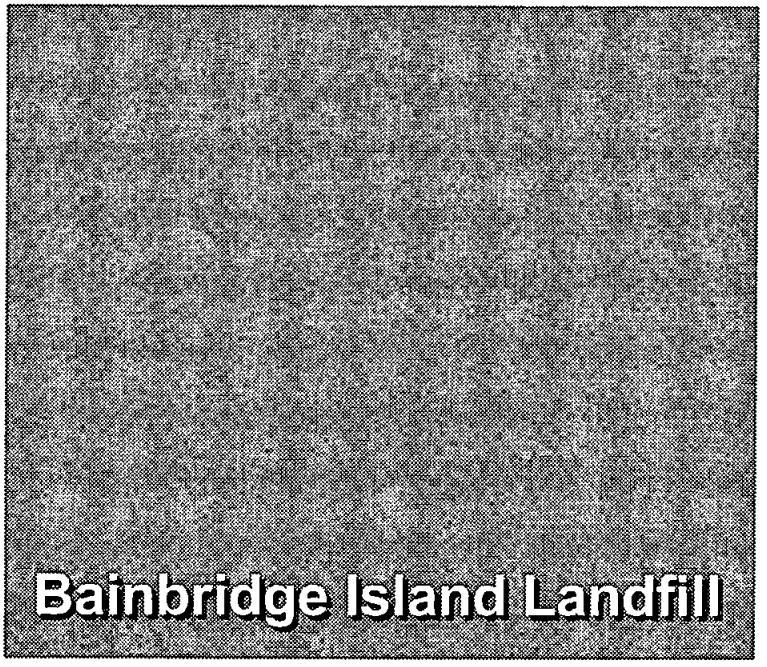

Cleanup Action Engineering Design Report

Final

VOLUME 1
Main Report

Prepared by
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Kitsap County Department of Public Works
Solid Waste Division

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Acronyms and Abbreviations

ARARs	applicable or relevant and appropriate requirements
BMPs	best management practices
CAP	Cleanup Action Plan
CN	curve number
COC	contaminants of concern
CQA	Construction Quality Assurance
EDR	Engineering Design Report
GM	garbage-like material
MTCA	Model Toxics Control Act
O&M	Operation and Maintenance
QA	quality assurance
QC	quality control
RAO	remedial action objectives
RI/FS	remedial investigation/feasibility study
SAP	Sampling and Analysis Plan
SBUH	Santa Barbara Urban Hydrograph
SEPA	State Environmental Protection Act
SLM	soil-like material
SWPPP	Stormwater Pollution Prevention Plan

CHAPTER 1

Introduction

The Bainbridge Island Landfill is a closed municipal solid waste landfill located in the City of Bainbridge Island, Kitsap County, Washington. Kitsap County acquired the property in 1942, and the site began operating as a landfill in about 1946 to reduce indiscriminate dumping on Bainbridge Island. The landfill accepted municipal solid waste, septic tank waste, and tank bottoms from a wood treatment facility. A series of private operators ran the landfill until 1975. The site stopped accepting waste in 1975 and was closed between 1974 and 1977.

Kitsap County completed a remedial investigation/feasibility study (RI/FS) and interim remedial actions for the site in accordance with the Model Toxics Control Act (MTCA, Chapter 173-340 WAC) and under a 1994 enforcement order from Ecology. The RI/FS documented the nature and extent of contamination at the landfill site and identified a preferred remedial action alternative. The RI/FS was approved final by Ecology on November 1, 2000. Ecology has prepared a Cleanup Action Plan (CAP) to implement the preferred alternative—landfill reclamation with monitored natural attenuation of groundwater. This Cleanup Action Engineering Design Report presents the plans, specifications, and details needed to implement the selected cleanup action (also referred to as the remedial action) in accordance with MTCA (173-340-400(4) (a)). This report was prepared by CH2M HILL on behalf of Kitsap County pursuant to the Consent Decree between Kitsap County and Ecology for implementation of the Cleanup Action Plan.

1.1 Purpose

The purpose of the Cleanup Action Engineering Design Report (EDR) is to present the details, plans, and specifications needed to implement the remedial action as outlined in the CAP and Final Feasibility Study Report (CH2M HILL, 2000d). An analysis of the feasibility of the remedial action was completed in the Feasibility Study report and was based on site data obtained in the remedial investigation (CH2M HILL 2000a-c).

This Engineering Design Report includes elements as required in 173-340-400(4)(a) WAC, Engineering Design Report. Plans, specifications, and other details in this report will be used to prepare the final contract documents that will direct work by contractors who will implement the cleanup action.

1.2 Project Description

The Bainbridge Island Landfill cleanup will consist of excavation of all waste (landfill reclamation) and covering with a permeable soil cover, and monitored natural attenuation of groundwater. The major activities that compose the remedial action are as follows:

- Excavate all waste

- Screen main landfill and west end area (northern and southern) waste into two size fractions: over 1 ½ inches and under 1 ½ inches
- Regrade the site with the under 1 ½ inch waste fraction (including landfill cover soil outside hotspot area and sediment from the settling ponds at the east end of the landfill)
- Dispose of the over 1 ½ inch fraction in an offsite permitted landfill
- Dispose of the septage pit waste and main landfill cover soil hotspot in an offsite permitted landfill (more than one disposal site may be used)
- Construct a minimum 2-foot-thick, site-derived, clean soil cap on the inert fraction
- Restore the site drainage and reestablish site vegetation
- Monitor natural attenuation in groundwater
- Monitor surface water for compliance with cleanup levels
- Establish institutional controls, including zoning and deed restrictions

1.3 RI/FS Summary

A remedial investigation and feasibility study (RI/FS) was completed under MTCA (Chapter 173-340 WAC) for the landfill site. The RI defined the nature and extent of contamination resulting from landfill activities. The FS evaluated remedial alternatives and selected reclamation as the preferred alternative. The FS also defined the cleanup levels for various media at the site and demonstrated how reclamation would meet the cleanup levels. A brief summary of the RI/FS findings is presented below.

1.3.1 RI Summary

The RI encompassed a complete investigation of all waste sources at the site and their potential impacts on environmental media in the vicinity of the site. The RI was presented in three reports, a main report and two supplements (CH2M HILL 2000a-c). The following waste sources were characterized and found to contain contaminants of concern at concentrations exceeding cleanup levels: the main landfill, the west end area, and five septage pits. Additional characterization of size fractions of the main landfill and west end area refuse and cover soil was completed. Results are presented in RI Supplement No. 2 (CH2M HILL, 2000c). The results indicated that fewer contaminants at lower concentrations are present in the under-sized fraction than in the over-sized fraction of refuse. This characterization was needed to complete a feasibility evaluation of the reclamation alternative.

Other areas were investigated, including further investigation of the Trench 3 area. Trench 3 was a disposal site for liquid creosote waste from the Wyckoff Company, a wood treatment facility located on Bainbridge Island. Trench 3 was remediated by Kitsap County during an independent action in 1992. Results from the RI indicated residual soil contamination that exceeds cleanup levels at a depth of 15 feet or greater below ground. At that depth, the soil is in compliance with MTCA standards.

Two secondary waste sources were identified: leachate and landfill gas. Both were found to contain contaminants of concern (COCs), and RI data indicated that leachate and probably landfill gas were impacting groundwater beneath the site. Leachate also was found to be affecting surface water where it discharged from a seep at the east toe of the main landfill during rainstorms. Landfill gas is still being generated by decomposing refuse, but RI results showed that gas concentrations quickly dissipate into the atmosphere and through the porous native sand matrix surrounding the landfill. No evidence of landfill gas was found in gas probes installed at the property boundary.

All environmental media were investigated for impacts from the waste sources: soil, sediment, surface water, groundwater, and air. Soil directly below the Trench 3 area and the main landfill was found to be impacted by some COCs found in the waste sources. Soil below the septage pits was not characterized. A fate and transport analysis completed in the RI indicated that septage pit contaminants are relatively immobile and soil contamination beneath the pits is not expected to be extensive. Sediment that accumulated in a catch basin in the main landfill and in two settling ponds east of the landfill (downstream of the leachate seep discharge) contained COCs above cleanup levels. Samples of surface water, which flows east across the site after significant rainstorms, showed impacts downstream of the leachate seep.

Groundwater in the upper aquifer downgradient of the main landfill also was found to contain COCs at concentrations exceeding cleanup levels, as well as leachate indicator parameters that were not present in upgradient groundwater samples. Groundwater impacts also were found offsite, downgradient in several domestic water supply wells. A health-based risk evaluation was conducted by the Washington State Department of Health on sample data collected from April 1996 through March 1999. Five reports were published, and the results showed that although one contaminant of concern, vinyl chloride, exceeded MTCA cleanup levels in one domestic water source, there was no elevated cancer risk to users of the water source.

1.3.2 FS Summary

The feasibility study included a review of regulatory requirements, development of a list of contaminants of concern and cleanup levels for each waste source and environmental medium, development of remedial action objectives, an evaluation of three remedial alternatives, and recommendation of the preferred alternative. The following three alternatives were evaluated:

Alternative 1—Waste Consolidation and Containment with Monitoring, Institutional Controls, and Monitored Natural Attenuation of Groundwater.

Waste, sediment, septage pit residue, and contaminated soil would be excavated and consolidated on the main landfill. An engineered cover system compliant with Chapter 173-351 WAC would be constructed and a passive landfill gas venting system would be installed. Surface water controls and monitoring, groundwater monitoring, and institutional controls would be implemented.

Alternative 2—Waste Reclamation with a Soil Cap, Monitoring, Institutional Controls, and Monitored Natural Attenuation of Groundwater.

The alternative evaluated was the same as that described above in Section 1.2.

Alternative 3—Waste Reclamation with an Impermeable Cap, Monitoring, Institutional Controls, and Monitored Natural Attenuation of Groundwater

This alternative was the same as Alternative 2 except that the cap over the inert materials would consist of a combination soil and impermeable geomembrane layer.

1.4 Remedial Action Objectives

The Remedial action objectives (RAOs) are the site-specific goals for protecting human health and the environment. The following RAOs were identified in the FS based on the nature and extent of contamination, as defined in during the RI:

- Protect the use of the upper aquifer as a drinking water source
- Prevent or minimize future releases of COCs from the waste sources to surface water and direct contact with humans or wildlife
- Reduce concentrations of COCs in soil, surface water, sediment, and groundwater to acceptable and appropriate cleanup levels
- Maximize permanence of the remedial action

1.5 Project Organization

Kitsap County, the property owner, is leading the remedial action under a Consent Decree with the Washington Department of Ecology. Kitsap County has contracted with CH2M HILL as the lead engineer and owner's representative to be onsite at all times during construction activities. A prime remediation contractor will be hired and will report directly to Kitsap County. As the onsite designee for Kitsap County, CH2M HILL will provide construction management services and communicate continually with contractor to verify that the contractor is performing in accordance with the contract. The remediation contractor will be responsible for all site construction activities, including waste excavation, hauling waste to the designated disposal facility, processing, staging and loading for offsite disposal, grading, and site restoration. Disposal of any materials taken from the site will be at a permitted facility approved by Kitsap County.

Specialty subcontractors also will be used to execute specific tasks for the project. These may include the following:

- Washington State licensed drilling subcontractor (well abandonment)
- Analytical laboratory (sample analysis)
- Hauling subcontractor (offsite disposal)

An organization chart showing the project roles and direct reporting responsibilities is shown in Figure 1-1.

1.6 Document Organization

This Cleanup Action Engineering Design Report follows an outline approved by Ecology. It is intended to be a comprehensive document containing all the necessary information for implementation of the CAP. In addition to Section 1, Introduction, the following sections and plans are included in this report:

Section 2, Engineering Justification. The design criteria used to develop the remedial design, including substantive permit requirements and restrictions.

Section 3, Engineering Analysis. A detailed description and analysis of the engineered systems and processes that compose the remedial action. Elements are included from site preparation through construction and compliance monitoring.

Section 4, Construction and Implementation Schedule. A schedule of critical path elements and milestones that must be met in order to complete construction within the Summer 2001 construction season.

Section 5, References. A comprehensive list of references used in the Engineering Design Report.

The following Appendixes are also included the Engineering Design Report:

Appendix A, SEPA Checklist. Supporting documentation to meet substantive requirements of State Environmental Protection Act.

Appendix B, Stormwater Pollution Prevention Plan. A plan to prevent stormwater pollution during the remedial action construction.

Appendix C, Operations and Maintenance Plan. Outlines activities and procedures for operations and maintenance of the facilities after the construction of the remedial action is complete.

Appendix D, Health & Safety Plan. Presents site-specific procedures and organization to comply with OSHA HAZWOPER requirements for hazardous waste sites for CH2M HILL's employees and activities on site. Meets the requirements of WAC 173-340-410-(1)(a).

Appendix E, Contingency Plan. This plan lists possible scenarios and outcomes during construction if assumptions used to develop the remedial design prove to be inaccurate. It includes an Emergency Response Plan and Spill Control Plan generally to be used by onsite contractors during construction.

Appendix F, Construction Quality Assurance Plan. This plan presents methods and procedures to be used to provide quality control (QC) and quality assurance (QA) during construction of the cleanup action.

Appendix G, Drainage Design Calculations. Supporting documentation for stormwater and erosion control design elements.

Appendix H, Performance Monitoring Sampling and Analysis Plan. Presents the sampling and analysis procedures to confirm that the cleanup action meets the cleanup standards; meets the requirements of WAC 173-340-410(2).

Appendix I, Confirmation Monitoring Plan. Presents the sampling and analysis procedures to confirm that the long-term effectiveness of the cleanup action meets the requirements of WAC 173- 3401-410(2).

Appendix J, Preliminary Construction Cost Estimate. An engineer's estimate of the construction costs based on the 90 percent complete engineering design, plans, and specifications.

1.7 Status Reports

Monthly status reports will be prepared and submitted to Ecology by the 15th of each month. The reports will include a list of activities completed in the preceding month, planned activities for the upcoming month, schedule changes, and major deliverables.

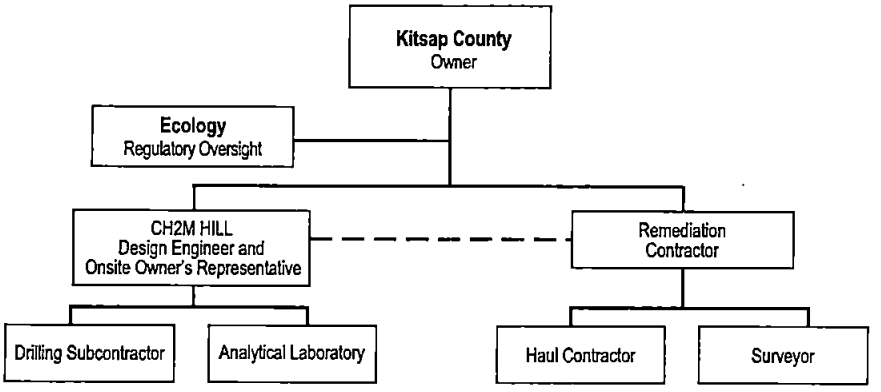


Figure 1-1

Project Organization

Bainbridge Island Landfill

CHAPTER 2

Engineering Justification

2.1 Permitting Requirements

A review of potential permit requirements that might be triggered by the cleanup action was made in the analysis of applicable or relevant and appropriate requirements (ARARs) completed in the feasibility study (CH2M HILL, 2000d). Contact was made with lead agencies for the identified potential permits and exemptions were granted for administrative requirements for the project. However, the project still must meet substantive requirements for the following permits:

- State Environmental Protection Act, Kitsap County lead
- Clearing and Grading Permit, City of Bainbridge Island lead
- NPDES Baseline General Permit for Stormwater Discharges, Ecology lead

To meet the SEPA requirement, a SEPA checklist was prepared and submitted to the lead agency for review. A copy of the SEPA checklist as submitted is attached (Appendix A). A public review period for the SEPA checklist is planned for March and April 2001. This public review period will be concurrent with public review of the Cleanup Action Plan and Consent Decree.

The City of Bainbridge Island has determined that the project is exempt from obtaining a grading permit under the 1997 Uniform Building Code Section 3306.2 (4). To meet substantive requirements of the permit, the City of Bainbridge Island will review and provide comments on the stormwater and erosion control elements of this Engineering Design Report.

Ecology has determined that the project is exempt from administrative requirements of an NPDES permit but that a Stormwater Pollution Prevention Plan (SWPPP) must be implemented. Stormwater and erosion control elements of the design have been incorporated into a SWPPP that is included as Appendix B.

2.2 Design Criteria

This section summarizes proposed project objectives and design criteria for the Bainbridge Island Landfill Reclamation project.

Reclamation of the landfill and associated septage pits was selected as the site remediation method through a remedial investigation/feasibility study (RI/FS) process under the Washington Model Toxics Control Act (MTCA) regulations. Reclamation will include excavation of all wastes within the solid waste landfill boundary. After onsite screening, soils that are currently layered and mixed with the landfill waste and the inert waste particles smaller than 1½ inches will be returned to the landfill excavation and used in

regrading the site. Waste material larger than 1½ inches will be disposed at an offsite permitted landfill facility. Landfill cover materials will be removed prior to waste excavation ,and clean cover material will be retained for reuse as the final cover. Waste material from the septage pits and a small area in the landfill cover soil that contains contaminated soil (referred to as the "cover soil hotspot" in the RI/FS reports) will be excavated and kept separated for offsite disposal. The design criteria are thus based on data obtained and concepts developed during the RI/FS process.

2.2.1 Objectives of the Landfill Reclamation Project

The objectives of the reclamation project are:

- Excavate the wastes from the Bainbridge Island Landfill, screen the materials to separate the wastes from inerts, and replace the inerts as part of a site-grading plan.
- Remove decomposable wastes from the site as the primary means of controlling the potential for groundwater contamination and gas migration and emissions. Dispose of the wastes at a disposal site permitted under current solid waste disposal regulations.
- Reclaim the site to meet the requirements of the approved cleanup action plan.
- Construct surface water channels and other control measures that meet all of the codified requirements of the City of Bainbridge Island.
- Establish a monitoring system in accordance with the Department of Ecology's requirements that will demonstrate natural attenuation of contaminants previously released from the landfill.

2.2.2 Base Map

- Contour intervals at 2-foot precision.
- Tree line defined.
- In areas where contours were previously estimated because of heavy brush (i.e., not the forested areas), contour intervals will be established based on ground survey vs. aerial survey.
- In the landfill and other areas where contours have been established with precision, the most recent aerial topography from Kitsap County will be used.
- Identify survey monuments and construction baseline.
- Identify existing facilities, including underground utilities.

2.2.3 Excavation and Stockpiles

- Excavation contours will be shown at approximately 2 feet below the estimated bottom of the landfill.
- Excavation of the entire landfill including the west end areas and the main landfill is included.

- The west septage pit, the three central septage pits, and the south septage pit will be excavated.
- Trees will be marked and saleable timber identified and cleared appropriately.
- Maximum excavation slope = 1.5:1.
- Minimum excavation slope = 5 percent.
- Provide access ramp into excavation for widest truck that may be required.
- Trenches 1 and 2 will not be excavated but may be regraded to conform to the overall site grading plan.
- Trench 3 will not be excavated or regraded, except that clean cover soil may be placed over Trench 3.
- Stockpile configuration will be optimized to minimize the footprint.
- Pads will be constructed for all stockpiles and will have a minimum slope of 1 percent to drain.
- Pads for all stockpiles except clean soil and inerts will be constructed of low-permeability materials that will prevent significant infiltration of water that contacts or flows from the raw waste or refuse material.
- Inert material, clean cover soil, and topsoil stockpile pads will be constructed from in situ soils.
- All stockpile pads will be constructed with run-on prevention berms and runoff collection ditches that channel runoff to the stormwater detention pond or through other appropriate sediment control features. Stockpiles will be covered overnight and when not being actively worked. The current assumption is that runoff from these stockpiles does not need to be collected for sewer disposal. Final determination will be by the City of Bainbridge Island.
- Stockpile pad runoff control ditches will be sized to handle 24-hour 25-year storm falling on stockpile.
- Stockpiles will be provided with access benches for the widest vehicle that can be expected for dirt hauling.
- Minimize stockpile runoff and infiltration water by minimizing footprint and any other means practical.
- Stockpile slopes will not exceed the following, based on geotechnical data collected during the RI or typical values established for similar materials (to be determined based on geotechnical input):
  - Raw waste (prior to screening): 1.5:1
  - Screened inerts: 2:1
  - Decomposable materials: 1.5:1
  - Clean sandy cover material: 2:1

  - Topsoil: 1.5:1

- Assumptions on which design of excavation and stockpile pads will be based (as means and methods of construction, these assumptions may be changed by the contractor, but are considered practical for establishing minimum site facility requirements):
  - Excavation production rate of (3,000 cubic yards per day).
  - Flexibility to allow either continuous loadout for disposal during working hours or for batch loading during a small part of the day because of potential transportation restrictions.
  - Flexibility to allow time for sampling and analysis of some areas prior to backfilling.
  - Screening, inter-stockpile transport and continuous loadout for disposal of refuse and bulky wastes resulting from 200 tons per hour excavation rate.
  - Buffer between excavation and regrading areas within the landfill of 50 feet.
  - Buffer between excavated waste stockpile and clean soil stockpile minimum of 25 feet. Clean soil stockpile also will be covered during active waste processing.

2.2.4 Waste-Processing Equipment

Screen Specifications

- Pre-screen to remove large and "stringy" items that may clog or damage the 1½ inch openings of the final screen.
- Refuse screen: 1½ inch opening size.
- Trommel screen or equivalent for rapid production and reliability.
- Total screen input capacity of 200 tons per hour with safety factor of 1.5.
- All equipment designed for outdoor all-season use.
- Noise and engine emissions to meet ARARs.
- Two screen trains in parallel, each with half of total required capacity.

Truck Wash

- Designed for largest haul vehicle (weight and dimensions) expected to regularly exit the site (once per day or more often).
- Able to accommodate trucks leaving site at rate sufficient to remove waste at 100 cubic yards/hour.
- Wheel wash only.

Route wash water to stormwater detention pond or appropriate sediment control features.

2.2.5 Site Grading and Final Cover

Final Cover Area

- Minimum slopes of 3 percent; Maximum slopes of 33 percent.
- Minimum 2 feet clean, onsite soils.
- Upper 6 inches, in addition to 2-foot clean soils cap, must be able to support native grasses.
- Grasses selected for proven ability to thrive and resist erosion in soil types used.

Areas Outside Final Cover

- Grade to meet stormwater criteria.
- No slopes steeper than 2:1 nor less steep than 2 percent.
- Soil outside of the landfill waste boundary will be used as clean landfill cover material, without testing for contaminant concentrations.
- Soil outside of landfill waste boundary may also be moved and used for site regrading without testing for contaminant concentrations.

Construction Access Roads

- All-weather roads.
- Road section designed to accommodate heaviest anticipated construction vehicle (105,000 lb) for 6 months continuous traffic.
- Minimum 30 feet wide for two-way roads, 15 feet wide for one-way.
- Maximum grade: 15 percent.
- 3 percent minimum cross slopes to promote drainage.
- Roads will be constructed only on clean soil.
- Road excavation and embankment slopes: 2:1.
- Minimum horizontal curve radius = 100 feet.
- Design speed: 20 mph.
- Return radius at road intersections will be 75 feet.

2.2.6 Stormwater Control

General Design Criteria

- The principal reference for the stormwater work will be Bainbridge Island Municipal Code, Chapter 15.20, Surface and Stormwater Management (the Municipal Code), supplemented with the Stormwater Management Manual for the Puget Sound Basin, Washington State Department of Ecology, February 1992 (the Manual).

- Runoff control will be provided in a detention pond.
- Water quality treatment will be required.
- Infiltration facilities will not be considered.
- Design stormwater collection and conveyance facilities to withstand anticipated settlement.
- Provide rock reinforcement or turf reinforcement matting at points of discharge from one ditch or berm to another to prevent erosion.

Hydrology

Design Storm Frequency

- Stormwater Collection and Conveyance System (storm drains, culverts, ditches): peak flow for 25-year and 100-year recurrence interval design storms.
- Detention Facilities: 2-, 10-, and 100-year recurrence interval, 24-hour duration design storms.
- Wet Ponds: 6-month recurrence interval, 24-hour duration design event.

Methods

For stormwater collection and conveyance facilities, determine peak flows using the modified rational method for drainage basins less than 25 acres:

- "C" values from Washington State Department of Ecology Stormwater Management Manual for the Puget Sound Basin, Vol. III, Hydrologic Analysis and Flow Control Design.
- Time-of-concentration from Washington State Department of Ecology Stormwater Management Manual for the Puget Sound Basin, Vol. III, Hydrologic Analysis and Flow Control Design.
- Intensity from Kitsap County Stormwater Management Ordinance and Design Manual.

For stormwater collection and conveyance facilities for drainage basins greater than 25 acres, detention facilities, and wet vaults, determine flows using the Santa Barbara Urban Hydrograph (SBUH) methodology:

- SCS type 1A storm distribution.
- Use curve number (CN) for Harstine, type C soil as shown in Table 2-1.
- Calculate time-of-concentration using procedures specified in the Manual. Use maximum sheet flow lengths as shown in Table 2-2.
- Precipitation as shown in Table 2-3.

Drainage Areas

- Existing subbasin boundaries will be maintained where possible.

- Drainage areas (subbasins) will be delineated on the project topographic map.

Ditches

- Ditches should be triangular in shape.
- Vegetated ditches will be used where possible; rock lining will be used when velocities for 25-year peak flow exceed 5 fps according to Table III-2.7 of the Manual and/or where ditch side slopes are steeper than 3 horizontal to 1 vertical.
- Ditch size initially based on uniform flow using Manning's equation.
- Ditch flow capacity verification will be done using backwater analyses following the procedures in Section 3.2.6 in the Manual.
- Determine design depth of stormwater ditches using the following criteria:
  - Size to convey the peak 25-year flow with 0.5-foot freeboard
  - Size to convey the peak 100-year flow without overtopping
  - Use n = 0.08 for vegetated ditches (high, standing grass)
  - Use n = 0.035 for rock-lined ditches
  - Use n = 0.013 for asphalt-lined ditches (for ditches located off final cover only)
  - Use 4 percent minimum drainage grade for ditches located over final cover
  - Side slopes of 3 horizontal to 1 vertical will be used where possible
  - Determine minimum depth of ditches located on final cover by using a minimum post-settlement drainage grade of 2 percent
  - Use 1 percent minimum slope for ditches located off final cover
- Determine design velocity using the following criteria:
  - Compute velocity for peak 25-year flow
  - Use n = 0.03 for a vegetated ditch (flat grass) if ditch is located over final cover and velocity is less than or equal to 5.0 fps
  - Use n = 0.035 for a rock-lined ditch if ditch is over final cover and the velocity calculated for the vegetated ditch is greater than 5.0 fps
  - Use n = 0.013 for an asphalt-lined ditch (for ditches located off final cover only)
- Use turf reinforcement matting for ditch lining as an alternative to quarry spalls.

Culverts

- Design to convey peak flow from 25-year design storm with:
  - Headwater to diameter ratio not to exceed 2.0 for 18-inch-diameter pipes and smaller
  - Headwater to diameter ratio not to exceed 1.5 for pipes larger than 18 inches in diameter

  - Water surface elevation at least 0.5 foot below road sub-grade

- Check that peak flow from 100-year design storm event will be conveyed without overtopping the adjacent road.
- Culvert flow capacity verification will be done using backwater analyses following the procedures in the Manual, using Manning's "n" of 0.012.
- Minimum culvert diameter of 12 inches to facilitate maintenance.
- Minimum pipe slope will be set to achieve at least 3 fps velocity for full pipe flow, with the absolute minimum pipe slope to be 0.005 ft/ft.
- Minimum cover of 2.0 feet above the outside diameter of the pipe, although 3.0 feet of cover and greater will be used where feasible.
- Headwater elevation for inlet control conditions for 25-year and 100-year peak flows will also be determined using procedures outlined in the Manual.
- Headwalls (rock or concrete) will be provided at each end of all culverts.
- Trash racks will be provided on the upstream end of all culverts that are greater than 60 feet in length and that are 18 to 36 inches in diameter.
- Culverts will not be designed to accommodate fish passage.

Runoff Control Facility (Detention Pond)

Discharge Criteria

- Post-project peak discharge rate from 2-year storm event not to exceed 50 percent of peak discharge rate for the 2-year storm event for existing site conditions.
- Post-project peak discharge rate from 10-, and 100-year storm event not to exceed the peak discharge rate for the 10- and 100-year storm event for the existing development conditions.
- A "factor of safety" will used and is based on Figure III-1.1 of the Manual.
- Determine size of detention facility using level pool routing.
- Control structures will have 0.5-inch minimum orifice size.
- Offsite runoff must bypass the detention facilities unless the existing peak runoff rate from the upstream offsite area for the 100-year recurrence interval 24-hour duration design storm event is less than 50 percent of the peak runoff rate from the project site for the same design event.

Facility Design

- Pond length at least 2 times the pond width at the maximum water surface level reached during the 100-year design storm.
- Two cells of approximately equal volume will be used to promote sedimentation and to avoid short circuiting.

- Have side slopes no steeper than 3 horizontal to 1 vertical. Steeper side slopes allowed if approved by the geotechnical engineer.
- Level pond bottom.
- Provide 0.5 feet of dead storage below inlet and outlet inverts for sediment accumulation.
- Provide overflow system for the peak flow from the 100-year 24-hour design storm.
- Size emergency overflow spillway to convey the post-project peak flow from the 100-year 24-hour design storm.
- Provide 1 foot minimum freeboard above maximum water surface elevation for 100-year design storm.

Water Quality Treatment Facilities

A combination wet pond/detention pond is the preferred water treatment facility. Design criteria for a biofiltration swale is presented as an alternative.

Combined Wet Pond / Detention Pond

Combined ponds will incorporate most of the criteria listed above for detention ponds and for water quality wet ponds with the following revisions:

- Length at maximum dead storage elevation will be 3 to 5 times the width.
- Minimum depth of dead storage will be 3 feet.
- Pond will be divided into two major cells, each with live storage volume of 50 percent of the required detention volume.
- Dead storage in the first major cell will have surface area at least 10 percent of design water quality surface area.
- The second major cell will be divided into two approximately equal secondary cells. The surface area of the dead storage in each of the secondary cells will be at least 45 percent of the design water quality surface area.

Sedimentation and Erosion Control During Construction

- The following erosion and sedimentation control criteria are consistent with the methods presented in Chapter 15.20 of the Bainbridge Island Municipal Code and Section III of the Manual. These will be used to develop a construction sedimentation and erosion control plan, to be described in the construction documents and required during construction. Minimize sedimentation damage to onsite sensitive areas and offsite drainage systems.
- Minimize disturbance of natural vegetation and soil during construction activities to reduce susceptibility to erosion and sediment loading of stormwater runoff.
- Design a plan for minimizing sediment-laden runoff from leaving the site during construction, incorporating the use of erosion and sedimentation control best management practices (BMPs).

- Design the project to fit the natural topography, soils, and drainage patterns.
- Emphasize erosion control, rather than sediment control.
- Minimize the extent to and duration for which an area is exposed.
- Keep runoff velocities low.
- Retain sediment onsite.
- Thoroughly monitor and maintain all erosion and sedimentation control measures.
- Schedule major earthwork during the dry season.

The following BMPs will be used to achieve effective erosion and sedimentation control during construction as necessary:

- Erosion control facilities will be installed prior to construction activity.
- Clearing limits will be established.
- Cover measures using nets, blankets, hydroseeding, or plastic will be required to reduce exposed surface erosion.
- Perimeter protection will be provided through use of silt fences or vegetated buffer strips.
- Stabilization of construction entrances, roads, and parking areas will be provided.
- Stormwater control measures will be provided consisting of runoff control berms, ditches (lined if necessary), outlet protection, and piping.
- Sediment retention will be provided by hay bales and silt fences.
- Dust-control measures (road sweeping and shoveling) will be implemented to prevent wind transport of soil onto roadways, drainage ways, and surface waters.
- Wet-season special provisions will be in effect from October 1 to March 31.
- Maintenance of erosion and sedimentation control measures will be on a regular basis or as conditions warrant to maintain the system's effectiveness.
- Winter stabilization cover will be provided for disturbed areas that do not receive hydroseeding within the designated fall seeding window.
- Final site stabilization will occur prior to removal of temporary erosion and sedimentation control facilities. Structural temporary BMPs will be removed from the site, and permanent stormwater facilities will be cleaned. All disturbed areas of the site will be vegetated or otherwise permanently stabilized.

2.2.7 Other Permanent Site Facilities

Fence

- Temporary fencing to prevent access to excavation and stockpile areas during construction.
- Permanent fencing will be provided around ponds.
- Permanent fencing to meet site access control requirements.

Site Entrance Lighting

To be determined based on Kitsap County preferences.

Signage

To be determined based on Kitsap County preferences.

TABLE 2-1
BAINBRIDGE ISLAND LANDFILL ENGINEERING DESIGN REPORT
CN Values for Specified Conditions and Cover Type

Condition	CN
Pre-Development Conditions	
Forested, established second growth, good condition	78
Meadow, pasture	85
Post-Development Conditions	
Open space, lawn,	86
Forested, established second growth, good condition	78
Roads, Asphalt	98

TABLE 2-2
BAINBRIDGE ISLAND LANDFILL ENGINEERING DESIGN REPORT
Maximum Sheet Flow Length for Time of Concentration Calculation

Slope (%)	Length (feet)
Less than 1	300
1 to 3	250
3 to 10	150
10 to 15	50
Greater than 15	30

TABLE 2-3
BAINBRIDGE ISLAND LANDFILL ENGINEERING DESIGN REPORT
Design Rainfall Amount

Recurrence Interval	24-Hour Duration Precipitation
6-month[a]	1.51 inches
2-year	2.36 inches
10- year	3.20 inches
25- year	3.80 inches
100- year	4.60 inches

a Estimated precipitation for 6-mo recurrence interval calculated as P(6-mo) = P(2-yr) x 0.64 (from Ecology, Stormwater Management Manual for Western Washington, 1992)

CHAPTER 3

Engineering Analysis

3.1 Site Preparation

Site preparation activities are to be done prior to or during mobilization of the prime remediation contractor. Site preparation activities will be done by the remediation contractor or specialty subcontractors.

3.1.1 Monitoring Well and Gas Probe Decommissioning

Most of the monitoring wells and gas probes on the site will be decommissioned because they are no longer needed for monitoring. The monitoring wells to be decommissioned and those that will remain in place are shown in Figure 3-1. All gas probes will be decommissioned, except those that are installed in the borehole of a well that will not be decommissioned.

The monitoring wells and gas probes will be decommissioned prior to construction by a Washington State licensed well driller in accordance with WAC 173-160-460. The decommissioning technique to be used is overdrilling with full removal of the well casing. The borehole will then be sealed with bentonite, cement grout, or neat cement. The well monument, concrete pad, bollards, and well casing will be disposed or recycled by the drilling subcontractor.

3.1.2 Clearing and Grubbing

Clearing consists of removing organic and other material from the ground surface that does not comprise the clean soil cover or waste material to be processed. This may include but is not limited to trees, including saleable timber and shrubs. Grubbing includes removal of grasses, forest duff and decomposing organic matter, and the upper 6 inches of soil that supports existing plant growth.

The contractor will remove saleable timber prior to mobilization, and the money received from the timber sale will be credited back to Kitsap County.

Clearing limits are shown in Drawing Sheet 4. In areas where landfill excavation or site grading to accommodate processing will occur, the contractor will remove surface material including the top 6 inches of soil and use the material to construct the grub/mulch/topsoil stockpile (Drawing Sheet 8). Pruning of branches from trees 15 feet above roadway beds and shoulders also will be completed by the contractor. Specifications for Site Preparation, including clearing, are in Section 02200 of the Technical Specifications.

The volume of grub/mulch material is estimated to be approximately 10,000 cubic yards. This volume was calculated by multiplying the area in square feet over which grubbing will be done by a nominal one-half-foot thickness. The material will be mulched, stockpiled, and

mixed with onsite soils to produce a growing medium soil that will be placed on top of the reclaimed landfill area to support vegetative growth.

3.1.3 Access Roads

A 30-foot-wide access road (24-ft-wide driving surface) will be constructed to allow rapid movement of the haul vehicles that will remove refuse excavated from the landfill. The access road will begin at the existing site entrance just south of Vincent Road. Approximately the northernmost 200 feet of the improved access road will be used by both the public and construction traffic. Approximately 200 feet south of Vincent Road, the construction access road diverges from the public site access road to the drop-box facility. Temporary gates will be placed across both roads just south of the divergence to control public access to the construction site and to limit unauthorized access to the drop-box facility during hours when it is closed.

The construction access road will be a gravel-surfaced road that extends across the landfill area to the waste screening area and stockpiles planned for the south side of the landfill. This road must be designed to withstand the heavy truck traffic during construction and will therefore be designed as a permanent road that will be useable for site access after construction.

3.1.4 Temporary Construction Facilities

No utilities are available at the site. The construction contractor will be required to provide noise-attenuated generators for electrical power needs during the project. Sanitary facilities for construction and engineering personnel will be required, with hand-washing facilities. Water for construction and cleaning will be trucked onto the site. A wheel wash consisting of a concrete sump with hose for spray-off will be constructed near the site entrance and used by haul and construction vehicles exiting the site. Onsite roads, including the access road and onsite excavation roads, will be watered as needed to prevent dust emissions.

The construction contractor will be required to submit an odor control plan that includes covering excavated refuse with tarps, foam, or other materials as the primary odor control method. Aerosol masking agents or enzymatic reactants may be used as secondary contingency controls.

Temporary erosion control during construction is discussed in Section 3.5, Erosion Control.

3.1.5 Worker and Public Safety

Maintaining a safe construction site for both site workers and the public is the responsibility of all project participants. Protection monitoring that assures protection of human health and the environment, is required under MTCA (WAC 173-340-410 (1)(a)). The primary site contractors, CH2M HILL and the remediation contractor, are required to prepare site-specific health and safety plans for protection of workers potentially exposed to contaminants and physical hazards. CH2M HILL's Health and Safety Plan and Contingency Plan are included as Appendixes D and E. Because of the potential for encountering dangerous or hazardous waste in the landfill, excavation personnel will be required to have current hazardous waste site operations training as required under 29 CFR 1910.134. The contractor will be required to address special safety considerations resulting from potential

contact with municipal solid waste, landfill leachate, and combustible landfill gas. The contractor will be required to be familiar with the landfill safety guidelines published by the Solid Waste Association of North America.

In addition, a portion of the landfill property, the Bainbridge Disposal Transfer and Recycling Station, is open to the public 5 days a week (Wednesday through Sunday, 10 am to 4 pm). Trucks owned and operated by Bainbridge Disposal also access the site Monday through Friday, approximately 6 a.m. to 4 p.m. As noted above, barriers will be maintained to prevent public access to the construction area.

3.2 Excavation

The existing landfill cover will be excavated incrementally prior to excavating the landfill materials beneath it. The final cover material, except for an area identified in the RI as containing contaminated soils, will be scraped off and stored in a clean cover stockpile. Other clean soils from outside the landfill that will be excavated to achieve required slopes and grades would also be stockpiled in the clean cover stockpile.

Prior to removing the existing landfill cover soils, the existing vegetation will be grubbed and any existing topsoil suitable for reuse in the final cover will be stripped (Drawing 5). The stripped and grubbed material will be removed to an area specifically defined for it. The grubbed material will be mulched and then disked into the final soil cover (provided from onsite clean soils) with soil amendments (lime, nitrogen fertilizer, etc.) to create topsoil for the final soil cover.

Estimated bottom excavation grades of the excavated landfill are shown in the design drawings. Maximum excavation slopes shown are 2:1 (2 horizontal to 1 vertical). The grades shown are for bidding purposes; the contract documents will also require the contractor to excavate until refuse is removed, i.e., to native soil. In areas of the landfill excavation that are outside the area that will be re-covered with inerts separated from the waste, testing will be done to demonstrate that the uncovered soils will meet the site cleanup standards.

It is anticipated that at least three excavators with minimum 3-cubic-yard buckets and thumbs and reach of 20 feet with support from one bulldozer will be required to excavate the material from the landfill within the time required. It appears there is sufficient space in the excavation area for this equipment to operate. A Caterpillar 345B excavator would meet this requirement. During excavation the contractor will be required to cast aside large items (car bodies, white goods, etc.) for later consolidation and loadout.

It is anticipated that hauling the excavated material to the processing plant as well as hauling the inert material back to the landfill via temporary loop haul roads will require eight articulated off-road haul vehicles with minimum 21-cubic-yard heaped capacity. A Caterpillar D30D or D300E articulated truck would meet this requirement. The layout shown on the design drawings provides sufficient area for these vehicles to operate.

The excavation grades within the landfill area shown in the design drawings were derived from the borehole logs presented in the RI. The bottom contours were extrapolated from the known bottom-of-waste locations shown in the borehole logs. This resulted in an estimated in situ volume of refuse to be excavated of 123,000 cubic yards or 154,000 cubic yards ex situ

(assuming a 25 percent swell factor). Sections were drawn at 50-foot intervals over the excavation area in both north-south and east-west directions. RI borehole logs were superimposed to check the depth of excavation against the known waste depth. Excavation grades were adjusted to match the waste depths and at the same time grade smoothly into the existing ground surface surrounding the landfill.

Approximately 2 feet of depth was added to the landfill excavation grades to provide a conservative estimate of excavation volume for bidding purposes. The excavation grades also include some excavation outside of the refuse, in order to create slopes accessible to excavation equipment and a level area south of the landfill for waste processing equipment.

Excavation will also include removal of the waste material from the west, north, south and east septage pits, and the settling ponds adjacent to the east end of the landfill.

The following are the computed excavation quantities:

- Cover strip/grub material: 9,000 cubic yards
- Clean soil from existing cover: 7,000 cubic yards
- Contaminated cover soil: 1,600 cubic yards
- Clean soil from outside landfill: 30,000 cubic yards (approximately)
- Landfill material: 123,000 cubic yards
- Septage: 6,000 cubic yards
- Settling ponds: 300 cubic yards

The above quantities are in situ volumes. The clean soil from outside the landfill will be used in road construction, regrading the site, and in providing at least 2 feet of clean soil cover over the inert materials that are placed back into the landfill excavation after screening.

3.3 Waste Processing

The waste processing facilities (and the excavation equipment) must be able to sustain an average throughput of up to 3,000 cubic yards per day. The screening plant area will be located in close proximity to the landfill excavation to reduce the transport distances for excavated material and inert (undersized) material back to the excavation. The proposed screen plant location is on the south end of the landfill. The area will be graded down from the current elevation to provide a nearly level surface for the processing equipment. This grading will also provide clean borrow soil for capping the landfill during restoration activities. The screen plant area will be graded at a 3 percent slope toward the excavation area (landfill) to shed surface water and eliminate site runoff.

