3.25" OD D&M Split-Spoon
- Ring Sampler

PID - Photoionization Detector
- Static Water Level
- Water Level (ATD)

Logged by: TDC
Approved by: JJS
Figure No. A-2

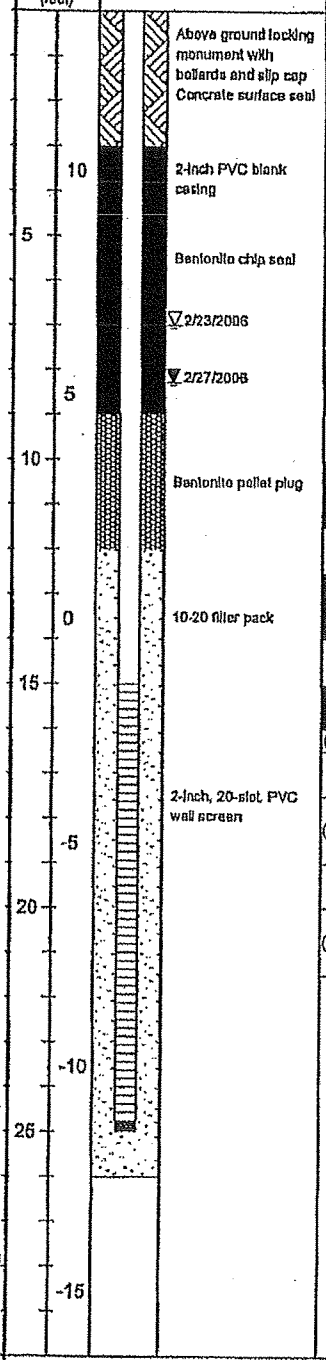
MONITORING WELL SOUTHPARK_WELLS.GPJ March 10, 2006

Aspect consulting
IN-DEPTH PERSPECTIVE

Monitoring Well Construction Log

Project Number	Well Number	Sheet
970041	MW-26	1 of 1

Project Name	South Park Custodial Landfill	Ground Surface Elev (NAVD88)	13.55
Location	Seattle, Washington	Top of Casing Elev. (NAVD88)	15.84
Driller/Method	Holt / Hollow Stem Auger	Depth to Water (BTOC)	8.27
Sampling Method	3.25" OD D&M Split-Spoon; 300 lbs Hammer	Start/Finish Date	2/23/2006



Sample Type/ID	Tests / PID	Blows/ 6"	Material Type	Description
				FILL Loose, damp, brown, fine to medium SAND
S-1		4 4 5		Loose, damp to wet, black, fine SAND
S-2		2 1 1		
S-3 S-4		1 1 1		RECENT ALLUVIUM Very soft, wet, brown SILT; abundant organics Very soft, wet, brown SILT; few organics
S-5		2 4 4		Grades to medium stiff, wet, gray sandy SILT; sand fine
S-6		1 2 2		Very loose to loose, wet, black, fine SAND; trace silt
S-7	DS26060223-	3 4 5		
S-8		4 4 4		
S-9		3 3 4		
				Bottom of Boring at 26'

Set pump intake ~ 20 ft BTOC

Coordinates N: 197121.60
E: 1271164.40

Sampler Type:
- No Recovery
- 3.25" OD D&M Split-Spoon
- Ring Sampler

PID - Photoionization Detector
- Static Water Level
- Water Level (ATD)

Logged by: TDC
Approved by: JJS
Figure No. A-3

MONITORING WELL SOUTHPARK_WELLS.GPJ March 10, 2006

Aspect consulting
IN-DEPTH PERSPECTIVE

Monitoring Well Construction Log

Project Number	Well Number	Sheet
970041	MW-27	1 of 1

Project Name	South Park Custodial Landfill	Ground Surface Elev (NAVD88)	12.72
Location	Seattle, Washington	Top of Casing Elev. (NAVD88)	14.76
Driller/Method	Holt / Hollow Stem Auger	Depth to Water (BTOC)	6.91
Sampling Method	3.25" OD D&M Split-Spoon; 300 lbs Hammer	Start/Finish Date	2/23/2006

Depth / Elevation (feet)	Well Completion	Sample Type/ID	Tests / PID	Blows/ 6"	Material Type	Description
10	Above ground locking monument with bollards and slip cap Concrete surface seal	S-1		7 10 11		FILL (Loose), moist, gray, GRAVEL Medium dense, damp, brown-gray, silty sandy GRAVEL
5	2-inch PVC blank casing Bentonite chip seal	S-2		3 2 2		Medium dense to loose, damp to wet, slightly silty, slightly gravelly, fine SAND
	▽ 3/3/2006					
5		S-3				Loose, wet, brown, medium to fine SAND; trace silt, trace gravel
	10-20 filter pack					
10		S-4		2 1 1		-Very loose, wet, gray-brown GRAVEL: well rounded to 0.5-inch
0		S-5		2 2 2		RECENT ALLUVIUM Loose, wet, gray, silty fine SAND
	2-inch, 20-slot PVC well screen					
15		S-6		2 2 2		
-5		S-7	DS27060223-	2 2 2		
		S-8		3 4 5		Loose, wet, black, fine to medium SAND; trace silt
20						
-10						Bottom of Boring at 21' Coordinates N: 196835.06 E: 1271357.64
25						Set Prism screw ~ 15 ft BTOC
-15						

Sampler Type:
- No Recovery
- 3.25" OD D&M Split-Spoon
- Ring Sampler

PID - Photoionization Detector
- Static Water Level
- Water Level (ATD)

Logged by: TDC
Approved by: JJS
Figure No. A-4

MONITORING WELL SOUTHPARK_WELLS.GPJ March 10, 2006

Boring Log

Aspect CONSULTING

Project Number	Boring Number	Sheet
100166	MW-29	1 of 1

Project Name: South Park Landfill
Location: Seattle, WA
Driller/Method: Cascade Drilling, LP / Direct Push Probe
Sampling Method: Continuous Core

Ground Surface Elev: 19.45' NAVD88
Depth to Water: 5.4' BGS (ATD)
Start/Finish Date: 1/14/2011

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID	Tests	PID (ppm)	Drive/ Recovery	Material Type	Description	Depth (ft)
0	Concrete seal, 0'-2'	S-1					Dense, moist, dark gray, slightly silty, sandy GRAVEL (GP-GM), occasional brick fragments.	0
							Dense, moist, brown, SAND (SP); medium sand.	
5	2-inch diameter schedule 40 PVC casing, 0'-20' ▽ 12/29/2010	S-2		0.0				5
	Hydrated bentonite chips, 2'-18'						Medium stiff, moist, dark brown SILT (ML); occasional wood fibers; glass pieces at 6'. Grades to light brown with frequent wood fibers.	
10		S-3		0.0			Grades to soft, dark gray, with black wood fragments.	10
							No wood, thin silt laminations.	
15		S-4		0.0			Dense, very moist, black SAND (SP); fine to medium sand.	15
		S-5		0.0			Dense, wet, dark gray, very silty SAND (SM); with occasional thin sandy silt interbeds.	
20	#8/12 sand filter pack, 18'-30'							20
	2-inch diameter schedule 40 PVC 20-slot prepacked screen, 20'-30'	S-6		0.0			Dense, wet, dark brown to black SAND (SP); with thick silty sand interbeds.	
25		S-7		0.0				25
							Dense, wet, dark brown to black, sandy SILT (ML).	
		S-8		0.0			Dense, wet, black SAND (SP); fine sand.	
30	PVC endcap Aluminum drive shoe							30
							Bottom of boring at 10' below ground surface. Soil vapors were measured using GEM 2000 gas analyzer, H2S meter, and PID: CH4: 0.2% CO2: 0.1% O2: 20.4% BAL: 79.5% H2S: 0.0 ppm PID: 0.0 ppm	
35								35

Sampler Type:
○ No Recovery
▌▌ Continuous Core

PID - Photoionization Detector (Headspace Measurement)
▼ Static Water Level
▽ Water Level (ATD)

Logged by: DFR
Approved by: JJS
Figure No. B- 25

_ENV BORING LOG SOUTH PARK LANDFILL 100116.GPJ December 1, 2011

Boring Log

Aspect CONSULTING

Project Number	Boring Number	Sheet
100166	MW-30	1 of 1

Project Name: South Park Landfill
Location: Seattle, WA
Driller/Method: Cascade Drilling, / Hollow Stem Auger
Sampling Method: Dames & Moore

Ground Surface Elev: 17.60' NAVD88
Depth to Water: 10.8' BGS (ATD)
Start/Finish Date: 6/15/2011

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID	Tests	PID (ppm)	Drive/ Recovery	Material Type	Description	Depth (ft)
	Concrete seal, 0'-2'						Loose, slightly moist, brown, trace to slightly silty SAND (SP-SM); fine to medium sand, predominantly fine.	
	2-inch diameter schedule 40 PVC casing, 0'-8'							
	Hydrated bentonite chips, 2'-6'							
5		S-1		0.0	1 1 1			5
	#2/12 sand filter pack, 6'-13'							
		S-2		0.0	1 1 1		Loose, slightly moist, brown, slightly silty SAND (SP-SM); with frequent, thin SILT (ML) lamina.	
	2-inch diameter schedule 40 PVC 10-slot screen, 8'-13'							
10							Loose, wet, brown, slightly silty SAND (SP-SM); trace fine gravel.	10
	▽6/15/2011	S-3		0.0	1 1 1		Soft, wet, gray, clayey SILT (ML).	
							Loose, wet, black, slightly silty to silty SAND (SP-SM). Gravelly.	
	PVC endcap	S-4		0.0	2 1 1		Loose, wet, black SAND (SP) with 2" gray SILT (ML) pockets.	
15	Slough						Loose, wet, black SAND (SP); fine to medium sand.	15
		S-5		0.0	3 4 6			
							Bottom of boring at 16.5' below ground surface.	