Material excavated from the landfill will be processed to separate material smaller than 1½ inches (unders or inerts) from larger materials (overs). Material larger than 1½ inches will be presumed to be decomposable refuse and will be disposed of offsite at a permitted solid waste disposal facility. For materials larger than 1½ inches, the contractor and

construction management personnel will be provided with visual criteria for separating special wastes, e.g., dangerous wastes such as gas cylinders, as well as other materials that may require separation such as white goods, tires, etc. These materials will be stored in a special area prior to offsite disposal. Also, some excavated loads may contain minimal amounts of soil (determined by visual inspection) and will bypass the processing equipment and be deposited directly in the "overs" stockpile for loadout to offsite disposal.

The Construction Quality Assurance plan for the remedial action is included as Appendix F.

3.3.1 Processing Equipment

CH2M HILL has developed minimum requirements for processing equipment based on our own experience with waste excavation projects, experience reported in the literature (USEPA 1993, CalRecovery 1993, Schillinger, Salerni and Boyd 1992) and product information provided by equipment manufacturers. The latter allowed us to develop minimum equipment requirements that can be provided by equipment available in the marketplace.

Two types of final (1½-inch) screens are commonly available that could be considered for this project. The first is a shaker deck screen, in which the landfill material would be placed on a rectangular screen that is shaken mechanically. With the shaker screen, the overs remain on the screen deck and tumble off the end while the unders fall through the screen deck. A small shaker deck screen was used to separate material excavated from test pits during the 1999 material testing at the site. The second type of screen is a trommel, which is an inclined cylindrical screen. The landfill materials are placed inside the cylinder at its high end. The undersized (inert) material falls through as the cylinder rotates, with the oversized (refuse) material being carried out the low end of the cylinder. The trommel screen has flights to facilitate material movement. The overs are discharged from the end of the cylinder while the unders fall through the rotating screen and are collected, typically to a single discharge point. A bar screen or grizzly will be used as a pre-screen for the trommel to remove material 6 inches or larger that may damage the trommel. The grizzly output feeds the trommel from a conveyor belt. Additional equipment may be required to further protect the trommel from large debris on the grizzly.

Our research and experience indicate that, for the processing rates required for the Bainbridge Island Landfill reclamation project, the 1½ inch shaker screens that are commercially available would be operating at the upper limits of their capacities for excavated refuse and soil, and may be subject to breakdown as well as blinding (clogging) of the screen decks. Trommel screens have a better operating record for separating waste materials than do shaker deck screens, especially at the required throughput rates. Several manufacturers of both types of screen were contacted for published capacities and experience. A CH2M HILL consultant to the composting industry provided experience on the relative performance of different types of screens used for raw waste processing. Based on all of the available information, CH2M HILL recommended that a trommel screen be used as the final processing screen, and this requirement has been written into the contractor requirements. Bidders will be invited to propose alternative equipment but will have to demonstrate its adequacy.

Local representatives of three commercially available grizzly/trommel screen units that can meet the above-listed minimum specifications were contacted regarding availability and purchase cost of the equipment, as well as availability for rental.

3.3.2 Processing Area Layout

A layout of required processing equipment was done so that site grading and drainage facilities could be designed to accommodate it (Drawing 8). The layout of the waste processing area in the design drawings consists of two parallel processing trains, each having a pre-screen "grizzly" bar screen. The bar screen will be followed by a 1½-inch trommel. The bar screen will remove large and "stringy" items that could jam the smaller opening size in the final screen. The material off of the pre-screen will be removed by loaders and either placed in the overs stockpile or directly loaded into offsite haul trucks, depending on the type of material in the two pre-screen overs piles. Conveyors from the screen plants will carry the overs and unders to day piles where loaders will then move the material to their respective piles (overs and inert stockpiles) or, alternatively, additional conveyors could stack out the material directly into their respective stockpiles. The contract documents will require two screening trains with capacities as specified. Two screen plants will be required in order to keep production up in order to meet the schedule, have at least one screen available at any given time during maintenance or breakdowns, and to provide operational flexibility. Methods for moving overs and unders from the equipment to the appropriate stockpiles will be left to the contractor, but consideration has been given to these methods to make sure enough space is provided in the processing area shown on the design drawings.

Space has been provided in the processing area for the above-described minimum processing equipment. The processing facilities surface will consist of an 8-inch layer of crushed base rock overlain by 5 inches of Class B asphalt concrete pavement (ACP) placed in two lifts. The ACP surface will be fog-sealed to reduce its permeability to water. The ACP will be left in place at project completion..

3.3.3 Stockpile Operations During Construction

A number of stockpiles will be required to manage different materials on the site during excavation and waste processing. Required volumes and plan areas for the required stockpiles were determined in order to make sure that enough area would be available within the site constraints. The design drawings show locations for stockpiles for the grub and/or topsoil material, raw excavated landfill material, processed inert material, refuse "overs" from the screening process, and clean cover soil. The construction contractor will be given the option of using different configurations if a more efficient use of space can be achieved. The raw excavated refuse and refuse "overs" stockpile will be underlain by impermeable materials to allow capturing of all runoff water, if necessary. The other stockpiles will be placed on graded native soils.

The size of each of these stockpiles shown on the drawing was determined by estimating the maximum volume of the material that will need to be in the stockpile at any time during the project. Together with the maximum slope at which each of the materials can be stockpiled, the maximum volume determines the surface area required for storage during the project.

Maximum slopes for each of the materials to be stockpiled are listed in the design criteria. Considerations in locating and sizing each of the stockpiles are listed below:

- ***Raw excavated waste stockpile:*** This stockpile will function as a "surge pile" for storing excavated waste before it is put through the screening process. It is located near the upstream end of the screening facility and close to the main landfill excavation area. It has sufficient volume to store at least 3 days of excavated material. This will assist in initial setup and operation of the screen plants as well as provide surge material if it is necessary to screen on Saturdays in the event catch-up is required. If screening is necessary on a Saturday, the stockpile will eliminate the need to run the off-road haul units, assuming sufficient space exists in the overs and inert stockpiles. The stockpile volume requirement is 9,000 cubic yards. It is anticipated that two bulldozers will be used continuously on this stockpile—one to maintain the stockpile and one to feed material to the tracked excavators that will be feeding the screening plant. Space for this equipment to maneuver has been provided in the layout. Ecology blocks or equivalent will be used to separate the stockpile from the screen plant operation area, and to minimize the stockpile area. Equipment will be staged on both sides of the ecology block wall to conduct stockpile maintenance and feed the screen plants during reclamation activities.

- ***"Overs" refuse stockpile:*** Loadout for offsite disposal of this material will be taken directly from this stockpile, so it is located adjacent to the offsite haul road and at the downstream end of the screen plant. The stockpile area is large enough to store an estimated 3 days of production from the screens, if necessary, providing maximum flexibility for the loadout operation. Volume requirement is 3,000 cubic yards, which is the volume of refuse overs anticipated to result from processing 9,000 cubic yards of raw waste. It is anticipated that one excavator and a part-time bulldozer will be needed for stockpile maintenance. Space for this equipment to maneuver has been provided.

- ***Inerts stockpile:*** Total inerts storage capacity must be large enough to store the maximum amount of inerts that will accumulate until the contractor can begin re-grading it back into the landfill excavation. The total volume of inert storage capacity will be between 12,000 and 16,000 cubic yards. The secondary inerts storage area as shown is farther from the screen plant but readily accessible to the excavation area for regrading. It is likely that a large portion of this windrow material will be placed into the excavation using bulldozers. It is anticipated that only during the initial excavation period will the maximum volume of storage area be needed and during the latter stages of construction only the primary inerts storage area near the screen plant will be required. It is estimated that one excavator and a bulldozer will be required for maintenance of the inerts stockpile and space has been provided in the layout for this equipment.

- ***Clean cover soil:*** The clean cover stockpile will need to provide storage for a large percentage of the volume of clean soils excavated during the project, because the last of this material will not be returned to the excavated area until all waste has been excavated, processed, and the inerts returned to the excavation. Maximum volume is 20,000 cubic yards. The soil cover will be placed incrementally as the excavation is brought to grade with inerts, and will be used in road construction so some will be used

before completion of excavation. It is assumed the soil cover will begin to be placed about halfway through the excavation process in order to gauge the cut/fill balance.

- *Grub/Compost/Topsoil stockpile:* Estimated volume assuming a 12-inch layer scraped from the entire excavation area is 9,000 in situ cubic yards and 11,000 ex situ cubic yards. Any chipped vegetation will also be placed in the grub pile. This material will be used for manufacturing growing medium soil that will be placed over excavated areas at the end of the project to support revegetation.

3.4 Disposal

Refuse material from the landfill excavation that is retained on the trommel screen will be hauled to a permitted offsite mixed municipal solid waste disposal facility. Also, large "bulky" refuse items that are removed prior to screening will be taken to a permitted offsite mixed municipal solid waste disposal facility. These materials will be tracked by haul vehicle number and weight tickets obtained at the disposal facility.

Excavated septage waste will be hauled to a mixed municipal solid waste disposal facility and tracked separately from other wastes.

Landfill cover soils that are known to be contaminated (as described in the site RI), will be tested after they are excavated. These soils will be stockpiled onsite until testing shows that they either are or are not dangerous or hazardous wastes, and will be disposed of accordingly.

Asbestos wastes identified during excavation will be contained and disposed of at a permitted disposal facility in accordance with applicable regulations.

Contractor's personnel will be trained in hazardous waste site operations and will therefore be capable of and responsible for identifying potentially dangerous or hazardous wastes if encountered in the landfill excavation. Any such materials encountered will be placed in a special area onsite designed to temporarily contain them and disposed of offsite at a permitted disposal facility in accordance with applicable regulations.

3.5 Erosion Control

Standard best management practices for erosion and sediment control will be implemented during construction, which includes excavation and processing operations. Foremost, the construction work schedule is planned for the dry summer months to minimize the risk of heavy rainfall events. Additionally, the duration of the excavation and processing operation is estimated to be four months. The construction sequence is planned to allow any stormwater that runs off the upper (northern section) road area and disturbed areas of the landfill to collect in the landfill excavation and infiltrate.

A temporary sediment trap was designed to remove most of the sediment from a large storm event (25 year event) originating from runoff from the processing area during construction. A straw bale/silt fence divider will be placed on the bottom of the sediment trap to divide the flow path into two sections and enhance the performance of the trap. The

processing area includes an asphalt pad with a drain system that directs stormwater runoff directly to the sediment trap.

Silt fencing will be installed along the down-gradient edge of the project and downgradient of stockpiles and processing areas. Catch basin inserts, silt fencing and straw bales will be installed at existing catch basins affected by the project and an orange barrier fence will be placed around the perimeter of the project. The silt fences and straw bales at the catch basins will be removed after hydroseeding or other revegetative practices have established.

Hydroseeding or other vegetative practices, as specified in the plans and specifications, will be performed as soon as an area has reached final grade. After remedial activities and construction of the drainage facilities are complete, rock check dams and rock lining will be used to reduce erosion in ditches where slopes exceed 10 percent. All other ditches will be grass-lined or matted, as appropriate. Drainage system outlet erosion control will be enhanced by placing quarry spalls or riprap, as appropriate, at outlets per the Ecology manual. Erosion control for the landfill site during construction activities and after reclamation are shown on Drawing Sheets 7 and 12, respectively, in the construction plans (see Volume 3).

3.6 Stormwater Control Systems

This section summarizes the proposed drainage facilities for the remediation of the Bainbridge Island Landfill. It describes the hydraulic facilities proposed for the routing of stormwater runoff originating offsite from neighboring properties to the west and south of the landfill and for drainage structures for stormwater runoff from the disturbed areas of this remediation project.

The major elements of the proposed drainage system include:

- A new storm drain system to collect stormwater runoff from offsite sources and the undisturbed areas of the property and route this runoff around the disturbed landfill area, related remediation work zones, and associated stormwater detention facilities. Undisturbed areas are defined as those onsite areas where no change in land use, cover, or significant hydraulic characteristics (slope, routing) occur.
- A new detention pond for the control of stormwater runoff originating from the disturbed areas of the landfill and new roadways. Disturbed areas are defined as those areas where changes in land use, cover, or significant hydraulic characteristics occur.
- Ditches and culverts to convey stormwater runoff along new roadways.
- Temporary sediment control for disturbed areas while remedial excavation and refuse processing are taking place.

3.6.1 Existing Conditions

Basin Description

A topographic high is located approximately 0.5 mile to the southwest of the landfill. Stormwater runoff from the offsite properties to the west and southwest discharges to the

landfill. The properties adjoining the landfill on the south and east do not drain through the landfill property. Stormwater runoff from the native forested areas within the property boundary and lying to the north and northwest of the existing landfill bypasses around the landfill area.

The existing drainage system for the property consists of a road culvert, storm catch basins, and 18" concrete pipe routed along the south side of the landfill area (Sheet 7 of the Construction Drawings).

Utility Location

There are no existing utilities in the project area.

3.6.2 Post-Development Conditions

The construction drawings show proposed modifications within the property boundaries of the Bainbridge Island Landfill. The existing storm drain system, shown in Drawing 4 of the Construction Drawings, will be replaced in order to complete remedial activities and maintain the stormwater runoff conveyance serving the offsite areas. A separate drainage system will be constructed for the disturbed area of the landfill. Stormwater runoff from the project will be collected in a series of ditches and culverts along the down-slope side of the new roadway, in a new stormwater channel in the landfill area, and will be conveyed to a detention pond located at the southeast side of the landfill area. Sediment control will be provided with a sediment trap installed at the inlet of the detention pond. A quarry spall berm divides the pond into two near-equal areas. The quarry spall berm also acts as a filter window to further reduce sediment at the outlet structure. Discharge from the treatment facility will exit through an outfall pipeline into a new manhole, which connects to the replacement offsite drainage pipe. The single outfall pipe will have similar outlet characteristics as the existing drainage pipe. A rock pad energy dissipater will be provided at the outfall of the replacement offsite drainage pipe.

Water quality treatment facilities, specifically for nutrients and oil, are not required after landfill closure because no pollution-generating impervious surface will be created with this project. Only maintenance personnel will frequent the landfill site after closure, and a gate will restrict vehicular access at the entrance to the new road. A 0.5-foot-deep sediment trap and filter window in the detention pond will provide sediment control from the reclaimed landfill area.

3.6.3 Stormwater Facilities Design Criteria

Drainage facilities for the proposed system are designed in accordance with the Stormwater Management Manual for the Puget Sound Basin (Ecology, 1992). The runoff control facility is designed assuming a meadow existing condition in the landfill area. Offsite and undisturbed areas of the property are assumed to be established second growth forest in good condition. After reclamation activities, the disturbed areas of the landfill are assumed to be open space, lawn.

3.6.4 Methods of Analysis

The rational method was used to compute peak flow rates for the conveyance system design. Rainfall Intensity data were obtained from the WSDOT hydraulics manual.

Peak flow rates were computed by using the Santa Barbara Urban Hydrograph for the treatment and runoff control facilities design. Level pool routing was used as the storage routing technique. The computer program StormShed (Engenious, 2000) was used to compute runoff hydrographs and to perform the level pool routing analysis. The Soil Conservation Service (SCS) Type 1A distribution was used as the design rainfall distribution. Table 2-C shows the design rainfall amounts used in the analysis.

3.6.5 Stormwater Facility Sizing

Stormwater Conveyance System

Offsite flows will be routed around the landfill and its associated conveyance and treatment facilities. Two new stormwater catch basins will collect offsite stormwater in a similar fashion as existing facilities. Interceptor channels will route offsite flows that may flow across disturbed areas of the landfill. These diversion channels will not contribute significantly to the peak runoff flow rate of offsite areas. Offsite flows are collected in a manhole and routed to the existing outfall area for the property, on the east side of the existing landfill area. The outfall of the replacement drainage system will be sited in the same area as the existing drainage system. Upgraded erosion control and energy dissipation including check dams on slopes over 10 percent will be implemented in this area.

The onsite stormwater conveyance system (channel) will convey stormwater runoff from roadways and disturbed areas of the landfill to the stormwater treatment facilities. The conveyance system was designed to meet the WSDOT design criteria. Under these design criteria, the storm channel must convey the peak discharge from the 10-year 24-hour design storm, based on post-development site conditions. An outlet structure will meter the discharge of the stormwater pond at existing-condition design rates to the replacement drainage system. Design calculations are found in Attachment A.

Stormwater Detention Facilities

The hydrology for the project site and for offsite runoff was calculated using the Santa Barbara Urban Hydrograph (SBUH) Method, as implemented by the StormShed model. StormShed is a single-event model commonly used in this region to develop estimates of stormwater runoff. Model input for the subbasins is shown in Table 3-1.

Runoff parameters were computed for existing and developed conditions for the area tributary (disturbed landfill area) to the detention facility. These parameters were computed based on information gathered from site visits, topographic, and project mapping. Table 3-1 shows the parameters used to compute the runoff hydrographs. Table 3-2 shows the resulting peak discharges. Hydrologic data development is presented in detail in Appendix .G

Detention (Runoff Control)

The 2-, 10-, and 100-year 24-hour events were used as the design events. The facility was sized to limit the 2-year developed condition peak outflow rate to one-half the existing 2-year peak runoff rate and to limit the 10- and 100-year developed condition peak discharges to the 10- and 100-year existing condition peak runoff rates. Runoff control is provided in an outlet control structure that comprises a 4.7-inch orifice to allow one-half of the 2-year discharge rate. Table 3-3 shows peak outflow rates for the runoff control facility.

This table shows that the pond meets the 2-, 10- and 100-year performance criteria. The detention design analysis is shown in Appendix G.

Detention Pond—The detention pond is approximately 60 feet long by 20 feet wide (pond bottom dimensions) by 4 foot-deep excavation. The pond will have a 2:1 side slope and be level with a bottom elevation of 236.0 feet at the outlet. The bottom 0.5 foot of the pond is reserved for sediment storage. Live storage occurs between elevation 236.5 feet and 238.5 feet. The total pond depth includes 1.0 foot of freeboard above the maximum water surface elevation. The pond is divided into two cells of approximately equal volume. A filter window will be used to enhance sediment removal in the first cell. Figure 3-2 shows the stage storage rating for the detention pond. Pond details are found in the Contract Plans.

Outlet Structure—The primary outlet structure will be the standard FROP-T control device located near the edge of the roadway at the York Road intersection. The diameter of the riser will be 15 inches and will have a crest elevation of 238.0 feet. The riser will pass the 100-year developed peak discharge with a head of 0.66 foot. The riser also acts as the emergency overflow structure. A bottom orifice of 4.7 inches in diameter is sized to pass 50 percent of the peak 2-year storm event. The bottom orifice is located at elevation 235 feet. Figure 3-3 shows the stage discharge rating for the control structure. This discharge assumes rectangular pond orientation (20 ft x 60 ft bottom dimensions). Actual discharge may vary slightly depending on actual constructed pond dimensions and orientation. Supporting details are found in Appendix G and the Contract Plans.

3.6.6 Infiltration

Infiltration of stormwater is not proposed for this project because of physical site constraints. An infiltration pond must be set back 50 feet from the property line and 25 feet from a steep slope. The surface water flow patterns necessitate that the pond be located at or near the east end of the property. The final graded slope at the east end of the project site qualifies as a steep slope and the toe will be closer than 50 feet to the east property line. The planned detention pond located west of the top of the slope is within 25 feet of the slope break. Soil boring information obtained during the RI indicates that the underlying soils are dense, fine sand with relatively low permeability. Without direct measurements of in situ permeability, it would be difficult to calculate the size needed for an infiltration pond, but it would need to be larger than the planned detention pond.

3.6.7 Offsite Analysis

Upgradient offsite flow is maintained with the replacement drainage system. Flows resulting from the landfill areas are maintained at existing conditions through the outlet structure of the stormwater detention pond. The combined discharges from offsite and onsite generated runoff exit at the same location as the existing drainage system; therefore, there is no net increase or decrease in offsite flows resulting from this project.

Field Review

The field review was performed on November 15, 2000, by CH2M HILL staff. The weather was overcast with a temperature of about 15° C. The entire project was toured including the upstream offsite area, project site, and downstream drainage to about 1,300 feet downstream of the east property line. Table 3-4 describes the existing drainage system.

Mitigation of Existing or Potential Project Impacts

Table 3-4 shows that the project may impact offsite areas at three downstream locations. Uncontrolled discharge may cause erosion in the area downgradient of the landfill (east of the property). Project impacts will be mitigated by the detention and water quality treatment facilities constructed as part of this project. Erosion control at the outlet of the new drainage pipe will mitigate potential erosion problems downgradient of the landfill.

The project is not expected to impact upstream drainage because the existing drainage system flow characteristics will be maintained with the new offsite drainage system.

3.7 Site Grading

Site grading shown on the design drawings is based on the excavation grades described in Section 3.2. The site grading drawing adds the screened inert material from the refuse excavation that will be replaced back into the excavated area. It also shows regrading of clean soils outside the refuse excavation for the purpose of creating processing areas, staging areas, access roads, and stormwater control facilities.

The material to be placed back into the landfill excavation will be the excavated landfill material that passes a 1½ inch screen. Testing during 1999, as reported in the RI Supplement 2 (CH2M HILL 2000c), showed that material smaller than this screen size contains negligible decomposable refuse and is primarily soil and gravel and debris such as glass. Maximum final grading slopes for the inerts placed back into the landfill excavation are 3 horizontal to 1 vertical. The "flat" top area is sloped at approximately 3 percent to shed water.

The 1999 testing also showed that approximately 66 percent by volume of the excavated refuse will screen out as inert material that can be replaced into the landfill excavation. That percentage will provide 81,000 in-place cubic yards of inert material to be regraded. The design drawings show the inert fill grading contours. The volume within the contours shown is somewhat larger than the estimated in-place inert volume The inerts will be re-graded with minimal compaction, so are expected to occupy a slightly larger volume when regraded than when originally in place.

The actual volume of inerts separated may be larger or smaller than the estimated volume. Part of the construction management plan will include tracking the fraction of inerts separated and making changes to the grading plan as necessary. Bidders for the construction contract will be asked to supply unit prices for adding or subtracting volume from the regrading so that changes can be made to the grading volume without negotiation.

Site grading outside the landfill area includes road grading and grading an area south of the landfill area for placement of processing equipment, staging areas, and stockpiles. The grading for these areas is also shown in the design drawings.

The clean soils remaining after site grading will be used as a clean soil final cover on the regraded inert materials. At least 2 feet of clean soil will be placed over the regraded inert material.

3.8 Performance Monitoring

Performance monitoring is required under MTCA (173-340-410(1)(b)) to confirm that the cleanup action has attained cleanup and/or performance standards. The Bainbridge Island Landfill remedial action comprises source control with monitored natural attenuation of groundwater. Compliance with cleanup standards for source control are addressed in the Performance Monitoring Plan presented in Appendix H. Compliance with cleanup standards in groundwater are addressed in the Confirmation Monitoring Plan, Appendix I.

Performance monitoring will evaluate the results of source control actions at the following waste source areas:

- Septage pits
- West end area
- Settling ponds
- Portions of the main landfill

Samples will be obtained from native soil below the waste source areas after excavation and results will be compared to cleanup levels for the COCs identified for each waste source area. A sampling grid will be used to determine sample locations in each waste area. General sample locations and analytical parameters are included in Appendix I.

In addition to the waste source areas, samples will be obtained from the inert fraction to document contaminant concentrations that will remain on site. The inert fraction comprises approximately 70,000 cubic yards. Ten samples were obtained during the RI. All of the samples will be used to obtain an average concentration for each COC.

3.9 Confirmation Monitoring

Confirmation monitoring is required under MTCA (173-340-410(1)(c)) to confirm the long-term effectiveness of the interim action or cleanup action once cleanup and/or other performance standards have been attained. For the Bainbridge Island Landfill remedial action, confirmation monitoring will address the long term affects of the clean up action on groundwater and surface water. The Confirmation Monitoring Plan is presented in Appendix I.

Fate and transport analyses in the RI report (CH2M HILL, 2000a) indicate that natural attenuation of groundwater is already occurring. It is expected that natural attenuation will continue to degrade residual groundwater contamination after the remedial action source control is complete. Groundwater monitoring will consist of obtaining samples twice per year from four onsite monitoring wells, one upgradient and three downgradient of the main landfill, and from one offsite domestic well, BOW37 (Stetson Acres well) that has shown evidence of impacts from landfill contaminants of concern (COCs; see Appendix H, Table H-1 for a list of COCs, and Appendix I, Figure I-3 for well locations). Compliance with cleanup standards will be achieved when four consecutive rounds of sample results have met cleanup levels. If results indicate that COC concentrations, particularly vinyl chloride, in groundwater wells do not decrease after 30 years of monitoring, a contingency to implement active groundwater remediation will be implemented.

Surface water monitoring will consist of obtaining samples once per year from one upstream location and one location downstream of the constructed surface water control system. Surface water impacts at the site identified during the RI predominantly originated from the leachate seep. The leachate seep will be removed by the remedial action. Therefore, surface water impacts are expected to be eliminated by the remedial action. Results of samples from surface water entering the site (upstream) and leaving the site (downstream) will be compared to contaminants of concern. Compliance with cleanup standards will be achieved when four consecutive rounds of sample results have met cleanup levels. See Appendix I for a list of COCs and monitoring locations.

TABLE 3-1
BAINBRIDGE ISLAND LANDFILL ENGINEERING DESIGN REPORT
Runoff Parameters

	Development Condition		
	Off-site and Undisturbed Landfill Property	**Onsite Existing Conditions**	**Onsite Developed Conditions**
Area (ac)	87.7	9.9	9.9
Impervious Area (ac)	2.0	0.0	1.0
Impervious Land Cover	Pavement	N/A	Pavement
Impervious Curve Number	98	N/A	98
Time of concentration (Tc) Impervious (min.)		N/A	7.8
Pervious Area (ac)	85.7	9.9	8.9
Pervious Land Cover[a]	Second Growth Forest	Meadow, Pasture	Open Space, Lawn
Pervious Curve Number	78	85	86
Tc Pervious (minutes)	105	10.8	3.0

[a] SCS Soil Type C (Soil Conservation Service, 1983, referenced in Ecology, 1992)

TABLE 3-2
BAINBRIDGE ISLAND LANDFILL ENGINEERING DESIGN REPORT
Summary of Peak Discharge (cubic feet per second)

	Development Condition		
Recurrence Interval	**Off-site and Undisturbed Landfill Property**	**Onsite Existing Conditions**	**Onsite Developed Conditions**
6-Month	Not Used	Not Used	1.01
2-Year	4.16	2.06	2.54
10-Year	9.21	3.72	4.28
25-Year	13.45	Not Used	Not Used
100-Year	19.80	6.74	7.36

TABLE 3-3
BAINBRIDGE ISLAND LANDFILL ENGINEERING DESIGN REPORT
Runoff Control Design Summary

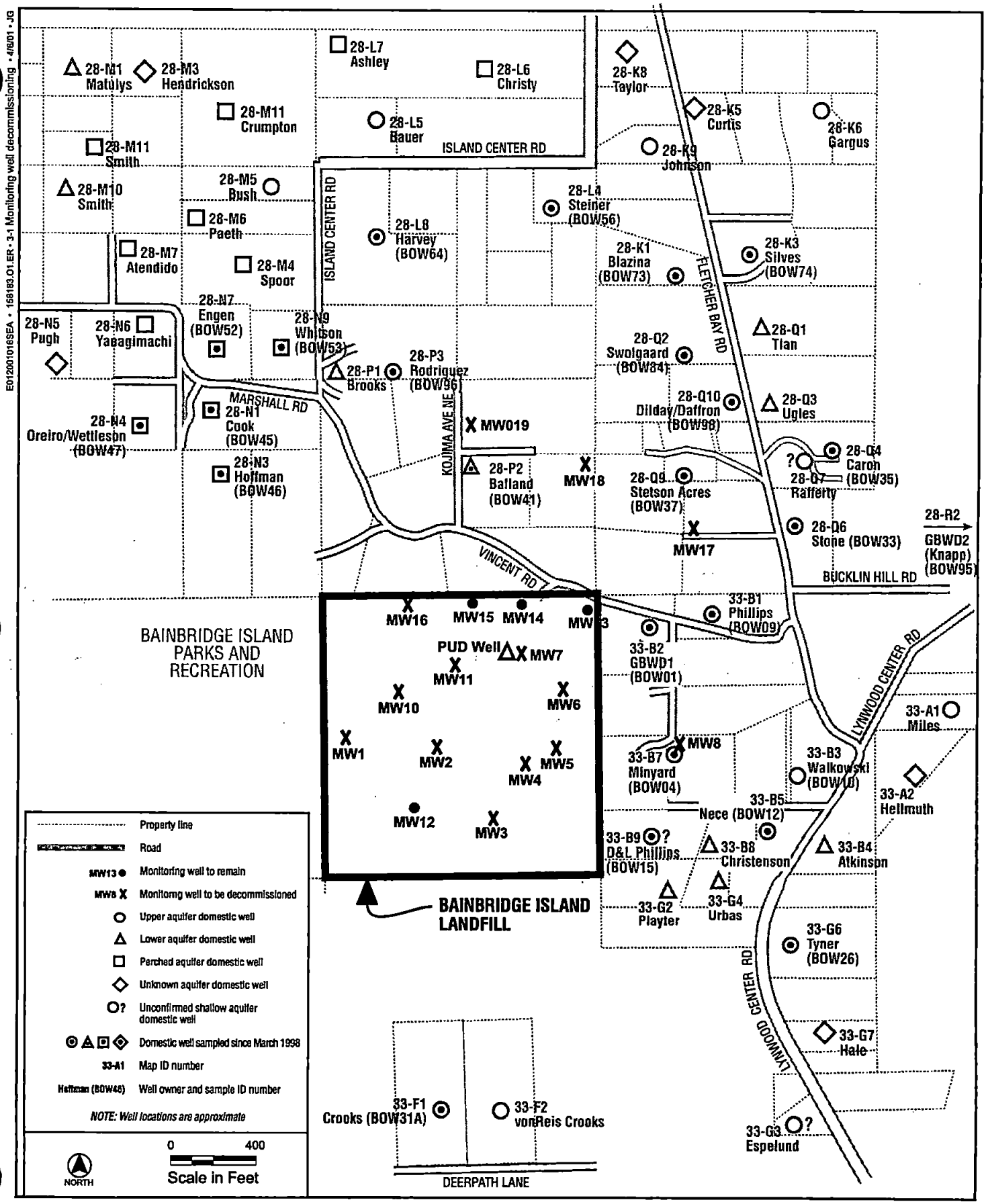
	Recurrence Interval		
	2-Year	**10-Year**	**100-Year**
Design release rate (cfs)	1.029	3.717	6.743
Peak outflow (cfs)	1.027	3.717	6.591
Peak elevation (feet)	234.26	235.05	235.51
Required storage volume (ac-ft)[a] at peak elevation	0.16	0.22	0.25

[a] From StormShed

TABLE 3-4
BAINBRIDGE ISLAND LANDFILL ENGINEERING DESIGN REPORT
Offsite Analysis Drainage System

Reach[a]	Description	Distance from Site[b] (feet)	Observations	Existing or Potential Problems
A	Undisturbed area north of the landfill area, including the existing transfer station	Project Site	Wooded area except for transfer station and entrance road. Transfer Station: Paved	None. Must replace existing drainage system.
B	Undisturbed off-site area to the west of the property	0 to 2400	Second growth forest, good condition, moderate slope	None. Must replace existing drainage system.
C	Undisturbed off-site area to the south of the property	0 to 2800	Second growth forest, good condition, moderate slope	None. Must replace existing drainage system.
D	Landfill Area	Project Site	Grassed area, flat-sloped in landfill, moderately sloped to south, extreme slope east from landfill to property line.	Peak runoff control required. Upgraded outlet control of drainage system needed.
E	Undisturbed off-site area east of the landfill	0 to 1300	Existing watershed drainage.	No known existing problems. Must supply erosion control at site outfall.

[a] See Figure 3-4
[b] Distances approximate surface water flow length



Reference Maps:

Kitsap County Tax Assessor Lot Maps, October 28, 1992.

(Sec. 33-25-2E North Half, Sec. 33-25-2E South Half, Sec. 25-25-2E South Half)

Figure 3-1

Monitoring Well Decommissioning

Bainbridge Island Landfill

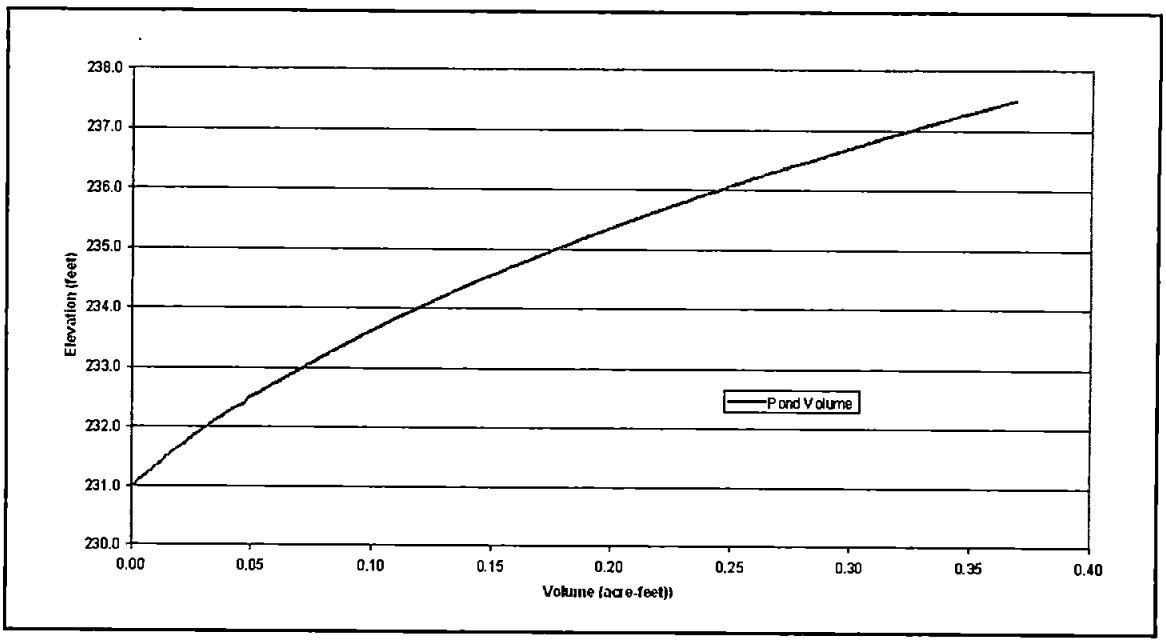


Figure 3-2

Detention Pond
Stage-Storage Rating

Bainbridge Island Landfill

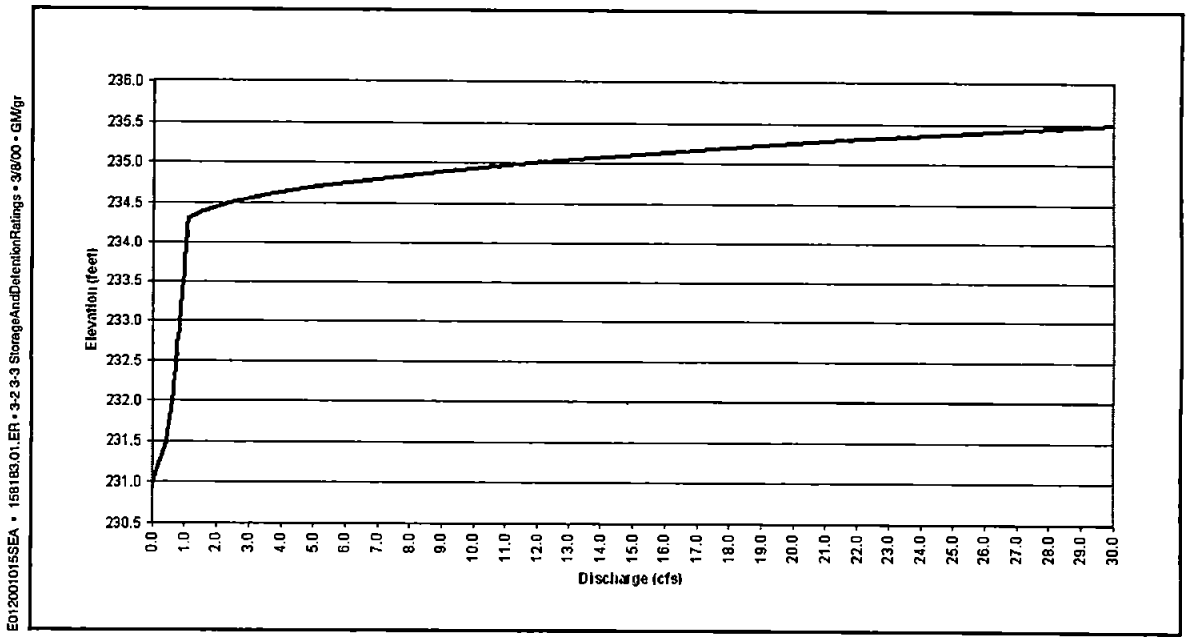


Figure 3-3

Stormwater Detention Pond
Stage-Discharge Rating

Bainbridge Island Landfill

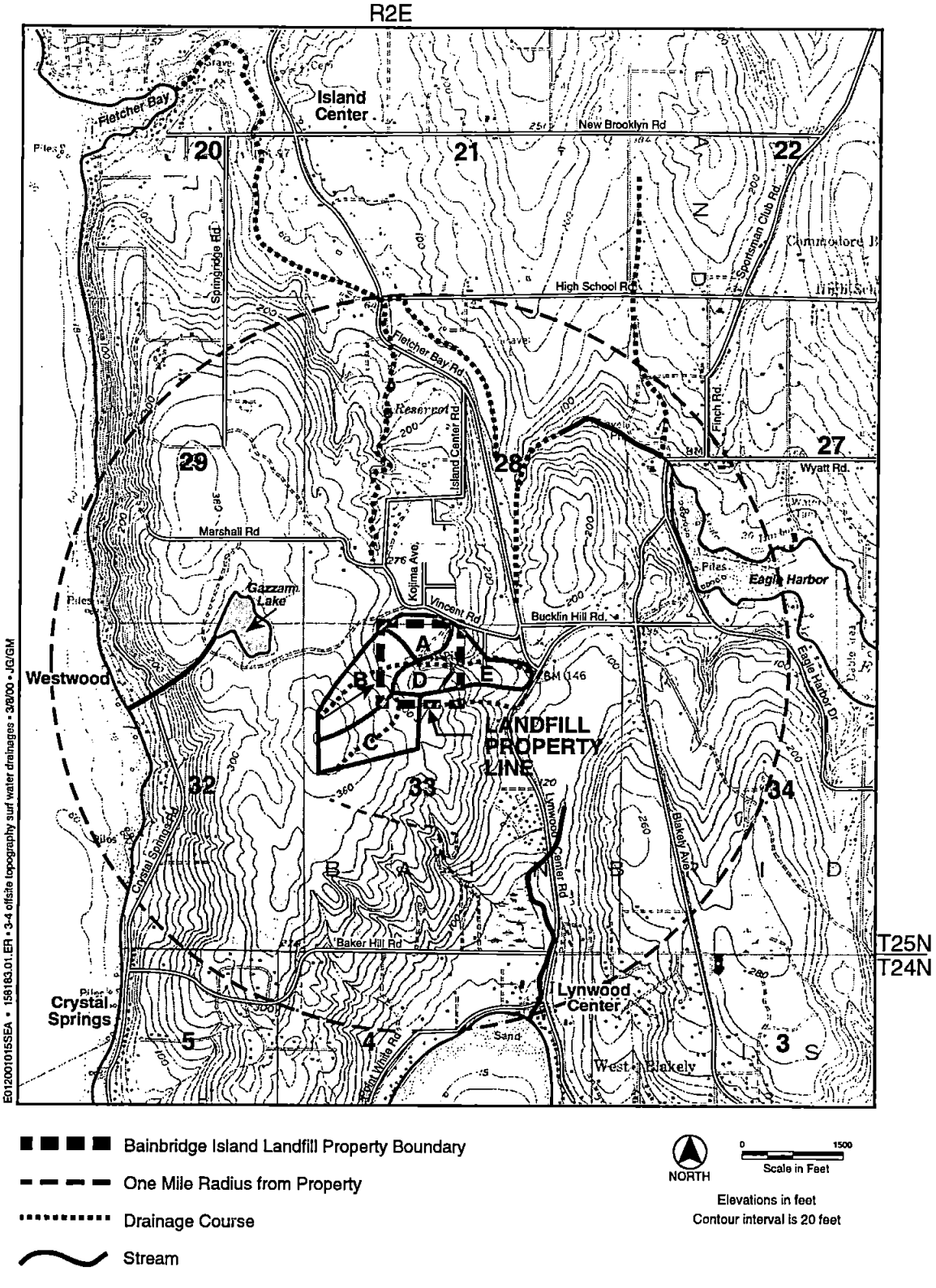


Figure 3-4

Off-site Topography and Surface Water Drainages

Bainbridge Island Landfill

CHAPTER 4

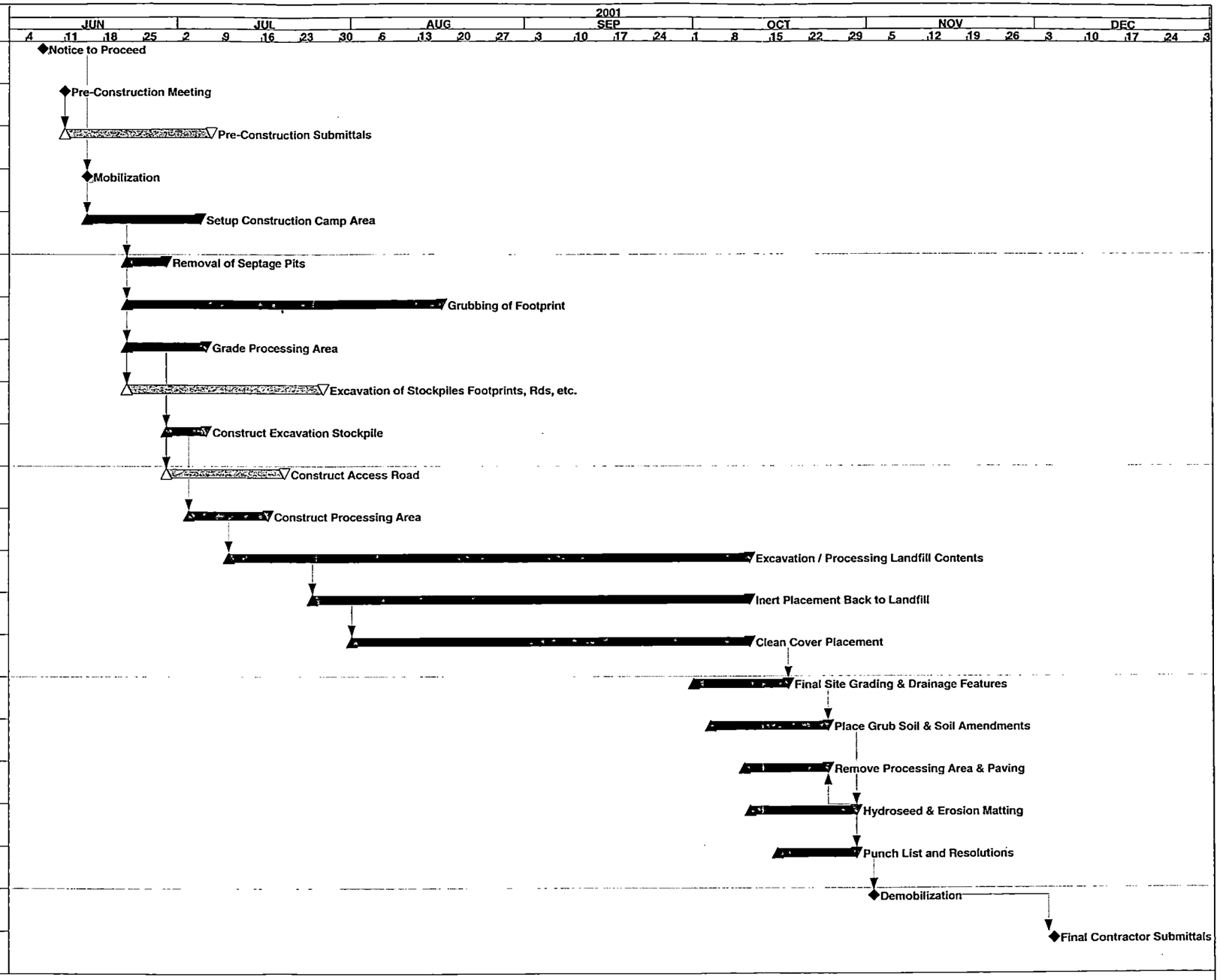
Construction and Implementation Schedule

A conceptual construction schedule is shown in Figure 4-1. The schedule was prepared based on the assumptions presented in the design in this report. The schedule is intended to be general and does not include all activities that may affect construction, such as sampling. Certain areas will require sampling and analysis prior to allowing final grading and/or backfilling. Sampling activities must be closely coordinated with construction activities so that they do not delay the completion of construction. It will be necessary to provide flexibility in the construction sequencing to accommodate the required sampling. .

The schedule could be affected by many factors that are beyond the control of Kitsap County, the remediation contractor, or CH2M HILL. For this reason, alternatives are being considered for expediting the schedule. These alternatives include pre-procurement of critical equipment such as the trommel screens for which availability is limited, early contract award, authorizing the contractor to begin certain preparation activities after award but during the contracting phase, and expediting the bidding and contracting phase.

Even if one or more of these contingencies is implemented to expedite the schedule, inclement weather could delay critical portions of construction. These possibilities will be discussed with the selected contractor during the pre-construction period, and a contingency plan will be developed in conjunction with the contractor.

Activity ID	Activity Description	Orig Dur	Early Start	Early Finish
1000	Notice to Proceed	0	07JUN01*	
1010	Pre-Construction Meeting	0	11JUN01*	
1020	Pre-Construction Submittals	20	11JUN01	06JUL01
1030	Mobilization	0	15JUN01	
1040	Setup Construction Camp Area	14	15JUN01	04JUL01
1060	Removal of Septage Pits	5	22JUN01	28JUN01
1070	Grubbing of Footprint	40	22JUN01	16AUG01
1080	Grade Processing Area	10	22JUN01	05JUL01
1100	Excavation of Stockpiles Footprints, Rds, etc.	25	22JUN01	26JUL01
1090	Construct Excavation Stockpile	5	29JUN01	05JUL01
1110	Construct Access Road	15	29JUN01	19JUL01
1120	Construct Processing Area	10	03JUL01	16JUL01
1130	Excavation / Processing Landfill Contents	67	10JUL01	10OCT01
1140	Inert Placement Back to Landfill	56	25JUL01	10OCT01
1150	Clean Cover Placement	51	01AUG01	10OCT01
1160	Final Site Grading & Drainage Features	13	01OCT01	17OCT01
1170	Place Grub Soil & Soil Amendments	15	04OCT01	24OCT01
1190	Remove Processing Area & Paving	11	10OCT01	24OCT01
1180	Hydroseed & Erosion Matting	13	11OCT01	29OCT01
1200	Punch List and Resolutions	10	16OCT01	29OCT01
1210	Demobilization	0		01NOV01
1220	Final Contractor Submittals	0		03DEC01



Start Date	05FEB01
Finish Date	03DEC01
Data Date	05FEB01
Run Date	08FEB01 08:50

Early Bar
Progress Bar
Critical Activity

FIGURE 4-1

Kitsap County Solid Waste Division

Bainbridge Island Landfill Remedial Design

Conceptual Construction Schedule

Sheet 1 of 1

Date	Revision	Checked	Approved

CHAPTER 5

References

CH2M HILL. 2000a. *Final Bainbridge Island Landfill Remedial Investigation Report.* Prepared for Kitsap County Department of Public Works, Solid Waste Division. November 1.

CH2M HILL. 2000b. *Final Bainbridge Island Landfill Remedial Investigation Report Supplement 1.* Prepared for Kitsap County Department of Public Works, Solid Waste Division. November 1.

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APPENDIX A

SEPA Checklist

BAINBRIDGE ISLAND LANDFILL

SEPA Checklist

prepared by

Kitsap County Department of Public Works
Solid Waste Division

March 2001

PART ELEVEN - FORMS

WAC 197-11-960 Environmental checklist.

ENVIRONMENTAL CHECKLIST

Purpose of checklist:

The State Environmental Policy Act (SEPA), chapter 43.21C RCW, requires all governmental agencies to consider the environmental impacts of a proposal before making decisions. An environmental impact statement (EIS) must be prepared for all proposals with probable significant adverse impacts on the quality of the environment. The purpose of this checklist is to provide information to help you and the agency identify impacts from your proposal (and to reduce or avoid impacts from the proposal, if it can be done) and to help the agency decide whether an EIS is required.

Instructions for applicants:

This environmental checklist asks you to describe some basic information about your proposal. Governmental agencies use this checklist to determine whether the environmental impacts of your proposal are significant, requiring preparation of an EIS. Answer the questions briefly, with the most precise information known, or give the best description you can.

You must answer each question accurately and carefully, to the best of your knowledge. In most cases, you should be able to answer the questions from your own observations or project plans without the need to hire experts. If you really do not know the answer, or if a question does not apply to your proposal, write "do not know" or "does not apply." Complete answers to the questions now may avoid unnecessary delays later.

Some questions ask about governmental regulations, such as zoning, shoreline, and landmark designations. Answer these questions if you can. If you have problems, the governmental agencies can assist you.

The checklist questions apply to all parts of your proposal, even if you plan to do them over a period of time or on different parcels of land. Attach any additional information that will help describe your proposal or its environmental effects. The agency to which you submit this checklist may ask you to explain your answers or provide additional information reasonably related to determining if there may be significant adverse impact.

Use of checklist for nonproject proposals:

Complete this checklist for nonproject proposals, even though questions may be answered "does not apply." IN ADDITION, complete the SUPPLEMENTAL SHEET FOR NONPROJECT ACTIONS (part D).

For nonproject actions, the references in the checklist to the words "project," "applicant," and "property or site" should be read as "proposal," "proposer," and "affected geographic area," respectively.

A. BACKGROUND

1. Name of proposed project, if applicable:

   Bainbridge Island Landfill Model Toxics Control Act (MTCA) Remediation Project

2. Name of applicant: Kitsap County

3. Address and phone number of applicant and contact person:
   614 Division St., MS-27
   Port Orchard, WA 98366
   Contact: Michelle Miller 360-337-4485
   or Gretchen Olsen 360-337-4626

4. Date checklist prepared: 1/31/01

5. Agency requesting checklist:

   Kitsap County

6. Proposed timing or schedule (including phasing, if applicable):

Project activities will be conducted during the 2001 construction season (approximately May through September).

7. Do you have any plans for future additions, expansion, or further activity related to or connected with this proposal? If yes, explain.

   No. Kitsap County intends to fulfill the remediation requirements set forth by the Department of Ecology. When the requirements have been met other uses for the property may be considered. Appropriate permit applications would be submitted for each proposed project.

8. List any environmental information you know about that has been prepared, or will be prepared, directly related to this proposal.

   Documents that have been prepared on behalf of Kitsap County are required under the State Model Toxics Control Act (MTCA) (Chapter 70.105D RCW,) and include: the Remedial Investigation Work Plan, Health and Safety Plan, Technical Memorandum, Remedial Investigation (RI) Report and 2 supplements, Feasibility Study (FS), and RI/FS Executive Summary. All of these documents have been reviewed and approved by the State Department of Ecology, and have gone through a public review process. The Washington State Department of Ecology has prepared the Cleanup Action Plan (CAP). As required under the CAP the following documents will be prepared: Engineering Report, Construction Plans and Specifications, Operation and Maintenance Plans, and Compliance Monitoring Plan. Bid documents will also be prepared to conduct the remediation activities.

9. Do you know whether applications are pending for governmental approvals of other proposals directly affecting the property covered by your proposal? If yes, explain.

   Yes. A private water system purveyor has requested an easement along the northwestern portion of the property for a water system storage tank. This purveyor is currently in the process of negotiating the easement from Kitsap County, obtaining permits from the City of Bainbridge Island, and the State Health Department. The location of the tank will not be affected by the reclamation project.

10. List any government approvals or permits that will be needed for your proposal, if known.

    The proposed activities are exempt from the City of Bainbridge Island's grading permit requirements. While this project is exempt from the administrative requirements of obtaining permits for other activities under the Cleanup Action Plan, all activities will be conducted in accordance with the substantive requirements of all applicable or relevant and appropriate (ARARs) federal, state or local standards, requirements, criteria, or limitations. These ARARs are identified in the RI/FS.

11. Give brief, complete description of your proposal, including the proposed uses and the size of the project and site. There are several questions later in this checklist that ask you to describe certain aspects of your proposal. You do not need to repeat those answers on this page. (Lead agencies may modify this form to include additional specific information on project description.)

The Bainbridge Island Landfill is situated on a 40-acre parcel and approximately 7 acres were used for disposing waste from 1948 through 1976. The cleanup action will include the following:

- Excavate all waste, screen main landfill and west end area waste, and re-grade the site with the inert waste fraction (i.e. constituents less than 1½ inches in diameter)
- Dispose of the bulky waste fraction (i.e. constituents greater than 3 inches in diameter) off site at a permitted landfill
- Dispose of the garbage waste fraction (i.e. constituents greater than 1½ inch but less than 3 inches in diameter) off site at a permitted landfill
- Dispose of the septage pit wastes and any cover soil requiring off site disposal at a permitted landfill.
- Construct a minimum 2-foot thick soil cover on top of the inert waste
- Restore site drainage and reestablish site vegetation
- Monitor groundwater quality and natural attenuation of contaminants
- Monitor surface water for compliance with cleanup levels
- Establish institutional controls, that may include installation of fencing to control access, zoning restrictions, and deed restrictions to prevent access to groundwater and protect the final cover system

12. Location of the proposal. Give sufficient information for a person to understand the precise location of your proposed project, including a street address, if any, and section, township, and range, if known. If a proposal would occur over a range of area, provide the range or boundaries of the site(s). Provide a legal description, site plan, vicinity map, and topographic map, if reasonably available. While you should submit any plans required by the agency, you are not required to duplicate maps or detailed plans submitted with any permit applications related to this checklist.

    The landfill is located off Vincent Road on Bainbridge Island, WA. The site comprises the northeast quarter of the northwest quarter of Section 33, Township 25 North, Range 2 East. The latitude is 47°37'02" North and longitude 122°33'02" West. See attached site map.

B. ENVIRONMENTAL ELEMENTS

1. **Earth**

a. General description of the site (circle one): Flat, rolling, hilly, steep slopes, mountainous, other . . . . . .

b. What is the steepest slope on the site (approximate percent slope)? 30%

c. What general types of soils are found on the site (for example, clay, sand, gravel, peat, muck)? If you know the classification of agricultural soils, specify them and note any prime farmland.

Sand. Unconsolidated glacial deposits.

d. Are there surface indications or history of unstable soils in the immediate vicinity? If so, describe.

No.

e. Describe the purpose, type, and approximate quantities of any filling or grading proposed. Indicate source of fill.

Approximately 120,000 cubic yards of material will be excavated, screened, and the fraction less than 1.5" will remain on site. Based on earlier studies, approximately 66% by volume of the excavated refuse will be placed back into the landfill excavation. The remaining 24% will be disposed of at a permitted landfill. This material will occupy a slightly smaller area than the original landfill and will be graded to allow drainage to flow in an easterly direction. Site grading outside of the landfill area will include temporary roads, processing area for equipment, staging area, and stockpiles. The material remaining onsite will be covered with a minimum two-foot thickness of soil that will all be derived from onsite.

f. Could erosion occur as a result of clearing, construction, or use? If so, generally describe.

Possibly, but best management practices for the prevention of erosion will be instituted.

g. About what percent of the site will be covered with impervious surfaces after project construction (for example, asphalt or buildings)?

Temporary roads will be constructed from compacted gravel and stockpile pads may be placed on asphalt. These surfaces may be left after the remediation project is completed. This will comprise less than 5 % of the 40-acre parcel.

h. Proposed measures to reduce or control erosion, or other impacts to the earth, if any:

Standard best management practices including scheduling major earthwork during the dry season, use of hay bales and silt fences, minimizing disturbance of natural vegetation and soil during construction, minimizing the extent to and duration for which an area is exposed, and instituting practices to keep runoff velocities low.

2. **Air**

a. What types of emissions to the air would result from the proposal (i.e., dust, automobile, odors, industrial wood smoke) during construction and when the project is completed? If any, generally describe and give approximate quantities if known.

Some dust may be generated from truck traffic during the construction phase. The potential for odors has been investigated and has been determined not to be a problem.

b. Are there any off-site sources of emissions or odor that may affect your proposal? If so, generally describe.

No.

c. Proposed measures to reduce or control emissions or other impacts to air, if any.

If dust control measures are needed, the temporary gravel roads will be watered, as necessary.

3. **Water**

a. Surface:

1) Is there any surface water body on or in the immediate vicinity of the site (including year-round and seasonal streams, saltwater, lakes, ponds, wetlands)? If yes, describe type and provide names. If appropriate, state what stream or river it flows into.

The only surface water body is a small seasonal drainage ditch that intermittently flows only during the wettest times of the year. Flow is directly related to a storm event.

There are two wetlands delineated on the 40-acre parcel and these are located on either side of an old road that divides the coniferous forest on the western edge of the property from the historic landfill on the eastern side of the road.

2) Will the project require any work over, in, or adjacent to (within 200 feet) the described waters? If yes, please describe and attach available plans.

Since the work will occur during the dry season, no impact will occur to the water in this intermittent drainage ditch.

The wetland to the east of the old road, referred to as Wetland A, is less than 5000 square feet. Removal of waste will occur within 50 feet of Wetland A. The wetland to the west of the old road, referred to as Wetland B, is a Category III wetland that lies within a coniferous forest. No remediation activities are planned in this area and thus Wetland B will not be impacted at all by the project.

3) Estimate the amount of fill and dredge material that would be placed in or removed from surface water or wetlands and indicate the area of the site that would be affected. Indicate the source of fill material.

Wetland A is near the northwest end of the landfill that contains approximately 2500 cubic yards of waste. Any waste located near or in Wetland A will be removed. Once the underlying soil has been confirmed as having met MTCA cleanup standards, the area will be graded such that water will continue to flow in the historic drainage.

4) Will the proposal require surface water withdrawals or diversions? Give general description, purpose, and approximate quantities if known.

No. Surface water only flows after a storm event. There will be no withdrawal or diversions of surface water.

5) Does the proposal lie within a 100-year floodplain? If so, note location on the site plan.

No.

6) Does the proposal involve any discharges of waste materials to surface waters? If so, describe the type of waste and anticipated volume of discharge.

Currently landfill leachate emanates from a surface seep at the toe of the main landfill and joins the surface water drainage after a storm event. The current system includes storm water ponds at the toe of the landfill. During the remediation activities, potentially contaminated vehicle wash down water, and any surface water will continue to flow through the existing surface water drainage system, which will be dry during the time period that the proposed activities will take place. The leachate seep will be remediated as part of the project and any waste discharge will be eliminated by the remediation project.

b. Ground:

1) Will ground water be withdrawn, or will water be discharged to ground water? Give general description, purpose, and approximate quantities if known.

No.

2) Describe waste material that will be discharged into the ground from septic tanks or other sources, if any (for example: Domestic sewage; industrial, containing the following chemicals. . . ; agricultural; etc.). Describe the general size of the system, the number of such systems, the number of houses to be served (if applicable), or the number of animals or humans the system(s) are expected to serve.

None.

c. Water runoff (including stormwater):

1) Describe the source of runoff (including storm water) and method of collection and disposal, if any (include quantities, if known). Where will this water flow? Will this water flow into other waters? If so, describe.

There are established storm water detention ponds at the site. These will be functioning until the waste is removed and the ponds are decommissioned. A new stormwater detention pond will be installed at the conclusion of the remediation project.

2) Could waste materials enter ground or surface waters? If so, generally describe.

No. Groundwater has already been impacted by the historic landfill. The purpose of the reclamation activity is to remove decomposable waste to control potential groundwater contamination from leachate and landfill gas

migration. Best management practices will be in place to prevent sediment from entering the surface water system.

d. Proposed measures to reduce or control surface, ground, and runoff water impacts, if any:

Best management practices will be applied to the stormwater runoff area (such as straw bales to prevent sediment runoff).

4. **Plants**

a. Check or circle types of vegetation found on the site:

✓ deciduous tree: alder, maple, aspen, other

✓ evergreen tree: fir, cedar, pine, other

✓ shrubs

✓ grass

—— pasture

—— crop or grain

✓ wet soil plants: cattail, buttercup, bullrush, skunk cabbage, other: pacific willow, water parsley, manna grass, salmonberry, hardhack, lady fern.

—— water plants: water lily, eelgrass, milfoil, other

✓ other types of vegetation

b. What kind and amount of vegetation will be removed or altered?

Some alder, fir and pine, and blackberry bushes.

c. List threatened or endangered species known to be on or near the site.

No known endangered plant species are on or near the site.

d. Proposed landscaping, use of native plants, or other measures to preserve or enhance vegetation on the site, if any:

Naturally occurring native grasses will be used to revegetate the land surface after the remediation is complete.

5. **Animals**

a. Circle any birds and animals which have been observed on or near the site or are known to be on or near the site:

birds: hawk, heron, eagle, songbirds, other:

mammals: deer, bear, elk, beaver, other: mountain beaver

fish: bass, salmon, trout, herring, shellfish, other:

b. List any threatened or endangered species known to be on or near the site.

The U.S. Fish and Wildlife Service was contacted regarding potential threatened or endangered species in the vicinity of the site. The only one identified was a bald eagle nest located over one-half mile west of the proposed remediation project.

c. Is the site part of a migration route? If so, explain.

None known.

d. Proposed measures to preserve or enhance wildlife, if any:

No structures are being erected. The site will still be open space after the project is completed. Existing drainage patterns will be maintained and an effort will be made to minimize the number of trees removed and the amount of landscape disturbed. Overall, wildlife habitat will be preserved or enhanced by the remediation activity.

6. **Energy and natural resources**

a. What kinds of energy (electric, natural gas, oil, wood stove, solar) will be used to meet the completed project's energy needs? Describe whether it will be used for heating, manufacturing, etc.

Diesel-powered construction equipment.

b. Would your project affect the potential use of solar energy by adjacent properties? If so, generally describe.

No

c. What kinds of energy conservation features are included in the plans of this proposal? List other proposed measures to reduce or control energy impacts, if any:

None.

7. **Environmental health**

a. Are there any environmental health hazards, including exposure to toxic chemicals, risk of fire and explosion, spill, or hazardous waste that could occur as a result of this proposal? If so, describe.

The removal of municipal solid waste has the potential to encounter household hazardous waste. A Health and Safety Plan and Contingency Plan, approved by Ecology, sets forth the appropriate actions needed to respond to such an event, if it occurs. The project manager will be certified in Hazardous Waste Handling, site personnel will have proper training and there will be daily safety meetings conducted.

1) Describe special emergency services that might be required.

All emergency services will be listed in the Health and Safety Plan as well as the Contingency Plan. Fire and emergency medical services will be notified prior to project initiation.

2) Proposed measures to reduce or control environmental health hazards, if any:

If environmental hazards are encountered, trained personnel will be onsite and will implement best management practices for handling hazardous waste as described in the approved Health and Safety and Contingency Plans. Site access will be controlled and restricted to prevent hazard exposure to untrained persons.

b. **Noise**

1) What types of noise exist in the area which may affect your project (for example: traffic, equipment, operation, other)?

There is existing truck traffic noise associated with the Drop Box and Recycling Facility. Noise will be generated by construction and screening equipment and the temporary increase in truck traffic hauling the waste to an off site disposal facility.

2) What types and levels of noise would be created by or associated with the project on a short-term or a long-term basis (for example: traffic, construction, operation, other)? Indicate what hours noise would come from the site.

For the short-term, noise levels will be typical of construction sites: heavy equipment, backup horns, shaker screens, and others equipment. The increase in traffic will also be on a short-term basis. It is anticipated that the hours of operation will be 7 a.m. to 7 p.m. Monday through Saturday. This is in accordance with the City of Bainbridge Island's noise ordinance Chapter 16.16.

3) Proposed measures to reduce or control noise impacts, if any:

Noise will be controlled by operating in accordance with the local noise ordinance.

8. **Land and shoreline use**

a. What is the current use of the site and adjacent properties?

A portion of this site is currently used as a Solid Waste Transfer Facility and Recycling Facility. The closed landfill is located on approximately 7 acres of the 40 acre parcel. Adjacent properties are residential, tree farm, outdoor recreation area.

b. Has the site been used for agriculture? If so, describe.

No

c. Describe any structures on the site.

A small toll booth for the transfer station. There is also a concrete, z-wall structure where the public can park and place recycled materials in open box containers located below the structure.

d. Will any structures be demolished? If so, what?

No

e. What is the current zoning classification of the site?

ROH 1 unit/2.5 acres.

f. What is the current comprehensive plan designation of the site?

Open space, residential (OS R-0.4)

g. If applicable, what is the current shoreline master program designation of the site?

N/A

h. Has any part of the site been classified as an "environmentally sensitive" area? If so, specify.

Wetlands, Class 5, seasonal drainage.

i. Approximately how many people would reside or work in the completed project?

None, other than the existing personnel employed by Bainbridge Disposal at the Solid Waste Transfer Facility.

j. Approximately how many people would the completed project displace?

None.

k. Proposed measures to avoid or reduce displacement impacts, if any:

N/A.

l. Proposed measures to ensure the proposal is compatible with existing and projected land uses and plans, if any:

There are currently no definite plans to change the existing land use. However, Kitsap County is working closely with the City of Bainbridge Island and area residents regarding future uses for the site. The City of Bainbridge Island will ensure compatibility with its land use ordinances through this process.

9. **Housing**

a. Approximately how many units would be provided, if any? Indicate whether high, middle, or low-income housing.

N/A

b. Approximately how many units, if any, would be eliminated? Indicate whether high, middle, or low-income housing.

N/A

c. Proposed measures to reduce or control housing impacts, if any:

N/A

10. **Aesthetics**

a. What is the tallest height of any proposed structure(s), not including antennas; what is the principal exterior building material(s) proposed?

No structures are proposed, thus this question in not applicable.

b. What views in the immediate vicinity would be altered or obstructed?

None.

c. Proposed measures to reduce or control aesthetic impacts, if any:

There will be no aesthetic impacts, thus this question is not applicable.

11. **Light and glare**

a. What type of light or glare will the proposal produce? What time of day would it mainly occur?

None. All activities will occur during daylight hours.

b. Could light or glare from the finished project be a safety hazard or interfere with views?

N/A

c. What existing off-site sources of light or glare may affect your proposal?

None.

d. Proposed measures to reduce or control light and glare impacts, if any:

N/A

12. **Recreation**

a. What designated and informal recreational opportunities are in the immediate vicinity?

Gazzam Lake is located to the west of the site. This is owned by the City of Bainbridge Island's Parks and Recreation District.

b. Would the proposed project displace any existing recreational uses? If so, describe.

No.

c. Proposed measures to reduce or control impacts on recreation, including recreation opportunities to be provided by the project or applicant, if any:

There are no anticipated impacts on recreation. However, an effort will be made to minimize the number of trees cut on the western property boundary.

13. **Historic and cultural preservation**

a. Are there any places or objects listed on, or proposed for, national, state, or local preservation registers known to be on or next to the site? If so, generally describe.

No.

b. Generally describe any landmarks or evidence of historic, archaeological, scientific, or cultural importance known to be on or next to the site.

None.

c. Proposed measures to reduce or control impacts, if any:

N/A

14. **Transportation**

a. Identify public streets and highways serving the site, and describe proposed access to the existing street system. Show on site plans, if any.

Vincent Road serves the site. See attached map for other nearby streets.

b. Is site currently served by public transit? If not, what is the approximate distance to the nearest transit stop?

No

c. How many parking spaces would the completed project have? How many would the project eliminate?

N/A

d. Will the proposal require any new roads or streets, or improvements to existing roads or streets, not including driveways? If so, generally describe (indicate whether public or private).

Temporary gravel roads will be constructed onsite to facilitate the loading and hauling of excavated waste.

e. Will the project use (or occur in the immediate vicinity of) water, rail, or air transportation? If so, generally describe.

No

f. How many vehicular trips per day would be generated by the completed project? If known, indicate when peak volumes would occur.

In order to complete the project during the 2001 construction season, approximately 1000 cubic yards of waste will be moved off-site daily to be disposed at permitted landfill. This will require an average of 30 trips per day. Peak volumes from the project would occur in the late morning, and will not coincide with the existing peak traffic volumes off-site.

g. Proposed measures to reduce or control transportation impacts, if any:

The materials to be hauled will be staged to reduce the number of trucks running daily and to reduce the total number of days the trucks are hauling waste off-site.

15. **Public services**

a. Would the project result in an increased need for public services (for example: fire protection, police protection, health care, schools, other)? If so, generally describe.

No

b. Proposed measures to reduce or control direct impacts on public services, if any.

There will be no impacts on public services, so this question is not applicable.

16. **Utilities**

a. Circle utilities currently available at the site: electricity, natural gas, water, refuse service, telephone, sanitary sewer, septic system, other: portable toilets

b. Describe the utilities that are proposed for the project, the utility providing the service, and the general construction activities on the site or in the immediate vicinity which might be needed.

None.

C. SIGNATURE

The above answers are true and complete to the best of my knowledge. I understand that the lead agency is relying on them to make its decision.

Signature:

Date Submitted:

NOTICE
DETERMINATION OF NONSIGNIFICANCE

Description of Proposal: Bainbridge Island Landfill Model Toxics Control Act (MTCA) Remediation Project. The proposal involves the Bainbridge Island landfill situated on a 40-acre parcel, approximately 7 acres of which were used for disposing waste from 1948 through 1976. The cleanup action will include the following:

- Excavate all waste, screen main landfill and west end area waste, and re-grade the site with the inert waste fraction (i.e. constituents less than 1½ inches in diameter).
- Dispose of the bulky waste fraction (i.e. constituents greater than 3 inches in diameter) off site at a permitted landfill.
- Dispose of the garbage waste fraction (i.e. constituents greater than 1½ inches but less than 3 inches in diameter) off site at a permitted landfill.
- Dispose of the seepage pit wastes and any cover soil requiring off site disposal at a permitted landfill.
- Construct a minimum 2-foot thick soil cover on top of the inert waste.
- Restore site drainage and reestablish site vegetation.
- Monitor groundwater quality and natural attenuation of contaminants.
- Monitor surface water for compliance with cleanup levels.
- Establish institutional controls, that may include installation of fencing to control access, zoning restrictions, and deed restrictions to prevent access to groundwater and protect the final cover system.

Proponent: Kitsap County
Lead Agency: KITSAP COUNTY

Location of proposal, including street address, if any: The landfill is located off Vincent Road on Bainbridge Island, Washington. The site comprises the Northeast Quarter of the Northwest Quarter of Section 33, Township 25 North, Range 2 East. The latitude is 47° 37' 02" North and Longitude 122° 33' 02" West.

The lead agency for this proposal has determined that it does not have a probable significant adverse impact on the environment. An environmental impact statement (EIS) is not required under RCW 43.21C.030(2)(c). This decision was made after review of a completed environmental checklist and other information on file with the lead agency. This information is available to the public on request.

This DNS is issued under 197-11-340(2); the lead agency will not act on this proposal for 30 days from the date of public notice. Comments must be submitted by: April 6, 2001.

Responsible Official: Bruce Freeland
Position/Title: Director, Dept. of Community Development Phone: (360) 337-7181
Contact Person: Rick Kimball
Position/Title: SEPA Administrator, Dept. of Community Dev. Phone: (360) 337-4966
Address: 614 Division Street, Port Orchard, WA 98366

DATE: March 1, 2001 Signature:
You may appeal this determination to the Dept. of Community Development, at 614 Division Street, Port Orchard WA 98366, no later than (date) April 6, 2001 in writing, with a $125.00 appeal fee.

You should be prepared to make specific factual objections. Contact **Rick Kimball** to read or ask about the procedures for SEPA appeals.

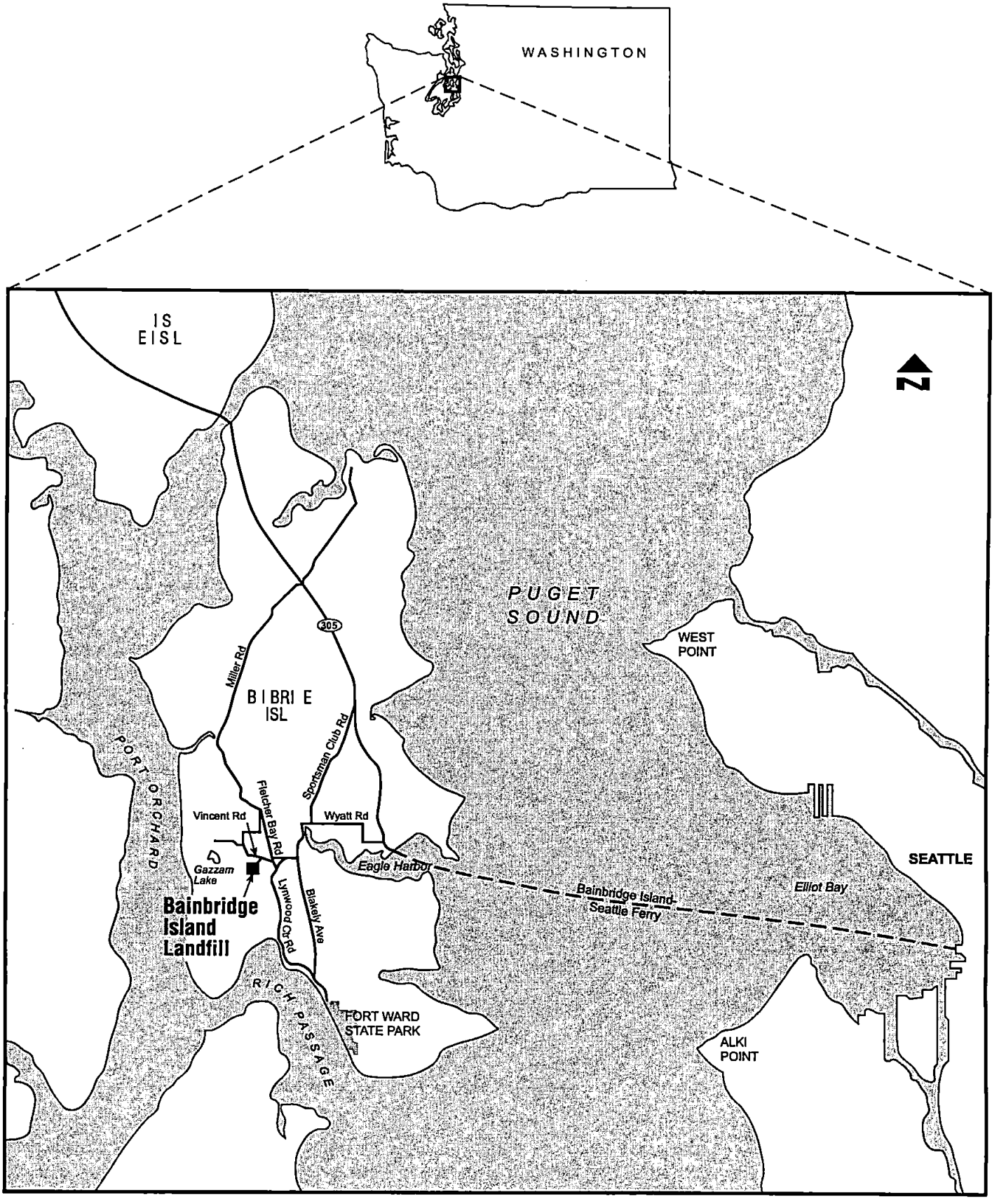
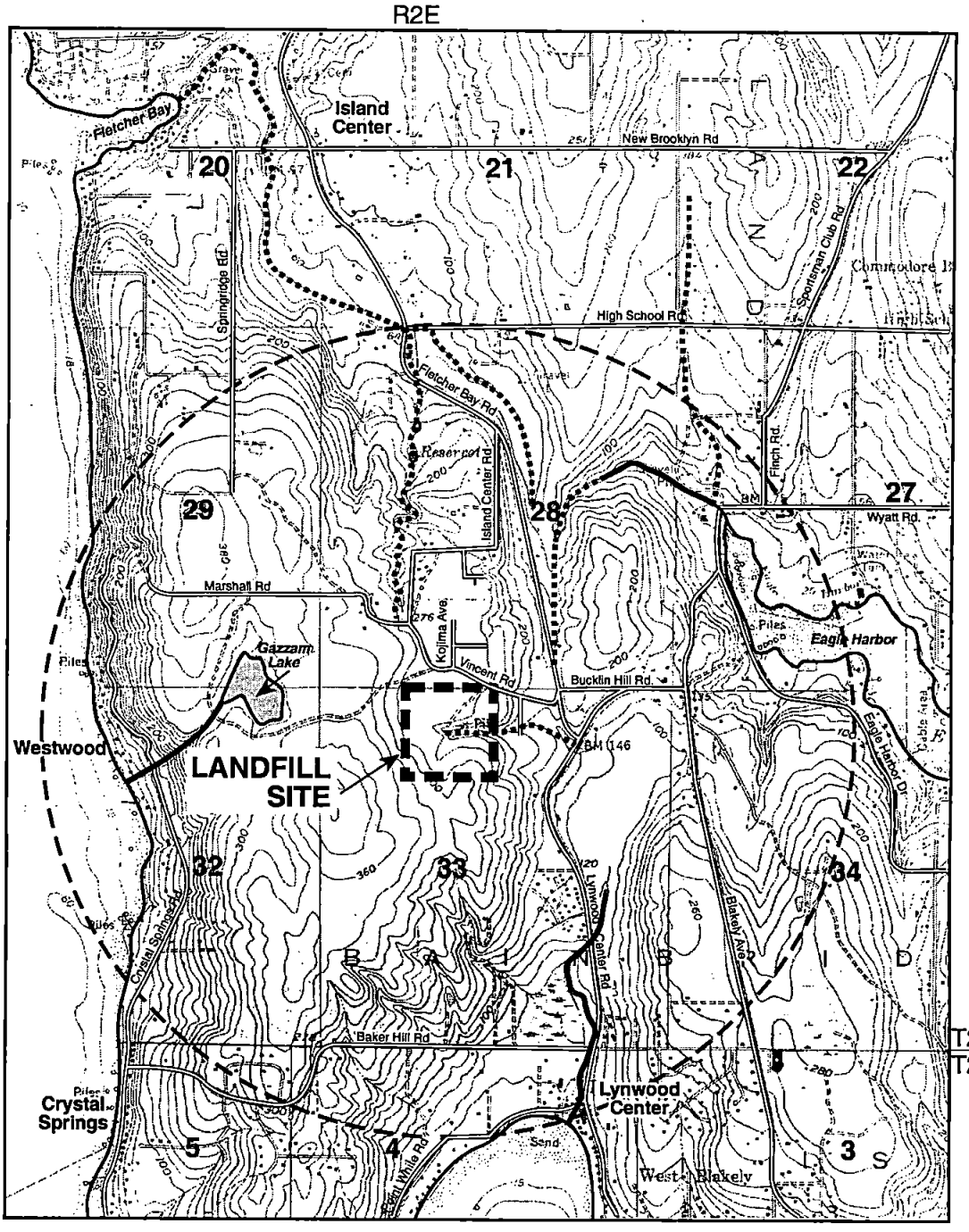


Figure 1

Site Location Map

Bainbridge Island Landfill SEPA Checklist



e022001017sea_158183.01.MT • surf water drainages (SEPA checklist) • 2/29/00 • JG

Figure 2

Regional Topography and Surface Water Drainages

Bainbridge Island Landfill SEPA Checklist

APPENDIX B

Stormwater Pollution Prevention Plan

APPENDIX B

Stormwater Pollution Prevention Plan

1 Introduction

This Stormwater Pollution Prevention Plan (SWPPP) is to be implemented during construction of the Bainbridge Island Landfill Cleanup Action. The purpose of this plan is to provide guidance, best management practices, and mitigation measures for managing stormwater during the cleanup action construction. The cleanup action is being conducted by Kitsap County, who has entered into a consent decree with the Washington State Department of Ecology. The cleanup action is regulated by the Model Toxics Control Act (MTCA, 173-340 WAC). Under MTCA, an NPDES permit is not required for the project although substantive requirements of a permit must be met. This SWPPP is intended to provide information and guidance needed to meet the substantive requirements of an NPDES permit for construction.

2 Site Assessment

There are several areas where material handling and storage activities take place.

- **Processing Area:** The processing area is designed with two parallel processing trains consisting of a "grizzly" bar screen as a pre-screen and a 1-1/2-inch screen. The bar screen removes large and stringy items, while the trommel screen removes the items larger than 1-1/2 inches from the inert material. Items larger than 1-1/2 inch are removed to an overs stockpiling area. The processing area and overs stockpile are placed on an asphalt pad that drains to the temporary sediment trap. Catch basin drains are equipped with filter fabric under grates to remove sediments and other debris.

- **Raw Excavated Waste:** The raw excavation stockpile is used as a surge pile for storing excavated waste before running it through the screening lines. It is located near the upstream side of each processing line and provides up to a 3-day supply for the screening process. The stockpile volume requirement is 9,000 cubic yards, and Ecology blocks or the equivalent will be used to separate the stockpile from the screen plant operations area. A visqueen and sand cover will be placed over the area where the raw excavated waste is placed. The stockpile will be tarped during storms and at night.

- **Overs Refuse Stockpile:** Loadout for offsite disposal of materials larger then 1-1/2 inches will be taken from this pile. It is located adjacent to the offsite haul road and at the downstream end of the screen plant. The stockpile area is large enough to store approximately 3 days of screening production, and is placed on a curbed asphalt pad with the processing area. The volume requirement for the stockpile is 3,000 cubic yards. This stockpile will be tarped during storms and at night.

- **Inerts Stockpile:** The inerts stockpile is large enough to contain the maximum amount of inerts that will accumulate until the contractor can begin to re-grade the inert material

back into the excavation site. The total storage volume for this stockpile is between 12,000 and 16,000 cubic yards. The secondary inerts storage area is located farther from the screen plant but readily accessible to the excavation area for regrading. Only during the initial excavation period will the maximum amount of storage area be needed, and during the later stages of excavation only the primary inerts storage area near the screen plant will be required. This stockpile will be tarped when not in use.

- **Clean Cover Soil:** The clean cover stockpile will be needed to provide storage for a large percentage of the volume of clean soil excavated during the project. The last of this material will not be returned to the excavated area until all waste has been excavated, processed, and the inerts returned to the excavation. Required volume is 20,000 cubic yards. A visqueen and sand cover will be placed over the area where the clean cover soil is placed. This stockpile will be tarped when not in use.
- **Grub/Compost/Topsoil Stockpile:** The estimated volume for this stockpile is 9,000 cubic yards in situ and 11,000 cubic yards ex situ. It will consist of chipped vegetation, and the top 12-inch layer scraped from the entire excavation area. This material will be placed over the excavated areas of the project after completion to support revegetation. A visqueen and sand cover will be placed over the area where the clean cover soil is placed. The stockpile will be tarped when not in use.
- **Contaminated Soil Stockpile:** As contaminated soils are encountered onsite, they will be stored in a stockpile until they can be tested and the extent of contamination determined. This includes hydrocarbon-affected material, asbestos, and other contaminated media. This stockpile will be tarped at all times except when soil is loaded or unloaded.

3 Summary of Pollutant Sources

There are four potential sources of stormwater pollutants:

1. Oil and grease from refueling and process equipment may stain the asphalt processing areas or drip onto uncovered ground and be carried to the stormwater system. This system drains to the sediment trap if originating from the processing area. Oils from refueling in the excavation area will be contained in the excavation area.
2. Leachate from the various stockpiles could contain contaminates and be carried into the storm drain system. Cover tarps will be used to prevent direct contact with rain water to minimize runoff from stockpiles.
3. Sediments and erosion from disturbed areas could potentially flow into the storm sewer system and cause clogging. Areas at finish grade will be hydroseeded as soon as possible.
4. Runoff from outside sources could enter disturbed areas and stockpiles and become contaminated. The offsite drainage system will be maintained in good working order to prevent entering disturbed areas or stockpiles.

4 Best Management Practices

4.1 Erosion Control

Standard best management practices for erosion and sediment control will be implemented during construction, which includes excavation and processing operations. Foremost, the construction work schedule is planned for the dry summer months to minimize the risk of heavy rainfall events. Additionally, the duration of the excavation and processing operation is estimated to be 4 months. The construction sequence is planned to allow any stormwater that runs off the upper (northern section) road area and disturbed areas of the landfill to collect in the landfill excavation and infiltrate.

A temporary sediment trap was designed to remove most of the sediment from a large storm event (25-year event) originating from runoff from the processing area during construction. A straw bale/silt fence divider will be placed on the bottom of the sediment trap to divide the flow path into two sections and enhance the performance of the trap. The processing area includes an asphalt pad with a drain system that directs stormwater runoff directly to the sediment trap.

Silt fencing will be installed along the downgradient edge of the project and downgradient of stockpiles and processing areas. Catch basin inserts, silt fencing, and straw bales will be installed at existing catch basins affected by the project and an orange barrier fence will be placed around the perimeter of the project. The silt fences and straw bales at the catch basins will be removed after hydroseeding or other revegetative practices have established.

Hydroseeding or other vegetative practices, as specified in the plans and specifications, will be performed as soon as possible after an area has reached final grade. After remedial activities and construction of the drainage facilities are complete, rock check dams and rock lining will be used to reduce erosion in ditches where slopes exceed 10 percent. All other ditches will be grass-lined or matted, as appropriate. Drainage system outlet erosion control will be enhanced by placing quarry spalls or riprap, as appropriate, at outlets per the Ecology manual.