Sampler Type:
- ○ No Recovery
- ◧ 3.25" OD D&M Split-Spoon Ring Sampler

PID - Photoionization Detector (Headspace Measurement)

▼ Static Water Level

▽ Water Level (ATD)

Logged by: AET

Approved by: JJS

Figure No. B- 26

_ENV BORING LOG SOUTH PARK LANDFILL 100116.GPJ December 1, 2011

Boring Log

Aspect CONSULTING

Project Number	Boring Number	Sheet
100166	MW-31	1 of 1

Project Name: South Park Landfill
Location: Seattle, WA
Driller/Method: Cascade Drilling, / Hollow Stem Auger
Sampling Method: Dames & Moore

Ground Surface Elev: 17.58' NAVD88
Depth to Water: 11' BGS (ATD)
Start/Finish Date: 6/15/2011

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID	Tests	PID (ppm)	Drive/ Recovery	Material Type	Description	Depth (ft)
	Concrete seal, 0'-2'						Loose, slightly moist, brown, slightly silty SAND (SP-SM); fine sand.	
5	2-inch diameter schedule 40 PVC casing, 0'-18'	S-1		0.0	3 3 3			5
		S-2		0.0	3 3 4		Loose, slightly moist, dark gray SAND (SP); fine to medium sand.	
10	Hydrated bentonite chips, 2'-16' ▽6/15/2011	S-3		0.0	4 4 3		Wet.	10
15		S-4		0.0	3 5 8		Stiff, wet, gray SILT (ML); with wood debris. Medium dense, wet, dark gray to black SAND (SP); trace silt; fine to medium sand.	15
	#2/12 sand filter pack, 16'-26'							
20	2-inch diameter schedule 40 PVC 10-slot screen, 18'-23'	S-5		0.0	4 6 8			20
	PVC endcap							
25		S-6		0.0	5 9 9		Bottom of boring at 26' below ground surface.	25

Sampler Type:
- ◯ No Recovery
- ◧ 3.25" OD D&M Split-Spoon Ring Sampler

PID - Photoionization Detector (Headspace Measurement)
- ▼ Static Water Level
- ▽ Water Level (ATD)

Logged by: AET
Approved by: JJS
Figure No. B- 27

_ENV BORING LOG SOUTH PARK LANDFILL 100116.GPJ December 1, 2011

Boring Log

Aspect CONSULTING

Project Number	Boring Number	Sheet
100166	MW-32	1 of 1

Project Name: South Park Landfill
Location: Seattle, WA
Driller/Method: Cascade Drilling, / Hollow Stem Auger
Sampling Method: Dames & Moore

Ground Surface Elev: 17.51' NAVD88
Depth to Water: 10.90' bTOC
Start/Finish Date: 6/29/2011

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID	Tests	PID (ppm)	Drive/ Recovery	Material Type	Description	Depth (ft)
0	Concrete seal, 0'-2'						Very loose, moist, dark red-brown, slightly silty SAND (SP-SM); fine sand; glass shards, burnt woods debris, and other refuse present	0
	2-inch diameter schedule 40 PVC casing, 0'-20'	S-1	CH4: 0.1% CO2: 0.1% O2: 20.1%	0.0	2 2 2			
5	Well installed with 10.25" ID conductor casing installed to a depth of 11.5' bgs. A 1 ft thick bentonite seal was constructed from 10.5' to 11.5' bgs and hydrated for 1 hr before drilling to 24' bgs with 4.25" ID hollow stem augers.	S-2	CH4: 0.1% CO2: 0.1% O2: 19.1%	0.0	4 1 1			5
		S-3		0.0	2 5 5		Very loose, very moist, black SAND (SP); medium sand; no refuse present	
10	▽6/29/2011	S-4	CH4: 0.1% CO2: 0.1% O2: 20.0%	0.0	2 3 4		Medium stiff, wet, dark blue-gray SILT (ML)	10
		S-5		0.0	1 2 2			
15	Hydrated bentonite chips, 2'-17'	S-6		0.0	3 3 4			15
	#2/12 sand filter pack, 17'-24'						Medium dense, wet, dark gray to black SAND (SP); trace silt; fine to medium sand.	
20	2-inch diameter schedule 40 PVC 10-slot screen, 19'-24'							20
		S-7		0.0	10 12 13			
	PVC endcap						Bottom of boring at 24' below ground surface. Ecology Well ID Tag BHA-082	
25								25

Sampler Type:
- ◯ No Recovery
- ◧ 3.25" OD D&M Split-Spoon Ring Sampler

PID - Photoionization Detector (Headspace Measurement)
- ▼ Static Water Level
- ▽ Water Level (ATD)

Logged by: DFR
Approved by: JJS
Figure No. B- 28

_ENV BORING LOG SOUTH PARK LANDFILL 100116.GPJ December 1, 2011

Boring Log

Aspect CONSULTING

Project Number	Boring Number	Sheet
100166	MW-33	1 of 1

Project Name: South Park Landfill
Location: Seattle, WA
Driller/Method: Cascade Drilling, / Hollow Stem Auger
Sampling Method: Dames & Moore

Ground Surface Elev: 17.81' NAVD88
Depth to Water: 11.05' bTOC
Start/Finish Date: 6/29/2011

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID	Tests	PID (ppm)	Drive/ Recovery	Material Type	Description	Depth (ft)
0	Concrete seal, 0'-2'						Very loose, slightly moist, brown, medium SAND (SP)	0
	2-inch diameter schedule 40 PVC casing, 0'-20'	S-1	CH4: 0.1% CO2: 0.1% O2: 19.1%	0.0	2 2 4			
5	Well installed with 10.25" ID conductor casing installed to a depth of 11.5' bgs. A 1 ft thick bentonite seal was constructed from 10.5' to 11.5' bgs and hydrated for 1 hr before drilling to 24' bgs with 4.25" ID hollow stem augers.	S-2	CH4: 0.1% CO2: 0.1% O2: 20.0%	0.0	2 3 4		Very loose, moist, dark red-brown, slightly silty SAND (SP-SM); fine sand; glass shards, burnt woods debris, and other refuse present	5
		S-3		0.0	8 16 20		Very loose, very moist, black SAND (SP); medium sand; no refuse present	
10	▽6/29/2011	S-4	CH4: 0.1% CO2: 0.1% O2: 20.1%	0.0	4 3 2		Medium stiff, wet, dark blue-gray SILT (ML)	10
		S-5		0.0	4 5 6		No sample recovery due to rock in sampler	
15	Hydrated bentonite chips, 2'-18'							15
		S-6		0.0	2 3 4		Medium dense, wet, dark gray to black SAND (SP); trace silt; fine to medium sand.	
20	#2/12 sand filter pack, 18'-25' 2-inch diameter schedule 40 PVC 10-slot screen, 19'-25'							20
		S-7		0.0	10 12 12			
25	PVC endcap						Bottom of boring at 25' below ground surface. Ecology Well ID Tag BHA-083	25

Sampler Type:
- ◯ No Recovery
- ◧ 3.25" OD D&M Split-Spoon Ring Sampler

PID - Photoionization Detector (Headspace Measurement)

▼ Static Water Level

▽ Water Level (ATD)

Logged by: DFR

Approved by: JJS

Figure No. B- 29

_ENV BORING LOG SOUTH PARK LANDFILL 100116.GPJ December 1, 2011

South Park Landfill

Landfill Post-Closure Operations, Maintenance, and Monitoring Plan

Attachment A.3
Groundwater Monitoring and Contingency Plan

Exhibit A.3.1
Sampling and Analysis Plan and Quality Assurance Project Plan

Attachment B
Groundwater Sampling Record Template

South Park Landfill

GROUNDWATER SAMPLE COLLECTION FORM

Well ID: _____ Date of Collection: _____ Field Personnel: _____

Purge Data

Well ID: _____ Secure: ☐ Yes ☐ No Well Condition/Damage Description: _____

_____

Depth Sounder decontaminated Prior to Placement in Well: ☐ Yes ☐ No One Casing Volume (gal): _____