4.2 Stormwater Control Systems

The major elements of the proposed drainage system include:

- A new storm drain system to collect stormwater runoff from offsite sources and the undisturbed areas of the property and route this runoff around the disturbed landfill area, related remediation work zones, and associated stormwater detention facilities. Undisturbed areas are defined as those onsite areas where no change in land use, cover, or significant hydraulic characteristics (slope, routing) occur.
- Ditches and culverts to convey stormwater runoff along new roadways.
- Temporary sediment control for disturbed areas while remedial excavation and refuse processing are taking place.

4.3 Stockpile Management

At night, during major rain events when equipment cannot be operated, and when stockpiles are not being used, the stockpiles will be covered with a tarp or other impervious materials to keep rainwater from soaking into the materials and picking up contaminants. Tarping stockpiles will also be necessary because wet soil cannot be processed as efficiently as dry soil. In addition each stockpile is placed on a ground cover of both visqueen and sand, or asphalt to prevent infiltration into native soil under the stockpiles.

4.4 Equipment Fueling

There will be pieces of equipment on the construction site that require refueling and maintenance on a regular basis. The contractor will be responsible for refueling and service of all applicable machinery. A service truck will be used to refuel and lubricate the machinery after hours. Several contractor trucks may contain bed-mounted diesel fuel tanks with hand-operated pumps for necessary fueling purposes. A spill control drum containing absorbent, a first-aid kit, and a fire extinguisher will be available in all use areas including the screen plant and conveyors, the stockpiles, and the various locations where heavy equipment is operating. Drip pans and absorbent pads will be placed under fuel tank fill pipes and for any maintenance activities that may release oils or greases to the ground.

Pollutant Source Identification		
List all potential stormwater pollutants from materials handled, treated, or stored onsite.		
Stormwater Pollutant Source	Existing Management Practices	Description of New BMP Options

Additional BMP Identification	
List all potential stormwater pollutants from materials handled, treated, or stored onsite.	
BMPs	**Brief Description of Activities of Improvements**
Additional BMPs	
Innovative BMPs	

Minimum BMP Identification	
Describe the BMPs that are needed for the facility to address existing and potential pollutant sources identified.	
BMPs	**Brief Description of Activities of Improvements**
Good Housekeeping	
Preventative Maintenance	
Spill Prevention and Emergency Cleanup	

BMPs	Description of Action(s) Required for Implementation	Schedule Milestone and Completion Date(s)	Person Responsible for Action
Source Control BMPs	1) Cover stockpiles when not in use.		
	2) Install filter fabric in catch basin grates.		
	3)		
	4)		
Erosion and Sediment Control	1) Install silt fencing down-slope of excavations and stockpiles.		
	2) Install rock outlet protection.		
	3) Line ditches as shown on plans.		
	4) Hydroseed disturbed areas as soon as practical.		
Management of Runoff	1) Direct runoff from disturbed areas into excavation.		
	2)		
	3)		
Innovative BMPs	1) Install sediment trap.		
	2) Install rock lining and check dams in ditches exceeding 10% slope as specified.		
	3)		
	4)		

5 Contacts

Bainbridge Island Landfill Vincent Road Bainbridge Island, Washington February 2001	
Stormwater Pollution Prevention Plan	
Primary Emergency Contact: [Contractor]	Work Phone:
Title:	Emergency Phone:
Secondary Contact: [Engineer]	Work Phone:
Title: Construction Manager	Emergency Phone:
Kitsap County Contact:	Work Phone:
Title:	Emergency Phone:
Type of Facility:	Start Date:
Operating Schedule:	
Number of Employees:	
Stormwater Pollution Plan Implemented:	

6 Pollution Prevention Team

Team Leader:

Title:

Phone:

Responsibilities:

1) Name:

   Title:

   Phone:

   Responsibilities:

2) Name:

   Title:

   Phone:

   Responsibilities:

3) Name:

   Title:

   Phone:

   Responsibilities:

7 Material Inventory

Whenever materials are brought onsite, during construction, excavation, remediation, or separation, this table is to be filled out. A separate line must be filled out for each unique item brought onsite.

Material	Quantity	Exposure Date	Likelihood of contact with Stormwater. (If yes, describe reason)	Spill or Leak?	
				Yes	No

8 Description of Exposed Significant Material

This table shall be completed by the team leader when materials are brought onsite and exposed to precipitation. The team leader shall indicate the location of materials on the appropriate site map.

Material	Quantity	Period of Exposure	Location (as indicated on the site map)	Method of storage, handling, treatment, or disposal

9 List of Significant Spills and Leaks

The team leader shall be responsible for completing this form if significant spills (as defined by Washington State Department of Ecology requirements and 40 CFR Part 117, and 40 CFR Part 302) occur onsite.

Material	Location (as indicated on the site map)	Type of Material	Description				Material no longer exposed to stormwater (yes/no)	Preventative Measure Taken
			Quantity	Source	Reason for Spill or Leak	Amount of Material Recovered		

10 Non-Stormwater Discharge Assessment and Certification

This form shall be completed as needed to ensure the stormwater system is working properly or after any significant rainfall event.

Date	Discharge Location	Method Used to Test or Evaluate Discharge	Describe Results from Test for Presence of Non-Stormwater Discharge	Identify Potential Significant Sources	Person Who Conducted the Test

11 Field Notebook

For Non-Stormwater Discharge Inspections to be carried out as needed to ensure the stormwater system is working properly or after any significant rainfall event.

Completed by:

Date:

Time:

Time since last rain:

Quantity of last rain:

Flow observed:

Description of flow:

Temperature:

Volume:

Signature:

_____

12 Employee Training Program

Who: Line Workers
Maintenance Crew

When: Employee Meetings to Discuss

- Any environmental/health and safety incidents
- Upcoming training sessions
- Reminders on good housekeeping, spill prevention and response procedures, and material handling practices.
- Announce any change to the plan
- Announce any new management practices

In-Depth Pollution Prevention training for new employees

Refresher courses held on:

- Good housekeeping
- Spill prevention and response procedures
- Materials handling and storage

Employee Training Program Topics:

Good Housekeeping

- Review and demonstrate basic cleanup (sweeping and vacuuming) procedures
- Clearly indicate proper disposal locations and review recycling program
- Post signs in materials handling areas reminding staff of good housekeeping procedures
- Be sure employees know where routine cleanup equipment is located

Spill Prevention and Response

- Clearly identify potential spill areas and drainage routes
- Familiarize employees with past spill events–why they happened and the environmental impact
- Post warning signs in spill areas with emergency contacts and telephone numbers
- Introduce the Spill Response Coordinator and the team
- Drill on spill cleanup procedures
- Post the locations of spill cleanup equipment and the persons responsible for operating the equipment

Materials Handling and Storage

- Be sure employees are aware which materials are hazardous and where those materials are stored
- Point out container labels
- Tell employees to use the oldest materials first
- Explain recycling practices
- Demonstrate how valves are tightly closed and how drums should be sealed
- Show how to fuel vehicles and avoid "topping off"
- Remind employees to use drip pans in fueling area

BMP Implementation Table

Develop a plan for implementing each BMP. Describe the steps necessary to implement the BMP, the schedule for completing those steps, and the persons responsible for implementation.

BMPs	Description of Actions Required for Implementation	Schedule Milestone and Completion Date	Person Responsible for Action
Good Housekeeping			
Preventative Maintenance			
Spill Prevention and Emergency Cleanup			
Inspections			

Employee Training Table

Describe the Training of employees on the SWPP, addressing spill response, good housekeeping, and material management practices.

Training Topics	Brief Description of Training Program/Materials	Schedule for Training	Attendees
Spill Prevention and Response			
Good Housekeeping			
Material Management Practices			
Other Topics			
Communication Channels			

13 Site Maps

- Sheet 6 – Road Grading, Drainage and Construction Erosion Control Plan (South)
- Sheet 7 – Road Grading, Drainage and Construction Erosion Control Plan (North)
- Sheet 8 – Processing Facility and Stockpile Plan (South)

NOTES FOR DRAWINGS 3 AND 4:

1. SEE DRAWING 2 FOR GENERAL NOTES AND LEGEND OF SYMBOLS.
2. CONSTRUCT ROADS, BERMS AND DITCHES BASED ON THE SURVEY ALIGNMENTS IN THE DATA TABLES IN THIS DWG AND AS SHOWN IN THE TYPICAL SECTIONS. ALIGNMENTS MAY BE FIELD ADJUSTED DURING CONSTRUCTION AS APPROVED BY THE ENGINEER.
3. PROVIDE SMOOTH AND UNIFORM TRANSITIONS BETWEEN ALIGNMENT CONTROL POINTS AT ROAD GRADE CHANGES, CULVERT CROSSINGS, AND AT TRANSITIONS TO EXISTING GROUND.
4. PROVIDE MINIMUM DRAINAGE GRADES AND MINIMUM COVER THICKNESS OVER PIPES AS SHOWN IN THE DETAILS. LAY PIPE TO UNIFORM GRADE BETWEEN INDICATED ELEVATION POINTS.
5. SEE DRAWINGS 4 AND 5 FOR THE LOCATION OF EXISTING FACILITIES TO BE PROTECTED OR ABANDONED.
6. ROAD GRADES SHOWN ON THE PLANS AND IN THE DATA TABLES ARE TO ROAD SUBGRADE (TOP OF ROAD EMBANKMENT). FINISH GRADES FOR ROADS SHALL BE TO THE TOP OF THE ROAD SURFACING (1'-0" TYP ABOVE ROAD EMBANKMENT).
7. EXCAVATE AND REMOVE EXISTING WASTE FROM THE MAIN LANDFILL AND NORTHERN WEST END AREA PRIOR TO PLACEMENT OF ROAD EMBANKMENT. CONSTRUCT ROAD EMBANKMENT FROM NATIVE SOILS IN ACCORDANCE WITH THE SPECIFICATIONS.

ABBREVIATIONS:

CD	CURVE DEFLECTION
DC	DEGREE OF CURVE
L	LENGTH
LC	LENGTH OF CURVE
PC	POINT OF CURVE
PI	POINT OF INTERSECTION
POB	POINT OF BEGINNING
POE	POINT OF ENDING
PT	POINT OF TANGENT
PVI	POINT OF VERTIVAL CURVE
RC	RADIUS OF CURVE

TABLE 1

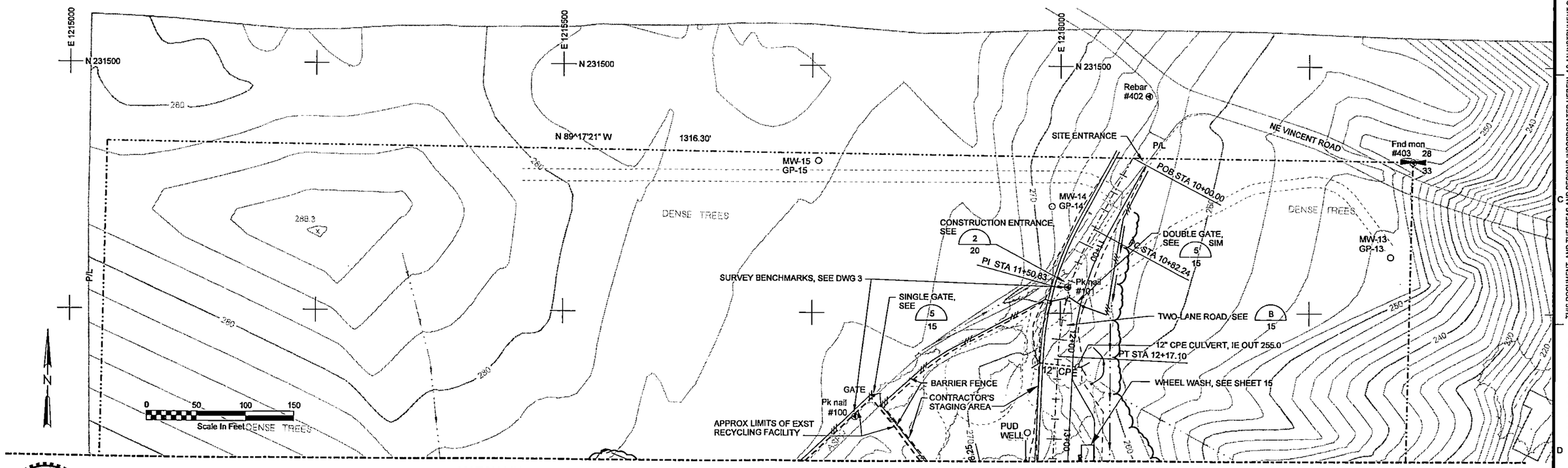
HORIZONTAL CONTROL POINTS FOR HAUL ROAD

	Station		Northing (Y)	Easting (X)
POB	10+00		231,407.6	1,216,072.9
L = 82.2		S 28° 24'18.212" W		
PC	10+82		231,335.3	1,216,033.8
LC = 134.8		CD= 25° 45'26.404"		
RC = 300		DC= 19° 05'54.935"		
PI	11+50		231,275.0	1,216,001.1
PT	12+17		231,206.4	1,215,998.0
L = 187.0		S 2° 38'51.808" W		
PC	14+05		231,019.6	1,215,989.3
LC = 64.2		CD= 73° 30'53.169"		
RC = 50		DC=114° 35'29.612"		
PI	14+41		230,982.3	1,215,987.6
PT	14+68		230,973.4	1,215,951.3
L = 265.7		S 76° 09'44.977" W		
PC	17+33		230,909.9	1,215,693.4
LC = 43.0		CD= 24° 38'20.339"		
RC = 100		DC= 57° 17'44.806"		
PI	17+55		230,904.6	1,215,672.2
PT	17+77		230,891.0	1,215,655.1
L = 211.3		S 51° 31'24.639" W		
PI	19+88		230,759.6	1,215,489.6
L = 127.5		S 14° 34'32.327" W		
PC	21+15		230,636.2	1,215,457.5
LC=146.9		CD=210° 25'29.730"		
RC = 40		DC=143° 14'22.016"		
PI	21+15			
PT	22+62		230,674.5	1,215,390.5
L = 130.5		N 49° 21'56.161" E		

TABLE 2

VERTICAL CONTROL POINTS FOR HAUL ROAD

	GRADE	LENGTH	STATION	ELEVATION
POB			10+00	264.0
	3.45%	150		
PVI			11+50	269.2
	-0.72%	150		
PVI			13+00	268.1
	-3.98%	150		
PVI			14+50	262.1
	2.94%	200		
PVI			16+50	268.0
	-3.00%	150		
PVI			18+00	263.5
	-6.50%	100		
PVI			19+00	257.0
	3.75%	80		
PVI			19+80	260.0
	2.00%	220		
PVI			22+00	264.4
	-1.94%	206		
POE			24+06	260.4



DSGN	CL ECKBERG				VERIFY SCALE	KITSAP COUNTY SOLID WASTE DIVISION	BAINBRIDGE ISLAND LANDFILL RECLAMATION DESIGN
DR	RK LATTA				BAR IS ONE INCH ON ORIGINAL DRAWING. 0 1" IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.	CH2MHILL	ROAD GRADING, DRAINAGE AND CONSTRUCTION EROSION CONTROL PLAN (NORTH)
CHK	TA KRAEMER					KITSAP COUNTY, WASHINGTON	
APVD	J RADLOFF	1	3/2001	FOR BID	CLE TAK		
		NO.	DATE	REVISION	BY APVD		

CATHERINE L. ECKBERG STATE OF WASHINGTON 18331 REGISTERED PROFESSIONAL ENGINEER
EXPIRES 3/21/03 3/30/01

SHEET	6
DWG	6 of 20
DATE	MARCH 2001
PROJ	158183

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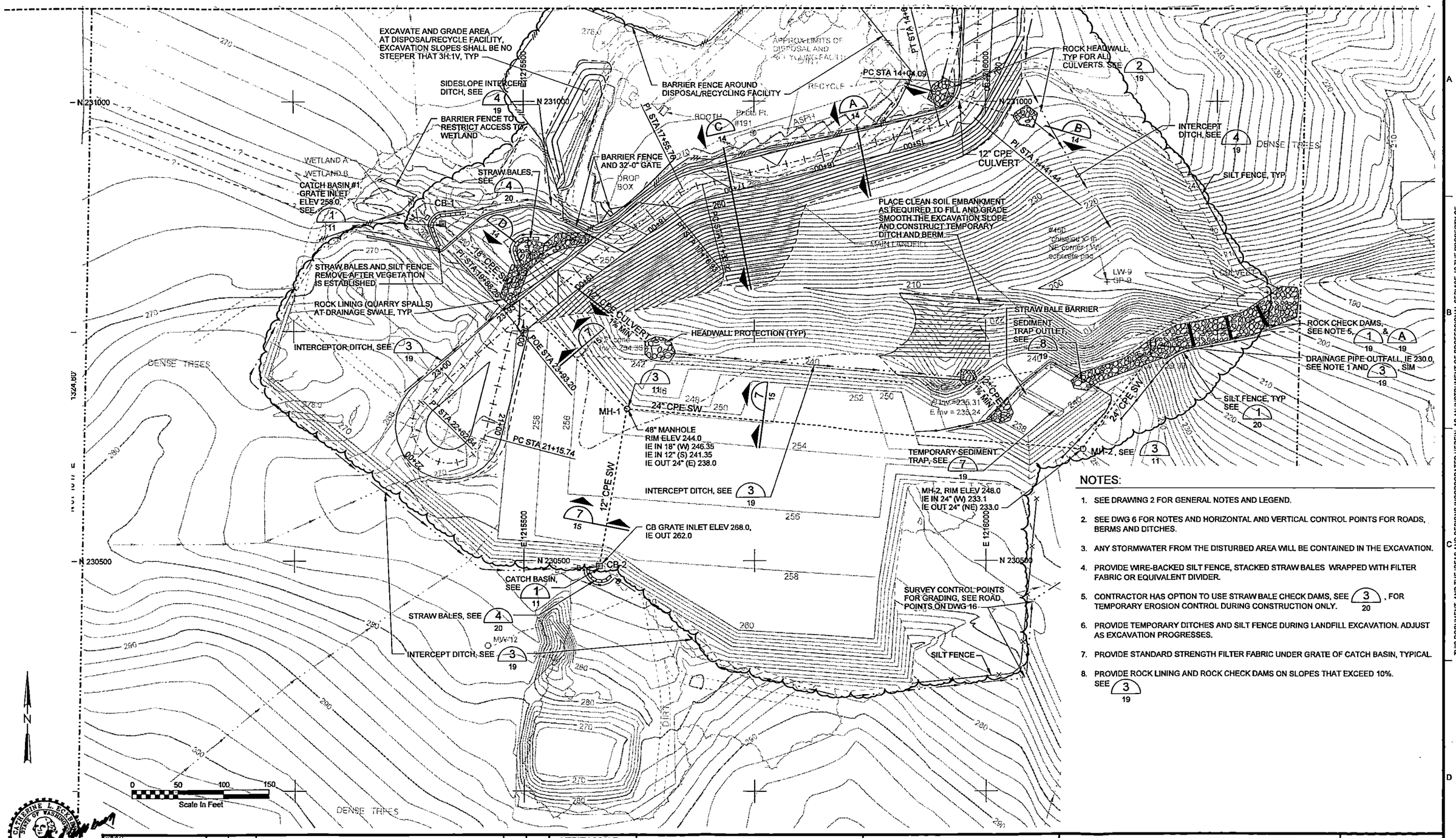
MATCH LINE



NOTES:

1. SEE DRAWING 2 FOR GENERAL NOTES AND LEGEND.
2. SEE DWG 6 FOR NOTES AND HORIZONTAL AND VERTICAL CONTROL POINTS FOR ROADS, BERMS AND DITCHES.
3. ANY STORMWATER FROM THE DISTURBED AREA WILL BE CONTAINED IN THE EXCAVATION.
4. PROVIDE WIRE-BACKED SILT FENCE, STACKED STRAW BALES WRAPPED WITH FILTER FABRIC OR EQUIVALENT DIVIDER.
5. CONTRACTOR HAS OPTION TO USE STRAW BALE CHECK DAMS, SEE 3/20, FOR TEMPORARY EROSION CONTROL DURING CONSTRUCTION ONLY.
6. PROVIDE TEMPORARY DITCHES AND SILT FENCE DURING LANDFILL EXCAVATION. ADJUST AS EXCAVATION PROGRESSES.
7. PROVIDE STANDARD STRENGTH FILTER FABRIC UNDER GRATE OF CATCH BASIN, TYPICAL.
8. PROVIDE ROCK LINING AND ROCK CHECK DAMS ON SLOPES THAT EXCEED 10%. SEE 3/19

CATHERINE L. ECKBERG STATE OF WASHINGTON 15259 REGISTERED PROFESSIONAL ENGINEER
EXPIRES 3/21/02
3/30/01

DSGN	CL ECKBERG					VERIFY SCALE
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CHK	TA KRAEMER	1	3/2001	FOR BID	CLE	TAK
APVD	J RADLOFF	NO.	DATE	REVISION	BY	APVD

CH2MHILL

KITSAP COUNTY
SOLID WASTE DIVISION
KITSAP COUNTY, WASHINGTON

BAINBRIDGE ISLAND LANDFILL RECLAMATION DESIGN
ROAD GRADING, DRAINAGE AND CONSTRUCTION EROSION CONTROL PLAN (SOUTH)

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DATE	MARCH 2001
PROJ	158183

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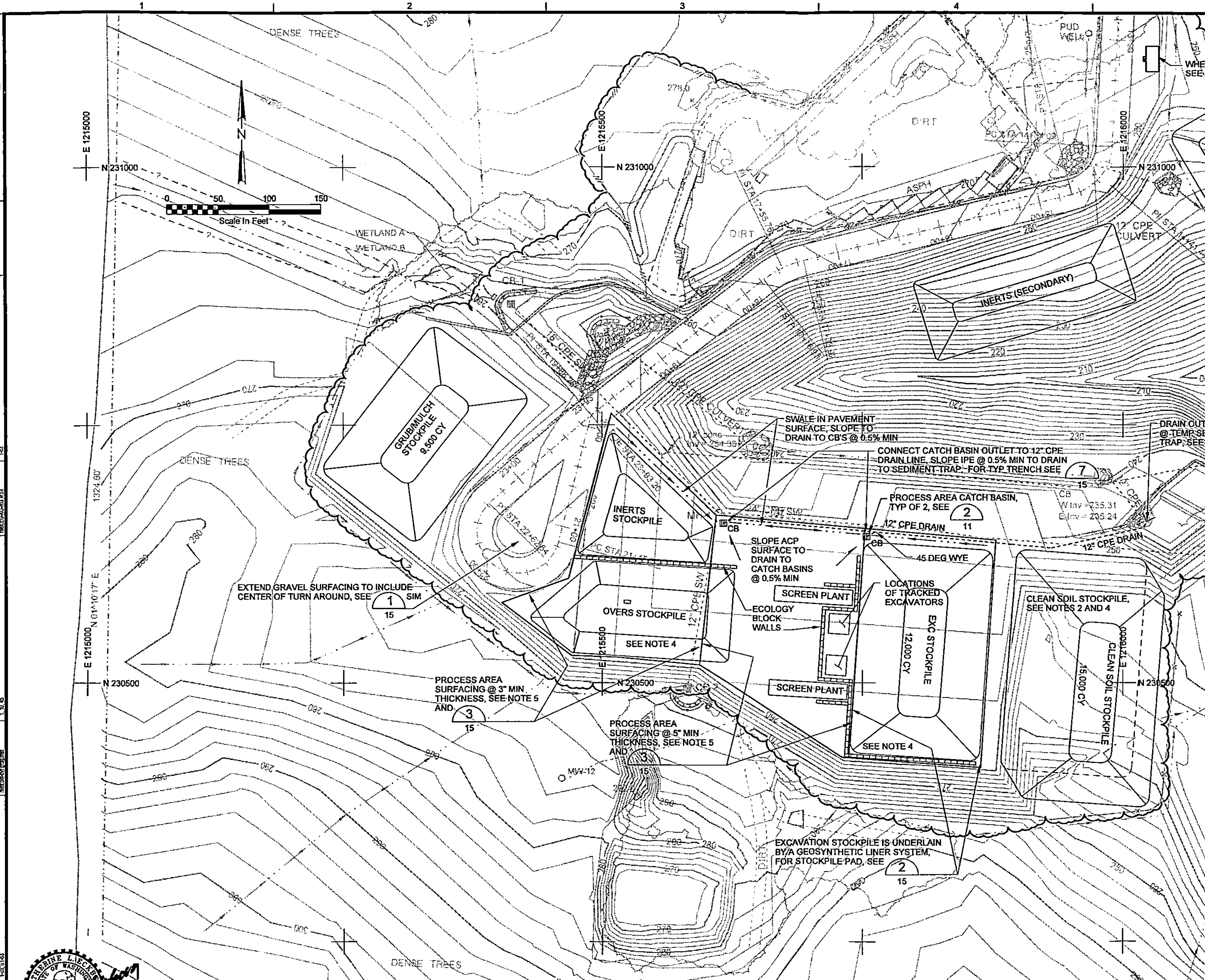

NOTES:

1. SEE DRAWING 2 FOR GENERAL NOTES AND LEGEND.
2. PLACE CLEAN SOIL EXCAVATED FROM PROCESSING AREA IN SEPARATE STOCKPILE. STOCKPILE MAY BE PLACED AGAINST EXCAVATION SLOPES.
3. PLACE CLEAN COVER MATERIAL SALVAGED FROM EXISTING LANDFILL COVER IN SEPARATE STOCKPILE.
4. PLACE TEMPORARY COVER OVER STOCKPILE WHEN NOT IN ACTIVE USE. ANCHOR TEMPORARY COVER AS NEEDED TO SECURE. PROVIDE SURFACE WATER RUNOFF AND EROSION CONTROLS IN ACCORDANCE WITH SPECIFICATIONS.
5. IN AREAS WHERE LOADERS ARE USED TO STACKOUT MATERIAL, PROVIDE ASPHALT CONCRETE PAVEMENT 5 INCHES THICK. IN AREAS WHERE CONVEYORS ARE USED ASPHALT CONCRETE PAVEMENT THICKNESS CAN BE REDUCED TO 3 INCHES.

CATHERINE L. ECKBERG, STATE OF WASHINGTON, REGISTERED PROFESSIONAL ENGINEER, 26058
EXPIRES 3/21/02
3/30/01

DSGN	CL ECKBERG					
DR	CL ECKBERG					
CHK	TA KRAEMER	1	3/2001	FOR BID	CLE	TAK
APVD	J RADLOFF	NO.	DATE	REVISION	BY	APVD

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

CH2MHILL

KITSAP COUNTY
SOLID WASTE DIVISION
KITSAP COUNTY, WASHINGTON

BAINBRIDGE ISLAND LANDFILL RECLAMATION DESIGN

PROCESSING FACILITY AND STOCKPILE PLAN (SOUTH)

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DWG	8 of 20
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PROJ	158183

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APPENDIX C

Operation and Maintenance Plan

APPENDIX C

Operation and Maintenance Plan

1 Overview

1.1 Background

This manual covers the operation and maintenance (O&M) of the final cover and stormwater control systems at the Bainbridge Island Landfill Site after the reclamation project has been completed.

In general the landfill reclamation will be conducted by excavating waste from the landfill areas, and conveying and loading bulk waste to an onsite bar and trommel screen plant. Bulky material will be plucked from the waste before it reaches the screen plant. At the screen plant, waste will be separated into two fractions:

- Refuse (or garbage) fraction, also referred to as "overs"—material that is retained by a 1½-inch (nominal) screen
- Inert fraction—material that passes a 1½-inch (nominal) screen

The bulky material and refuse fraction will be loaded into trucks and removed from the site. The inert fraction will be returned and graded within the former main landfill area. Clean soil cover at least two feet thick will be placed over the regraded inerts. The clean cover soil will in turn be covered with vegetation growing medium soil. The stormwater control system will prevent site erosion by both divert offsite stormwater and provide channels for routing onsite stormwater to detention ponds.

1.1.1 Components and Operation

Major components of the system include:

- Landfill cover
- Ditches
- Catch Basins
- Roads
- Culverts
- Stormwater Detention Pond

2 Landfill Cover

2.1 Description

The primary function of the landfill cover is to provide a physical barrier between the inert material, which may still contain contaminants at concentrations that exceed cleanup levels, and potential contact with human and ecological receptors. Slope stabilization, prevention

of surface erosion, and control of the surface water runoff discharge rate are other important functions.

The cover system is designed to resist both slippage on slopes and weather and temperature extremes. The cover must be capable of sustaining vegetation to resist erosion. Also, the Cleanup Action Plan regulations require that the landfill cover be maintained at a minimum depth of 2 feet.

2.2 Inspection Procedures

Periodic inspection of the landfill cover will identify problems and minimize maintenance requirements. Visual inspections of the cover system from the ground should be performed at least semiannually. Each spring and fall (preferably late April and September), thorough walk-through of all the drainage facilities should be conducted. The entire cover area should be inspected, switching back approximately every 15 feet. During the walk-through, the following tasks should be performed:

- Note any erosion problems (even small areas).
- Look for any signs of settling, rutting, or pooling water, and record the nature and location of the problem.
- Check vegetation growth throughout the area, especially where erosion has previously been repaired. Look for signs of vegetative stress, including wilted or dead plants in one area of the landfill cover, lack of vegetation, or poor growth of vegetative cover relative to other areas.
- Look for signs of burrowing animals. If burrowing animals are identified, the animals should be removed, and the cover system should be checked for potential damage from the burrows. Any damage should be repaired, the hole filled, and the area re-seeded.

In addition, burrowing animals must be discouraged from colonized the cover, especially the mountain beaver which has the potential to burrow deeper than 2 feet into the underlying inert material. To discourage mountain beaver and other burrowing mammals, the cover must be kept clear of trees and shrubs that comprise potential habitat for these animals.

2.3 Maintenance and Repair

2.4.1 Groundskeeping

The vegetative layer of the landfill cover should be trimmed as necessary to prevent growth of unwanted species. Frequency of grass cutting will depend largely on the weather conditions and temperature. The layer must be monitored periodically for signs of vegetative stress. Browning of the grass in hot dry weather common in the summer months does not necessarily indicate a problem; however, persistent brown or dying grass should be dealt with on a case-by-case basis.

2.4.2 Erosion Repair

Erosion of the landfill cover may occur as either sheet or gully erosion. Sheet erosion refers to the movement of a section of topsoil, a condition sometimes encountered with a landfill cover. Although sheet erosion generally removes only a thin layer of topsoil, in extreme cases the underlying earth may wash away over a broad area.

Gully erosion occurs when a water channel is eroded and continues to cut a deep, narrow channel through the cover. Erosion is an unavoidable byproduct of stormwater drainage. Early detection of problems will minimize maintenance efforts. Repairs involve replacing eroded cover material, returning topsoil to its original condition and grade, and replacing vegetation. These repairs are outlined in the following steps.

Note: Equipment operating on the cover during erosion repair operations must be rubber-wheeled to prevent further damage to the cover. If heavy equipment needs to be operated on the cover, observe the impact of the equipment when mobilizing onsite. If any damage is detected, cease maintenance activities and use a different piece of equipment.

1. Remove any exposed inert material from the area and re-bury to a minimum depth of 2 feet, and compact. If earthfill has been eroded, compact the exposed area and scarify the remaining soil.

2. Place suitable earthfill over the area. Earthfill may be either imported material or excavated material free from roots, organic matter, refuse, trash, debris, and rocks larger than 3 inches in any dimension, and any other deleterious materials. Place earthfill in 6-inch lifts and compact each lift using a vibratory drum roller. Hand-held vibratory tampers are acceptable for repair of eroded areas smaller than 500 square feet.

3. Do not compact fill material with excessive moisture content.

4. Grade the area uniformly so that the surface is reasonably smooth, compacted, and free from irregular surface changes. The surface area should be finished to a smoothness suitable for the application of turf materials

5. Replace growing medium soil and re-establish vegetation.

If repeated erosion occurs in the same area, placement of erosion control material should be considered. Any of the following materials may be appropriate depending on the size of the affected area:

- **Erosion Control Blanket:** wood excelsior covered with either knitted straw, plastic mesh, plastic netting or twisted kraft paper cord

- **Erosion Control Fabric:** knitted polypropylene yarn with uniform mesh openings approximately ¾ to 1 inch square with biodegradable paper

- **Soil Erosion Control Net:** heavy, twisted jute mesh with openings approximately 1 inch square

Wood or plastic anchors may be used to a maximum depth not to exceed 1 foot. Preparation of the soil and seeding should be performed as outlined in the Washington State Standard Specifications, Section 800.

3 Drainage Facilities

3.1 Description

Surface water drainage facilities are intended to protect the cover system and to comply with state and local regulations. State and local regulations require that the post-development rate of stormwater runoff from a 25-year storm not exceed the pre-development rate. Surface water drainage facilities are critical to proper operation of the landfill closure systems. The drainage system consists of the following components:

- Rock-lined drainage ditches
- Grass-lined drainage ditches
- Check dams
- Catch basins
- Access roadways
- PVC storm drain
- Stormwater detention pond
- Outfall control structure
- Emergency spillway

The design drawings (Final Cover Grading and Drainage Plan) show a plan view of the landfill and drainage system along with the location of the various components. The topography of the closed landfill site is designed to facilitate proper drainage. All stormwater is directed to either grass-lined drainage ditches or manholes shown in the design drawings. Water from ditches and manhole locations flows by gravity to the stormwater pond at the southeast corner of the landfill. Discharge from the pond is controlled by the outfall structure shown in the design drawings

3.3 Inspection Procedures

3.3.1 Monthly Inspection

The drainage ditches, culverts, and catch basins, and stormwater detention pond should be inspected monthly during the first year after construction for erosion, and blockage of surface drainage structures. This inspection can be accomplished by driving the site along the access roads shown in the design drawings. and walking along drainage ditches. Items to note include erosion and sediment buildup. For the stormwater pond, a measurement of sediment depth should be taken if sediment buildup is observed. After one year without problems, the frequency can be reduced to quarterly.

3.3.2 Post-Storm Inspection

An inspection should be performed following a rainfall event exceeding 2.0 inches in a 24-hour period. Perform an inspection as described in Section 3.3.1. Operation and maintenance personnel are encouraged to perform post-storm inspections for storms producing less than 2.0 inches, if blockages or problems are suspected.

3.4 Maintenance and Repair

3.4.1 Cleaning Drainage Facilities

Flow control structures must be kept free from debris. Maintenance of these structures includes the following:

1. Removal of debris including leaves, grass, branches, and trash
2. Identifying and removing sediment from ditches. Erosion problems should be dealt with according to Section 3.4.2.
3. Trimming overlying trees and shrubs; plants growing in water channel should be removed to prevent damage.
4. Remove material blocking all pipe inlets and outlets
5. Remove sediment from the stormwater detention pond when depth of material exceeds ½ foot; access to the pond is through a fenced gate.

3.4.2 Drainage Ditch Repair

Erosion repair of drainage ditches proceeds in the same manner as sheet erosion but has several additional measures needed to prevent reoccurrence of erosion on steep slopes.

1. Remove any trees or bushes growing in the drainage ditches or within the flow area of the berms.
2. Remove any exposed inert material from the area and re-bury to a minimum depth of 2 feet, and compact. If earthfill has been eroded, compact the exposed area and scarify the remaining soil.
3. The choice of fill and finishing material for ditches depends on the top layer. For subgrade areas to be overlain with aggregate surface coarse, the following measures are to be taken:
   - Replace soft or otherwise unsatisfactory material with earthfill
   - Bring low areas resulting from removal of unsatisfactory materials back to the desired grade
4. For ditch subgrade areas to be finished with turf, the following measures should be taken:
   - Place suitable earthfill over the area. Earthfill may be either imported material or excavated material free from roots, organic matter, refuse, trash, debris, and rocks larger than 3 inches in any dimension, and any other deleterious materials. Place earthfill in 6-inch lifts and compact each lift to 90 percent compaction. (Compaction for fill material may be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment depending on the size of the eroded area.)
5. Finish grading the ditch to permit adequate drainage.

3.4.3 Repairing Pipes

Repairs to pipes below grade may involve excavation and replacement. This type of construction requires engineering approval, and therefore is not covered in this manual.

3.4.4 Detention Pond

The detention pond should be mucked out whenever sediments exceed ½ foot in depth. Repairs typically include bottom lining repair and replacement of spillway riprap.

4 Safety

This section is to be read and understood by anyone performing operation and maintenance at the Bainbridge Island Landfill.

4.1 Emergency Contact Information

Category	Individual/Agency	Contact Information
Fire	**Bainbridge Island Fire Department**	**911**
Medical/Rescue		**911**
	Virginia Mason Winslow Clinic	**206/842-5632**
	North Kitsap County Medical Center	**360/779-6527**
Police		**911**
	Bainbridge Island Police Department	**206/842-1773**
All	Kitsap County Project Manager	Michelle Miller 360/337-4485 (ph) 360/271-5125 (cell)
All	CH2M Hill Project Manager	Judi Radloff 425/453-5005 x5495 (ph) 425/922-7088 (cell)
All	CH2M Hill Assistant Project Manager	Tom Kraemer 425/453-5005 x5228 (ph)
All	CH2M Hill Onsite Construction Manager	TBD
Site Safety	CH2M Hill Site Safety Manager	TBD
Construction/Municipal Waste	Olympic View Landfill	Dan Wilson/WMI, 360/674-2331
Industrial/Hazardous Waste	Philip Services Corp.	425/227-0311
Radiological/Nuclear Waste		911
	Terry Frazee/WDOH	360- 236-3221
Ordnance		911
Biological Waste	Kitsap County Health District	Jan Brower, 360/692
Environmental	Washington State Department of Ecology	Brian Sato 425/649-7000

4.2 Restricted Entry Areas

The stormwater detention pond is a restricted access area. The gate should remain locked at all times except for maintenance purposes to be performed by approved personnel. Access to the restricted area is controlled by a combination lock.

4.3 Confined Space Entry

Manholes on the site are considered confined spaces and present a significant safety hazard. The following requirements must be met prior to confined space entry:

- Confined space entry notices should be placed on all applicable manholes, access doors, or other openings into confined spaces that are large enough for a person to enter.
- All confined space entries must be conducted in accordance with OSHA regulations.

APPENDIX D

Health and Safety Plan

CH2M HILL HEALTH AND SAFETY PLAN

This Health and Safety Plan (HSP) will be kept on the site during field activities and will be reviewed as necessary. The plan will be amended or revised as project activities or conditions change or when supplemental information becomes available. The plan adopts, by reference, the Standards of Practice (SOPs) in the CH2M HILL *Corporate Health and Safety Program, Program and Training Manual,* as appropriate. In addition, this plan adopts procedures in the project Work Plan. The Site Safety Coordinator (SSC) is to be familiar with these SOPs and the contents of this plan. CH2M HILL's personnel and subcontractors must sign Attachment 1.

Project Information and Description

PROJECT NO: 158183.01.ER

CLIENT: Kitsap County

PROJECT/SITE NAME: Bainbridge Island Landfill

SITE ADDRESS: Vincent Road
Bainbridge Island, WA

CH2M HILL PROJECT MANAGER: Judi Radloff

CH2M HILL OFFICE: SEA

DATE HEALTH AND SAFETY PLAN PREPARED: January 19, 2001

DATE(S) OF SITE WORK: March – December 2001

SITE ACCESS: Access to the site is restricted through a gate at the northern entrance only. Personnel should check in with the person inside the office.

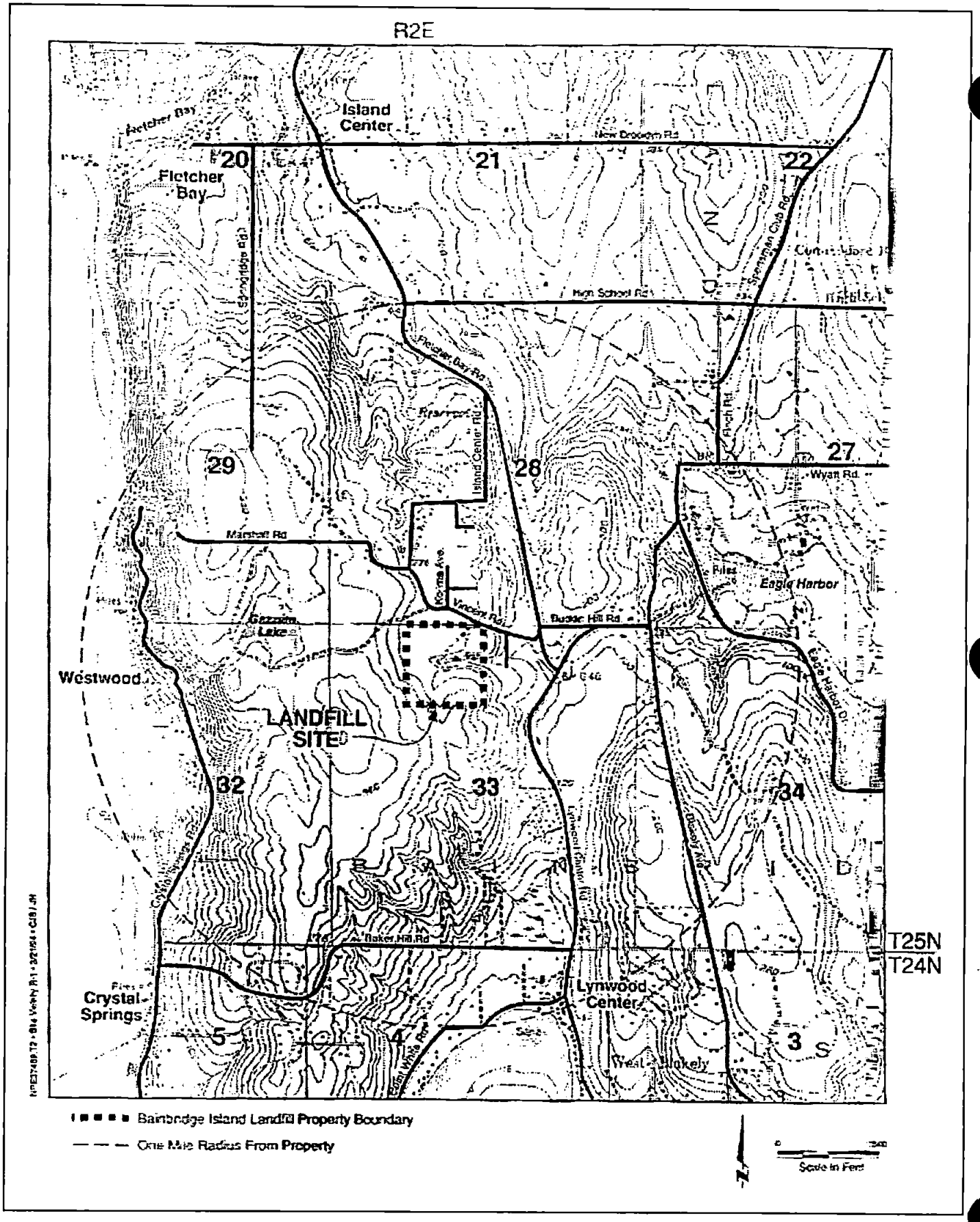
SITE SIZE: 40 Acres

SITE TOPOGRAPHY: Originally, the site was a steep narrow ravine surrounded by heavily wooded area. The ravine was reshaped by bulldozing operations in the disposal area.