Depth of water (from top of well casing): _____ Well Casing Type/Diameter: _____

After 5 minutes of purging (from top of casing): _____ Screened Interval: _____

Sample intake depth: _____

Begin purge (time): _____

End purge (time): _____

Gallons purged: _____

Purge water disposal method: _____

Volume of Schedule 40 PVC Pipe

Diameter	O.D.	I.D.	Volume (Gal/Linear Ft.)	Weight of Water (Lbs/Lineal Ft.)
1 ¼"	1.660"	1.380"	0.08	0.64
2"	2.375"	2.067"	0.17	1.45
3"	3.500"	3.068"	0.38	3.2
4"	4.500"	4.026"	0.66	5.51
6"	6.625"	6.065"	1.5	12.5

Time	Depth to Water	Vol. Purged	pH	DO	Conductivity	Turbidity	Temp	ORP	Comments

Sampling Data

Sample ID: _____ Location and Depth: _____

Date Collected (mo/dy/yr): _____ Time Collected: _____ ☐ AM ☐ PM Weather: _____

Sample: ☐ Filtered ☐ Unfiltered Other: _____

Sample Collected with: ☐ Bailer ☐ Pump Other: _____ Type: _____

Water Quality Instrument Data Collected with: _____

Sample Decon Procedure: Sample collected with (circle one): decontaminated all tubing; disposable and/or dedicated silicon and poly tubing Other: _____

Sample Description (Color, Turbidity, Odor, Other): _____

Types of Sample Containers: Quantity:

_____ _____

Duplicate Sample Collected: ☐ Yes ☐ No If yes, ID(s)

_____ _____

Additional Information/Comments

_____

_____

_____

_____

_____

_____

_____

_____

South Park Landfill

Landfill Post-Closure Operations, Maintenance, and Monitoring Plan

Attachment A.4
Annual Report Checklist

South Park Landfill

Annual Report Checklist

DUE TO ECOLOGY March 31 of each calendar year
(includes January 1 through December 31 of the previous year)

1. Landfill cap inspection and maintenance (per CMP)

☐ Cap inspection field form (annual) Date completed: _____
☐ Cap maintenance documentation
☐ No maintenance performed during this reported period

2. Documentation of non-routine subsurface work in accordance with MHP

☐ Completed during this reporting period
☐ Not completed during this reporting period

3. Quarterly LFG Perimeter Probe Monitoring in accordance with LFGMCP

Date Completed		Field Forms	Uploaded into Database
☐ Q1	_____	☐	☐
☐ Q2	_____	☐	☐
☐ Q3	_____	☐	☐
☐ Q4	_____	☐	☐

4. Quarterly Inspection of on-site building methane detectors and alarms

Date Completed
☐ Q1 _____
☐ Q2 _____
☐ Q3 _____
☐ Q4 _____

Off-site building monitoring conducted?

☐ Yes ☐ No

If yes provide location, date, and field documentation:

_____

_____

5. Quarterly groundwater monitoring in accordance with GMCP

Date Completed		Field Forms
☐ Q1	_____	☐
☐ Q2	_____	☐
☐ Q3	_____	☐
☐ Q4	_____	☐

_____ _____
Signature Date

South Park Landfill

Cleanup Action Plan

Appendix B
Environmental Covenants for South Park Landfill

South Park Landfill

Cleanup Action Plan

Appendix B
Environmental Covenants for
South Park Landfill

South Park Property Development Parcel

After Recording Return
Original Signed Covenant to:

Jerome Cruz
Toxics Cleanup Program
Department of Ecology
Northwest Regional Office
3190 - 160th Ave. SE
Bellevue, WA 98008-5452

Environmental Covenant

Grantor: South Park Property Development LLC
Grantee: State of Washington, Department of Ecology (hereafter "Ecology")
Brief Legal Description: Ptn. NW¼ S. 32, T. 24 N, R. 4 E.W.M.
Additional Legal Description on pages 8-10
Tax Parcel Nos.: 3224049005
Cross Reference: NONE

RECITALS

a. This document is an environmental (restrictive) covenant (hereafter "Covenant") executed pursuant to the Model Toxics Control Act ("MTCA"), chapter 70.105D RCW, and Uniform Environmental Covenants Act ("UECA"), chapter 64.70 RCW.

b. The Property that is the subject of this Covenant is part of a site commonly known as South Park Landfill (Facility Site ID # 2180). The Property is legally described in Exhibit A, and illustrated in Exhibit B, both of which are attached (hereafter "Property"). If there are differences between these two Exhibits, the legal description in Exhibit A shall prevail.

c. The Property is the subject of remedial action conducted under MTCA. This Covenant is required because residual contamination remains on the Property after completion of remedial actions. Specifically, the following principal contaminants remain on the Property:

Medium	Principal Contaminants Present[1]
Waste within the closed landfill	Aged municipal solid waste with soil. Arsenic and lead have been detected in soil.
Soil (landscaping above the landfill cap)	Various common urban hazardous substances, such as PAHs and metals, are present at concentrations above unrestricted land use cleanup levels (Methods A and B) but below industrial land use cleanup levels (Methods A and C).
Soil vapor	Landfill gas (Methane)
Groundwater	Vinyl Chloride, Iron, Manganese, Arsenic

d. It is the purpose of this Covenant to restrict certain activities and uses of the Property to protect human health and the environment and the integrity of remedial actions conducted at the site. Records describing the extent of residual contamination and remedial actions conducted are

[1] For a full description of the contaminants of concern at the South Park Landfill Site, see Exhibit A to the Consent Decree (King County Cause No XXXXX), Draft Cleanup Action Plan, in Table 4.2.

available through Ecology. This includes but is not limited to the following documents (hereafter the "Site Documents"):

- Cleanup Action Plan **<citation to be completed>,** including the Operations, Maintenance, and Monitoring Plan (OMMP) for South Park Landfill, which includes the following:
    - Attachment A.1: Landfill Cap Inspection and Maintenance Plan
    - Attachment A.2: Landfill Gas Monitoring and Contingency Plan
    - Attachment A.3: Groundwater Monitoring and Contingency Plan
    - Attachment A.4: Annual Report Checklist
- Consent Decree **<citation to be completed once entered by court>**
- RI/FS **<citation to be completed>**

e. This Covenant grants Ecology certain rights under UECA and as specified in this Covenant. As a Holder of this Covenant under UECA, Ecology has an interest in real property, however, this is not an ownership interest which equates to liability under MTCA or the Comprehensive Environmental Response, Compensation, and Liability Act, 42 U.S.C. § 9601 *et seq*. The rights of Ecology as an "agency" under UECA, other than its' right as a holder, are not an interest in real property.

COVENANT

South Park Property Development LLC ("SPPD"), as Grantor and fee simple owner of the Property, hereby grants to the Washington State Department of Ecology, and its successors and assignees, the following covenants. Furthermore, it is the intent of the Grantor that such covenants shall supersede any prior interests SPPD has in the property and run with the land and be binding on all current and future owners of any portion of, or interest in, the Property.

Section 1. General Restrictions and Requirements.

The following general restrictions and requirements shall apply to the Property:

a. Interference with Remedial Action. The Grantor shall not engage in any activity on the Property that may adversely impact or interfere with the remedial action and any operation, maintenance, inspection or monitoring of that remedial action without prior written approval from Ecology.

b. Protection of Human Health and the Environment. The Grantor shall not engage in any activity on the Property that may threaten continued protection of human health or the environment without prior written approval from Ecology. This includes, but is not limited to, any activity that results in the release of residual contamination that was contained as a part of the remedial action or that exacerbates or creates a new exposure pathway to residual contamination remaining on the Property.

c. Continued Compliance Required. Grantor shall not convey any interest in any portion of the Property without providing for the continued adequate and complete operation, maintenance and monitoring of remedial actions and continued compliance with this Covenant.

d. Leases. Grantor shall restrict any lease for any portion of the Property to uses and activities consistent with this Covenant and notify all lessees of the restrictions on the use of the Property.

e. Preservation of Reference Monuments. Grantor shall make a good faith effort to preserve any reference monuments and boundary markers used to define the areal extent of

coverage of this Covenant. Should a monument or marker be damaged or destroyed, Grantor shall have it replaced by a licensed professional surveyor within 30 days of discovery of the damage or destruction.

Section 2. Specific Prohibitions and Requirements.

In addition to the general restrictions in Section 1 of this Covenant, the following additional specific restrictions and requirements shall apply to the Property.

a. Land use. The remedial action for the Property is based on a cleanup designed for industrial property. As such, the Property shall be used in perpetuity only for industrial uses, as that term is defined in the rules promulgated under Chapter 70.105D RCW. Prohibited uses on the Property include but are not limited to residential uses, childcare facilities, K-12 public or private schools, parks, grazing of animals, growing of food crops, and non-industrial commercial uses.

b. Containment of soil/solid wastes. The remedial action for the Property is based on containing contaminated soil and landfill waste under a cap consisting of buildings, asphalt, concrete, soil layers with a visible barrier (non-paved areas), and soil with low permeability layer or an impermeable geomembrane at least 50 millimeters thick (stormwater conveyance and treatment facilities such as swales, ditches, or ponds). Exhibit C shows the extent and type of the cap on the Property. The primary purpose of this cap is to prevent direct contact with the contaminated soil and landfill wastes. The cap is an inherent element of the stormwater and landfill gas controls that are part of landfill closure. The following restrictions shall apply within the cap area illustrated in Exhibit C:

i. Any activity on the Property that will compromise the integrity of the cap including: drilling; digging; piercing the cap with sampling device, post, stake or similar device; grading; excavation; installation of underground utilities; removal of the cap; or, application of loads in excess of the cap load bearing capacity, is prohibited without prior written approval by Ecology. The Grantor shall report to Ecology within forty-eight (48) hours of the discovery of any damage to the cap. Unless an alternative plan has been approved by Ecology in writing, the Grantor shall promptly repair the damage and submit a report documenting this work to Ecology within thirty (30) days of completing the repairs.

ii. The Grantor shall not alter or remove the existing structures on the Property in any manner that would expose contaminated soil and landfill waste, result in a release to the environment of contaminants, or create a new exposure pathway, without prior written approval of Ecology.

iii. The Grantor covenants and agrees that it shall annually, or at other time as approved in writing by Ecology, inspect the cap and building floor or foundation and report within thirty (30) days of the inspection the condition of the cap and building floor or foundation and any changes to the cap and building floor and foundation that would impair their performance.

c. Stormwater facilities. To minimize the potential for mobilization of contaminants remaining in soil, landfill waste, and groundwater on the Property, no stormwater infiltration facilities or unlined ponds shall be constructed on the portion of the Property that overlies refuse as detailed in Exhibit D. All stormwater catch basins, conveyance systems, and other appurtenances installed on the Property to manage stormwater shall be of water-tight construction.

d. Landfill Gas Controls and Protections. The residual contamination on the Property includes biodegradable wastes/chemicals that may generate methane, a combustible gas. The

following restrictions shall apply on the Property to minimize the potential for exposure to methane vapors:

i. Grantor shall equip all buildings on the Property with methane alarms operating 24 hours, 7 days per week. Grantor shall maintain the alarms in good working order, and will replace any alarm that fails within 7 days after discovery of the failure.

ii. No building or other enclosed structure shall be constructed on the Property unless approved by Ecology.

iii. Grantor shall ensure that any new building or other enclosed structure constructed on the Property will comply with all City Code requirements related to methane mitigation, and will contain, at a minimum, a sealed foundation and a gas venting system unless otherwise approved in writing by Ecology.

e. Landfill Gas Monitoring. Grantor shall monitor landfill gas on the Property. The following monitoring is required:

i. The Grantor will monitor indoor spaces using the methane alarms described in 2(d) above to ensure that concentrations of methane gas in (a) buildings overlying refuse illustrated in Exhibit B do not exceed 1.25 percent by volume, or 25 percent of the lower explosive limit (LEL), and (b) buildings outside the area of the Property overlying refuse illustrated in Exhibit B do not exceed 100 parts per million by volume.

ii. The Grantor will monitor performance of the landfill gas controls installed on the Property as part of 2(d) above;

iii. The Grantor shall promptly report to Ecology any exceedance of methane gas allowable limits, and shall take immediate, appropriate action to respond to such exceedances.

f. Groundwater use. The groundwater beneath the Property remains contaminated and shall not be extracted for any purpose other than temporary construction dewatering, investigation, monitoring or remediation. Drilling of a well for any water supply purpose is strictly prohibited. Groundwater extracted from the Property for any purpose shall be considered potentially contaminated and any discharge of this water shall be done in accordance with state and federal law.

g. Groundwater Monitoring. Groundwater monitoring wells are located on the Property to monitor the performance of the remedial action. The Grantor shall maintain clear access to these devices and protect them from damage. The Grantor shall report to Ecology within 14 days of the discovery of any damage to any monitoring device located on the Property. Unless Ecology approves of an alternative plan in writing, the Grantor shall arrange for the prompt repair of the damage and submission of a report documenting this work to Ecology within thirty (30) days of completing the repairs.

Section 3. Access.

a. The Grantor shall maintain clear access to all remedial action components necessary to construct, operate, inspect, monitor and maintain the remedial action.

b. The Grantor freely and voluntarily grants Ecology, its authorized representatives, and the Site Coordinator, upon reasonable notice, the right to enter the Property at reasonable times to evaluate the effectiveness of this Covenant and associated remedial actions, and enforce compliance with this Covenant and those actions, including the right to take samples, inspect any remedial actions conducted on the Property, and to inspect related records.

c. No right of access or use by a third party to any portion of the Property is conveyed by this instrument.

Section 4. Notice Requirements.

a. Conveyance of Any Interest. The Grantor, when conveying any interest in any part of the Property, including but not limited to title, easement, leases, and security or other interests, must:

i. Provide written notice to Ecology of the intended conveyance at least thirty (30) days in advance of the conveyance.

ii. Include in the conveying document a notice in substantially the following form, as well as a complete copy of this Covenant:

NOTICE: THIS PROPERTY IS SUBJECT TO AN ENVIRONMENTAL COVENANT GRANTED TO THE WASHINGTON STATE DEPARTMENT OF ECOLOGY ON [DATE] AND RECORDED WITH THE KING COUNTY RECORDER'S OFFICE UNDER RECORDING NUMBER [RECORDING NUMBER]. USES AND ACTIVITIES ON THIS PROPERTY MUST COMPLY WITH THAT COVENANT, A COMPLETE COPY OF WHICH IS ATTACHED TO THIS DOCUMENT.

iii. Unless otherwise agreed to in writing by Ecology, provide Ecology with a complete copy of the executed document within thirty (30) days of the date of execution of such document.

b. Reporting Violations. Should the Grantor become aware of any violation of this Covenant, Grantor shall promptly report such violation in writing to Ecology.

c. Emergencies. For any emergency or significant change in site conditions due to Acts of Nature (for example, flood or fire) resulting in a violation of this Covenant, the Grantor is authorized to respond to such an event in accordance with state and federal law. The Grantor must notify Ecology in writing of the event and response actions must be planned or taken as soon as practical but no later than within 24 hours of the discovery of the event.

d. Notification procedure. Any required written notice, approval, reporting or other communication shall be personally delivered or sent by first class mail to the following persons. Any change in this contact information shall be submitted in writing to all parties to this Covenant. Upon mutual agreement of the parties to this Covenant, an alternative to personal delivery or first class mail, such as e-mail or other electronic means, may be used for these communications.

South Park Property Development, LLC Attn: Rob Howie 165 NE Juniper Street Suite 100 Issaquah, WA 98027 425-837-9720 rhowie@seaconllc.com	Environmental Covenants Coordinator Washington State Department of Ecology Toxics Cleanup Program P.O. Box 47600 Olympia, WA 98504 – 7600 (360) 407-6000 ToxicsCleanupProgramHQ@ecy.wa.gov

Section 5. Modification or Termination.

a. Grantor must provide written notice and obtain approval from Ecology at least sixty (60) days in advance of any proposed activity or use of the Property in a manner that is inconsistent with this Covenant. For any proposal that is inconsistent with this Covenant and permanently modifies an activity or use restriction at the site:

i. Ecology must issue a public notice and provide an opportunity for the public to comment on the proposal; and

ii. If Ecology approves of the proposal, the Covenant must be amended to reflect the change before the activity or use can proceed.

b. If the conditions at the site requiring a Covenant have changed or no longer exist, then the Grantor may submit a request to Ecology that this Covenant be amended or terminated. Any amendment or termination of this Covenant must follow the procedures in MTCA and UECA and any rules promulgated under these chapters.

Section 6. Enforcement and Construction.

a. This Covenant is being freely and voluntarily granted by the Grantor.

b. Within ten (10) days of execution of this Covenant, Grantor shall provide Ecology with an original signed Covenant and proof of recording and a copy of the Covenant and proof of recording to others required by RCW 64.70.070.

c. Ecology shall be entitled to enforce the terms of this Covenant by resort to specific performance or legal process. All remedies available in this Covenant shall be in addition to any and all remedies at law or in equity, including MTCA and UECA. Enforcement of the terms of this Covenant shall be at the discretion of Ecology, and any forbearance, delay or omission to exercise its rights under this Covenant in the event of a breach of any term of this Covenant is not a waiver by Ecology of that term or of any subsequent breach of that term, or any other term in this Covenant, or of any rights of Ecology under this Covenant.

d. The Grantor shall be responsible for all costs associated with implementation of this Covenant. Furthermore, the Grantor, upon request by Ecology, shall be obligated to pay for Ecology's costs to process a request for any modification or termination of this Covenant and any approval required by this Covenant.

e. This Covenant shall be liberally construed to meet the intent of MTCA and UECA.

f. The provisions of this Covenant shall be severable. If any provision in this Covenant or its application to any person or circumstance is held invalid, the remainder of this Covenant or its application to any person or circumstance is not affected and shall continue in full force and effect as though such void provision had not been contained herein.

g. A heading used at the beginning of any section or paragraph or exhibit of this Covenant may be used to aid in the interpretation of that section or paragraph or exhibit but does not override the specific requirements in that section or paragraph.

h. This Covenant shall not be considered or interpreted to diminish the governmental or police powers of the State of Washington or the City of Seattle.