PREVAILING WEATHER: Mild wet winters, Warm dry summers.

SITE DESCRIPTION AND HISTORY: The landfill was leased and managed by a series of operators dating from the 1940s through 1976. The landfill accepted domestic solid waste from Bainbridge Island residents and merchants and a small amount of construction debris. Refuse was burned at the site until 1968. Waste from the Wyckoff wood treatment facility were disposed in an unlined trench that was remediated in 1992. A transfer station has operated on the site from 1976 to present. Land use in the vicinity consists primarily of residential homes with a small number of commercial and industrial operations within a 3-mile radius.

DESCRIPTION OF SPECIFIC TASKS TO BE PERFORMED: Construction management for a landfill reclamation operation. Specific tasks include: monitoring well and gas probe decommissioning; soil and waste sampling.



Bainbridge Island Landfill
Site Vicinity Map

Site Map

This page is reserved for a Site Map.

Note locations of Support, Decontamination, and Exclusion Zones; site telephone; first aid station; evacuation routes; and assembly areas.

TABLE OF CONTENTS

1 Tasks to be Performed Under this Plan

1.1 Description of Tasks

(Reference Field Project Start-up Form)

Refer to project documents (i.e., Work Plan) for detailed task information. A health and safety risk analysis (Section 1.2) has been performed for each task and is incorporated in this plan through task-specific hazard controls and requirements for monitoring and protection. Tasks other than those listed below require an approved amendment or revision to this plan before tasks begin. Refer to Section 8.2 for procedures related to "clean" tasks that do not involve hazardous waste operations and emergency response (Hazwoper).

1.1.1 Hazwoper-Regulated Tasks

Municipal solid waste sampling
Drilling to abandon wells
Oversight of remediation and construction
Observation of material loading for offsite disposal and onsite cover
Soil sampling

1.1.2 Non-Hazwoper-Regulated Tasks

Under specific circumstances, the training and medical monitoring requirements of federal or state Hazwoper regulations are not applicable. It must be demonstrated that the tasks can be performed without the possibility of exposure in order to use non-Hazwoper-trained personnel. **Prior approval from the Health and Safety Manager (HSM) is required before these tasks are conducted on regulated hazardous waste sites.**

TASKS	CONTROLS
Electrical installation	Brief on hazards, limits of access, and emergency procedures
Iron work (installing rebar)	Post contaminant areas as appropriate (refer to Section 8.2 for details)
Masonry work	Sample and monitor as appropriate (refer to Section 5.0)
General heavy equipment work (excavation, grading, etc.)	
Mechanical installations (equipment, pumps, etc.)	
Engineering testing/evaluation	
Building construction	

1.2 Task Hazard Analysis

(Refer to Section 2 for hazard controls)

POTENTIAL HAZARDS	TASKS			
	Drilling, geoprobe, and well installation & abandonment	Sampling waste near screen plant	Observation of loading material for offsite disposal	Remediation & construction oversight
Flying debris/objects	X	X	X	X
Noise > 85dBA	X	X	X	X
Electrical	X	X		X
Suspended loads	X	X	X	X
Buried utilities, drums, tanks	X			X
Slip, trip, fall	X	X	X	X
Back injury	X	X		X
Confined space entry				X
Trenches / excavations				X
Visible lightning	X	X	X	X
Vehicle traffic			X	X
Elevated work areas/falls		X		X
Fires	X	X		X
Entanglement	X	X		
Drilling	X			
Heavy equipment	X		X	X

2 Hazard Controls

This section provides safe work practices and control measures used to reduce or eliminate potential hazards. These practices and controls are to be implemented by the party in control of either the site or the particular hazard. CH2M HILL employees and subcontractors must remain aware of the hazards affecting them regardless of who is responsible for controlling the hazards. CH2M HILL employees and subcontractors who do not understand any of these provisions should contact the SSC for clarification.

In addition to the controls specified in this section, Project-Activity Self-Assessment Checklists are contained in Attachment 6. These checklists are to be used to assess the adequacy of CH2M HILL and subcontractor site-specific safety requirements. The objective of the self-assessment process is to identify gaps in project safety performance, and prompt for corrective actions in addressing these gaps. Self-assessment checklists should be completed early in the project, when tasks or conditions change, or when otherwise specified by the HSM. The self-assessment checklists, including documented corrective actions, should be made part of the permanent project records, and be promptly submitted to the HSM.

Project-specific frequency for completing self-assessments: Complete Self Assessments Monthly

2.1 Project-Specific Hazards

Discovery of Hazardous Materials in Landfill

2.1.1 Potential Asbestos Containing Materials (ACM)

Asbestos waste material is normally disposed in light blue poly bags. If any of these are observed, do not damage the bag, if possible, and treat as ACM
Materials suspected of containing asbestos shall be treated as asbestos unless documentation and/or testing results indicate otherwise.
Where the presence of asbestos is suspected, design all operations to avoid contact.
Do not disturb waste or other materials labeled "Danger - Asbestos Fibers."
Follow Emergency plan for asbestos

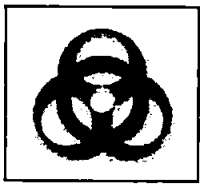
2.1.2 Potential Mercury Containing materials

Mercury containing items include gages, thermostats and thermometers. Items discarded in Red poly bags may also contain mercury. For example, the US Navy segregates mercury waste and uses Red Poly bags for disposal. Materials suspected of containing mercury will be segregated and stored in a lined area.

2.1.3 Compressed Gas Cylinders

Compressed gas cylinders in the landfill may contain unknown hazardous gasses.
If intact compressed gas cylinders are observed in the landfill warn others in the area.
If the cylinders can be removed without damaging or jarring the cylinder then remove the cylinder from the debris and place in a segregated area for inspection and disposal.
If a cylinder breeched or damaged during excavation and is discharging gas, sound the evacuation alarm and proceed to the assembly area. Call 911.
Only return to the are when the pressure in the cylinder has equalized (stopped leaking) and the safety coordinator has monitored the area with a photoionization detector and explosive meter and declares the area safe to return.
If a damaged cylinder is observed in the landfill specific handling procedures will be prepared to safely remove the cylinder. Any procedures must be approved the project manager and H&S manager.

2.1.4 Medical Waste



Medical waste can include needles or contaminated items. If an bag or other items with this symbol is observed assume it is hazardous medical waste.
Medical waste should be segregated .
If there is potential exposure through needle sticks or contact with broken skin contact the corporate medical consultant and H&S manager for possible vaccination against potential bloodborne pathogens.

2.1.5 Potential Radiological Items

Radiological items may be present in the landfill and can take any form. Radiological items can normally be identified by the internationals radiological symbol which is a magenta propeller on a yellow back ground. Yellow poly bags with magenta propellers should also be treated as radiological items.
If suspect radiological items are observed, stop work immediately, warn others in the area and proceed to the office trailer. Emergency services for radiological items are accessed through the 911 systems. In addition, the following contact should be made: Terry Frazee, Supervising Health Physicist, Radioactive Materials Section, Washington State Dept. of Health, Division of Radiation Protection, 7171 Clearwater Lane, Bldg. 5, PO Box 47827, Olympia, WA 98504-7827. Phone: 360.236-3221
Non-emergency information can be obtained from the Washington Department of Health Division of Radiation Protection, Environmental Radiation Section. Debra McBaugh, supervisor.
(360) 236-2351
Radioactive items may be identified by the State Department of Health Radiation and Environmental Health Laboratory. (206) 361-2894

2.1.6 Potential Unexploded Ordnance/Ordnance and Explosive Waste (UXO/OEW)

The presence of UXO/OEW is not anticipated.
If any live ammunition, ordnance shell casings, grenade casings, or other suspect items are observed stop work immediately and leave the area. Even small caliber ammunition may have become unstable after deteriorating in the landfill.
Proceed to the office trailer. Emergency services for UXO/OEW are accessed through the 911 system.

2.1.7 Excavation

(Reference CH2M HILL SOP HS-32, Excavations)

Do not enter the excavations unless completely necessary, and only after the competent person has completed the daily inspection and has authorized entry.
Follow all excavation entry requirements established by the competent person.
Do not enter excavations where protective systems are damaged or unstable.
Do not enter excavations where objects or structures above the work location may become unstable and fall into the excavation.
Do not enter excavations with the potential for a hazardous atmosphere until the air has been tested and found to be at safe levels.
Do not enter excavations with accumulated water unless precautions have been taken to prevent excavation cave-in.
H&S Self-Assessment Checklist – Excavations, found in Attachment 5 of this plan, should be used to evaluate excavations prior to entry.

2.1.8 Drilling

(Reference CH2M HILL SOP HS-35, Drilling)

Only authorized personnel are permitted to operate drill rigs.
Stay clear of areas surrounding drill rigs during every startup.
Stay clear of the rotating augers and other rotating components of drill rigs.
Stay as clear as possible of all hoisting operations. Loads shall not be hoisted overhead of personnel.
Do not wear loose-fitting clothing or other items such as rings or watches that could get caught in moving parts. Long hair should be restrained.

If equipment becomes electrically energized, personnel shall be instructed not to touch any part of the equipment or attempt to touch any person who may be in contact with the electrical current. The utility company or appropriate party shall be contacted to have line de-energized prior to approaching the equipment.
Smoking around drilling operations is prohibited.

2.1.9 Earthmoving Equipment

(Reference CH2M HILL SOP HS-27, Earthmoving Equipment)

Only authorized personnel are permitted to operate earthmoving equipment.
Maintain safe distance from operating equipment and stay alert of equipment movement. Avoid positioning between fixed objects and operating equipment and equipment pinch points, remain outside of the equipment swing and turning radius. Pay attention to backup alarms, but not rely on them for protection. Never turn your back on operating equipment.
Approach operating equipment only after receiving the operator's attention. The operator shall acknowledge your presence and stop movement of the equipment. Caution shall be used when standing next to idle equipment; when equipment is placed in gear it can lurch forward or backward. Never approach operating equipment from the side or rear where the operator's vision is compromised.
When required to work in proximity to operating equipment, wear high-visibility vests to increase visibility to equipment operators. For work performed after daylight hours, vests shall be made of reflective material or include a reflective stripe or panel.
Do not ride on earthmoving equipment unless it is specifically designed to accommodate passengers. Only ride in seats that are provided for transportation and that are equipped with seat belts.
Stay as clear as possible of all hoisting operations. Loads shall not be hoisted overhead of personnel.
Earthmoving equipment shall not be used to lift or lower personnel.
If equipment becomes electrically energized, personnel shall be instructed not to touch any part of the equipment or attempt to touch any person who may be in contact with the electrical current. The utility company or appropriate party shall be contacted to have line de-energized prior to approaching the equipment.

2.2 General Hazards

2.2.1 General Practices and Housekeeping

(Reference CH2M HILL SOP HS-20, *General Practices*)

Site work should be performed during daylight hours whenever possible. Work conducted during hours of darkness require enough illumination intensity to read a newspaper without difficulty.
Good housekeeping must be maintained at all times in all project work areas.
Common paths of travel should be established and kept free from the accumulation of materials.
Keep access to aisles, exits, ladders, stairways, scaffolding, and emergency equipment free from obstructions.
Provide slip-resistant surfaces, ropes, and/or other devices to be used.
Specific areas should be designated for the proper storage of materials.
Tools, equipment, materials, and supplies shall be stored in an orderly manner.
As work progresses, scrap and unessential materials must be neatly stored or removed from the work area.
Containers should be provided for collecting trash and other debris and shall be removed at regular intervals.
All spills shall be quickly cleaned up. Oil and grease shall be cleaned from walking and working surfaces.

2.2.2 Hazard Communication

(Reference CH2M HILL SOP HS-05, *Hazard Communication)*

The SSC is to perform the following:

Complete an inventory of chemicals brought on site by CH2M HILL using Attachment 2.
Confirm that an inventory of chemicals brought on site by CH2M HILL subcontractors is available.
Request or confirm locations of Material Safety Data Sheets (MSDSs) from the client, contractors, and subcontractors for chemicals to which CH2M HILL employees potentially are exposed.
Before or as the chemicals arrive on site, obtain an MSDS for each hazardous chemical.
Label chemical containers with the identity of the chemical and with hazard warnings, and store properly.
Give employees required chemical-specific HAZCOM training using Attachment 3.
Store all materials properly, giving consideration to compatibility, quantity limits, secondary containment, fire prevention, and environmental conditions.

2.2.3 Shipping and Transportation of Chemical Products

(Reference CH2M HILL's *Procedures for Shipping and Transporting Dangerous Goods)*

Chemicals brought to the site might be defined as hazardous materials by the U.S. Department of Transportation (DOT). All staff who ship the materials or transport them by road must receive CH2M HILL training in shipping dangerous goods. All hazardous materials that are shipped (e.g., via Federal Express) or are transported by road must be properly identified, labeled, packed, and documented by trained staff. Contact the HSM or the Equipment Coordinator for additional information.

2.2.4 Lifting

(Reference CH2M HILL SOP HS-29, *Lifting*)

Proper lifting techniques must be used when lifting any object.
Plan storage and staging to minimize lifting or carrying distances.
Split heavy loads into smaller loads.
Use mechanical lifting aids whenever possible.
Have someone assist with the lift – especially for heavy or awkward loads.
Make sure the path of travel is clear prior to the lift.

2.2.5 Fire Prevention

(Reference CH2M HILL SOP HS-22, *Fire Prevention*)

Fire extinguishers shall be provided so that the travel distance from any work area to the nearest extinguisher is less than 100 feet. When 5 gallons or more of a flammable or combustible liquid is being used, an extinguisher must be within 50 feet. Extinguishers must:
be maintained in a fully charged and operable condition,
be visually inspected each month, and
undergo a maintenance check each year.
The area in front of extinguishers must be kept clear.
Post "Exit" signs over exiting doors, and post "Fire Extinguisher" signs over extinguisher locations.
Combustible materials stored outside should be at least 10 feet from any building.
Solvent waste and oily rags must be kept in a fire resistant, covered container until removed from the site.
Flammable/combustible liquids must be kept in approved containers, and must be stored in an approved storage cabinet.

2.2.6 Electrical

(Reference CH2M HILL SOP HS-23, Electrical)

Only qualified personnel are permitted to work on unprotected energized electrical systems.
Only authorized personnel are permitted to enter high-voltage areas.
Do not tamper with electrical wiring and equipment unless qualified to do so. All electrical wiring and equipment must be considered energized until lockout/tagout procedures are implemented.
Inspect electrical equipment, power tools, and extension cords for damage prior to use. Do not use defective electrical equipment, remove from service.
All temporary wiring, including extension cords and electrical power tools, must have ground fault circuit interrupters (GFCIs) installed.
Extension cords must be:
equipped with third-wire grounding.
covered, elevated, or protected from damage when passing through work areas.
protected from pinching if routed through doorways.
not fastened with staples, hung from nails, or suspended with wire.
Electrical power tools and equipment must be effectively grounded or double-insulated UL approved.
Operate and maintain electric power tools and equipment according to manufacturers' instructions.
Maintain safe clearance distances between overhead power lines and any electrical conducting material unless the power lines have been de-energized and grounded, or where insulating barriers have been installed to prevent physical contact. Maintain at least 10 feet from overhead power lines for voltages of 50 kV or less, and 10 feet plus ½ inch for every 1 kV over 50 kV.
Temporary lights shall not be suspended by their electric cord unless designed for suspension. Lights shall be protected from accidental contact or breakage.
Protect all electrical equipment, tools, switches, and outlets from environmental elements.

2.2.7 Stairways and Ladders

(Reference CH2M HILL SOP HS-25, *Stairways and Ladders*)

Ladders must be inspected by a competent person for visible defects prior to each day's use. Defective ladders must be tagged and removed from service.
Ladders must be used only for the purpose for which they were designed and shall not be loaded beyond their rated capacity.
Only one person at a time shall climb on or work from an individual ladder.
User must face the ladder when climbing; keep belt buckle between side rails
Ladders shall not be moved, shifted, or extended while in use.
User must use both hands to climb; use rope to raise and lower equipment and materials
Straight and extension ladders must be tied off to prevent displacement
Ladders that may be displaced by work activities or traffic must be secured or barricaded
Portable ladders must extend at least 3 feet above landing surface
Straight and extension ladders must be positioned at such an angle that the ladder base to the wall is one-fourth of the working length of the ladder
Stepladders are to be used in the fully opened and locked position
Users are not to stand on the top two steps of a stepladder; nor are users to sit on top or straddle a stepladder

2.2.8 Heat Stress

(Reference CH2M HILL SOP HS-09, *Heat and Cold Stress*)

Drink 16 ounces of water before beginning work. Disposable cups and water maintained at 50°F to 60°F should be available. Under severe conditions, drink 1 to 2 cups every 20 minutes, for a total of 1 to 2 gallons per day. Do not use alcohol in place of water or other nonalcoholic fluids. Decrease your intake of coffee and caffeinated soft drinks during working hours.
Acclimate yourself by slowly increasing workloads (e.g., do not begin with extremely demanding activities).
Use cooling devices, such as cooling vests, to aid natural body ventilation. These devices add weight, so their use should be balanced against efficiency.
Use mobile showers or hose-down facilities to reduce body temperature and cool protective clothing.
Conduct field activities in the early morning or evening and rotate shifts of workers, if possible.
Avoid direct sun whenever possible, which can decrease physical efficiency and increase the probability of heat stress. Take regular breaks in a cool, shaded area. Use a wide-brim hat or an umbrella when working under direct sun for extended periods.
Provide adequate shelter/shade to protect personnel against radiant heat (sun, flames, hot metal).
Maintain good hygiene standards by frequently changing clothing and showering.
Observe one another for signs of heat stress. Persons who experience signs of heat syncope, heat rash, or heat cramps should consult the SSC/DSC to avoid progression of heat-related illness.

SYMPTOMS AND TREATMENT OF HEAT STRESS

	Heat Syncope	Heat Rash	Heat Cramps	Heat Exhaustion	Heat Stroke
Signs and Symptoms	Sluggishness or fainting while standing erect or immobile in heat.	Profuse tiny raised red blister-like vesicles on affected areas, along with prickling sensations during heat exposure.	Painful spasms in muscles used during work (arms, legs, or abdomen); onset during or after work hours.	Fatigue, nausea, headache, giddiness; skin clammy and moist; complexion pale, muddy, or flushed; may faint on standing; rapid thready pulse and low blood pressure; oral temperature normal or low	Red, hot, dry skin; dizziness; confusion; rapid breathing and pulse; high oral temperature.
Treatment	Remove to cooler area. Rest lying down. Increase fluid intake. Recovery usually is prompt and complete.	Use mild drying lotions and powders, and keep skin clean for drying skin and preventing infection.	Remove to cooler area. Rest lying down. Increase fluid intake.	Remove to cooler area. Rest lying down, with head in low position. Administer fluids by mouth. Seek medical attention.	Cool rapidly by soaking in cool– but not cold–water. Call ambulance, and get medical attention immediately!

Monitoring Heat Stress

These procedures should be considered when the ambient air temperature exceeds 70°F, the relative humidity is high (>50 percent), or when workers exhibit symptoms of heat stress.
The heart rate (HR) should be measured by the radial pulse for 30 seconds, as early as possible in the resting period. The HR at the beginning of the rest period should not exceed 100 beats/minute, or 20 beats/minute above resting pulse. If the HR is higher, the next work period should be shortened by 33 percent, while the length of the rest period stays the same. If the pulse rate still exceeds 100 beats/minute at the beginning of the next rest period, the work cycle should be further shortened by 33 percent. The procedure is continued until the rate is maintained below 100 beats/minute, or 20 beats/minute above resting pulse.

2.2.9 Cold Stress

(Reference CH2M HILL SOP HS-09, *Heat and Cold Stress*)

Be aware of the symptoms of cold-related disorders, and wear proper, layered clothing for the anticipated fieldwork. Appropriate rain gear is a must in cool weather.
Consider monitoring the work conditions and adjusting the work schedule using guidelines developed by the U.S. Army (wind-chill index) and the National Safety Council (NSC).
Wind-Chill Index is used to estimate the combined effect of wind and low air temperatures on exposed skin. The wind-chill index does not take into account the body part that is exposed, the level of activity, or the amount or type of clothing worn. For those reasons, it should only be used as a guideline to warn workers when they are in a situation that can cause cold-related illnesses.
NSC Guidelines for Work and Warm-Up Schedules can be used with the wind-chill index to estimate work and warm-up schedules for fieldwork. The guidelines are not absolute; workers should be monitored for symptoms of cold-related illnesses. If symptoms are not observed, the work duration can be increased.
Persons who experience initial signs of immersion foot, frostbite, hypothermia should consult the SSC/DSC to avoid progression of cold-related illness.
Observe one another for initial signs of cold-related disorders.
Obtain and review weather forecast – be aware of predicted weather systems along with sudden drops in temperature, increase in winds, and precipitation.

SYMPTOMS AND TREATMENT OF COLD STRESS			
	Immersion (Trench) Foot	**Frostbite**	**Hypothermia**
Signs and Symptoms	Feet discolored and painful; infection and swelling present.	Blanched, white, waxy skin, but tissue resilient; tissue cold and pale.	Shivering, apathy, sleepiness; rapid drop in body temperature; glassy stare; slow pulse; slow respiration.
Treatment	Seek medical treatment immediately.	Remove victim to a warm place. Re-warm area quickly in warm–but **not** hot–water. Have victim drink warm fluids, but **not** coffee or alcohol. Do not break blisters. Elevate the injured area, and get medical attention.	Remove victim to a warm place. Have victim drink warm fluids, but **not** coffee or alcohol. Get medical attention.

2.2.10 Compressed Gas Cylinders

Valve caps must be in place when cylinders are transported, moved, or stored.
Cylinder valves must be closed when cylinders are not being used and when cylinders are being moved.
Cylinders must be secured in an upright position at all times.
Cylinders must be shielded from welding and cutting operations and positioned to avoid being struck or knocked over; contacting electrical circuits; or exposed to extreme heat sources.
Cylinders must be secured on a cradle, basket, or pallet when hoisted; they may not be hoisted by choker slings.

2.2.11 Procedures for Locating Buried Utilities

Local Utility Mark-Out Service – No Utilities at Landfill Site

Name:
Phone:
Where available, obtain utility diagrams for the facility.
Review locations of sanitary and storm sewers, electrical conduits, water supply lines, natural gas lines, and fuel tanks and lines.
Review proposed locations of intrusive work with facility personnel knowledgeable of locations of utilities. Check locations against information from utility mark-out service.
Where necessary (e.g., uncertainty about utility locations), excavation or drilling of the upper depth interval should be performed manually
Monitor for signs of utilities during advancement of intrusive work (e.g., sudden change n advancement of auger or split spoon).
When the client or other onsite party is responsible for determining the presence and locations of buried utilities, the SSC should confirm that arrangement.

2.2.12 Confined Space Entry

(Reference CH2M HILL SOP HS-17, *Confined Space Entry*)

No confined space entry will be permitted. Confined space entry requires additional health and safety procedures, training, and a permit. If conditions change such that confined-space entry is necessary, contact the HSM to develop the required entry permit.

When planned activities will not include confined-space entry, permit-required confined spaces accessible to CH2M HILL personnel are to be identified before the task begins. The SSC is to confirm that permit spaces are properly posted or that employees are informed of their locations and hazards.

2.3 Biological Hazards and Controls

2.3.1 Snakes

Snakes typically are found in underbrush and tall grassy areas. If you encounter a snake, stay calm and look around; there may be other snakes. Turn around and walk away on the same path you used to approach the area. If a person is bitten by a snake, wash and immobilize the injured area, keeping it lower than the heart if possible. Seek medical attention immediately. **DO NOT** apply ice, cut the wound, or apply a tourniquet. Try to identify the type of snake: note color, size, patterns, and markings.

2.3.2 Poison Ivy and Poison Sumac

Poison ivy, poison oak, and poison sumac typically are found in brush or wooded areas. They are more commonly found in moist areas or along the edges of wooded areas. Become familiar with the identity of these plants. Wear protective clothing that covers exposed skin and clothes. Avoid contact with plants and the outside of protective clothing. If skin contacts a plant, wash the area with soap and water immediately. If the reaction is severe or worsens, seek medical attention.

2.3.3 Ticks

Ticks typically are in wooded areas, bushes, tall grass, and brush. Ticks are black, black and red, or brown and can be up to one-quarter inch in size. Wear tightly woven light-colored clothing with long sleeves and pant legs tucked into boots; spray **only outside** of clothing with permethrin or permanone and spray skin with only DEET; and check yourself frequently for ticks.

If bitten by a tick, grasp it at the point of attachment and carefully remove it. After removing the tick, wash your hands and disinfect and press the bite areas. Save the removed tick. Report the bite to human resources. Look for symptoms of Lyme disease or Rocky Mountain spotted fever (RMSF). Lyme: a rash might appear that looks like a bullseye with a small welt in the center. RMSF: a rash of red spots under the skin 3 to 10 days after the tick bite. In both cases, chills, fever, headache, fatigue, stiff neck, and bone pain may develop. If symptoms appear, seek medical attention.

2.3.4 Bees and Other Stinging Insects

Bee and other stinging insects may be encountered almost anywhere and may present a serious hazard, particularly to people who are allergic. Watch for and avoid nests. Keep exposed skin to a minimum. Carry a kit if you have had allergic reactions in the past, and inform the SSC and/or buddy. If a stinger is present, remove it carefully with tweezers. Wash and disinfect the wound, cover it, and apply ice. Watch for allergic reaction; seek medical attention if a reaction develops.

2.3.5 Bloodborne Pathogens

(Reference CH2M HILL SOP HS-36, *Bloodborne Pathogens*)

Exposure to bloodborne pathogens may occur when rendering first aid or CPR, or when coming into contact with landfill waste or waste streams containing potentially infectious material. Exposure controls and personal protective equipment (PPE) are required as specified in CH2M HILL SOP HS-36, *Bloodborne Pathogens*. Hepatitis B vaccination must be offered before the person participates in a task where exposure is a possibility.

See section 2.1.4 on medical waste in the landfill.

2.3.6 Hanta Virus

The hanta virus is sometimes transmitted by deer mice, and causes respiratory distress, sometimes with fatal consequences. Transmission of the hanta virus occurs with exposure to deer mouse droppings. The virus can be inhaled in the dust from areas where mice have nested or left their droppings. Avoid these areas whenever possible. Good hygiene practices such as washing hands and face prior to eating and drinking will help to minimize the potential for exposure to the hanta virus. If work must be done in areas with potential exposure spray the area with disinfectant and let sit for one hour before disturbing the area. Use Level C protection with high efficiency particulate air filters (HEPA) cartridges and work practices which minimize generation of dust and aerosols. Thoroughly wash hands and face after removing personal protective equipment (PPE).

2.3.7 Other Anticipated Biological Hazards

2.4 Radiological Hazards and Controls

Refer to CH2M HILL's *Corporate Health and Safety Program, Program and Training Manual,* and *Corporate Health and Safety Program, Radiation Protection Program Manual,* for standards of practice in contaminated areas.

Hazards	Controls
Limited soil contamination may be found at the site. The nature of landfill excavation is that unknown materials, including radioactive materials may have been disposed Monitoring will be performed as described in Section 5 for radioactive materials. Appendix 8	Perform area monitoring using a Bicron Micro Rem Scintillation meter. If air monitoring indicates radiation levels above 3 times the background level, then work will stop and personnel will contact the RSM for additional guidance.

See section 2.1.5 on potential radiological hazards in the landfill.

Contaminants of Concern

(Refer to Project Files for more detailed contaminant information)

Contaminant	Location and Maximum[a] Concentration (ppm)	Exposure Limit[b]	IDLH[c]	Symptoms and Effects of Exposure	PIP[d] (eV)
PolyNuclear Aromatics PNAs (Limits as Coal Tar Pitch)	SB: 13,089	02 mg/m³	80 Ca	Dermatitis and bronchitis	UK
Pentachlorophenol	SB: 2,100	0.5 mg/m³ (skin)	2.5	Eye, nose, and throat irritation; sneezing; coughing; weakness; sweating; headache; dizziness; nausea; vomiting; chest pain; dermatitis	NL
Vinyl Chloride	GW: 1	1 ppm	NL Ca	Weakness, abdominal pain, gastrointestinal bleeding, enlarged liver, pallor or cyanosis of extremities	9.99

Footnotes:

[a] Specify sample-designation and media: SB (Soil Boring), A (Air), D (Drums), GW (Groundwater), L (Lagoon), TK (Tank), S (Surface Soil), SL (Sludge), SW (Surface Water).

[b] Appropriate value of PEL, REL, or TLV listed.

[c] IDLH = immediately dangerous to life and health (units are the same as specified "Exposure Limit" units for that contaminant); NL = No limit found in reference materials; CA = Potential occupational carcinogen.

[d] PIP = photoionization potential; NA = Not applicable; UK = Unknown.

2.6 Potential Routes of Exposure

Dermal: Contact with contaminated media. This route of exposure is minimized through proper use of PPE, as specified in Section 4.	**Inhalation:** Vapors and contaminated particulates. This route of exposure is minimized through proper respiratory protection and monitoring, as specified in Sections 4 and 5, respectively.	**Other:** Inadvertent ingestion of contaminated media. This route should not present a concern if good hygiene practices are followed (e.g., wash hands and face before drinking or smoking).

3 Project Organization and Personnel

3.1 CH2M HILL Employee Medical Surveillance and Training

(Reference CH2M HILL SOPs HS-01, *Medical Surveillance,* and HS-02, *Health and Safety Training)*

The employees listed below are enrolled in the CH2M HILL Comprehensive Health and Safety Program and meet state and federal hazardous waste operations requirements for 40-hour initial training, 3-day on-the-job experience, and 8-hour annual refresher training. Employees designated "SSC" have completed a 12-hour site safety coordinator course, and have documented requisite field experience. An SSC with a level designation (D, C, B) equal to or greater than the level of protection being used must be present during all tasks performed in exclusion or decontamination zones. Employees designated "FA-CPR" are currently certified by the American Red Cross, or equivalent, in first aid and CPR. At least one FA-CPR designated employee must be present during all tasks performed in exclusion or decontamination zones. The employees listed below are currently active in a medical surveillance program that meets state and federal regulatory requirements for hazardous waste operations. Certain tasks (e.g., confined-space entry) and contaminants (e.g., lead) may require additional training and medical monitoring.

Pregnant employees are to be informed of and are to follow the procedures in CH2M HILL's SOP HS-04, *Reproduction Protection,* including obtaining a physician's statement of the employee's ability to perform hazardous activities before being assigned fieldwork.

Employee Name	Office	Responsibility	SSC/FA-CPR
Antipas, Artemis	SEA		
Borne, Gary	SEA		FA/CPR
Bose, Dean	SEA		
Brooks, Gregory	SEA		FA/CPR
Buford, Mark	SEA		
Burkhardt, Janine	SEA		Level C SSC; FA/CPR
Crawford, James	SEA		Level C SSC; FA/CPR
Culley, John	SEA		Level C SSC; FA/CPR
Dugan, Stacia	SEA		
Egan, Tanner	SEA		
Friedman, Henry	SEA		Level C SSC; FA/CPR
Gauthier, Marilyn	SEA		Level C SSC; FA/CPR
Harding, Stephen	SEA		
Hicks, Duane	SEA		Level C SSC; FA/CPR
Kossik, Carolyn	SEA		
Kunkel, Douglas	SEA		Level C SSC; FA/CPR

Lindell, Wayne	SEA	Level C SSC; FA/CPR
Luecker, Elizabeth	SEA	
Mack, Jamiyo	SEA	
Miller, Burt	SEA	
Moore, Susan	SEA	Level C SSC; FA/CPR
Pyle, Amanda	SEA	Level C SSC; FA/CPR
Radloff, Judi	SEA	Level C SSC; FA/CPR
Reimbold, Michael	SEA	Level C SSC; FA/CPR
Rossi, Amadeo	SEA	
Saban, Lisa	SEA	
Sampaco, Casan	SEA	
Schaeffer, Jennifer	SEA	
Scheffler, Kenneth	SEA	Level C SSC; FA/CPR
Schwabel, Sandra	SEA	
Schwartz, Candice	SEA	
Theodore, Joel	SEA	
Thomas, Tamara	SEA	
Townley, Paul	SEA	Level C SSC; FA/CPR
Trotman, Kenneth	SEA	
Vedera, Glen	SEA	Level C SSC; FA/CPR
Von Wallmenich, Theodore	SEA	
Wall, Madeline	SEA	FA/CPR
Wilcox, Jay	SEA	Level C SSC; FA/CPR
Wong, Bernard	SEA	Level C SSC; FA/CPR
Young, Jeffrey	SEA	

3.2 Field Team Chain of Command and Communication Procedures

3.2.1 Client – Kitsap County

Contact Name: Michelle Miller, Project Manager
Phone: 360/337-4485
Facility Contact Name:
Phone:

3.2.2 CH2M HILL

Project Manager: Judi Radloff/SEA
Health and Safety Manager: Jim Bushnell/SEA
Field Team Leader: Jay Wilcox/SEA
Site Safety Coordinator: Jay Wilcox/SEA

The SSC is responsible for contacting the Field Team Leader and Project Manager. In general, the Project Manager will contact the client. The Health and Safety Manager should be contacted as appropriate.

3.2.3 CH2M HILL Subcontractors

(Reference CH2M HILL SOP HS-55, *Subcontractor, Contractor, and Owner*)

Subcontractor: Cascade Drilling
Subcontractor Contact Name:John Murnane
Telephone: 425/485-8908
Task: Monitoring Well and gas probe decommissioning

The subcontractors listed above are covered by this HSP and must be provided a copy of this plan. However, this plan does not address hazards associated with the tasks and equipment that the subcontractor has expertise in (e.g., drilling, excavation work, electrical). Subcontractors are responsible for the health and safety procedures specific to their work, and are required to submit these procedures to CH2M HILL for review before the start of field work. Subcontractors must comply with the established health and safety plan(s). The CH2M HILL SSC should verify that subcontractor employee training, medical clearance, and fit test records are current and must monitor and enforce compliance with the established plan(s). CH2M HILL's oversight does not relieve subcontractors of their responsibility for effective implementation and compliance with the established plan(s).

CH2M HILL should continuously endeavor to observe subcontractors' safety performance. This endeavor should be reasonable, and include observing for hazards or unsafe practices that are both readily observable and occur in common work areas. CH2M HILL is not responsible for exhaustive observation for hazards and unsafe practices. In addition to this level of observation, the SSC is responsible for confirming CH2M HILL subcontractor performance against both the subcontractor's safety plan and applicable self-assessment checklists. Self-assessment checklists contained in Attachment 6 are to be used by the SSC to review subcontractor performance.

Health and safety related communications with CH2M HILL subcontractors should be conducted as follows:

Brief subcontractors on the provisions of this plan, and require them to sign the Employee Signoff Form included in Attachment 1.
Request subcontractor(s) to brief the project team on the hazards and precautions related to their work.
When apparent non-compliance/unsafe conditions or practices are observed, notify the subcontractor safety representative and require corrective action – the subcontractor is responsible for determining and implementing necessary controls and corrective actions.
When repeat non-compliance/unsafe conditions are observed, notify the subcontractor safety representative and stop affected work until adequate corrective measures are implemented.
When an apparent imminent danger exists, immediately remove all affected CH2M HILL employees and subcontractors, notify subcontractor safety representative, and stop affected work until adequate corrective measures are implemented. Notify the Project Manager and HSM as appropriate.
Document all oral health and safety related communications in project field logbook, daily reports, or other records.

3.2.4 Contractors

(Reference CH2M HILL SOP HS-55, *Subcontractor, Contractor, and Owner*)

Contractor: To be determined
Contractor Contact Name:
Telephone:

This plan does not cover contractors that are contracted directly to the client or the owner. CH2M HILL is not responsible for the health and safety or means and methods of the contractor's work, and we must never assume such responsibility through our actions (e.g., advising on H&S issues). In addition to this plan, CH2M HILL staff should review contractor safety plans so that we remain aware of appropriate precautions that apply to us. Except in unusual situations when conducted by the HSM, CH2M HILL must never comment on or approve contractor safety procedures. Self-assessment checklists contained in Attachment 6 are to be used by the SSC to review the contractor's performance ONLY as it pertains to evaluating our exposure and safety.

Health and safety related communications with contractors should be conducted as follows:

Request the contractor to brief CH2M HILL employees and subcontractors on the precautions related to the contractor's work.
When an apparent contractor non-compliance/unsafe condition or practice poses a risk to CH2M HILL employees or subcontractors:
Notify the contractor safety representative
Request that the contractor determine and implement corrective actions
If needed, stop affected CH2M HILL work until contractor corrects the condition or practice. Notify the client, Project Manager, and HSM as appropriate.
If apparent contractor non-compliance/unsafe conditions or practices are observed, inform the contractor safety representative. Our obligation is limited strictly to informing the contractor of our observation – the contractor is solely responsible for determining and implementing necessary controls and corrective actions.
If an apparent imminent danger is observed, immediately warn the contractor employee(s) in danger and notify the contractor safety representative. Our obligation is limited strictly to immediately warning the affected individual(s) and informing the contractor of our observation – the contractor is solely responsible for determining and implementing necessary controls and corrective actions.
Document all oral health and safety related communications in project field logbook, daily reports, or other records.

4 Personal Protective Equipment (PPE)

(Reference CH2M HILL SOP HS-07, *Personal Protective Equipment*, HS-08, *Respiratory Protection*)

PPE Specifications [a]

	Level		Head	Respirator [b]
General site entry Surveying Observation of material loading for offsite disposal Oversight of remediation and construction	D	Work clothes; steel-toe, leather work boots; work glove.	Hardhat [c] Safety glasses Ear protection [d]	None required
Refuse sampling	Modified D	Work clothes or cotton coveralls **Boots:** Steel-toe, chemical-resistant boots OR steel-toe, leather work boots with outer rubber boot covers **Gloves:** Inner surgical-style nitrile & outer chemical-resistant nitrile gloves.	Hardhat [c] Safety glasses Ear protection [d]	None required
Soil boring	Modified D	**Coveralls:** Uncoated Tyvek® **Boots:** Steel-toe, chemical-resistant boots OR steel-toe, leather work boots with outer rubber boot covers **Gloves:** Inner surgical-style nitrile & outer chemical-resistant nitrile gloves.	Hardhat [c] Splash shield [c] Safety glasses Ear protection [d]	None required.
Tasks requiring upgrade	C	**Coveralls:** Polycoated Tyvek® **Boots:** Steel-toe, chemical-resistant boots OR steel-toe, leather work boots with outer rubber boot covers **Gloves:** Inner surgical-style nitrile & outer chemical-resistant nitrile gloves.	Hardhat [c] Splash shield [c] Ear protection [d] Spectacle inserts	APR, full face, MSA Ultratwin or equivalent; with GME-H cartridges or equivalent[e].
Tasks requiring upgrade	B	**Coveralls:** Polycoated Tyvek® **Boots:** Steel-toe, chemical-resistant boots OR steel-toe, leather work boots with outer rubber boot covers **Gloves:** Inner surgical-style nitrile & outer chemical-resistant nitrile gloves.	Hardhat [c] Splash shield [c] Ear protection [d] Spectacle inserts	Positive-pressure demand self-contained breathing apparatus (SCBA); MSA Ultralite, or equivalent.

Reasons for Upgrading or Downgrading Level of Protection

Upgrade[f]	Downgrade
Request from individual performing tasks. Change in work tasks that will increase contact or potential contact with hazardous materials. Occurrence or likely occurrence of gas or vapor emission. Known or suspected presence of dermal hazards. Instrument action levels (Section 5) exceeded.	New information indicating that situation is less hazardous than originally thought. Change in site conditions that decreases the hazard. Change in work task that will reduce contact with hazardous materials.

[a] Modifications are as indicated. CH2M HILL will provide PPE only to CH2M HILL employees.

[b] No facial hair that would interfere with respirator fit is permitted.

[c] Hardhat and splash-shield areas are to be determined by the SSC.

[d] Ear protection should be worn when conversations cannot be held at distances of 3 feet or less without shouting.

[e] Cartridge change-out schedule is at least every 8 hours (or one work day), except if relative humidity is > 85%, or if organic vapor measurements are > midpoint of Level C range (refer to Section 5)—then at least every 4 hours. If encountered conditions are different than those anticipated in this HSP, contact the HSM.

[f] Performing a task that requires an upgrade to a higher level of protection (e.g., Level D to Level C) is permitted only when the PPE requirements have been approved by the HSM, and an SSC qualified at that level is present.

5 Air Monitoring/Sampling

(Reference CH2M HILL SOP HS-06, *Air Monitoring)*

5.1 Air Monitoring Specifications

Instrument	Tasks	Action Levels[a]		Frequency [b]	Calibration
PID: OVM with 10.6eV lamp or equivalent	Screening suspicious materials	0 – 5 ppm 5 – 10 ppm > 10 ppm	Level D Level C Level B	Initially and periodically when visually contaminated or odorous materials are exposed	Daily
CGI: Personal methane and H_2S monitor	Observation of excavation near excavation face.	0-10% : 10-25% LEL: >25% LEL: 0 – 10 ppm H_2S > 10 ppm H_2S	No explosion hazard Potential explosion hazard Explosion hazard; evacuate or vent Level D	Continuous during advancement of boring or trench	Daily
Radiation Meter [d]: Ludlum Model 2 with GM probe model 44-9, or equivalent	Screen suspicious materials	Background: >3x Background: >2 mR/Hr:	Continue work Consult RHM Establish REZ	Initially, periodically, and at end of task	Daily

[a] Action levels apply to sustained breathing-zone measurements above background.

[b] The exact frequency of monitoring depends on field conditions and is to be determined by the SSC; generally, every 5 to 15 minutes if acceptable; more frequently may be appropriate. Monitoring results should be recorded. Documentation should include instrument and calibration information, time, measurement results, personnel monitored, and place/location where measurement is taken (e.g., "Breathing Zone/MW-3", "at surface/SB-2", etc.).

[c] If the measured percent of O_2 is less than 10, an accurate LEL reading will not be obtained. Percent LEL and percent O_2 action levels apply only to ambient working atmospheres, and not to confined-space entry. More-stringent percent LEL and O_2 action levels are required for confined-space entry (refer to Section 2).

[d] Refer to SOP HS-10 included as appendix 8 for instructions and documentation on radiation monitoring and screening.

[e] Noise monitoring and audiometric testing also required.

5.2 Calibration Specifications

(Refer to the respective manufacturer's instructions for proper instrument-maintenance procedures)

Instrument	Gas	Span	Reading	Method
PID: OVM, 10.6 or 11.8 eV bulb	100 ppm isobutylene	RF = 1.0	100 ppm	1.5 lpm reg T-tubing
PID: MiniRAE, 10.6 eV bulb	100 ppm isobutylene	CF = 100	100 ppm	1.5 lpm reg T-tubing
PID: TVA 1000	100 ppm isobutylene	CF = 1.0	100 ppm	1.5 lpm reg T-tubing
Bicron Micro Scintillation Detector	Source check	N/A	N/A	N/A
Personal methane/H_2S meter	Follow manufacturers recommendations			

5.3 Air Sampling

Sampling, in addition to real-time monitoring, may be required by other OSHA regulations where there may be exposure to certain contaminants. Air sampling typically is required when site contaminants include lead, cadmium, arsenic, asbestos, and certain volatile organic compounds. Contact the HSM immediately if these contaminants are encountered.