The undersigned Grantor warrants he/she holds the title to the Property and has authority to execute this Covenant.

EXECUTED this _____ day of _____, 20___.

SOUTH PARK PROPERTY DEVELOPMENT LLC

_____

By: _____

Title: _____

REPRESENTATIVE ACKNOWLEDGEMENT

STATE OF _____
COUNTY OF _____

On this _____ day of _____, 20__, I certify that _____ personally appeared before me, acknowledged that **he/she** signed this instrument, on oath stated that **he/she** was authorized to execute this instrument, and acknowledged it as the _____ [TYPE OF AUTHORITY] of South Park Property Development LLC to be the free and voluntary act and deed of such party for the uses and purposes mentioned in the instrument.

_____
Notary Public in and for the State of Washington
Residing at _____
My appointment expires _____

Exhibit A

LEGAL DESCRIPTION

The Land is located in King County, Washington, and is legally described as follows:

Parcel A:

That portion of Government Lots 2 through 4, inclusive, and of the Southwest Quarter of the Northwest Quarter of Section 32, Township 24 North, Range 4 East, Willamette Meridian, in King County, Washington, described as follows:

Beginning at a point on the West line of George Holt's Donation Claim No. 51, as established by Superior Court Case No. 14450, which is 400 feet North of the Southwesterly corner thereof;

thence South along said West line 400 feet to the South line of said donation claim;

thence East along said South line to the West line of A. Hograve's Donation Claim No. 37;

thence South along the last described West line to the production West of the centerline of Sullivan Street;

thence West along said produced line to the East line of 1st Avenue South, as established by Ordinance No. 21498;

thence North along said East line 39.56 feet;

thence North 66°52'24" East 562.14 feet;

thence North 16°56'06" West 861.57 feet;

thence North 24°43'54" East 35.17 feet;

thence North 64°14'54" East 98 feet;

thence Easterly along a straight line to the Point of Beginning;

EXCEPT that portion thereof described as follows:

Beginning at the intersection of a line 794 feet West of and parallel with the West line of A. Hograve's Donation Claim No. 37 and the production West of the centerline of Sullivan Street;

thence West along said produced line to the East line of 1st Avenue South, as established by Ordinance No. 21498;

thence North along said East line 39.56 feet;

thence North 66°52'24" East 562.14 feet;

thence Southeasterly along a straight line to the Point of Beginning; and

EXCEPT those portions conveyed to the City of Seattle by deeds recorded under recording numbers 5947050 and 6240807; and

EXCEPT that portion lying Southwesterly of the Northeasterly line of Occidental Avenue South (Road No. 51); and

EXCEPT that portion thereof described as follows:

That portion of Government Lot 4, Section 32, Township 24 North, Range 4 East, Willamette Meridian, in King County, Washington, described as follows:

Beginning at a point on the West line of Geo. Holt Donation Claim No. 51 which is 516.36 feet South of the North line of Section 32, Township 24 North, Range 4 East, Willamette Meridian, in King County, Washington;

thence South 02°03'26" West along said line 400 feet;

thence North 89°53'36" East along the South line of said donation claim 73.16 feet;

thence South 00°35'49" West along a line parallel to and 794 feet West of the West line of A. Hograve Donation Claim No. 37, a distance of 350 feet;

thence Westerly to a concrete monument on the East line of Chas. Prentice tract;

thence North 16°56'06" West 705.57 feet;

thence North 24°43'54" East 35.17 feet;

thence North 64°14'54" East 98 feet;

thence Easterly to the Point of Beginning.

Parcel B:

That portion of Government Lot 4, Section 32, Township 24 North, Range 4 East, Willamette Meridian, in King County, Washington, described as follows:

Beginning at a point on the West line of Geo. Holt Donation Claim No. 51 which is 516.36 feet South of the North line of Section 32, Township 24 North, Range 4 East, Willamette Meridian, in King County, Washington;

thence South 02°03'26" West along said line 400 feet;

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thence South 00°35'49" West along a line parallel to and 794 feet West of the West line of A. Hograve Donation Claim No. 37, a distance of 350 feet;

thence Westerly to a concrete monument on the East line of Chas. Prentice tract;

thence North 16°56'06" West 705.57 feet;

thence North 24°43'54" East 35.17 feet;

thence North 64°14'54" East 98 feet;

thence Easterly to the Point of Beginning;

EXCEPT any portion thereof lying within Occidental Avenue; and

EXCEPT that portion conveyed to the City of Seattle by deed recorded under recording number 5947050.

Exhibit B

PROPERTY MAP

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Aspect CONSULTING
HERRERA

South Park Landfill
Seattle, Washington

Exhibit B
Property Boundary–SPPD Parcel

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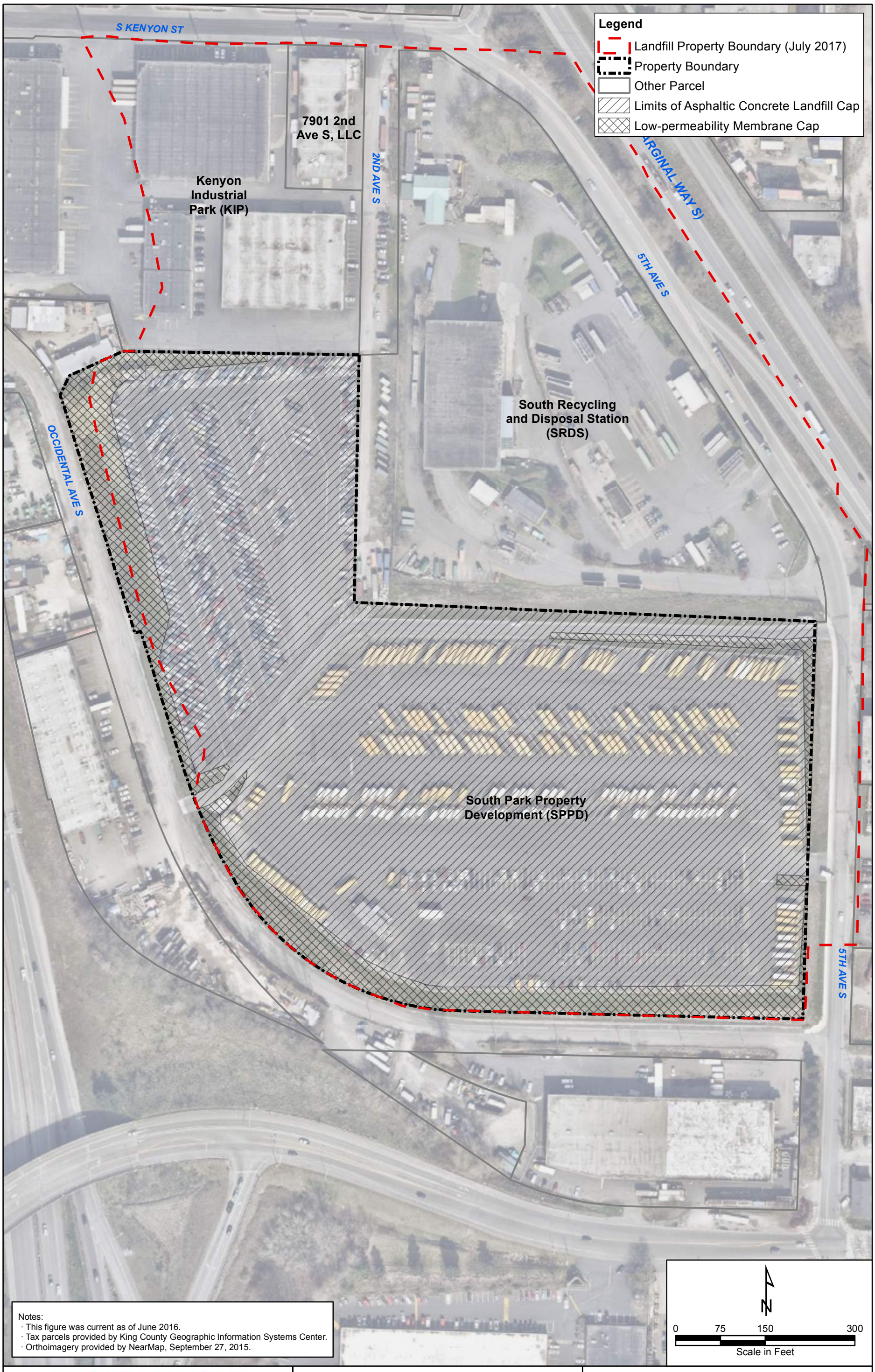
9/28/2017

Exhibit C

LANDFILL CAP BOUNDARY



Notes:
· This figure was current as of June 2016.
· Tax parcels provided by King County Geographic Information Systems Center.
· Orthoimagery provided by NearMap, September 27, 2015.

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Aspect CONSULTING
HERRERA

South Park Landfill
Seattle, Washington

Exhibit C
Landfill Cap Boundary–SPPD Parcel

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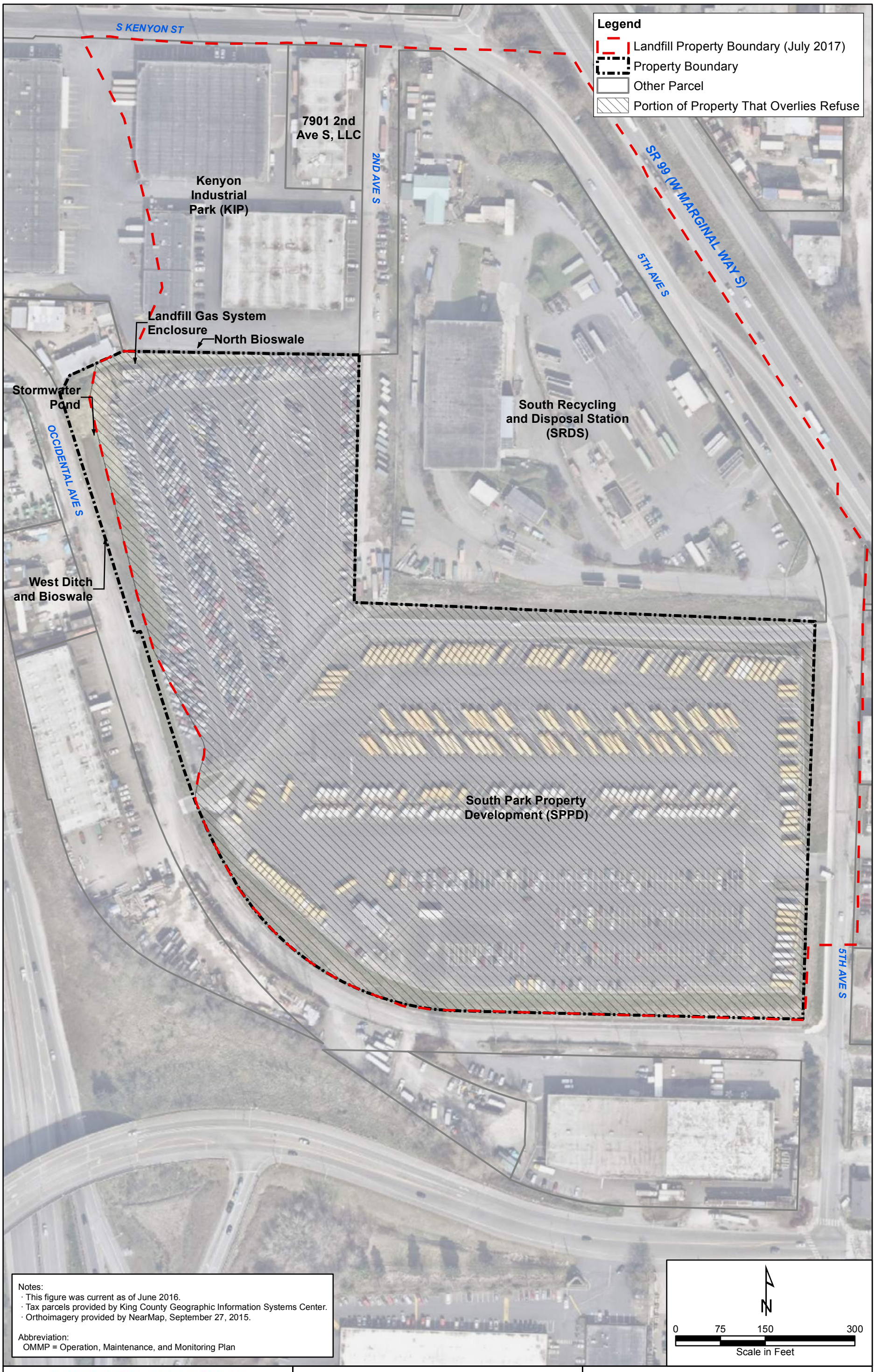
9/28/2017

Exhibit D

PORTION OF THE PROPERTY THAT OVERLIES REFUSE



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HERRERA

South Park Landfill
Seattle, Washington

Exhibit D
Portion of Property That Overlies Refuse–SPPD Parcel

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9/28/2017

South Park Landfill

Cleanup Action Plan

Appendix B
Environmental Covenants for
South Park Landfill

South Recycling and Disposal Station Parcel

After Recording Return
Original Signed Covenant to:

Jerome Cruz
Toxics Cleanup Program
Department of Ecology
Northwest Regional Office
3190 - 160th Ave. SE
Bellevue, WA 98008-5452

Environmental Covenant

Grantor: City of Seattle
Grantee: State of Washington, Department of Ecology (hereafter "Ecology")
Brief Legal Description: PTN OF GOV'T LOT 4 STR 32-24-04
Tax Parcel Nos.: 7328400005 and 3224049110
Cross Reference: NONE

RECITALS

a. This document is an environmental (restrictive) covenant (hereafter "Covenant") executed pursuant to the Model Toxics Control Act ("MTCA"), chapter 70.105D RCW, and Uniform Environmental Covenants Act ("UECA"), chapter 64.70 RCW.

b. The Property that is the subject of this Covenant is part of a site commonly known as South Park Landfill (Facility Site ID # 2180). The Property is legally described in Exhibit A, and illustrated in Exhibit B, both of which are attached (hereafter "Property"). If there are differences between these two Exhibits, the legal description in Exhibit A shall prevail.

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[1] For a full description of the contaminants of concern at the South Park Landfill Site, see Exhibit A to the Consent Decree (King County Cause No XXXXX), Draft Cleanup Action Plan, in Table 4.2.

available through Ecology. This includes but is not limited to the following documents (hereafter the "Site Documents"), which are incorporated herein:

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b. Protection of Human Health and the Environment. The Grantor shall not engage in any activity on the Property that may threaten continued protection of human health or the environment without prior written approval from Ecology. This includes, but is not limited to, any activity that results in the release of residual contamination that was contained as a part of the remedial action or that exacerbates or creates a new exposure to residual contamination remaining on the Property.

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b. Containment of soil/solid wastes. The remedial action for the Property is based on containing contaminated soil and landfill waste under a cap consisting of buildings, asphalt, concrete, soil layers with a visible barrier (non-paved areas), and soil with low permeability layer or an impermeable geomembrane at least 50 millimeters thick (stormwater conveyance and treatment facilities such as swales, ditches, or ponds). Exhibit C shows the extent of and type of the cap on the Property. The primary purpose of this cap is to prevent direct contact with the solid wastes and is an inherent element of the stormwater and landfill gas controls that are part of landfill closure. The following restrictions shall apply within the cap area illustrated in Exhibit C:

i. Any activity on the Property that will compromise the integrity of the cap including: drilling; digging; piercing the cap with sampling device, post, stake or similar device; grading; excavation; installation of underground utilities; removal of the cap; or, application of loads in excess of the cap load bearing capacity, is prohibited without prior written approval by Ecology. The Grantor shall report to Ecology within forty-eight (48) hours of the discovery of any damage to the cap. Unless an alternative plan has been approved by Ecology in writing, the Grantor shall promptly repair the damage and submit a report documenting this work to Ecology within thirty (30) days of completing the repairs.

ii. The Grantor shall not alter or remove the existing structures on the Property in any manner that would expose contaminated soil and landfill waste, result in a release to the environment of contaminants, or create a new exposure pathway, without prior written approval of Ecology.

iii. The Grantor covenants and agrees that it shall annually, or at other time as approved in writing by Ecology, inspect the cap and building floor or foundation and report within thirty (30) days of the inspection the condition of the cap and building floor or foundation and any changes to the cap and building floor and foundation that would impair its performance.

c. Stormwater facilities. To minimize the potential for mobilization of contaminants remaining in soil, waste materials, and groundwater on the Property, no stormwater infiltration facilities or unlined ponds shall be constructed on the portion of the Property that overlies refuse as detailed in Exhibit D. All stormwater catch basins, conveyance systems, and other appurtenances installed on the Property shall be of water-tight construction.

d. Landfill Gas Controls and Protections. The residual contamination on the Property includes biodegradable wastes/chemicals that may generate methane, a combustible gas. As such,

the following restrictions shall apply on the Property to minimize the potential for exposure to these vapors:

i. Grantor shall equip all buildings on the Property with methane alarms operating 24 hours, 7 days per week. Grantor shall maintain the alarms in good working order, and will replace any alarm that fails within 7 days after discovery of the failure.

ii. No building or other enclosed structure shall be constructed on the Property unless approved by Ecology.

iii. Grantor shall ensure that any new building or other enclosed structure constructed on the Property will comply with all City Code requirements related to methane mitigation, and will contain, at a minimum, a sealed foundation and a gas venting system unless otherwise approved in writing by Ecology.