Method Description

Air monitoring is not required for this project.

Personnel and Areas

Results must be sent immediately to the HSM. Regulations may require reporting to monitored personnel. Results reported to:

HSM:
Other:

6 Decontamination

(Reference CH2M HILL SOP HS-13, *Decontamination*)

The SSC must establish and monitor the decontamination procedures and their effectiveness. Decontamination procedures found to be ineffective will be modified by the SSC. The SSC must ensure that procedures are established for disposing of materials generated on the site.

6.1 Decontamination Specifications

Personnel	Sample Equipment	Heavy Equipment
Boot wash/rinse	Wash/rinse equipment	Power wash
Glove wash/rinse	Solvent-rinse equipment	Steam clean
Outer-glove removal	Contain solvent waste for offsite disposal	Dispose of equipment rinse water to facility or sanitary sewer, or contain for offsite disposal
Body-suit removal		
Inner-glove removal		
Respirator removal		
Hand wash/rinse		
Face wash/rinse		
Shower ASAP		
Dispose of PPE in municipal trash, or contain for disposal		
Dispose of personnel rinse water to facility or sanitary sewer, or contain for offsite disposal		

6.2 Diagram of Personnel-Decontamination Line

No eating, drinking, or smoking is permitted in contaminated areas and in exclusion or decontamination zones. The SSC should establish areas for eating, drinking, and smoking. Contact lenses are not permitted in exclusion or decontamination zones.

Figure 6-1 illustrates a conceptual establishment of work zones, including the decontamination line. Work zones are to be modified by the SSC to accommodate task-specific requirements.

7 Spill-Containment Procedures

Sorbent material will be maintained in the support zone. Incidental spills will be contained with sorbent and disposed of properly.

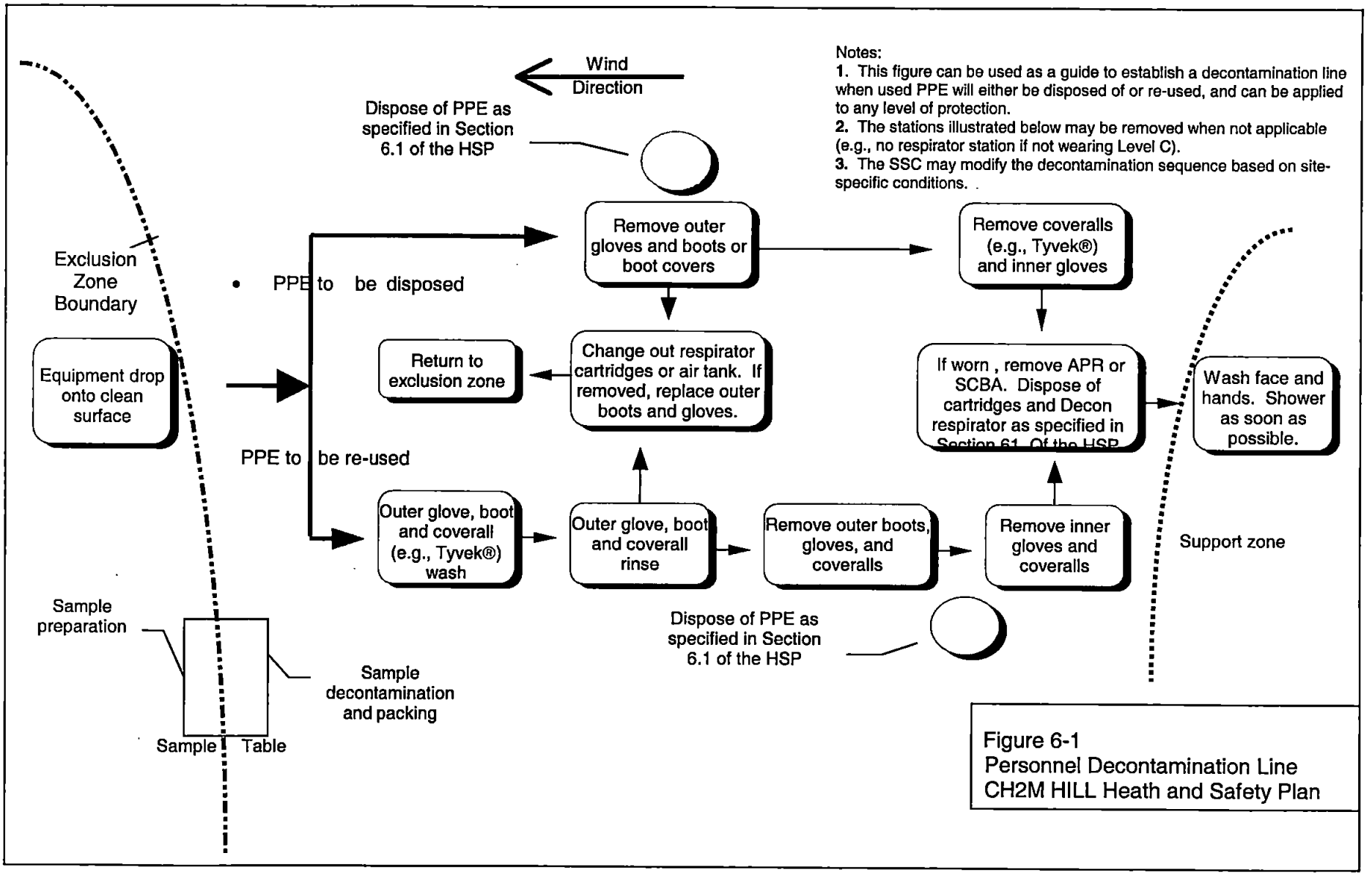


Figure 6-1
Personnel Decontamination Line
CH2M HILL Heath and Safety Plan

8 Site-Control Plan

8.1 Site-Control Procedures

(Reference CH2M HILL SOP HS-11, *Site Control)*

The SSC will conduct a site safety briefing (see below) before starting field activities or as tasks and site conditions change.
Topics for briefing on site safety: general discussion of Health and Safety Plan, site-specific hazards, locations of work zones, PPE requirements, equipment, special procedures, emergencies.
The SSC records attendance at safety briefings in a logbook and documents the topics discussed.
Post the OSHA job-site poster in a central and conspicuous location in accordance with CH2M HILL SOP HS-71, *OSHA Postings.*
Establish support, decontamination, and exclusion zones. Delineate with flags or cones as appropriate.
Support zone should be upwind of the site. Use access control at entry and exit from each work zone.
Establish onsite communication consisting of the following:
Line-of-sight and hand signals
Air horn
Two-way radio or cellular telephone if available
Establish offsite communication.
Establish and maintain the "buddy system."
Initial air monitoring is conducted by the SSC in appropriate level of protection.
The SCC is to conduct periodic inspections of work practices to determine the effectiveness of this plan – refer to Sections 2 and 3. Deficiencies are to be noted, reported to the HSM, and corrected.

8.2 Hazwoper Compliance Plan

(Reference CH2M HILL SOP HS-19, *Site-Specific Written Safety Plans)*

Certain parts of the site work are covered by state or federal Hazwoper standards and therefore require training and medical monitoring. Anticipated Hazwoper tasks (Section 1.1.1) might occur consecutively or concurrently with respect to non-Hazwoper tasks. This section outlines procedures to be followed when approved activities specified in Section 1.1.2 do not require 24- or 40-hour training. Non-Hazwoper-trained personnel also must be trained in accordance with all other state and federal OSHA requirements.
In many cases, air sampling, in addition to real-time monitoring, must confirm that there is no exposure to gases or vapors before non-Hazwoper-trained personnel are allowed on the site, or while non-Hazwoper-trained staff are working in proximity to Hazwoper activities. Other data (e.g., soil) also must document that there is no potential for exposure. The HSM must approve the interpretation of these data. Refer to subsections 2.5 and 5.3 for contaminant data and air sampling requirements, respectively.
When non-Hazwoper-trained personnel are at risk of exposure, the SSC must post the exclusion zone and inform non-Hazwoper-trained personnel of the:
nature of the existing contamination and its locations
limitations of their access
emergency action plan for the site
Periodic air monitoring with direct-reading instruments conducted during regulated tasks also should be used to ensure that non-Hazwoper-trained personnel (e.g., in an adjacent area) are not exposed to airborne contaminants.
When exposure is possible, non-Hazwoper-trained personnel must be removed from the site until it can be demonstrated that there is no longer a potential for exposure to health and safety hazards.
Remediation treatment system start-ups: Once a treatment system begins to pump and treat contaminated media, the site is, for the purposes of applying the Hazwoper standard, considered a treatment, storage, and disposal facility (TSDF). Therefore, once the system begins operation, only Hazwoper-trained personnel (minimum of 24 hour of training) will be permitted to enter the site. All non-Hazwoper-trained personnel must not enter the TSDF area of the site.

9 Emergency Response Plan

(Reference CH2M HILL, SOP HS-12, *Emergency Response*)

9.1 Pre-Emergency Planning

The SSC performs the applicable pre-emergency planning tasks before starting field activities and coordinates emergency response with CH2M HILL onsite parties, the facility, and local emergency-service providers as appropriate.

Review the facility emergency and contingency plans where applicable.
Determine what onsite communication equipment is available (e.g., two-way radio, air horn).
Determine what offsite communication equipment is needed (e.g., nearest telephone, cell phone).
Confirm and post emergency telephone numbers, evacuation routes, assembly areas, and route to hospital; communicate the information to onsite personnel.
Field Trailers: Post "Exit" signs above exit doors, and post "Fire Extinguisher" signs above locations of extinguishers. Keep areas near exits and extinguishers clear.
Review changed site conditions, onsite operations, and personnel availability in relation to emergency response procedures.
Where appropriate and acceptable to the client, inform emergency room and ambulance and emergency response teams of anticipated types of site emergencies.
Designate one vehicle as the emergency vehicle; place hospital directions and map inside; keep keys in ignition during field activities.
Inventory and check site emergency equipment, supplies, and potable water.
Communicate emergency procedures for personnel injury, exposures, fires, explosions, and releases.
Rehearse the emergency response plan before site activities begin, including driving route to hospital.
Brief new workers on the emergency response plan.

The SSC will evaluate emergency response actions and initiate appropriate follow-up actions.

9.2 Emergency Equipment and Supplies

The SSC should mark the locations of emergency equipment on the site map and post the map.

Emergency Equipment and Supplies	Location
20 LB (or two 10-lb) fire extinguisher (A, B, and C classes)	Support Zone/Heavy Equipment
First aid kit	Support Zone/Field Vehicle
Eye Wash	Support & Decon Zone/Field Vehicle
Potable water	Support & Decon Zone/Field Vehicle
Bloodborne-pathogen kit	Support Zone/Field Vehicle
Additional equipment (specify):	

9.3 Incident Response

In fires, explosions, or chemical releases, actions to be taken include the following:

Shut down CH2M HILL operations and evacuate the immediate work area.
Notify appropriate response personnel.
Account for personnel at the designated assembly area(s).
Assess the need for site evacuation, and evacuate the site as warranted.

Instead of implementing a work-area evacuation, note that small fires or spills posing minimal safety or health hazards may be controlled.

9.4 Emergency Medical Treatment

The procedures listed below may also be applied to non-emergency incidents. Injuries and illnesses (including overexposure to contaminants) must be reported to Human Resources. If there is doubt about whether medical treatment is necessary, or if the injured person is reluctant to accept medical treatment, contact the CH2M HILL medical consultant. During non-emergencies, follow these procedures as appropriate.

Notify appropriate emergency response authorities listed in Section 9.8 (e.g., 911).
The SCC will assume charge during a medical emergency until the ambulance arrives or until the injured person is admitted to the emergency room.
Prevent further injury.
Initiate first aid and CPR where feasible.
Get medical attention immediately.
Perform decontamination where feasible; lifesaving and first aid or medical treatment take priority.
Make certain that the injured person is accompanied to the emergency room.
When contacting the medical consultant, state that the situation is a CH2M HILL matter, and give your name and telephone number, the name of the injured person, the extent of the injury or exposure, and the name and location of the medical facility where the injured person was taken.
Report incident as outlined in Section 9.7.

9.5 Evacuation

Evacuation routes and assembly areas (and alternative routes and assembly areas) are specified on the site map.
Evacuation route(s) and assembly area(s) will be designated by the SSC before work begins.
Personnel will assemble at the assembly area(s) upon hearing the emergency signal for evacuation.
The SSC and a "buddy" will remain on the site after the site has been evacuated (if safe) to assist local responders and advise them of the nature and location of the incident.
The SSC will account for all personnel in the onsite assembly area.
A designated person will account for personnel at alternate assembly area(s).
The SSC will write up the incident as soon as possible after it occurs and submit a report to the Corporate Director of Health and Safety.

9.6 Evacuation Signals

Signal	Meaning
Grasping throat with hand	Emergency-help me.
Thumbs up	OK; understood.
Grasping buddy's wrist	Leave area now.
Continuous sounding of horn	Emergency; leave site now.

9.7 Incident Notification and Reporting

Upon any project incident (fire, spill, injury, near miss, death, etc.), immediately notify the PM and HSM. Call emergency beeper number if HSM is unavailable.
For CH2M HILL work-related injuries or illnesses, contact and help Human Resources administrator complete an Incident Report Form (IRF). IRF must be completed within 24 hours of incident.
For CH2M HILL subcontractor incidents, complete the Subcontractor Accident/Illness Report Form and submit to the HSM.
Notify and submit reports to client as required in contract.

10 Approval

This site-specific Health and Safety Plan has been written for use by CH2M HILL only. CH2M HILL claims no responsibility for its use by others unless that use has been specified and defined in project or contract documents. The plan is written for the specific site conditions, purposes, dates, and personnel specified and must be amended if those conditions change.

10.1 Original Plan

Written By: Jim Bushnell **Date:** January 19, 2001

Approved By: Jim Bushnell **Date:**

10.2 Revisions

Revisions Made By: **Date:**

Revisions to Plan:

Revisions Approved By: **Date:**

11 Attachments

Attachment 1: **Employee Signoff Form – Field Safety Instructions**
Attachment 2: **Project-Specific Chemical Product Hazard Communication Form**
Attachment 3: **Chemical-Specific Training Form**
Attachment 4: **Emergency Contacts**
Attachment 5: **Project H&S Forms/Permits**
Attachment 6: **Project Activity Self-Assessment Checklists**
Attachment 7: **Applicable Material Safety Data Sheets**

EMPLOYEE SIGNOFF FORM

Health and Safety Plan

The CH2M HILL project employees and subcontractors listed below have been provided with a copy of this HSP, have read and understood it, and agree to abide by its provisions.

Project Name: **Project Number:**

EMPLOYEE NAME (Please print)	EMPLOYEE SIGNATURE	COMPANY	DATE

Project-Specific Chemical Product Hazard Communication Form

This form must be completed prior to performing activities that expose personnel to hazardous chemicals products. Upon completion of this form, the SSC shall verify that training is provided on the hazards associated with these chemicals and the control measures to be used to prevent exposure to CH2M HILL and subcontractor personnel. Labeling and MSDS systems will also be explained.

Project Name: **Project Number:**

MSDSs will be maintained at the following location(s):

Hazardous Chemical Products Inventory

Chemical	Quantity	Location	MSDS Available	Container labels	
				Identity	Hazard
Methane	1 liter, compressed	Support Zone			
Isobutylene	1 liter, compressed	Support Zone			
Pentane	1 liter, compressed	Support Zone			
Hydrochloric acid	< 500 ml	Support Zone / sample bottles			
Nitric acid	< 500 ml	Support Zone / sample bottles			
Sulfuric Acid	< 500 ml	Support Zone / sample bottles			
Sodium hydroxide	< 500 ml	Support Zone / sample bottles			
Methanol	< 1 Gallon	Support/Decon Zones			
Hexane	< 1 Gallon	Support/Decon Zones			
pH buffers	< 500 ml	Support Zone			
MSA Sanitizer	< 1 liter	Support/Decon Zones			
Alconox/Liquinox	< 1liter	Support/Decon Zones			

Refer to SOP HS-05 *Hazard Communication* for more detailed information.

CH2MHILL

CHEMICAL-SPECIFIC TRAINING FORM

Location:	Project # :
HCC:	Trainer:

TRAINING PARTICIPANTS:

NAME	SIGNATURE	NAME	SIGNATURE

REGULATED PRODUCTS/TASKS COVERED BY THIS TRAINING:

The HCC shall use the product MSDS to provide the following information concerning each of the products listed above.

☐ Physical and health hazards

☐ Control measures that can be used to provide protection (including appropriate work practices, emergency procedures, and personal protective equipment to be used)

☐ Methods and observations used to detect the presence or release of the regulated product in the workplace (including periodic monitoring, continuous monitoring devices, visual appearance or odor of regulated product when being released, etc.)

Training participants shall have the opportunity to ask questions concerning these products and, upon completion of this training, will understand the product hazards and appropriate control measures available for their protection.

Copies of MSDSs, chemical inventories, and CH2M HILL's written hazard communication program shall be made available for employee review in the facility/project hazard communication file.

Emergency Contacts

24-hour CH2M HILL Emergency Beeper – 888/444-1226

Medical Emergency – 911

CH2M HILL Medical Consultant
Dr. Peter Greaney
GMG WorkCare, Orange, CA
800/455-6155
(After hours calls will be returned within 20 minutes)

Fire/Spill Emergency – 911
Bainbridge Island Fire Dept #: (206) 842-7686
Washington State Patrol (360) 377-9111
Kitsap County Dept. of Emer. Svc. (360) 377-9117

Local Occupational Physician
Virginia Mason Winslow Clinic
380 Winslow Way E.

Security & Police – 911
Bainbridge Island Police #: (206) 842-5211

Corporate Director Health and Safety
Name: Mollie Netherland/SEA
Phone: 206/453-5005
24-hour emergency beeper: 888-444-1226

Radiation Information
State of Washington Health Department
Division of Radiation Safety
Radioactive Materials Section.
Terry Frazee, Supervising Health Physicist
(360) 236-3251

Radioactive Material Testing
State of Washington Health Department
Radiation and Environmental Laboratory
Marina Silverstone (206) 361-2894

Utilities Emergency
Water: BI Utilities (206) 842-7633
Gas: 911
Electric: PSE 800/562-6428

Health and Safety Manager (HSM)
Name: Jim Bushnell/SEA
Phone: 425/453-5005 ext. 5678
Cell: 206/931-6504

Safety Coordinator HW Construction(SC – HW/C)
Name: Jay Wilcox
Phone: 425/453-5000

Regional Human Resources Department
Name: Elaine Jones/SEA
Phone: 425/453-5000

Project Manager
Name: Judi Radloff/SEA
Phone: 425/453-50000

Corporate Human Resources Department
Name: John Monark/COR
Phone: 303/771-0900

Federal Express Dangerous Goods Shipping
Phone: 800/238-5355
CH2M HILL Emergency Number for Shipping Dangerous Goods
Phone: 800/255-3924

Worker's Compensation and Auto Claims
Sterling Administration Services
Phone: 800/420-8926 After hours: 800/497-4566

Report fatalities AND report vehicular accidents involving pedestrians, motorcycles, or more than two cars.

Contact the Project Manager. Generally, the Project Manager will contact relevant government agencies.

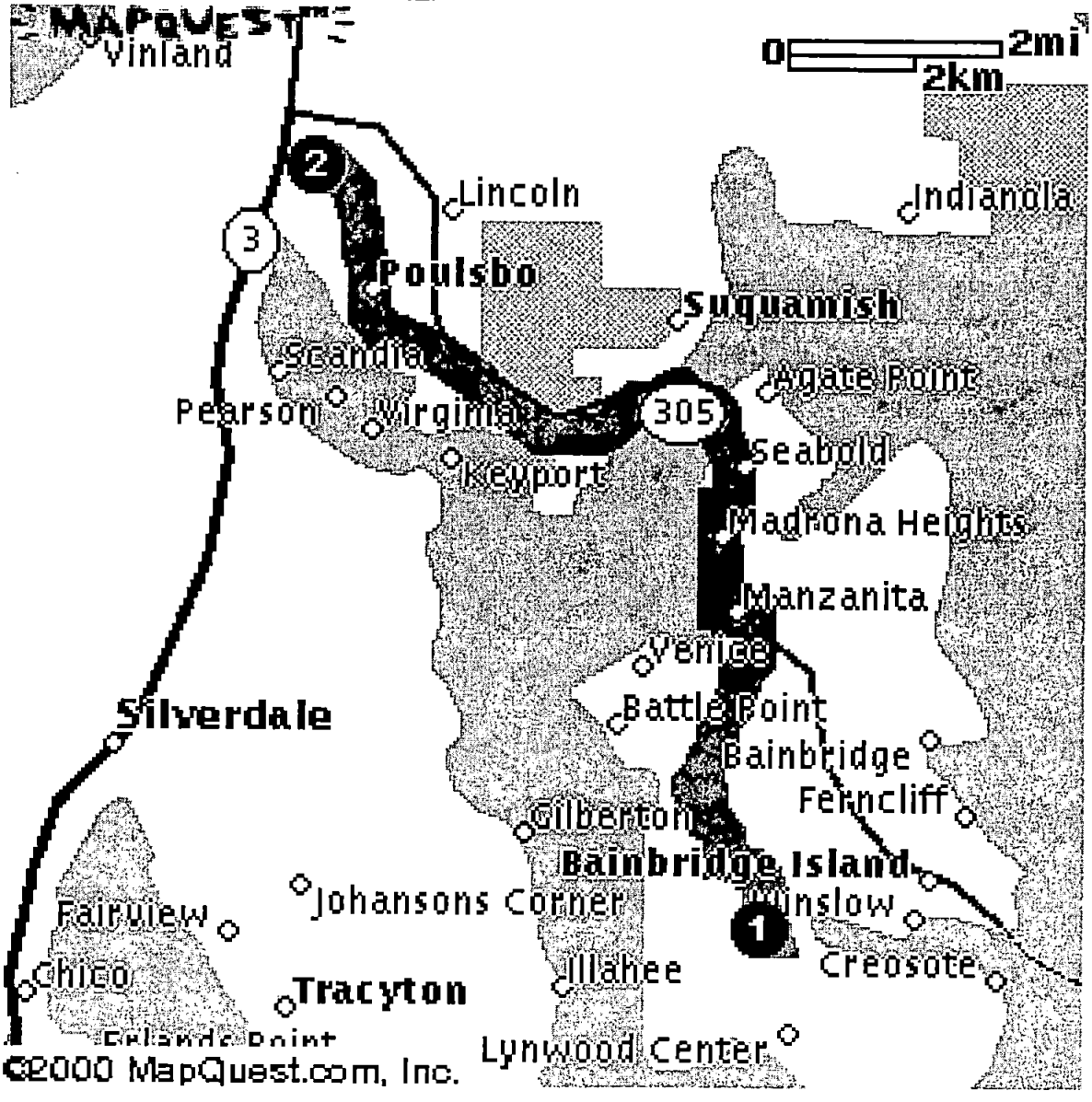
Hospital Name/Address: North Kitsap Medical Center
20696 Bond Rd. NE
Poulsbo, WA 98370

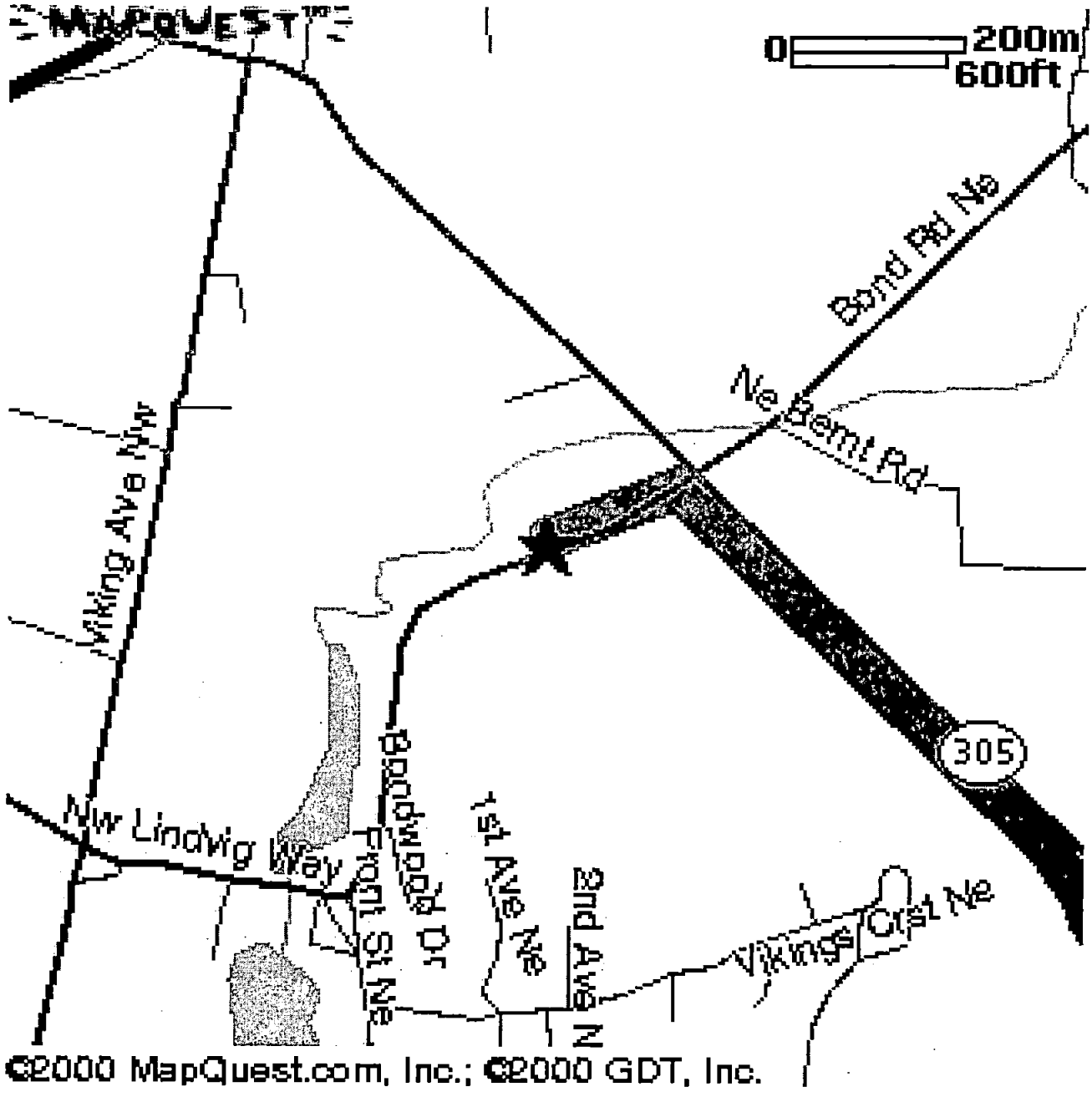
Hospital Phone #: 360/779-7011

Directions to Hospital

North Kitsap Medical Ctr
20696 Bond Rd NE, Poulsbo, WA 98370
(360) 779-6527

	Directions	Miles
1.	Start out going East on **NE VINCENT RD** towards **FLETCHER BAY RD NE** by turning left.	0.2
2.	Turn SLIGHT LEFT onto **FLETCHER BAY RD NE**.	1.2
3.	**FLETCHER BAY RD NE** becomes **FLETCHER BAY RD NE/WA-162**.	0.6
4.	**FLETCHER BAY RD NE/WA-162** becomes **MILLER RD/WA-162**.	0.4
5.	**MILLER RD/WA-162** becomes **MILLER RD NE**.	1.5
6.	Turn SLIGHT LEFT onto **PETERSON HILL RD NE**.	0.5
7.	Turn LEFT onto **NE BERGMAN RD**.	0.2
8.	**NE BERGMAN RD** becomes **MANZANITA RD NE**.	1.1
9.	**MANZANITA RD NE** becomes **HENDERSON RD NE**.	0.2
10.	Turn RIGHT onto **NE RALSTON RD**.	0.1
11.	Turn LEFT onto **KOMEDAL RD NE**.	0.5
12.	Turn RIGHT onto **NE SEABOLD RD**.	0.0
13.	Turn LEFT onto **WA-305**.	6.8
14.	Turn LEFT onto **BOND RD NE**.	0.1

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Broadpond Dr
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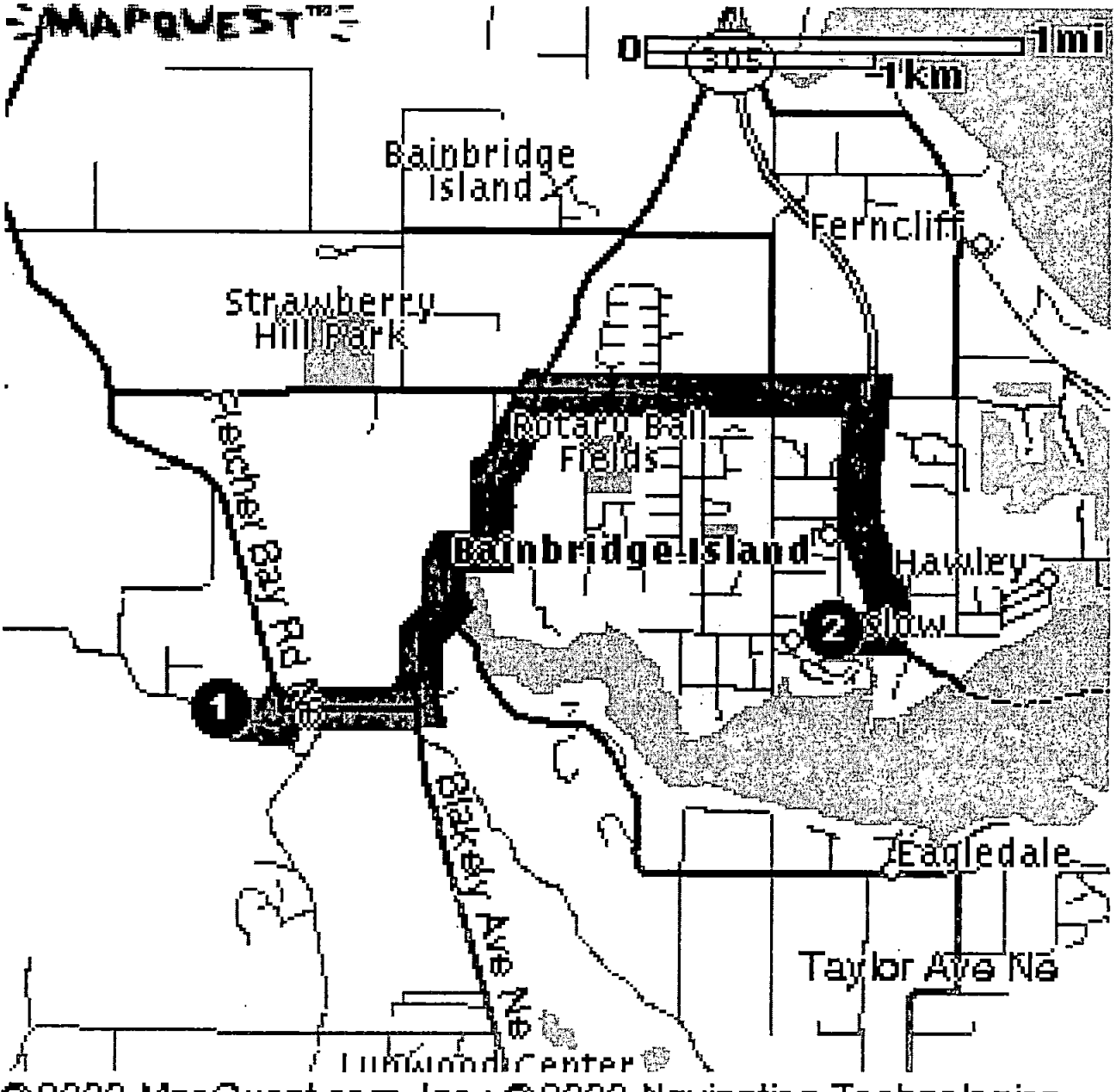
2nd Ave Ne
Front St Ne
Nw Lindvig Way
Viking Ct
1st Ne
©2000 MapQuest.com, Inc.; ©2000 GDT, Inc.

Virginia Mason Winslow Clinic
380 Winslow Way E
(206) 842-5632

Directions to Cliniv

Start out going East on **NE VINCENT RD** towards **FLETCHER BAY RD NE** by turning left.	0.2
Turn RIGHT onto **BUCKLIN HILL RD NE.**	0.7
Turn SLIGHT LEFT onto **EAGLE HARBOR DR NE.**	0.2
Turn RIGHT onto **WYATT WAY NW.**	0.1
Turn LEFT onto **FINCH RD NE.**	0.3
Turn RIGHT onto **SPORTSMAN CLUB RD NE.**	0.3
Turn RIGHT onto **NE HIGH SCHOOL RD.**	0.9
Turn RIGHT onto **WA-305.**	0.8
Turn RIGHT onto **WINSLOW WAY E.**	0.1



CH2M HILL HEALTH AND SAFETY PLAN

Attachment 5

Project H&S Forms and Permits

CH2M HILL HEALTH AND SAFETY PLAN

Attachment 6

Project Activity Self-Assessment Checklists

CH2MHILL

H&S Self-Assessment Checklist - DRILLING

This checklist shall be used by CH2M HILL personnel **only** and shall be completed at the frequency specified in the project's HSP/FSI.

This checklist is to be used at locations where: 1) CH2M HILL employees are potentially exposed to hazards associated with drilling operations (complete Sections 1 and 3), and/or 2) CH2M HILL oversight of a drilling subcontractor is required (complete entire checklist).

SSC/DSC may consult with drilling subcontractors when completing this checklist, but shall not direct the means and methods of drilling operations nor direct the details of corrective actions. Drilling subcontractors shall determine how to correct deficiencies and we must carefully rely on their expertise. Items considered to be imminently dangerous (possibility of serious injury or death) shall be corrected immediately or all exposed personnel shall be removed from the hazard until corrected.

Completed checklists shall be sent to the health and safety manager for review.

Project Name: _____ Project No.: _____

Location: _____ PM: _____

Auditor: _____ Title: _____ Date: _____

This specific checklist has been completed to:

☐ Evaluate CH2M HILL employee exposures to drilling hazards
☐ Evaluate a CH2M HILL subcontractor's compliance with drilling H&S requirements

Subcontractors Name: _____

Check "Yes" if an assessment item is complete/correct.
Check "No" if an item is incomplete/deficient. Deficiencies shall be brought to the immediate attention of the drilling subcontractor. Section 3 must be completed for all items checked "No."
Check "N/A" if an item is not applicable.
Check "N/O" if an item is applicable but was not observed during the assessment.
Numbers in parentheses indicate where a description of this assessment item can be found in Standard of Practice HS-35.

SECTION 1	Yes	No	N/A	N/O
PERSONNEL SAFE WORK PRACTICES (3.1)				
1. Only authorized personnel operating drill rig	☐	☐	☐	☐
2. Personnel cleared during rig startup	☐	☐	☐	☐
3. Personnel clear of rotating parts	☐	☐	☐	☐
4. Personnel not positioned under hoisted loads	☐	☐	☐	☐
5. Loose clothing and jewelry removed	☐	☐	☐	☐
6. Personnel instructed not to approach equipment that has become electrically energized	☐	☐	☐	☐
7. Smoking is prohibited around drilling operation	☐	☐	☐	☐
8. Personnel wearing appropriate PPE, per HSP/FSI	☐	☐	☐	☐

SECTION 2	Yes	No	N/A	N/O
GENERAL (3.2.1)				
9. Daily safety briefing/meeting conducted with crew	☐	☐	☐	☐
10. Daily inspection of drill rig and equipment conducted before use	☐	☐	☐	☐
DRILL RIG PLACEMENT (3.2.2)				
11. Location of underground utilities identified	☐	☐	☐	☐
12. Safe clearance distance maintained from overhead powerlines	☐	☐	☐	☐
13. Drilling pad established, when necessary	☐	☐	☐	☐
14. Drill rig leveled and stabilized	☐	☐	☐	☐
DRILL RIG TRAVEL (3.2.3)				
15. Rig shut down and mast lowered and secured prior to rig movement	☐	☐	☐	☐
16. Tools and equipment secured prior to rig movement	☐	☐	☐	☐
17. Only personnel seated in cab are riding on rig during movement	☐	☐	☐	☐
18. Safe clearance distance maintained while traveling under overhead powerlines	☐	☐	☐	☐
19. Backup alarm or spotter used when backing rig	☐	☐	☐	☐
DRILL RIG OPERATION (3.2.4)				
20. Kill switch clearly identified and operational	☐	☐	☐	☐
21. All machine guards are in place	☐	☐	☐	☐
22. Rig ropes not wrapped around body parts	☐	☐	☐	☐
23. Pressurized lines and hoses secured from whipping hazards	☐	☐	☐	☐
24. Drill operation stopped during inclement weather	☐	☐	☐	☐
25. Air monitoring conducted per HSP/FSI for hazardous atmospheres	☐	☐	☐	☐
26. Rig placed in neutral when operator not at controls	☐	☐	☐	☐
DRILL RIG MAINTENANCE (3.2.5)				
27. Defective components repaired immediately	☐	☐	☐	☐
28. Lockout/tagout procedures used prior to maintenance	☐	☐	☐	☐
29. Cathead in clean, sound condition	☐	☐	☐	☐
30. Drill rig ropes in clean, sound condition	☐	☐	☐	☐
31. Fall protection used for fall exposures of 6 feet or greater	☐	☐	☐	☐
32. Rig in neutral and augers stopped rotating before cleaning	☐	☐	☐	☐
33. Good housekeeping maintained on and around rig	☐	☐	☐	☐
DRILLING AT HAZARDOUS WASTE SITES (3.2.6)				
34. Waste disposed of according to HSP	☐	☐	☐	☐
35. Appropriate decontamination procedures being followed, per HSP	☐	☐	☐	☐

SECTION 3

Complete this section for all items checked "No" in Sections 1 or 2. Deficient items must be corrected in a timely manner.

Item #	Corrective Action Planned/Taken	Date Corrected

CH2M HILL HEALTH AND SAFETY PLAN

Attachment 7

Applicable Material Safety Data Sheets

CH2M HILL HEALTH AND SAFETY PLAN

Attachment 8

External Radiation Dose Monitoring

Standard of Practice HS-10

1.0 Introduction

This Standard of Practice (SOP) represents CH2M HILL's written external dosimetry (dose monitoring) program. When occupational exposure to external radiation hazards is suspected, external dosimetry may be necessary; it uses specialized instruments or other measuring devices to continuously or periodically determine the amount of penetrating external radiation present in a given area and the associated worker exposure. External dosimetry is generally required when working at sites with known radioactive contamination (such as facilities, soils, sediments, etc.), working with radioactive sources (such as nuclear density gauges, industrial radiography systems, etc.), or working at regulated sites (such as DOE, NRC, etc.). External dosimetry results are compared to established radiation dose limits to ensure exposures are being maintained as low as reasonably achievable and to document compliance with legal standards.

This standard of practice discusses basic external radiation dosimetry practices and provides a decision tree to determine when an external dosimetry program is needed. CH2M HILL's program is described in the CH2M HILL Radiation Safety Manual.

2.0 Regulatory Review

The Nuclear Regulatory Commission (NRC) and OSHA publish radiation exposure standards and monitoring protocols which must be followed when a potential for employee exposure to radiation exists. Likewise, federal agencies such as the DOE and the EPA publish comprehensive guidelines that incorporate the federal regulations and must be followed in certain specific instances. Such guidelines generally are enforceable. Radiation sources (such as nuclear density gauges) must be licensed under federal and state law. Use of these sources is strictly regulated, requiring training and rigid documentation procedures.

3.0 Responsibilities

3.1 Project Manager (PM)

The PM is responsible for ensuring the implementation of the appropriate external dosimetry monitoring and radiation protection program for affected CH2M HILL employees, and that CH2M HILL subcontractors implement appropriate programs as necessary for their employees. Site-specific procedures must be documented in the health and safety plan or other appropriate project document.

CH2M HILL employees and subcontractors must be informed of the hazards, and they must comply with established external radiation dosimetry procedures. Supplemental programs (that is, contamination controls surveys, internal radiation dosimetry, airborne contamination monitoring) may be necessary if external dosimetry procedures are not sufficient to provide adequate protection.

The site safety coordinator (SSC), health and safety manager (HSM), and radiation health manager (RHM) all support the PM in implementing the external radiation dosimetry program.

3.2 Radiation Health Manager (RHM)

The RHM is responsible for developing the external radiation dosimetry program in coordination with the HSM. They also assist the project manager and the SSC in implementing the program. The RHM or

their representative is responsible for reviewing and investigating dosimetry results, and for providing technical support as necessary or requested by the project.

3.3 Health and Safety Manager (HSM)

The HSM is responsible for overall site safety program development, as well as the day-to-day oversight of program implementation, including integration of radiation dosimetry with other components of the safety program. The HSM provides routine technical support to the SSC and coordinates RHM support.

3.4 Site Safety Coordinator (SSC)

For projects with simple or low-level radiological hazards, responsibility for implementation is assigned to the SSC. The SSC has the authority to stop work being done by CH2M HILL and its subcontractors if the provisions of this SOP (or any other radiation protection program) are not followed. At sites with more complex or higher-level radiological hazards, health physics technicians may be assigned to the project if the project manager or SSC does not have the knowledge or training to implement the radiation protection plan. The health physics technicians would then be responsible for implementing the program.

3.5 CH2M HILL Employees

CH2M HILL employees are responsible for wearing their assigned TLD badge when onsite, appropriate handling of the badges, returning their badges quarterly for analysis, and reporting loss of a TLD badge to the RHM or their representative.

4.0 CH2M HILL Policy

It is the policy of CH2M HILL to conduct its radiological operations in a manner that ensures the health and safety of all its employees, subcontractors, and the general public. In achieving this objective, CH2M HILL ensures that radiation exposure to its workers and the public, as well as releases of radioactivity to the environment are maintained below regulatory limits. Deliberate efforts will be taken to further reduce exposures and releases in accordance with a process that seeks to make any such exposures or releases as low as reasonably achievable. CH2M HILL is fully committed to implementing a radiological control program of the highest quality that consistently reflects this policy.

5.0 Definitions

As low as reasonably achievable (ALARA) is the process through which reasonable efforts are made to reduce radiation exposure to workers, the public, and the environment, taking into consideration regulations, the current state of technology and socioeconomic factors.

External exposure is exposure to the body, body tissues, and organs from sources of penetrating ionizing radiation outside the body.

External whole body dose equivalent is the radiation dose, expressed in units of mrem, received from external exposure to penetrating radiation.

Ionizing radiation is any radiation consisting of ionizing particles or photons, and includes both alpha and beta particles, as well as gamma and x-rays.