e. Landfill Gas Monitoring. Grantor shall monitor landfill gas on the Property. The following monitoring is required:

i. The Grantor will monitor indoor spaces using the methane alarms in 2(d) above to ensure that concentrations of methane gas in (a) buildings overlying refuse illustrated in Exhibit B do not exceed 1.25 percent by volume, or 25 percent of the lower explosive limit (LEL), and (b) buildings outside the area of the Property overlying refuse illustrated in Exhibit B do not exceed 100 parts per million by volume.

ii. The Grantor will monitor performance of the landfill gas controls installed on the Property as part of 2(d) above;

iii. The Grantor shall promptly report to Ecology any exceedance of methane gas allowable limits, and shall take immediate, appropriate action to respond to such exceedances.

f. Groundwater use. The groundwater beneath the Property remains contaminated and shall not be extracted for any purpose other than temporary construction dewatering, investigation, monitoring or remediation. Drilling of a well for any water supply purpose is strictly prohibited. Groundwater extracted from the Property for any purpose shall be considered potentially contaminated and any discharge of this water shall be done in accordance with state and federal law.

g. Groundwater Monitoring. Groundwater monitoring wells are located on the Property to monitor the performance of the remedial action. The Grantor shall maintain clear access to these devices and protect them from damage. The Grantor shall report to Ecology within 14 calendar days of the discovery of any damage to any monitoring device located on the Property. Unless Ecology approves of an alternative plan in writing, the Grantor shall arrange for the prompt repair of the damage and submission of a report documenting this work to Ecology within thirty (30) days of completing the repairs.

Section 3. Access.

a. The Grantor shall maintain clear access to all remedial action components necessary to construct, operate, inspect, monitor and maintain the remedial action.

b. The Grantor freely and voluntarily grants Ecology, its authorized representatives, and the Site Coordinator, upon reasonable notice, the right to enter the Property at reasonable times to evaluate the effectiveness of this Covenant and associated remedial actions, and enforce compliance with this Covenant and those actions, including the right to take samples, inspect any remedial actions conducted on the Property, and to inspect related records.

c. No right of access or use by a third party to any portion of the Property is conveyed by this instrument.

Section 4. Notice Requirements.

a. Conveyance of Any Interest. The Grantor, when conveying any interest in any part of the property, including but not limited to title, easement, leases, and security or other interests, must:

i. Provide written notice to Ecology of the intended conveyance at least thirty (30) days in advance of the conveyance.

ii. Include in the conveying document a notice in substantially the following form, as well as a complete copy of this Covenant:

NOTICE: THIS PROPERTY IS SUBJECT TO AN ENVIRONMENTAL COVENANT GRANTED TO THE WASHINGTON STATE DEPARTMENT OF ECOLOGY ON [DATE] AND RECORDED WITH THE KING COUNTY RECORDER'S OFFICE UNDER RECORDING NUMBER [RECORDING NUMBER]. USES AND ACTIVITIES ON THIS PROPERTY MUST COMPLY WITH THAT COVENANT, A COMPLETE COPY OF WHICH IS ATTACHED TO THIS DOCUMENT.

iii. Unless otherwise agreed to in writing by Ecology, provide Ecology with a complete copy of the executed document within thirty (30) days of the date of execution of such document.

b. Reporting Violations. Should the Grantor become aware of any violation of this Covenant, Grantor shall promptly report such violation in writing to Ecology.

c. Emergencies. For any emergency or significant change in site conditions due to Acts of Nature (for example, flood or fire) resulting in a violation of this Covenant, the Grantor is authorized to respond to such an event in accordance with state and federal law. The Grantor must notify Ecology in writing of the event and response actions planned or taken as soon as practical but no later than within 24 hours of the discovery of the event.

d. Notification procedure. Any required written notice, approval, reporting or other communication shall be personally delivered or sent by first class mail to the following persons. Any change in this contact information shall be submitted in writing to all parties to this Covenant. Upon mutual agreement of the parties to this Covenant, an alternative to personal delivery or first class mail, such as e-mail or other electronic means, may be used for these communications.

City of Seattle Seattle Public Utilities Attn: Jeff Neuner P.O. Box 34018 Seattle, WA 98124-4018 206-684-7693 Jeff.Neuner@seattle.gov	Environmental Covenants Coordinator Washington State Department of Ecology Toxics Cleanup Program P.O. Box 47600 Olympia, WA 98504 – 7600 (360) 407-6000 ToxicsCleanupProgramHQ@ecy.wa.gov

Section 5. Modification or Termination.

a. Grantor must provide written notice and obtain approval from Ecology at least sixty (60) days in advance of any proposed activity or use of the Property in a manner that is inconsistent with this Covenant. For any proposal that is inconsistent with this Covenant and permanently modifies an activity or use restriction at the site:

i. Ecology must issue a public notice and provide an opportunity for the public to comment on the proposal; and

ii. If Ecology approves of the proposal, the Covenant must be amended to reflect the change before the activity or use can proceed.

b. If the conditions at the site requiring a Covenant have changed or no longer exist, then the Grantor may submit a request to Ecology that this Covenant be amended or terminated. Any amendment or termination of this Covenant must follow the procedures in MTCA and UECA and any rules promulgated under these chapters.

Section 6. Enforcement and Construction.

a. This Covenant is being freely and voluntarily granted by the Grantor.

b. Within ten (10) days of execution of this Covenant, Grantor shall provide Ecology with an original signed Covenant and proof of recording and a copy of the Covenant and proof of recording to others required by RCW 64.70.070.

c. Ecology shall be entitled to enforce the terms of this Covenant by resort to specific performance or legal process. All remedies available in this Covenant shall be in addition to any and all remedies at law or in equity, including MTCA and UECA. Enforcement of the terms of this Covenant shall be at the discretion of Ecology, and any forbearance, delay or omission to exercise its rights under this Covenant in the event of a breach of any term of this Covenant is not a waiver by Ecology of that term or of any subsequent breach of that term, or any other term in this Covenant, or of any rights of Ecology under this Covenant.

d. The Grantor shall be responsible for all costs associated with implementation of this Covenant. Furthermore, the Grantor, upon request by Ecology, shall be obligated to pay for Ecology's costs to process a request for any modification or termination of this Covenant and any approval required by this Covenant.

e. This Covenant shall be liberally construed to meet the intent of MTCA and UECA.

f. The provisions of this Covenant shall be severable. If any provision in this Covenant or its application to any person or circumstance is held invalid, the remainder of this Covenant or its application to any person or circumstance is not affected and shall continue in full force and effect as though such void provision had not been contained herein.

g. A heading used at the beginning of any section or paragraph or exhibit of this Covenant may be used to aid in the interpretation of that section or paragraph or exhibit but does not override the specific requirements in that section or paragraph.

h. This Covenant shall not be considered or interpreted to diminish the governmental or police powers of the State of Washington or the City of Seattle.

The undersigned Grantor warrants he/she holds the title to the Property and has authority to execute this Covenant.

EXECUTED this _____ day of _____, 20___.

CITY OF SEATTLE

_____

by: _____

Title: _____

Exhibit A

LEGAL DESCRIPTION

The Land is located in King County, Washington, and is legally described as follows:

Parcel A:

Those portions of Blocks 6, 7, 17 and 18, First Addition to River Park, according to the Plat thereof recorded in Volume 8 of Plats, page 65, in King County, Washington, lying westerly and southwesterly of the westerly and southwesterly margin of that certain property conveyed by the State of Washington to the City of Seattle for road purposes by deed recorded under Recording No. 9012260159;

EXCEPT any portion thereof lying west of the west line of George Holt Donation Claim No. 51;

AND EXCEPT any portion thereof lying within 2nd Avenue South, conveyed to the City of Seattle by deed recorded under Recording No. 4192618;

AND EXCEPT any portion thereof lying within South Kenyon Street;

TOGETHER WITH vacated South Monroe, South Elmgrove and South Southern Streets adjoining, vacated pursuant to City of Seattle Ordinance No. 96804 and attaching thereto by operation of law.

Parcel B:

That portion of Government Lot 4, Section 32, Township 24 North, Range 4 East, W.M., in King County, Washington, described as follows:

A strip of land, 60 feet in width, lying between lines, the west line being 60 feet west of, as measured at right angles to and parallel with the following described east line:

Beginning on the north line of said Section 32, 264 feet east from the northwest corner thereof;

thence south 15031'06" east, 547.61 feet;

thence easterly to intersect a point on a line drawn south 02°03'26" west from a point on the north line of said section, 73.81 feet west of the west line of George Holt Donation Claim No. 51, said point being 516.36 feet south of said north line;

thence continuing easterly on said line to the west line of said Donation Claim and the TRUE POINT OF BEGINNING of east line description;

thence south along the west line of said Donation Claim to an intersection with a line distant 30 feet south of and parallel with the south line of Block 6, First Addition to River Park, according to the plat thereof recorded in Volume 8 of Plats, page 65, in King County, Washington, and the terminus of east line description.

Parcel C:

That portion of Government Lots 2 and 4, Section 32, Township 24 North, Range 4 East, W.M., in King County, Washington, described as follows:

A strip of land, 30 feet in width, lying between lines, the south line being 30 feet south of, as measured at right angles to and parallel with the following described north line:

Beginning at the intersection of the west line of George Holt Donation Claim No. 51, with the south line of Block 6, First Addition to River Park, according to the plat thereof recorded in Volume 8 of Plats, page 65, in King County, Washington;

thence easterly, along the south line of said Block 6, to the southeast corner of Lot 1, said Block 6, and the terminus of north line description;

EXCEPT that portion thereof, if any, lying within 5th Avenue South.

Exhibit B

PROPERTY MAP

FLOYD | SNIDER
strategy ▪ science ▪ engineering
Aspect CONSULTING
HERRERA

South Park Landfill
Seattle, Washington

Exhibit B
Property Boundary–SRDS Parcel

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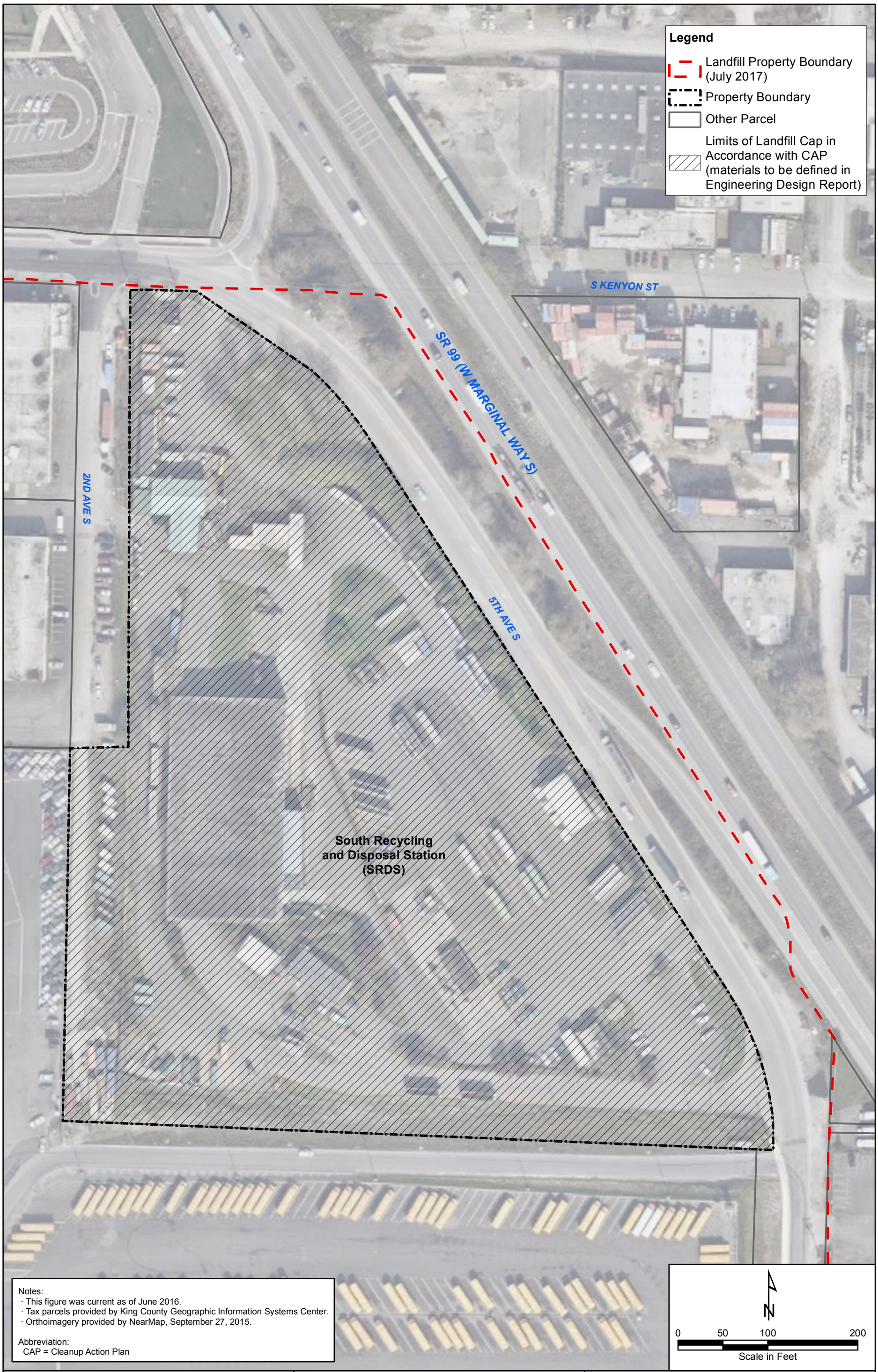
9/28/2017

Exhibit C

LANDFILL CAP BOUNDARY



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strategy ▪ science ▪ engineering
Aspect CONSULTING
HERRERA

South Park Landfill
Seattle, Washington

Exhibit C
Landfill Cap Boundary–SRDS Parcel

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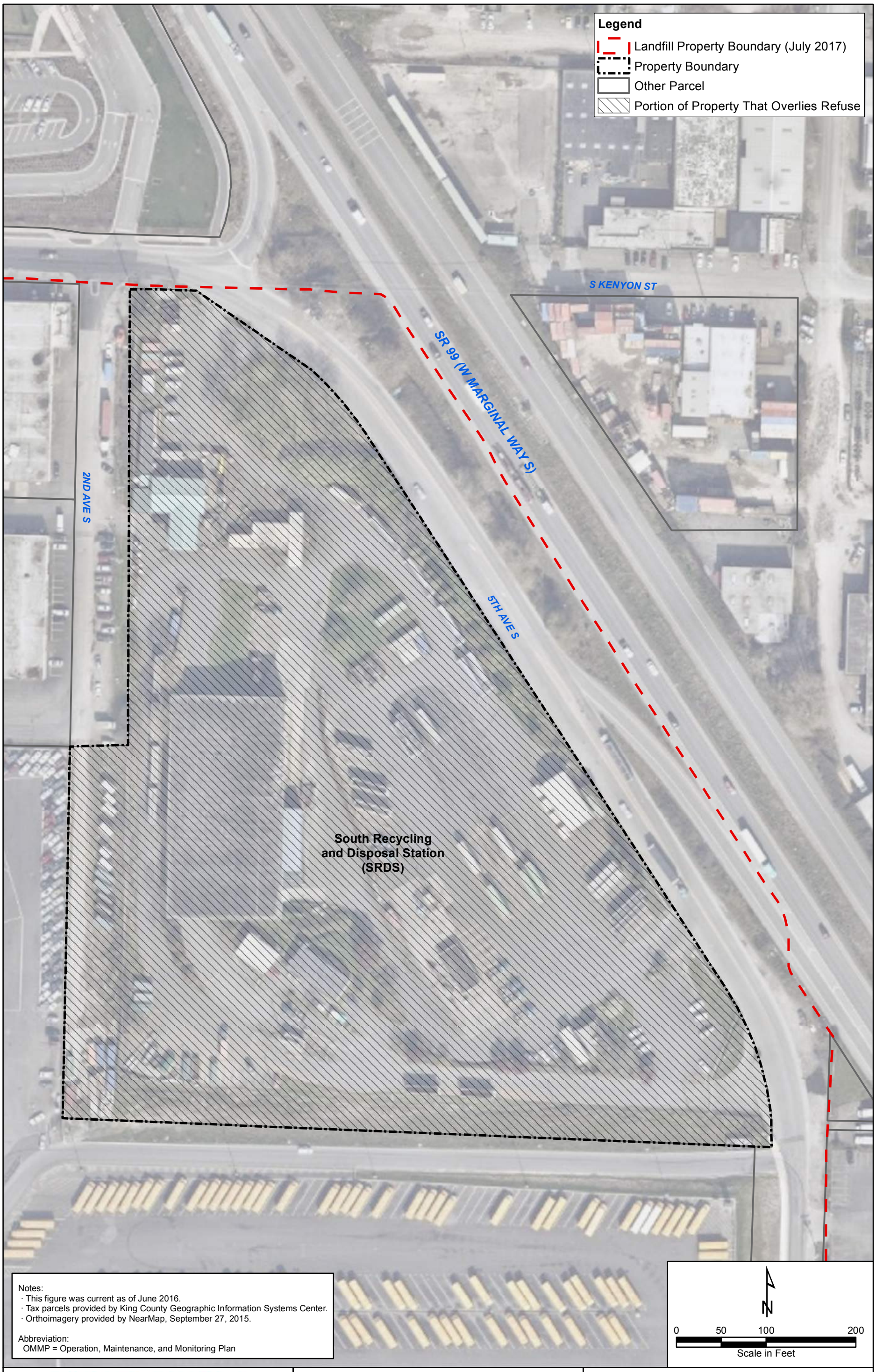
9/28/2017

Exhibit D

PORTION OF PROPERTY THAT OVERLIES REFUSE



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South Park Landfill
Seattle, Washington

Exhibit D
Portion of Property That Overlies Refuse–SRDS Parcel

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9/28/2017