Penetrating ionizing radiation, for dosimetry purposes, refers to any radiation capable of penetrating clothing and skin, resulting in the exposure of the whole body and internal organs. Gamma and x-rays are considered to be penetrating ionizing radiation.

Radiation dosimetry is the process of determining the radiation dose to individuals resulting from exposure to radiation.

Radiation screening refers to measuring radiation levels with a direct-reading instrument to determine if a radiation is present.

Geiger-Mueller (G-M) detector is a highly sensitive, gas-filled measuring device that operates at voltages high enough to produce multiple ionizations from each interaction with radiation, thus allowing detection.

Thermoluminescent dosimeter (TLD) is a badge used to record external beta and gamma radiation exposure. It has two parts: a holder, and an inner card containing lithium fluoride chips that store energy deposited by ionizing radiation. After the dosimeter is worn, it is analyzed by heating the chips, which then release the stored energy in the form of visible light. The amount of light indicates the ionizing radiation dose.

6.0 External Radiation Dosimetry Measurements

In general, external radiation dosimetry will be implemented at project sites where employees are likely to encounter detectable radiation or radioactive materials in the course of their work. In any event, external radiation dosimetry is required whenever an annual external whole body dose greater than 100 mrem is expected. External radiation doses are generally measured using TLD badges. TLD badges will be issued to each CH2M HILL employee expected to be exposed while working onsite. The groups of employees automatically included under this policy are nuclear density gauge users, site workers regulated by the Department of Energy (DOE) or the Nuclear Regulatory Commission (NRC), and employees who work at hazardous waste sites that contain radioactive materials.

Employees performing hazardous waste work will not routinely be monitored for radiation exposures using TLD badges. Attachment 1 provides the decision process to be used in determining the need for an external radiation dosimetry program.

7.0 Attachments

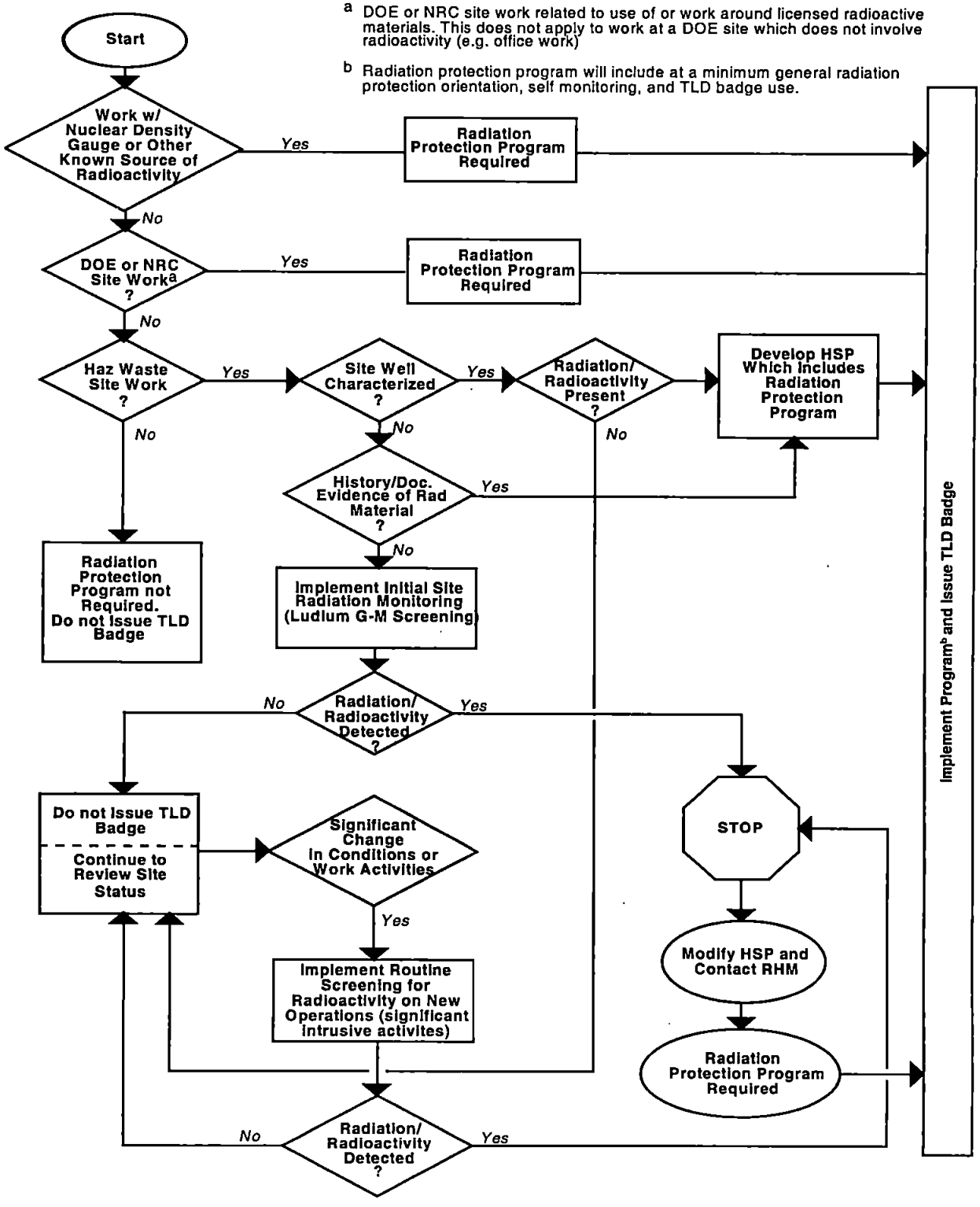
Attachment 1: External Radiation Dosimetry Program Decision Diagram.

CH2MHILL

External Radiation Dose Monitoring

2.2.3 Standard of Practice HS-10

Attachment 1: Radiation Monitoring, Screening and Protection Program Decision Diagram



APPENDIX E

Contingency Plan

APPENDIX E

Contingency Plan

1 Introduction

This document presents contingency planning procedures to be implemented during the remedial construction of the Bainbridge Island Landfill MTCA cleanup site. The remedial action consists of reclaiming refuse materials by excavating and sorting the refuse, regrading the site with the inert fraction, and covering the regraded inert material with clean soil. Refuse and other waste sorted from the excavation will be disposed offsite at a permitted facility. The site is owned by Kitsap County, and the remediation is being conducted by the Public Works Division under a Consent Decree with the Washington State Department of Ecology.

The Bainbridge Island Landfill is located west of Eagle Harbor on Bainbridge Island, near Seattle, Washington (Figure E-1). Access to the landfill is restricted to the gated northern entrance, which is off of Vincent Road.

1.1 Objective

The objective of contingency planning is to develop a plan and corresponding response procedures that will ensure emergency preparedness and provide means for mitigating the consequences of emergencies or unplanned outcomes, including low-probability events, in order to protect the health and safety of the general public and personnel. The plan and the emergency response procedures provide directions for response to emergencies. These emergencies may vary in severity from minor personnel injuries to situations involving real or potential offsite releases. The onsite emergency response efforts and the corresponding emergency response procedures are described in this plan.

1.2 Purpose

The purpose of this Contingency Plan is to provide organization and procedures for managing unexpected outcomes, including potential emergencies, that may arise during the remedial action. A remedial investigation (RI) was completed to define the nature and extent of potentially hazardous materials at the site. The RI included several test explorations into the main landfill refuse to further characterize the waste. The test explorations included both drilled small-diameter borings and larger dug excavations. Observations of the physical and chemical character of the materials encountered indicate that the refuse is composed of domestic waste with small amounts of construction waste. Included in domestic refuse will be small quantities of household hazardous waste such as paint, solvents, and cleaning products. Household appliances and automobile parts were also encountered. Although no evidence was found of industrial or hazardous waste (either during the test explorations or a review of the landfill history provided by former operators), the possibility still exists that the refuse contains undiscovered hazardous, industrial, or other waste that will require special handling.

This plan includes steps needed to manage unanticipated wastes that may be encountered during the excavation and processing. It also includes a description of any staging equipment, machinery, and materials located at the site for use during construction. It includes response actions to be taken in the event of a fire, medical, rescue, or hazardous material emergency. This plan also includes actions to be taken in the event of the unexpected gathering of unauthorized persons (e.g., onlookers, trespassers, etc.).

Note: This plan is a working document. At a minimum, revisions will be made and communicated when there is a significant increase in the hazards of foreseeable emergencies or changing conditions at the site, and their corresponding responses.

1.3 Definitions

1.3.1 Emergency

The Contingency Plan is activated in cases of fire, hazardous material spills/releases, confined space rescues, and other emergencies. The Contingency Plan may also be used for non-emergency tasks such as spill response and cleanup.

1.3.2 Fire

A fire is the unplanned and undesired combustion of materials that poses a threat to employees and property.

Incipient Fire—A fire that is in its early stages and can be easily extinguished with one portable fire extinguisher or a 1 ½-inch hose line and does not require protective clothing or respiratory protection.

Fires involving hazardous materials are addressed as Hazardous Materials Incidents.

Employees, contractors, or visitors are instructed to report all fires that occur at the site to the Onsite Construction Manager or the Contractor Foreman. (See Evacuation Procedures in Section 5.)

1.3.3 Hazardous Materials

Regulations define many different types of materials as hazardous. Generally, a hazardous material is a substance that may burn or harm people when it is released. This plan is geared to respond to incidents involving all of these definitions, which are grouped together, when referring to hazardous materials. Listed below are the different terms and their defining regulations:

Hazardous Chemical—defined by the federal Occupational Safety and Health Administration (OSHA) as having hazards that are to be communicated to employees that may be exposed to them.

Highly Hazardous Chemical—a listed chemical that falls under OSHA Process Safety Management regulations that is handled above threshold quantities. These chemicals are listed in the regulation based on their toxic, reactive, flammable, or explosive properties.

Hazardous Material—defined by the federal Department of Transportation (DOT) as having hazards that must be managed while the material is transported.

Hazardous Substance—defined in MTCA as any dangerous or extremely hazardous waste as defined or designated by rule under Washington law, and includes petroleum products, solid waste decomposition products, or any other substance determined to present a threat to human health or the environment if released.

Hazardous Waste—defined by federal and state regulations as having the potential to threaten health or the environment if improperly disposed.

1.3.4 Spills and Releases

Incidental Release—a spill or release of a hazardous or toxic material that is **all** of the following:

- Limited in quantity
- Does not pose a significant threat to the safety and health of people in the area or to properly trained personnel that clean it up
- Not likely to become a higher-level emergency in a short period of time
- Can be cleaned up by trained personnel with readily available materials and equipment.

Response to an incidental release would include protecting uninvolved persons, eliminating the hazard, cleaning up any residuals, and following procedures for any required regulatory reporting.

Mid-Level Release—an uncontrolled spill or release of a hazardous or toxic material that is **any** of the following:

- More than an incidental release that area personnel can clean up
- Requires special personal protective equipment that area employees are not trained to use
- Requires special materials or equipment to clean up that are not available to area employees

Mid-level releases are focused on containing and cleaning up spilled materials. The extent of the spill might be large, but the actions being taken are defensive, or do not involve direct contact with the spilled hazardous substance to stop the release.

Note: An outside responder may be required to respond to a mid-level release.

Hazardous Materials Incident—an uncontrolled spill or release of a hazardous material that requires an aggressive response or direct contact with the material to stop it. Personnel working in a hazardous materials release incident require personal protective equipment and/or clothing to reduce their exposure to safe levels.

There are three severity levels of hazardous material incidents. These are based on the amount of material released and the evacuation required.

- **Level One**—A potential emergency. The incident is confined to a small area and evacuation is limited, if any.

- **Level Two**—A limited emergency. A restricted area of the site is evacuated. Outside Responders may or may not respond.
- **Level Three**—A full emergency. Hazards extend over a large area and require a large-scale evacuation of the site and/or surrounding areas. Outside Responders would be required.

1.3.5 Confined Space Emergency

Confined spaces are those areas that cannot be easily entered or exited and pose any of several hazards to workers inside them. Confined space hazards are managed by the site's Health and Safety Plan. The only anticipated confined-space scenario will be that of an open excavation trench (or area) in refuse. The Contingency Plan focuses on rescue operations only.

In general, a confined space emergency exists when non-entry rescue assistance is needed or when any entry rescue is required. The need for a rescue may be reported by a confined space entrant or attendant. A rescue would typically be required when injuries, collapse, engulfment, or entanglement occur. The cause of the emergency may or may not be directly related to the hazards posed by the confined space.

There are three general types of confined space emergencies. These are based on the type of rescue required.

Self-Rescue—the person in the confined space realizes that a hazard exists and can leave without assistance. Typically, this is when a worker might feel ill for reasons that may or may not be related to the actual hazards present.

Non-Entry Rescue—retrieving a victim from within a confined space that involves lifelines attached to a mechanical retrieving device which should be attached to a tripod or other support system for vertical entries.

Entry Rescue—physical entry of a rescuer into a confined space to retrieve a victim. This type of rescue is not to be attempted by any employee except confined space rescue team members taking part in a coordinated response.

Note: Outside responders may be used to facilitate Non-Entry and Entry rescues.

1.3.6 Other Emergencies

There are other situations that might require emergency services. Generally, these would be circumstances not already defined that pose the same level of threat or potential threat to life, health, safety, environment, or property. Following are several examples of other emergencies that may require emergency services:

Medical Emergencies—An emergency will be declared if an employee, contractor, or visitor is injured while working or visiting the Bainbridge Island Landfill.

Weather or Natural Disaster—A site emergency will be declared if severe weather threatens the safety of employees, contractors, visitors, or site property.

Bombs—A site emergency will be declared if a live bomb (or munitions) is discovered during excavation.

Demonstrations—An emergency will be declared if demonstrations or gatherings of unauthorized persons threaten to disrupt the normal day-to-day operation during excavation at the Bainbridge Island Landfill.

Note: An outside responder may be required for other emergencies.

1.3.7 Prevention

Prevention of an emergency involves emergency awareness on the job. The site's Health and Safety Plan must be followed to ensure the highest level of prevention. CH2M HILL has prepared a site-specific Health and Safety Plan for their employees that will work on site. This Health and Safety Plan is included as Appendix D of the Engineering Design Report. Each site contractor is responsible for preparing a site-specific Health and Safety Plan that addresses potential hazards for their own employees.

Employees and contractors are instructed, through their own site-specific Health and Safety Plan, of specific hazards associated with the materials and equipment to be used for the duration of the excavation, and the potential exposures related to digging in the area. They are also instructed to report immediately any unusual occurrences.

Prevention also involves periodic inspection and testing of all monitoring equipment, to ensure it is in proper working order.

2 Pre-Emergency Planning and Coordination with Outside Responders

Preplanning information is used to anticipate potential emergencies. This information consists of materials, equipment, and facilities that may cause or be involved in an emergency.

Preplanning is also the process of analyzing the materials, equipment, and facilities at a site, and establishing guidelines and procedures for responding to incidents. Emergencies involving other types of hazards such as weather or bomb threats should also be included.

It is CH2M HILL's responsibility to protect their employees from any danger that may originate at this site. Contractors will be responsible for providing their own safety initiatives. Both CH2M HILL and the prime remediation contractor, along with the site owner, Kitsap County, are responsible for protecting visitors, the public, and the environment from potential site hazards. Every effort is made to provide failsafe systems that will not allow hazardous or toxic emissions to escape the site. However, certain events could preclude the accomplishment of this plan.

Planning includes examining the hazards and recommended procedures to isolate the hazards, based on generally accepted standards, and experience with the site-specific factors. A response procedure should lay out the basics for physically preparing for and mitigating the incident.

As established in this plan, initial contact will be made to outside responders in the event that a community evacuation (See Section 5) is necessary. For a list of the site contacts and

outside responders to handle various emergency incidents at the Bainbridge Island landfill, refer to Table E-1.

2.1 Fires

Fire preplanning is addressed by the Fire Prevention Plan, located in Section 6 of this Contingency Plan. When a fire has been reported, the Remediation Contractor Foreman is to immediately assess the fire, notify the CH2M HILL Onsite Construction Manager (see Section 3 for personnel position descriptions), and implement an incident response plan based on the location and severity of the fire.

The CH2M HILL Onsite Construction Manager (or Remediation Contractor Foreman) will call **911** to notify the Fire Department to respond to the fire, if needed. The general guidelines for a fire response are as follows:

1. The Remediation Contractor Foreman will assess the incident to determine if **911** (the Fire Department) should be called.
2. Contain the fire as close as possible to the original source until the Fire Department arrives. The most senior responding member will assess the incident and, if needed, call for assistance from additional fire departments or a hazardous waste resource.
3. Protect nearby equipment and structures from the fire.
4. Prevent the fire from causing an explosion.
5. Extinguish the fire, if possible, according to the severity.

2.2 Hazardous and Potentially Toxic Materials

Landfill gas is expected to be encountered during excavation but should dissipate rapidly into the atmosphere. Monitoring for landfill gas, which consists primarily of methane, is addressed in the Health and Safety Plan. Other potentially hazardous or toxic materials could be encountered during excavation and sorting.

The following materials were either found or have the potential to be found at the Bainbridge Island Landfill:

- Found – domestic waste (including burned residue), construction debris, tires, automobiles (& parts), appliances
- Potential to be Found – household waste, oily residue, batteries
- Potential to be Found (No Evidence) – PCBs, compressed gas cylinders, ordnance (bullets, flares, etc.), industrial waste, radiological waste, biological waste

Table E-2 lists some specific substances and items that could be found at the site, and the immediate responses for each.

As with fire and medical emergencies, the primary contact for hazardous and potentially toxic materials emergency response will be provided by contacting **911**. Depending on the type of incident, the CH2M HILL Onsite Construction Manager will call 911 who will notify other agencies as appropriate. One agency that should be contacted by 911 in the case of

chemical spills or radiological waste is the Kitsap County Department of Emergency Management (DEM). The Construction Manager should verify that the 24-hour duty officer from DEM will be notified by the 911 call center.

2.3 Emergency Medical/First Aid Services

Emergency medical support will be provided by contacting 911. There are two medical facilities in close proximity of the landfill—Virginia Mason Winslow Clinic (Bainbridge Island) and North Kitsap Medical Center (Poulsbo). Contact information for both facilities can be found in Table E-1.

3 Communication Procedures

The personnel that coordinate the Contingency Plan will work in specific roles during the excavation. Standards of the incident response system are used to coordinate their roles. This section lists the roles that are played in the incident response system as it will be used at this site.

Figure E-2 is a chart showing the project hierarchy (with the names of each individual involved in emergency response). A listing of their roles and responsibilities is included in this section.

3.1 Lines of Authority

The following is an outline of the lines of authority and the corresponding roles and responsibilities of those individuals involved in the emergency response system.

3.1.1 Kitsap County Project Manager

- Serves as the director of the overall project
- Has final responsibility for ensuring proper reporting of the emergency.
- Ensures that the proper coordinators will be present onsite to facilitate the Contingency Plan during excavation through assignments to site contractors.

3.1.2 CH2M HILL Project Manager(s)

- Assists the Kitsap County Project Manager by providing onsite guidance for all other coordinators
- Is responsible for ensuring that this Contingency Plan and supporting procedures are reviewed by all employees, contractors, and visitors prior to work commencing, and as required by changes at the site or personnel assignments
- Makes initial notifications to all federal, state, and local agencies governing any specific emergency or incident that takes place at the site
- Makes follow-up calls with additional information, if necessary, to federal, state, and local environmental agencies

- Notifies the Kitsap County Project Manager of any emergencies, incidents, or environmental regulatory issues, and the corresponding actions taken. Will provide the KC Project Manager with an update after the incident is under control and status reports during incident responses.

3.1.3 CH2M HILL Onsite Construction Manager (CM)

- Reports to the CH2M HILL Project Manager and provides assistance in the coordination of day-to-day field activities
- Communicates with Remediation Contractor Foreman about day-to-day activities, project schedule and status, and any issues of concern or clarification
- Is responsible for overseeing other CH2M HILL employees, regulatory personnel, and visitor activity while they are on the site
- Ensures that there is proper communication between all persons working at the site (point of contact for contractor foremen)
- Keeps a chronological record of any emergency, incident, or environmental regulatory issue and the corresponding actions taken and reports them to the CH2M HILL Project Manager(s).

3.1.4 CH2M HILL Site Safety Coordinator (SSC)

- Reports to the CH2M HILL Construction Manager any safety-related incidents that occur on the site. (Note: CH2M HILL Construction Manager may perform SSC duties)
- Provides onsite safety supervision of CH2M HILL employees during day-to-day activities
- Notifies contractor of situations considered to be imminently dangerous to site workers

Note: Other SSC duties can be found in the site-specific Health and Safety Plan.

3.1.5 Remediation Contractor Foreman

- Reports to the Kitsap County Project Manager information on any fire, hazardous material release/spill, or emergency that occurs during the excavation; simultaneously notifies CH2M HILL CM
- Is responsible for protection of their personnel, equipment, facilities, and the surrounding environment of the construction site.
- Notifies the CH2M HILL SSC about any safety-related incidents that occur on the site
- Determines the course of action to take in the event of a fire, hazardous material release/spill, or emergency (includes notifying and coordinating emergency treatment from outside responders when necessary)
- Follows up with a written report of the incident(s) to the Kitsap County Project Manager (to be reviewed by CH2M HILL CM)

3.1.6 Remediation Contractor Field Supervisor

- Reports to the Contractor Foreman any fire, hazardous material release/spill, emergency, or safety-related incidents that occur in the field during day-to-day operations on the site

3.1.7 Regulatory Personnel

- Reports to the CH2M HILL Onsite Construction Manager any fire, hazardous material release/spill, emergency, or safety-related incidents that occur in the field during day-to-day operations on the site

3.1.8 Analytical Services Personnel

- Reports to the CH2M HILL Onsite Construction Manager any fire, hazardous material release/spill, emergency, or safety-related incidents that occur in the field during day-to-day operations on the site

3.2 Methods of Communication

One of the most important factors in the emergency response is communication. This starts with the individual finding the emergency, and extends to the site managers and outside responders.

3.2.1 Internal Communication

The methods of internal communication shall be as follows:

- Portable radios
- Internal telephones (cellular)
- Electronic pagers
- Audible alarm system (see Section 4)

The main communication for CH2M HILL employees and contractors during an emergency will be the radios.

3.2.2 External

Designated members of the project team will be on call during regular working hours each day during the excavation. Offsite emergency agencies, fire departments, hazmat or haz-waste responders, and other agencies, will use telephones to maintain a constant update of site events. All emergency phone numbers can be found in Table E-1.

3.3 Emergency Communication

3.3.1 Making Emergency Contact with Outside Responders

Depending on the severity of an emergency and the personnel affected, it will be the responsibility of either the CH2M HILL Onsite Construction Manager or Remediation Contractor Foreman to notify the appropriate Outside Responder. Table E-1 lists the contacts for various incidents.

3.3.2 Briefing the Media

In the event of an emergency that brings about media attention, the Kitsap County Public Affairs Coordinator or his or her designee (the CH2M HILL Project Manager) will meet with the news media and escort them to the outer perimeter of the site near the entrance gate at Vincent Road. The Public Affairs Coordinator or his or her designee will check the credentials of the media personnel prior to releasing any information. The statement (which may need upper-level approval) to the media may contain the following:

- Acknowledgment that an emergency exists, with a brief description of the nature of the emergency, including approximate location of the incident and time.
- Number of injured, if known. No comment on the extent of the injuries is to be made at this time. Names of the injured or deceased are not to be released until notification of family members is completed and confirmed. A comment to this effect must be made at this time to the media along with a comment that as soon as family members are notified and the extent of injured is known, this information will be released.
- Appropriate family members must be notified promptly, especially if the injured are taken to a hospital for treatment or examination.
- State that a second bulletin will be forthcoming as soon as the situation has been assessed and accurate information is available. Dollar amounts should not be attached to losses incurred in an emergency until such information is cleared by the Kitsap County Risk Management Department.

3.3.3 Follow-Up Action

The day after the emergency has occurred, follow-up news containing known facts will be released by the Kitsap County Public Affairs Coordinator or his or her designee (the CH2M HILL Project Manager). In a major emergency, it may be necessary to call a press conference. In less extreme cases, a follow-up news release will be sufficient. The follow-up release may contain:

- Details not previously released
- Causes of the accident, if determined
- An estimate of damages, if possible (any estimate of damage must be checked and approved by the Kitsap County Risk Management Department and Prosecuting Attorney's Office)
- Effectiveness of the company safety program in preventing further injuries and damages
- Assurance that all danger has passed
- Biographical data on injured employees: names, addresses, ages, occupations, lengths of service, family status
- Expression of thanks to all outside responders assisting in emergency operations

4 Alert/Alarm System

The complete response to an incident may be divided into several steps. They are:

- Recognition
- Reporting
- Alerting
- Evacuation
- Response
- Termination

This section addresses the alerting of employees, contractors, and visitors, and possibly the community. Alerting is what occurs between the reporting of the emergency and when the outside responders arrive at the site.

Employees, contractors, and visitors are given basic instructions in recognizing and reporting emergencies. Emphasis is given to immediate reporting before any other action is taken. Secondary instructions include securing the area and denying entry to the area, or evacuating as needed. A physical response to an emergency is permissible only by trained emergency response personnel.

Note: Control of the incident is the responsibility of the Remediation Contractor Foreman and the outside responder when they arrive on the scene.

4.1 Site Alarm System

The site alarm system at Bainbridge Island Landfill will provide warning for necessary emergency actions (as cited in Section 5) or for reaction time for safe escape of employees from the work place or immediate work area, or both.

An audible alarm will be sounded using an air horn to alert employees, contractors, or visitors of an emergency event. The audible alarm will sound according to the type of emergency or evacuation taking place. Table E-3 summarizes the different tones (see Section 5 for details on the types of evacuations).

When an emergency is discovered by an employee, visitor, or contractor, that person's immediate supervisor will be notified by radio, telephone or by personal contact. The supervisor will follow the Lines of Authority in communicating the emergency (as outlined in Section 3). The immediate supervisor will respond to the scene to investigate and to determine the severity and type of incident. If needed, the immediate supervisor will contact the CH2M HILL Onsite Construction Manager to actuate the alarm system. This is to allow for an early assessment of the hazards as well as to provide a safe approach by the outside responders.

4.2 Community Alert

Emergencies that may pose a threat to the community will be handled by the appropriate emergency responder. The CH2M HILL Onsite Construction Manager or the Remediation Contractor Foreman will call **911**. Emergency contact numbers are in Table E-1.

5 Evacuation Plan

This section describes how the need for an evacuation is determined and how the evacuation is managed.

In general, an evacuation is needed if the hazards from an emergency pose or are likely to pose a significant threat to safety or health outside of the immediate vicinity of the incident. There are different emergencies that might indicate an evacuation, and different levels of evacuation based on the area that is cleared. The purpose of evacuation is to remove the threatened people from the hazard area until safe conditions can be restored.

The order to evacuate will be transmitted by telephone or radio to the affected area where the proper alerting procedures will be initiated (refer to Section 4). The order to evacuate will include:

- Which employees, contractors, or visitors must evacuate from the affected areas
- The location where personnel must assemble, depending on prevailing wind direction and the nature of the incident
- Employees must remain in the safe area(s) until the Onsite Construction Manager and the Onsite Safety Manager terminate the evacuation and give the all clear

5.1 Types of Evacuations

An evacuation may be required for a localized area within the site, or over a wide area, including the neighboring community. The priority of an evacuation may be total and immediate, or a partial evacuation of some employees and/or contractors, with a delayed evacuation of others.

In some cases, only those employees or contractors in the affected area may be expected to evacuate or move to a safe area (such as when there is a local fire).

Different levels of evacuation are used to minimize additional hazards due to the nature or severity of the incident. Table E-4 lists examples of types of evacuations that could occur at the Bainbridge Island Landfill site.

Note: The area and priority of the evacuation are determined by the CH2M HILL Onsite Construction Manager based on information provided by the CH2M HILL SSC and/or Remediation Contractor Foreman.

To ensure that no one is left behind in the event that a disaster or other emergency makes it necessary to evacuate personnel from involved areas, the individuals listed in Table E-5 are assigned the responsibility of ensuring a safe and orderly evacuation of their assigned areas. Once evacuation is accomplished, these individuals have the additional responsibility for an accurate accounting of all employees, contractors, and/or visitors in their assigned area.

5.2 Site Evacuation Routes

An evacuation route map is included in Figure E-3. In the event of an evacuation, employees, contractors, and visitors should proceed to the nearest indicated exit, then immediately proceed cross-wind then upwind to one of the assembly points indicated on the evacuation

map. Primary routes are identified by a solid pattern. Secondary routes are identified by a dashed pattern.

5.3 Evacuation Staging Areas

Safe places of refuge are preselected areas at the site that are used to gather employees, contractors, or visitors that have evacuated their work areas. These areas will be identified by posted signs that read **SAFE AREA 1 and SAFE AREA 2**. The Safe Areas are depicted on the site evacuation route map (Figure E-3).

- Safe Area 1—Site Entrance Gate
- Safe Area 2—CH2M HILL Trailer Staging Area

6 Fire Prevention Plan

This section establishes a Fire Prevention Plan in compliance with 29 CFR 1910.38(b) for the Bainbridge Island Landfill Project. This procedure applies to all Kitsap County and CH2M HILL employees, contractors, or visitors onsite.

6.1 Site Fire Hazards

The major workplace fire hazards and their proper handling and storage procedures are listed in Table E-6. The type of fire protection equipment or systems which can control or contain a fire are also listed for each hazard.

Contractor management in each work area shall control accumulation of flammable and combustible waste material and residues so that they do not contribute to a fire emergency. The intent is to ensure that hazardous accumulations of combustible waste materials are controlled so that a fast-developing fire, rapid spread of toxic smoke, or an explosion will not occur. Large accumulations of waste paper or trash can pose a significant fire hazard.

Oil-soaked rags have to be treated differently than general paper or trash. Oil-soaked rags should be stored in metal containers with lids.

Employees and contractors should communicate any major workplace fire hazards to their immediate supervisor, report when a fire extinguisher or the fire hose is actuated, and return fire protection equipment to its proper position and location after use.

6.2 Designated Smoking Areas

Smoking is not allowed in potentially hazardous areas or around potentially hazardous equipment. Smoking only is allowed in the contractor trailer area near the site entrance. Posting and strong enforcement are used to ensure compliance with smoking regulations. Smoking is only allowed in posted areas that will be determined after construction of the trailer area. For the smoking policy, refer to the site Health and Safety Plan.

6.3 Alternative Water Source and Fire Extinguishers

Due to the fact that there is no running water at the site or any known fire hydrants, alternative water sources must be identified. A portable water storage tank will be required onsite. Fire hose will be connected to the tank for use in fire protection.

Portable fire extinguishers will also be used during excavation at the site. Fire extinguishers can be found at the following locations:

- Northern trailer/staging area
- Contractor staging area
- Screen plant
- Each stockpile pad (6 total)
- Loadout area
- Diesel/gasoline storage areas

Note: It is assumed that staged large equipment and haul trucks will be equipped with fire extinguishers.

7 Spill Prevention Plan

This section gives information on the types of flammable/combustible or potentially hazardous substances that will be located at the site during excavation activities. This section also details the proper secondary containment and storage required for the substances and the regulations governing them.

7.1 Flammable Substances Inventory and Storage

This section describes the flammable/combustible substances that may be used at the site and includes information on flammable/combustible chemical storage and their respective quantities. If above certain threshold quantities, this information will be submitted to local and state planning agencies, as well as the local fire department. Table E-6 lists potential flammable substances and their locations. Note that a particular substance may be located in several places around the facility.

This is not a comprehensive list of all of the substances that exist on the site, but is a comprehensive list of those that are stored in amounts that are significant for preplanning purposes.

The location column lists a brief description of the precise location of the chemical, so that emergency responders can locate the area easily.

7.3 Spill Prevention

The contractor will be responsible for assessing the types, quantities, storage requirements, and spill prevention measures for any flammable/combustible, lubricating, or fueling substances they bring onto the site. The contractor will be required to establish a Spill Prevention Plan that meets all federal, state, and local regulatory requirements.

8 Other Emergencies

There are other situations that might require emergency services. Generally, these would be circumstances not already defined that pose the same level of threat or potential threat to life, health, safety, environment, or property.

8.1 Medical Emergency

In the event that an employee, contractor, or visitor is injured while visiting or working at the site, the following steps should be taken:

- Notify the CH2M HILL SSC and/or Remediation Contractor Foreman
- The Remediation Contractor Foreman will assess the condition and determine the next course of action (it is the responsibility of the Remediation Contractor Foreman to notify an outside responder when necessary)
- Notify the CH2M HILL Onsite Construction Manager of the emergency
- Follow up with a written report of the incident(s) to Kitsap County

8.2 Weather or Natural Disaster

A site emergency will be declared if severe weather (wind, electrical storm) or other natural disasters such as an earthquake or volcanic eruption threaten the safety of employees, contractors, visitors, or site property. The area and priority of the evacuation are determined by the CH2M HILL Onsite Construction Manager or Remediation Contractor Foreman, based upon information provided by the National Weather Services Center (see Section 5).

8.3 Bombs or Live Munitions

The following measures should be taken in the event that a bomb or live munitions are uncovered during excavation:

- Remediation Contractor Supervisor will stop work and notify the Remediation Contractor Foreman immediately of the device.
- The Remediation Contractor Foreman will call **911** to report that a suspicious object has been found (the appropriate responding agency will be notified by the 911 dispatch).
- The Remediation Contractor Foreman will notify the CH2M HILL Onsite Construction Manager, and will order all personnel to clear the area around the device. Do not attempt to touch, move, or disarm the device.
- The CH2M HILL Onsite Construction Manager will immediately notify the CH2M HILL Project Manager of the device that was found.
- Any equipment located near the bomb should be shut down. Any chemical-containing storage vessels should have the chemicals drained or be moved outside the danger area. This should only be done if it is known that there is enough time to carry out these activities.
- Actuate the alarm/alert system (see Section 4).

- After the device has been removed or deactivated, resume normal operations under the direction of the CH2M HILL Onsite Construction Manager; notify all areas and personnel by radio and telephone.
- The Remediation Contractor Foreman will prepare an incident report and submit it to the CH2M HILL Onsite Construction Manager.

8.4 Protest Rallies or Demonstrations

If a protest group should gather at the site entrance, the following procedures will be put into effect immediately:

- The main entrance will be closed or blocked in the event that a group appears at the site entrance. A security guard should be posted and prepared for possible verbal abuse, and the proper conduct should be maintained.
- The guard will immediately call the CH2M HILL Onsite Construction Manager, who has the authority to approach the group initially.
- The CH2M HILL Onsite Construction Manager may call 911 if he/she deems it necessary to keep control of the group.
- The main entry will be maintained in such a fashion to allow truck traffic to continue.
- The guard will be on standby to contact the CH2M HILL Onsite Construction Manager. If the group remains orderly and wants to have a discussion, it is possible that selected persons will be invited to meet with the Kitsap County Project Manager or his or her designee (CH2M HILL Project Manager).

If the group is hostile, and after an attempt to talk has been made by the Kitsap County Project Manager or his or her designee (CH2M HILL Project Manager) and has failed, the group will be asked to leave. If the group refuses, 911 will be called at the direction of the CH2M HILL Onsite Construction Manager.

9 Site Safety and Control Plan

The safety and security of response personnel and others in the area of an emergency response incident site are the joint concern of the CH2M HILL Onsite Construction Manager and the Remediation Contractor Supervisor. The use of a site Health and Safety Plan will greatly assist those in charge of ensuring the safety and health of employees on the site.

9.1 Hazard Analysis and Risk Analysis

A list of known and potentially hazardous materials that may be on the site can be found in Section 7 and Table E-2. All onsite personnel are responsible for becoming familiar with known and potential hazards and for reporting them to their direct supervisor if one is suspected.

9.2 Site Map

A general site plan showing the possible layout of construction facilities is included in Figure E-3. The construction layout may change as work progresses. The Onsite Construction Manager and the CH2M HILL Onsite Construction Manager are responsible for maintaining a current site plan available for emergency procedures. The Health & Safety Plan also includes site location maps and routes to local medical emergency facilities.

9.3 Site Security

Site security will be maintained by construction fencing placed around the construction areas and locking gates to prevent personnel and vehicle access. The CH2M HILL CM and the Remediation CS are responsible for securing the gate at the end of each day's work. Under emergency situations, a security guard may be posted at the main entrance. The main function of the guard is to:

- Secure entry points and remain until directed to evacuate by the Onsite Construction Manager or Onsite Safety Manager
- Monitor the radio for additional information
- Allow no one to enter the facility during an emergency incident unless ordered to do so by the Onsite Construction Manager or Contractor Foreman (whomever is responsible for contacting an outside responder)

The primary objective of the outside responders will be to isolate and control the incident area and restrict vehicles and unauthorized individuals to the area. The following is a list of three potential incident areas and how they are secured.

9.3.1 Fire Area

In fire emergencies, the fire operations area will be secured with banner tape. This includes the command area and outside response vehicles.

9.3.2 Confined Space Rescue Area

In confined space rescue emergencies, the rescue operations area and emergency response vehicle area will be secured.

9.3.3 Hazardous Materials Incident

In hazardous materials emergencies, the hot (contaminated) and warm (contamination reduction) zones will be flagged by banner tape. The hot zone will be restricted to outside responders or contractors using the appropriate chemical protective clothing. The area in the warm zone will be restricted to trained personnel in the decontamination process using the appropriate chemical protective clothing. The backup teams, medical teams, incident command area, and any other outside responders will be in the cold zone (support zone). Only trained personnel can determine the extent of the zones, and have the knowledge of the potential of exposure, explosion, or any other hazard that might be present.

The contractor's site-specific Contingency Plan will be able to amend the method in which they will secure an incident area.

10 Training

This section defines the general requirements for emergency response plan training and the specific plan for training employees, contractors, and visitors.

The fundamental requirement is that employees or contractors who participate in emergency response activities must be trained based on the duties and functions they perform. All personnel performing site activities are required to completed training as specified in Chapter 173-340-810 WAC. Training may include but is not limited to OSHA 40-hour HAZWOPER training, participation in medical monitoring, and other requirements of MTCA (WAC 173-340), OSHA 29 U.S.C. Sec. 651 et seq., and WISHA 49.17 RCW. Supervisors and construction personnel must have additional training. Awareness training is required for all employees, contractors, and visitors who will be on the site during excavation activities at the Bainbridge Island Landfill. The training of contractor employees will be the responsibility of the Contractor Foreman or Field Supervisor.

TABLE E-1
BAINBRIDGE ISLAND LANDFILL ENGINEERING DESIGN REPORT
Emergency Phone Numbers and Contacts

Category	Individual/Agency	Contact Information
Fire	**Bainbridge Island Fire Department**	**911**
Medical/Rescue		**911**
	Virginia Mason Winslow Clinic	**206/842-5632**
	North Kitsap County Medical Center	**360/779-6527**
Police		**911**
	Bainbridge Island Police Department	**206/842-1773**
All	Kitsap County Project Manager	Michelle Miller 360/337-4485 (ph) 360/271-5125 (cell)
All	CH2M Hill Project Manager	Judi Radloff 425/453-5005 x5495 (ph) 425/922-7088 (cell)
All	CH2M Hill Assistant Project Manager	Tom Kraemer 425/453-5005 x5228 (ph) (cell)
All	CH2M Hill Onsite Construction Manager	TBD
Site Safety	CH2M Hill Site Safety Manager	TBD
Construction/Municipal Waste	Olympic View Landfill	Dan Wilson/WMI, 360/674-2331
Industrial/Hazardous Waste	Philip Services Corp.	425/227-0311
Radiological/Nuclear Waste		911
	Terry Frazee/WDOH	360- 236-3221
Ordnance		911
Biological Waste	Kitsap County Health District	Jan Brower, 360/692-
Environmental	Washington State Department of Ecology	Brian Sato 425/649-7000

TABLE E-2
BAINBRIDGE ISLAND LANDFILL ENGINEERING DESIGN REPORT
Potential Hazardous Materials, Toxic Substances, and other Waste Products and Their Notification Requirements

Material/ Substance	Example	Actions Taken by Contractor	Actions Taken by CH2M HILL	Who Will be Notified
Potential Asbestos-Containing Material (ACM)	Friable insulation, asbestos cement pipe	Separate suspected ACM. Dampen to minimize dust. Notify CH2M HILL on-site personnel. If ACM is confirmed, place material in plastic bags for disposal at landfill. Mark shipment to landfill for handling on receipt.	Examine suspected ACM and evaluate if testing is required. Collect & manage samples.	PSCAA Olympic View Landfill
PCBs	Transformers, fluorescent bulbs	Separate material from central waste pile to pre-designated area. Notify CH2M HILL on-site personnel.	Notify Philip Services Corp. for special handling.	Potential for KC Project Mgr. to notify WA Dept. Of Ecology
Household Hazardous Wastes	Paint thinner, lighter fluid, aerosol cans, oils & lubricants, ≤5 gal. of paint, ≤1 gal. any others	Do not separate from waste, Process as normal, unless container appears to to have never been opened and is intact..		
Compressed Gas Cylinders	All types – not punctured or damaged otherwise	Separate material from central waste pile. Notify CH2M HILL on-site personnel.	Confirm waste. Notify Philip Services Corp. for handling.	Philip Services Corp.
Ordnance	Boxes of or random gathering of munitions	Stop work. Notify CH2M HILL on-site personnel.	Notify KC project manager. Call 911	KC Project Manager
Industrial Wastes and Contaminated Media	Liquid or non-liquid, drums >5 gal. – marked or unmarked, solvents, other unknown substances	Stop work. Isolate zone. Notify CH2M HILL on-site personnel.	Notify Philip Services Corp..	KC Project Mgr. Philip Services Corp., Department of Ecology
Radiological Wastes	Nuclear, radioactive, material in bright yellow bags, etc.	Stop work. Isolate zone. Notify CH2M HILL on-site personnel.	Notify KC project manager. Call 911	KC Project Mgr.
Biological Wastes	Dead animals, potential biological waste bags (marked from medical facility)	Separate from central waste pile. Notify CH2M HILL on-site personnel.	Evaluate whether testing is required. Notify Philip Services Corp.	KC Project Mgr. - KC – Philip Services Corp. and Bainbridge-KC Health District.
Batteries	Large - Car, truck, 12V or greater	Separate material from central waste pile Notify CH2M HILL and Phillips Environmental for disposal.		Philips Services Corp.
Appliances, White Goods	Refrigerators, water heaters	Separate only apparently intact refrigerators for recycling in BI Disposal Drop Box. Manage remaining white goods as bulky waste.		Olympic View Landfill (intact refrigerators only)
Autos	Chassis, doors, engine blocks	Separate only if large intact auto bodies w/ readable VIN number. Handle engine blocks with leaking oil to contain oil spill. Dispose all other with bulky waste; Note: Do not separate out tires.		

TABLE E-3
BAINBRIDGE ISLAND LANDFILL ENGINEERING DESIGN REPORT
Alarm Tones

Tone	Emergency/Evacuation Type
Two short tones	Fire
Three short tones (followed by:)	Hazardous/Toxic Material Spill/Release
one short tone	Incidental Release
two short tones	Mid-Level Release
one long tone	Hazardous Material Incident
One short tone (followed by:)	Confined Space Rescue
one short tone	Self-Rescue
two short tones	Non-Entry Rescue
one long tone	Entry Rescue
Four short tones (followed by:)	Other Emergency
one short tone	Medical
two short tones	Weather/Natural Disaster
one long tone	Bombs (live munitions)
three short tones	Demonstrations/Gatherings
One long tone (followed by:)	Evacuation
one short tone	Area
two short tones	Site
three short tones	Community
another long tone	Immediate
	Emergency Shutdown

TABLE E-4
BAINBRIDGE ISLAND LANDFILL ENGINEERING DESIGN REPORT
Evacuation Definitions

Evacuation	Priorities	Examples
Area	An evacuation of a restricted area within the site. This might be selected areas (e.g., excavation, shakers, stockpile, etc.)	Fire a minor liquid or gas release Discovery of potential hazardous, radiological, or biological waste
Site	An evacuation of widespread areas or the entire site	Large fire requiring outside responder Discovery of radiological waste
Community	An evacuation of the site and the surrounding community. The site evacuation is managed by the CH2M Hill Onsite Construction Manager. A community evacuation is managed by the appropriate 911 dispatched emergency responder..	Same as site evacuation but with greater severity
Immediate	Danger to health and safety is present or expected within 5-10 minutes.	Gaseous release of hazardous substance is ongoing; plume may threaten or actually be causing exposures
Emergency Shutdown*	An incident has occurred or is expected to escalate in severity. The emergency shutdown of all operations at the site commence immediately.	Ongoing gaseous or liquid flammable/combustible substance in an atmosphere conducive to ignition Discovery of live munitions

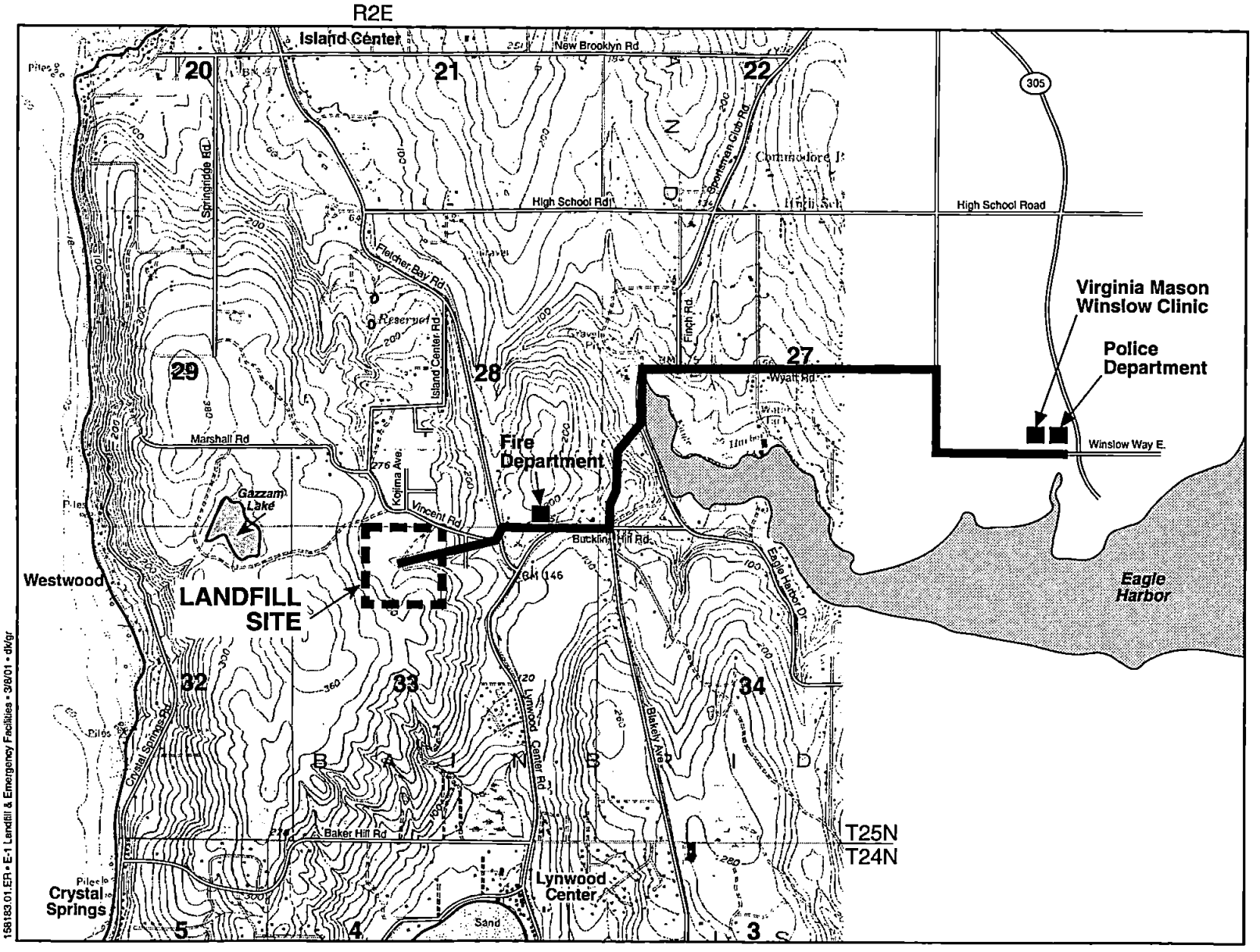
* Emergency shutdown actions are to minimize additional hazards to evacuees, responders, and the community from uncontrolled events. Further action to minimize environmental impacts as well as material, equipment, and property may be taken if the evacuation priority allows. There are circumstances which preclude the normal evacuation procedures for various areas. Such instances are an impending explosion, toxic vapor cloud, or fire rapidly engulfing the location. At times such as these, when life is at risk, the area will be evacuated immediately.

TABLE E-5
BAINBRIDGE ISLAND LANDFILL ENGINEERING DESIGN REPORT
Responsible Persons

Agency	Responsible Person	Alternate
Kitsap County	Michelle Miller/ PM	Gretchen Olsen/Contracts Administrator
CH2M HILL, Inc	CH2M HILL Onsite Construction Manager	CH2M HILL Site Safety Coordinator
ARI or Onsite Lab	TBD	TBD
Remediation Contractor	Remediation Contractor Foreman	Remediation Contractor Field Supervisor
Disposal Contractor	Individual Truck Driver	Truck Dispatcher

TABLE E-6
BAINBRIDGE ISLAND LANDFILL ENGINEERING DESIGN REPORT
Potential Fire Hazards

Item	Where Stored/Located	Fire Protection Equipment
Gasoline	TBD	Portable fire extinguisher
Diesel	TBD	Portable fire extinguisher
Stockpiles of Combustible Materials	TBD	Portable fire extinguisher, fire hose connected to "water buffalo"
Oils, Lubricants, & Greases	TBD	Portable fire extinguisher



Bainbridge Island Landfill Property Boundary

Shortest Route to Emergency Services

NORTH

0 1500

Scale in Feet

Elevations in feet

Contour interval is 20 feet

Figure E-1

Location of Landfill and Emergency Facilities

Bainbridge Island Landfill

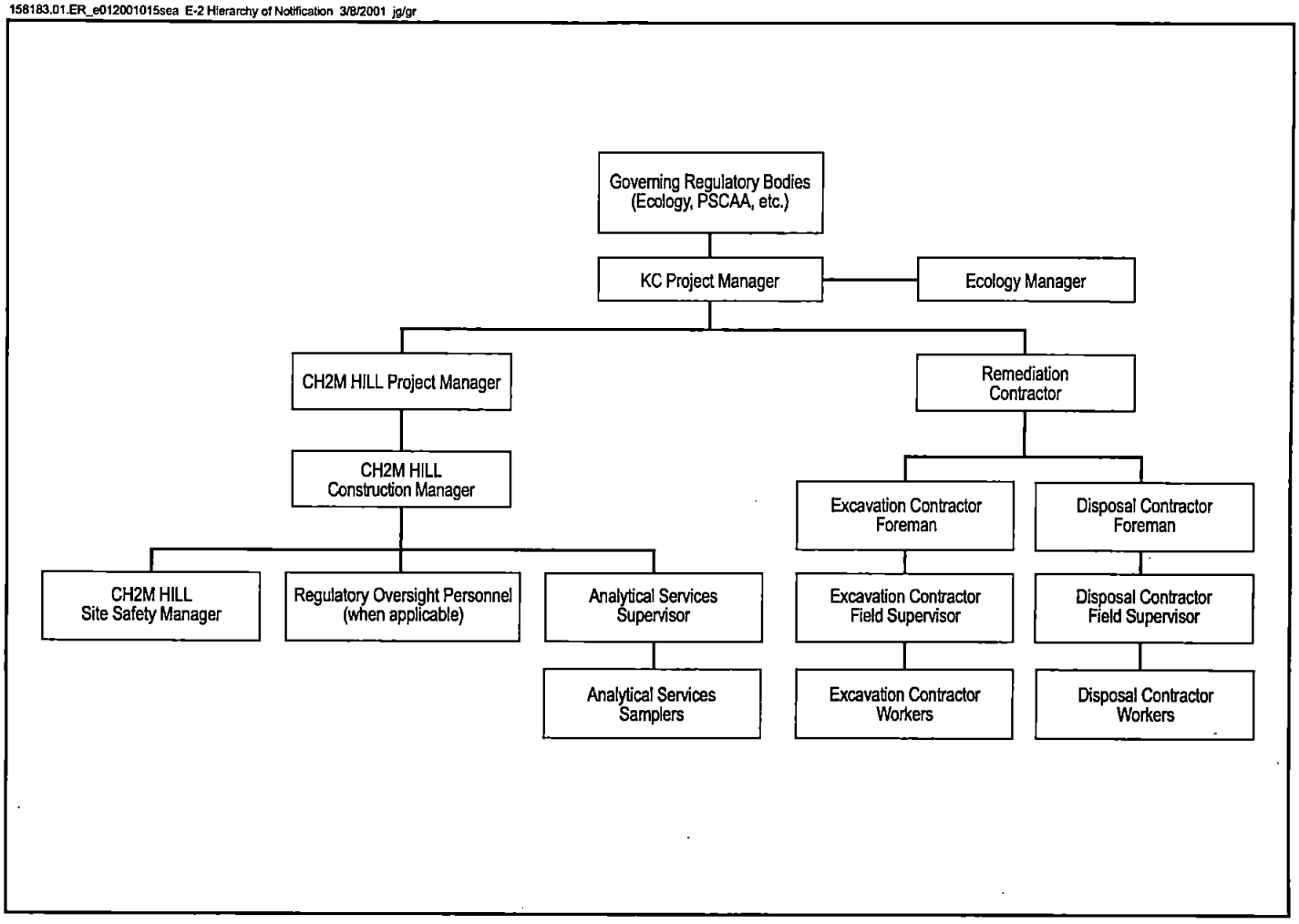


Figure E-2

Hierarchy of Notification

Bainbridge Island Landfill

VINCENT ROAD

CH2M HILL STAGING AREA

SITE ENTRANCE

PROPERTY BOUNDARY

HAUL ROAD

WHEEL WASH FACILITY

CONTRACTOR'S STAGING AREA

MAINTAIN 50' MIN. BUFFER FROM TOE OF INERT BACKFILL TO PROPERTY BOUNDARY

CLEARING UNITS

FINAL COVER GRADING

APPROXIMATELY 180' BUFFER TO PROPERTY BOUNDARY

HAUL ROAD LOOP

PROCESSING AREA

DETENTION POND

SOUTH SEPTAGE PIT

LEGEND

- First aid kit
- Fire extinguisher
- Primary evacuation route
- Secondary evacuation route
- Safe area

0 100 200 300

Scale In Feet

N

Figure E-3

Evacuation Routes and Safe Areas

Bainbridge Island Landfill

E01200101SEA • 158183.01.ER • E-3 evacroutes and safeareas • 3/8/00 • JG/GM/gr

APPENDIX F

Construction Quality Assurance Plan

APPENDIX F

Construction Quality Assurance Plan

1 Introduction

This construction quality assurance (CQA) plan, hereafter referred to as the CQA Plan, presents methods and procedures to be used by Kitsap County Solid Waste Division (Kitsap County) or its representatives to provide quality control (QC) and quality assurance (QA) during implementation of the Bainbridge Island Landfill cleanup project. Cleanup work includes excavation and processing of wastes, removal and offsite disposal of decomposable wastes, and onsite placement and covering of inert wastes. Kitsap County (the Owner) will implement this project using a construction contractor (the Contractor) to perform the work and CH2M HILL (hereafter referred to as the Engineer) to observe and document the work. Additional information on the project is provided in Section 1.3, and a detailed description of the roles and responsibilities of each party is provided in Section 2.

1.1 Purpose and Scope

The purpose of this CQA Plan is to identify procedures that will be used by the Owner's onsite representative (Engineer) to guide QA activities during construction and to obtain independent, documented confirmation that the standards of quality required by the Contract Documents have been met. The general format of this CQA Plan has been prepared in general accordance with WAC 173-351-730 for municipal solid waste landfills. The CQA Plan:

- Identifies the organization, roles, and responsibilities of individuals who will be charged with implementing the CQA Plan during construction
- Briefly summarizes the minimum qualifications of lead project participants from the Engineer's and Contractor's organizations
- Describes key activities that will take place and processes that will be used to meet quality standards, including review and observation functions, sampling and testing requirements, acceptance/rejection criteria, and corrective measures to be used when deficiencies are found

Further information on testing specifications and results is provided in the Contract Documents.

1.2 Key Terms

Three related but independent processes will be used during construction to verify that the standards of quality identified in the Contract Documents are met. These processes are construction quality assurance (CQA), construction quality control (CQC), and construction administration and management. Definitions of these terms and the identification of the parties responsible for each of these processes follow.

Construction Quality Assurance. CQA refers to a planned system of activities that provides sufficient documentation and confidence that a facility is constructed as specified in the design and that the materials used in construction are manufactured according to specification. CQA generally includes the inspection, verification, audit, and evaluation of materials and workmanship necessary to determine and document the quality of the constructed facility. For the Bainbridge Island Landfill project, the evaluation of materials and workmanship includes field sample collection and laboratory analysis of CQA samples. CQA activities will be performed by the Engineer as an independent, third-party entity.

Construction Quality Control. CQC refers to a planned system of actions taken by manufacturers, fabricators, or the Contractor to monitor and control the quality of products and work to meet the requirements of the Contract Documents. CQC includes inspection and testing to directly monitor the quality of all furnished, constructed, and installed components. CQC activities are the responsibility of the Contractor. They are independent of the CQA activities.

Construction Administration and Management. Construction administration and management refers to those activities carried out to administer the construction contract, including conducting project meetings, monitoring project schedules, reviewing and acting on requests for payment, and coordinating changes to Contract Documents resulting from changed site conditions or the selection of alternative methods of construction or installation. The Engineer will be responsible for these activities.

1.3 Project Description

The Bainbridge Island Landfill is a closed municipal solid waste landfill located in the City of Bainbridge Island, Kitsap County, Washington. Kitsap County acquired the property in 1942 and the site began operating as a landfill in about 1946. A series of private operators ran the landfill until 1975. The site stopped accepting waste in 1975 and was closed between 1974 and 1977.

Kitsap County completed a remedial investigation/feasibility study (RI/FS) and interim remedial actions for the site in accordance with the Model Toxics Control Act (MTCA, Chapter 173-340 WAC). The RI/FS documented the nature and extent of contamination at the landfill site, evaluated technologies and alternatives that might be appropriate for cleanup of the site, and identified a preferred remedial action alternative. The RI/FS was approved final by Ecology on November 1, 2000.

The preferred alternative identified in the FS was waste reclamation with installation of a permeable soil cap. This construction project will implement the preferred alternative. The construction activities include:

- Excavate all waste, process municipal solid waste to separate decomposable wastes from inert wastes
- Regrade the site with the inert waste fraction (hereafter referred to as inerts)
- Haul and offsite disposal of decomposable wastes including processed wastes and unprocessed bulky wastes (hereafter referred to as overs)

- Haul and offsite disposal of other wastes including septage pit waste, sediment, and contaminated soil
- Haul and offsite disposal of hazardous or dangerous wastes and asbestos if these wastes are found in significant quantities (i.e., exceeding household quantities)
- Construct a 2-foot-thick, site-derived soil cap on the inert fraction
- Restore site drainage and reestablishing site vegetation
- Install fencing to control access

1.4 CQA Guidelines

This CQA Plan was prepared to meet the requirements of the Washington State Model Toxics Control Act (Chapter 173-340-400(4)(a)(xiii) and (b)(v) WAC) and the general intent of the QA requirements as referenced in the *Criteria for Municipal Solid Waste Landfills*, Chapter 173-351 WAC (Washington State Department of Ecology, filed October 26, 1993, and effective on November 27, 1993).

2 Organization, Roles, and Responsibilities

The major parties involved in the construction of this project are the Owner, the Contractor, and the Engineer, as defined in the Contract Documents. Of these, only the Owner and Contractor are parties to the construction contract. The Engineer will serve as the representative of the Owner for the purpose of providing construction management, third-party CQA services, and additional technical support services, as requested by the Owner. The Engineer and Owner have a separate agreement for these services.

2.1 Project Organization

The assignment of responsibilities for the Bainbridge Island Landfill cleanup project is as follows:

• Construction and related site work	Contractor
• Construction contract execution	Owner
• Construction management	Engineer
• CQC	Contractor
• Third-party CQA	Engineer
• Design assistance during construction	Engineer

Key personnel for each of these parties are discussed below.

2.2 Owner

The Owner of the site and project is Kitsap County. The Owner is responsible for executing all administrative aspects of the contract and is represented by the Kitsap County project manager. The Owner has final authority for approval of the contract, all claims, any change orders and amendments, and all pay applications and has overall control of all materials directly and indirectly through the Engineer. The CH2M HILL project team is responsible for engineering design, day-to-day administration procedures, documentation, and

interpretation of the design. Bainbridge Disposal Company is responsible for maintaining ongoing operations of the Bainbridge Island Transfer Station facility. . Day-to-day activities to maintain regular operation of the Bainbridge Disposal facility and to prevent disturbance of operations during construction will be coordinated by CH2M HILL and the remediation contractor. The Owner also is responsible for coordination with other Kitsap County-owned construction projects that may be at or near the site.

2.3 Construction Contractor

The Contractor for this project will have the authority and responsibility to perform construction activities within the limits of the binding terms of the contract between the Owner and the Contractor. To accomplish this work, the Contractor will designate individuals to serve as the Contractor's project manager and Contractor's site superintendent for the duration of the project.

The Contractor will be responsible for CQC. Specifically, the Contractor will be responsible for providing evidence of the Contractor's qualifications, preparing manufacturer's QA/QC plans, submitting CQC documentation and certifications, and performing the work in general accordance with the Contract Documents. The Contractor's responsibilities are fully defined in the Contract Documents and include all work that the Contractor may delegate to subcontractors.

The Contractor is responsible for the development of the construction schedule and maintaining that schedule. The Engineer will review the schedule and verify that it meets overall project schedule requirements. The schedule is intended to provide a basis for the Contractor to manage progress and initiate corrective action as necessary.

It is the responsibility of the Contractor to maintain and conduct its operations in a safe manner. The Contractor and each subcontractor are responsible for creating a site-specific health and safety plan (HSP) for their respective personnel at the site. All of the contractor's personnel and subcontractors performing or observing work at the site will be responsible for conforming to the requirements of the Contractor's HSP.

2.4 Engineer

The Engineer for this project, CH2M HILL, will perform construction contract administration and third-party CQA in general accordance with this CQA Plan and in accordance with the Engineer's agreement with Kitsap County. In addition, the Engineer will provide technical design support during construction on an as-needed basis and at the request of the Owner. The Engineer's project staff will consist of both office support and field staff. The Engineer's office support staff will include a project manager, who will be responsible for maintaining communications with Kitsap County and providing continuity with the design phase of the project; a project engineer, who will be responsible for construction administration and management; and technical support staff who will be responsible for handling design-related services. In addition, the Engineer will provide technical design support during construction on an as-needed basis and at the request of the Owner.

The Engineer's field staff will include a resident project engineer who will be responsible for coordinating CQA and technical support work, and CQA observers, who will be responsible

for CQA services described in this CQA Plan. The Engineer also will be responsible for selecting and overseeing certified testing laboratories required for the conduct of CQA testing. The responsibilities of these individuals are discussed in further detail in the following subsections.

2.4.1 Office Support Staff

Project Manager

The Engineer's project manager will be responsible for communications with Kitsap County and for providing overall continuity from the design phase of the project. The project manager also will be responsible for internally administering and monitoring work performed by the Engineer during the construction phase.

Project Engineer

The project engineer will be primarily responsible for the administration of the construction contract in accordance with the Contract Documents and CQA Plan. The project engineer, along with the technical support staff, will also have the authority and responsibility to review technical submittals and shop drawings, interpret the project design, and assist with the preparation of contract interpretation and clarification requests and change orders. The responsibilities of the project engineer will also include identifying the appropriate technical support staff to complete the requested reviews, establishing schedules for reviews, and participating with selected staff in meetings requested by the resident project engineer.

2.4.2 Field Support Staff

Resident Project Engineer

The resident project engineer (RPE) will have overall responsibility for observing and documenting the Contractor's construction of the project. These responsibilities include review, liaison, coordination, interpretation, documentation, and observation activities necessary for the completion of the project. The RPE will also issue defective/rejected work notifications to the Contractor if CQA test results, Contractor's submittals, and/or direct observations indicate that materials and work quality do not meet requirements of the Contract Documents.

CQA Observers

The CQA observers will have the authority to:

- Perform the RPE's duties, as delegated by the RPE.
- Carry out activities required to confirm that the Contractor's materials and work meet the requirements of the Contract Documents and are being appropriately documented in accordance with this CQA Plan (e.g., take samples of materials, perform tests, arrange for and review results of CQA laboratory tests, review Contractor's certification submittals and CQC test results).
- Identify, make arrangement for, and oversee CQA laboratory and field testing by certified testing laboratories. These laboratories will be selected by the Engineer and will be separate from those used by the Contractor for CQC.
- Assist the RPE in determining when satisfactory resolution of defective/rejected work has been reached.

The CQA observers will be present at the site during construction of major components of this project. At the end of construction, the CQA observers will have responsibility for stating in writing whether the work has been conducted in general conformance with the Contract Documents.

3 Personnel Qualifications

This section presents a brief summary of the qualifications required for lead project participants. Specific qualification requirements for the Contractor and the Contractor's subcontractors, fabricators, or suppliers, particularly as related to experience on projects with similar work, can be found in the Contract Documents.

3.1 Project Engineer

The project engineer will be licensed by the State of Washington to practice as a Professional Engineer. This individual will have sufficient practical, technical, and managerial experience and background to coordinate design staff in addressing design-related issues that arise during construction.

3.2 Resident Project Engineer

The RPE will have sufficient practical, technical, and managerial experience and background to oversee the management and implementation of the construction observation and CQA activities associated with the construction of the Bainbridge Island Landfill cleanup project.

3.3 CQA Observers

The CQA observers will work under the direct supervision of the RPE. These individuals will be qualified by formal technical education and practical experience to successfully coordinate and implement onsite CQA activities for the construction of the Bainbridge Island Landfill cleanup project. These individuals will have:

- An understanding of the importance of CQA and CQC
- Knowledge of specific practices associated with cleanup of municipal solid waste landfill sites (e.g., waste excavation, processing, and testing)
- Knowledge of observation and testing procedures
- Ability to maintain clear and organized records

3.4 Technical Support Staff

The RPE and CQA observers will consult with technical support staff during the course of construction when unexpected conditions or unusual test results are obtained. Each technical support staff member will have had education and experience in the specific subject on which he or she is consulted. Technical support staff may be on the staff of the Engineer, its authorized subconsultants, or a testing laboratory. The work of the technical support staff will be coordinated by the project engineer.

3.5 Contractor

The Contractor must be licensed by the State of Washington and meet all of the requirements as presented in the Contract Documents. In addition, the Contractor will be required, as specified in the Contract Documents, to demonstrate qualifications and experience of subcontractors performing specialized components of the work.

4 Quality Assurance Activities

This section describes QA activities that will take place and processes that will be used during construction. These activities and processes include review and observation, sampling and testing, the use of acceptance/rejection criteria, and the identification of corrective measures as they apply to the construction project. QA activities will be associated with the following components of the construction project:

- Production of inerts and overs
- Inerts
- Waste excavation and placement of inerts
- Growing medium soil
- Waste sampling and testing
- Soil sampling and testing

The Contractor will be responsible for CQC of all of these components except for waste and soil sampling and testing. Sampling and testing of waste is required by the Kitsap County Health District and the Washington State Department of Ecology (Ecology) to verify that Inerts may remain onsite and that overs may be disposed in an offsite municipal solid waste landfill.

After construction, some native soil will be exposed in areas where waste was excavated and not covered by inerts or growing medium soil. Sampling and testing of these exposed native soil is required by Ecology to verify that the soil can remain uncovered at the ground surface. Waste and soil sampling and testing will be the responsibility of the Engineer. Detailed information on waste and soil sampling and testing is provided in the Performance Monitoring Sampling and Analysis Plan (Appendix H of this report). Information on QA activities for other components of the construction project is provided below after a discussion of general QA activities.

4.1 General QA Activities

4.1.1 Review and Observation

The review and observation function will involve the review, observation, and recording of the Contractor's submittals and work methods to confirm that products and methods are meeting the intent and/or requirements of the Contract Documents. These efforts will take place before, during, and after construction.

Prior to construction, the RPE and CQA observers will familiarize themselves with the project design and observation procedures by reviewing and becoming familiar with Contract Documents and this CQA Plan and by reviewing existing reports that pertain to the construction project. Once familiar with the project requirements, the RPE or designated

representative will carry out the following preconstruction review and observation functions:

- Reviewing the construction schedule
- Reviewing the Contractor's certifications, submittals, test results, material sources, and samples for acceptance requirements described in the Contract Documents.
- Reviewing imported material submittals and, if necessary, visiting material sources
- Reviewing the Contractor's plan for waste processing and site management
- Reviewing the Contractor's proposed construction procedures for design and specification compatibility and constructibility

During construction, oversight by the RPE and CQA observers will include, but is not limited to, the following:

- Verifying that required submittals have been submitted for review
- Confirming that materials are consistent with requirements specified in the Contract Documents
- Observing that equipment is meeting specifications for inerts and achieving production rates as specified in the Contract Documents
- Observing construction and maintenance of erosion control facilities
- Observing and maintaining records of the Contractor's loading, hauling, and disposal of overs
- Implementing the Performance Monitoring Sampling and Analysis Plan
- Observing phases of the construction, documenting the Contractor's compliance or noncompliance with the Contract Documents, and verifying the correction of defective work
- Reviewing the Contractor's work progress schedules
- Reviewing Contractor's submittals, samples, and supporting test reports, and verifying that documentation required by the specifications has been received and is in compliance
- Confirming that lines and grades of inerts have been verified by the Contractor prior to placement of clean cover soil

These oversight activities will not relieve the Contractor from meeting the requirements, including the Contractor's CQC procedures, set forth in the Contract Documents.

Upon completion of the project, a post-construction inspection will be conducted by the RPE, project engineer, and or one or more of the CQA observers to check for imperfections and identify those areas that require corrective action by the Contractor. The RPE and CQA observers will inspect for items including, but not limited to, the following:

- Low spots or depressions that would cause water to pond
- Areas that have been excessively eroded by rainfall during construction or as a result of construction activities
- Construction of stormwater control facilities
- Depth of placement of growing medium soil
- Surface restoration of disturbed areas

4.1.2 Sampling and Testing

CQC testing, as required in the Contract Documents, will be performed by a certified testing laboratory selected by the Contractor. The Contractor will collect samples of the types specified at the frequencies and locations specified by the CQA observers and perform the tests specified in the Contract Documents.

Sampling and chemical analytical testing for environmental samples of waste and soil will be conducted by the Engineer as outlined in the Performance Monitoring Sampling and Analysis Plan (Appendix H of the Engineering Design Report). Chemical analysis will be performed by a state-certified analytical testing laboratory selected by the Engineer.

4.1.3 Acceptance/Rejection Criteria

The criteria for acceptance or rejection of components of the work will be as stated in the Contract Documents. Regular checks will be made through field and laboratory testing to verity the adequacy of the Contractor's CQC procedures. Test results that fail to meet the required values will require corrective action. The CQA observers will notify the Contractor upon receipt of a failing CQA or CQC test result. A defective/rejected work notification will be issued if the deficiency in the test result is not acknowledged or corrected.

4.1.4 Corrective Measures

Corrective measures will be identified, as necessary, to bring the work to the required quality and may include additional waste processing or replacement of the work. Where replacement of work is required, the area to be replaced will be defined and documented by the RPE with input, as appropriate, by CQA observer(s) on the basis of test results, visual analysis, and professional judgment.

4.1.5 Record Drawings and CQA Report

At the completion of the project, the Engineer will prepare record drawings and a CQA report to document changes made to the design during the construction phase and document results of QA observations and testing that were performed during construction. The report will include a complete set of record drawings, a brief description of each major element of facility construction, a summary of the results of QA testing performed during construction, and a statement by the Engineer, based on test results and field observations, as to whether the project has been constructed in substantial compliance with the Contract Documents.

4.2 Specific QA Activities

Specific QA activities will be performed for the following project components:

- Production of inerts and overs
- Processing of inerts
- Waste excavation and placement of inerts
- Clean cover
- Growing medium soil

QA activities for each of these components is discussed below. Note that QA/QC procedures for all sampling and testing related to chemical analytical testing of environmental samples, including soil and waste samples, are addressed in the Performance Monitoring Sampling and Analysis Plan, Appendix H.

4.2.1 Production of Inerts and Overs

Observation Activities

The observation activities for the production of inerts and overs will be to verify that the Contractor is meeting or exceeding the production rate specified in the Contract Documents. Specific observations will include estimating the weekly volume of waste excavated and inerts and overs produced and monitoring the performance and reliability of waste processing equipment.

Sampling and Testing

No sampling and testing will be associated with this work component.

Acceptance/Rejection Criteria

Criteria for the acceptance of the production rate for inerts and overs are described in the Contract Documents.

Corrective Measures

The Contractor will be notified immediately if observations indicate that the Contractor is not meeting the required production schedule. The RPE will meet with the Contractor to determine if the problem is the result of work methods or defective equipment. Corrective measures will include revisions to work methods and/or replacement of defective equipment.

4.2.2 Inerts

Observation Activities

The observation activities for inerts will be to verify that the Contractor is meeting the particle size requirements specified in the Contract Documents. Specific observations will include verifying the processing and screening of excavated waste, reviewing the Contractor's test results, and performing testing to confirm the Contractor's test results.

Sampling and Testing

Particle size analysis will be performed on a daily basis during startup to confirm that Contractor's equipment is processing waste in accordance with project specifications. Daily testing will cease when startup is completed and CQA test results are comparable with Contractor's CQC test results. Additional testing will be performed as necessary if there are

observed changes in quality of inerts, changes in performance of processing equipment, or changes in type of processing equipment.

Chemical analytical testing of the inerts will also be conducted. QA/QC procedures for this sampling are outlined in the Performance Monitoring Sampling and Analysis Plan.

Acceptance/Rejection Criteria

Criteria for the acceptance of inerts is described in the Contract Documents.

Corrective Measures

The Contractor will be notified immediately if observations indicate that the Contractor is not meeting the particle size specification for inerts. The RPE will meet with the Contractor to determine if the problem is the result of processing methods or the type of equipment used for processing. The Contractor will revise processing methods or obtain new equipment that meets particle size requirements for inerts. If inerts have been placed onsite that do not meet particle size requirements, the Contractor will be required to remove and reprocess inerts to achieve the specified particle size requirements prior to replacement onsite.

4.2.3 Waste Excavation and Placement of Inerts

Observation Activities

The observation activities associated with waste excavation and placement of inerts will be to verify that the Contractor is accurately measuring the quantities of waste excavation and placement of inerts. Specific observations will include reviewing the Contractor's survey data and calculations and conducting surveys to verify the source of the Contractor's survey data.

Sampling and Testing

No sampling or testing will be done for this work component.

Acceptance/Rejection Criteria

Criteria for the acceptance of the measurement of waste excavation and placement of inerts is described in the Contract Documents.

Corrective Measures

The Contractor will be notified immediately if observations indicate that the Contractor's data or calculations are incorrect or if the RPE's surveys do not produce data consistent with the Contractor's data. The RPE will meet with the Contractor to determine if the problem is the result of calculation or survey errors. Corrective measures will include additional surveys and recalculation of data by the Contractor with additional reviews by the RPE.

4.2.4 Clean Cover

Observation Activities

The observation activities for the clean cover will be to verify that the Contractor is meeting or exceeding the material specifications and placing the material at the required thicknesses specified in the Contract Documents. Specific observations will include examination of clean cover and testing, if necessary, to verify that it meets material specifications, observation of compaction during placement, and excavation of soil following placement to verify thicknesses.

Sampling and Testing

Clean cover will be sampled, inspected, and tested, if necessary, to verify that it does not contain deleterious material, soil with a particle size exceeding 3 inches, or soil with a high percentage of fines (more than 10 percent by weight passing the No. 200 sieve). If visual inspection is insufficient to determine that clean cover meets particle size requirements, samples of clean cover will be tested for particle size analysis. Sampling frequency will be every 1,000 cubic yards or more frequent if changes in material quality are observed. Testing frequency will be determined by the Engineer during construction.

Acceptance/Rejection Criteria

Criteria for the acceptance of clean cover will be described in the Contract Documents.

Corrective Measures

The Contractor will be notified immediately if observations indicate that clean cover is not meeting the material specifications. Corrective measures will include directing the Contractor to produce clean cover from other areas of excavation or other sources. If clean cover exceeds requirements for maximum particle size or maximum percent fines, then additional processing of the soil will be required. If the Contractor is not meeting compaction requirements, the Engineer will notify the Contractor immediately and direct the Contractor to increase compaction efforts. If the depth of clean cover is less than 2 feet, corrective measures will include placing additional soil to meet project requirements.

4.2.5 Growing Medium Soil

Observation Activities

The observation activities associated with the growing medium soil will be to verify that the Contractor is meeting or exceeding the material specifications and placing the material at the required thicknesses specified in the Contract Documents. Specific observations will include sampling and testing of growing medium soil to verify the Contractor's CQC sampling and testing, and excavation of soil following placement to verify thicknesses.

Sampling and Testing

Growing medium soil will be sampled and tested for particle size analysis, organic content, and nutrients. Sampling frequency will be every 1,000 cubic yards or more frequent if changes in material quality are observed.

Acceptance/Rejection Criteria

Criteria for the acceptance of growing medium soil is described in the Contract Documents.

Corrective Measures

The Contractor will be notified immediately if observations indicate that growing medium soil is not meeting the material specifications. Corrective measures will include adjusting the particle size or the addition of organics or nutrients. If the maximum particle size exceeds 2 inches, then additional processing of the soil will be required. If the required organic and nutrient contents are not met, the material will be adjusted by adding more or less organics or nutrients as necessary. If the depth of growing medium soil is less than 6 inches, corrective measures will include placing additional soil to meet project requirements.

5 References

CH2M HILL. 2000a. *Final Bainbridge Island Landfill Remedial Investigation Report.* Prepared for Kitsap County Department of Public Works, Solid Waste Division. November 1.

CH2M HILL. 2000b. *Final Bainbridge Island Landfill Remedial Investigation Report Supplement 1.* Prepared for Kitsap County Department of Public Works, Solid Waste Division. November 1.

CH2M HILL. 2000c. *Final Bainbridge Island Landfill Remedial Investigation Report Supplement 2.* Prepared for Kitsap County Department of Public Works, Solid Waste Division. November 1.

CH2M HILL. 2000d. *Final Bainbridge Island Landfill Feasibility Study Report.* Prepared for Kitsap County Department of Public Works, Solid Waste Division. November 1.

State of Washington Department of Ecology (Ecology). *Criteria for Municipal Solid Waste Landfills.* WAC 173-351. Filed October 26, 1993 (effective November 27, 1993).

APPENDIX G

Drainage Design Calculations

Hydrologic Analysis

Existing Event Summary:

BasinID	Peak Q	Peak T	Peak Vol	Area	Method	Raintype	Event
-------	(cfs)	(hrs)	(ac-ft)	ac	/Loss		
Existing	2.06	8.00	0.8811	9.90	SBUH/SCS	TYPE1A	2 yr
Existing	3.72	8.00	1.4500	9.90	SBUH/SCS	TYPE1A	10 yr
Existing	6.74	8.00	2.4752	9.90	SBUH/SCS	TYPE1A	100 yr

Drainage Area: Existing

Hyd Method:	SBUH Hyd		Loss Method:	SCS CN Number
Peak Factor:	484.00		SCS Abs:	0.20
Storm Dur	24.00 hrs			
	Area	CN	TC	
Pervious	9.9000 ac	85.00	0.18 hrs	
Impervious	0.0000 ac	98.00	0.00 hrs	
Total	9.9000 ac			

Supporting Data:

Pervious CN Data:

Grass - SCS Type C	85.00	9.9000 ac

Pervious TC Data:

Flow type:	Description:	Length:	Slope:	Coeff:	Travel Time
Shallow	None Entered	390.00 ft	9.00%	13.0000	1.67 min
Channel	Pipe Flow	350.00 ft	1.00%	42.0000	1.39 min
Sheet	Grass	150.00 ft	9.00%	0.1300	7.71 min

Developed Event Summary:

BasinID	Peak Q	Peak T	Peak Vol	Area	Method	Raintype	Event
-------	(cfs)	(hrs)	(ac-ft)	ac	/Loss		
Developed	2.54	8.00	1.0157	9.90	SBUH/SCS	TYPE1A	2 yr
Developed	4.28	8.00	1.6083	9.90	SBUH/SCS	TYPE1A	10 yr
Developed	7.36	8.00	2.6595	9.90	SBUH/SCS	TYPE1A	100 yr
Developed	1.01	8.00	0.4774	9.90	SBUH/SCS	TYPE1A	6 mo

Drainage Area: Developed

Hyd Method:	SBUH Hyd		Loss Method:	SCS CN Number
Peak Factor:	484.00		SCS Abs:	0.20
Storm Dur	24.00 hrs			
	Area	CN	TC	
Pervious	8.9000 ac	86.00	0.18 hrs	
Impervious	1.0000 ac	98.00	0.09 hrs	
Total	9.9000 ac			

Supporting Data:

Pervious CN Data:

Grass - SCS Type C	86.00	8.9000 ac

Impervious CN Data:

Impervious	98.00	1.0000 ac

Pervious TC Data:

Flow type:	Description:	Length:	Slope:	Coeff:	Travel Time
Sheet	Grass	150.00 ft	9.00%	0.1300	7.71 min
Shallow	Grass	390.00 ft	9.00%	13.0000	1.67 min
Channel	Grass	350.00 ft	1.00%	42.0000	1.39 min

Impervious TC Data:

Flow type:	Description:	Length:	Slope:	Coeff:	Travel Time
Sheet	Pavement	150.00 ft	1.00%	0.0100	2.39 min
Channel	Grass Lined	390.00 ft	9.00%	13.0000	1.67 min
Channel	Grass	350.00 ft	1.00%	42.0000	1.39 min

Runoff Control

CH2MHILL SUBJECT KITSAP COUNTY BY D. Hicks

BAINBRIDGE ISLAND LANDFILL SHEET NO. 1 of 1 DATE 1-10-2001

TIME OF CONCENTRATION VALUES PROJECT NO. 158183

LANDFILL AREA

EXISTING CONDITIONS - NO IMPERVIOUS AREA

START ELEV - 288
CB ELEV. - 240 $\Rightarrow \Delta = 48$ FT

LENGTH OF FLOW - 355 FT

SLOPE = 0.135 > 10% - SHEET FLOW FOR FIRST 50 FT
- SHALLOW CONC. FLOW FOR 305 FT

→ T_c - SHEET FLOW

$$T_{c(SF)} = \frac{0.42 (n_s L)^{0.8}}{(P_2)^{0.5} (S_0)^{0.4}}$$

$$T_{c(SF)} = \frac{0.42 (0.13 * 50)^{0.8}}{(2.36)^{0.5} (0.135)^{0.4}} \rightarrow T_{c(SF)} = 2.72 \text{ min}$$

→ T_c - SHALLOW CONCENTRATED FLOW

$T_{c(SC)} = L/60\,V$

$V = K * \sqrt{S_0} = 13 * \sqrt{0.135} = 4.77$

$T_{c(SC)} = 305/60(4.77) = 1.06$ MIN

→ $T_{c\ TOTAL} = T_{c(SF)} + T_{c(SC)} = 2.72 + 1.06 = \boxed{3.78 \text{ MIN}}$

DEVELOPED CONDITIONS

PERVIOUS AREA

SLOPE EXCEEDS 15% (18) - SHEET FLOW FIRST 30 FT, $n_s = 0.15$

→ $T_{c(SF)} = \frac{0.42[(0.15)(30)]^{0.8}}{(2.36)^{0.5}(0.8)^{0.4}} \rightarrow T_{c(SF)} = 1.0$ MIN

→ $T_{c(SC)}$ - SLOPE = 9/250 = 0.036, K = 11, L = 250

$V = K\sqrt{S_0} = 11\sqrt{0.036} = 2.08$ FPS

$T_{c(SC)} = \frac{250}{(60)(2.08)} \rightarrow T_{c(SC)} = 2.0$ MIN

→ $\boxed{T_{c\ PERVIOUS} = 3.0 \text{ MIN}}$

IMPERVIOUS AREA (PAVED ROAD & DITCH)

SLOPE = 0.03, $n_s = 0.011$, L = 30 FT

→ $T_{c(SF)} = \frac{0.42[0.011 * 30]^{0.8}}{(2.36)^{0.5}(0.03)^{0.4}} \rightarrow T_{c(SF)} = 0.46$ MIN

→ $T_{c\ DITCH}$ - SLOPE = 2%, K = 17, L = 1060 FT

$T_{c(D)} = 7.34$

$\boxed{T_{c\ (IMPERV)} = 7.8 \text{ MIN}}$

CH2MHILL SUBJECT KITSAP COUNTY BY D. HICKS
BAINBRIDGE ISLAND LANDFILL SHEET NO. 1 of 4 DATE 1-19-01
DITCH, CULVERT, DRAINS PROJECT NO. 158183

→ REFER TO: DESIGN CRITERIA FOR BAINBRIDGE ISLAND LANDFILL, DECEMBER 15, 2000

DITCH #1 - TRANSFER STATION DRAINAGE (AREA E) - 1.5 AC.

- BY SBUH METHOD

25 YR FLOW = 0.83 CFS
100 YR FLOW = 1.03 CFS

→ USE TRIANGULAR DITCH, 1.0 FT DEEP, 6.0 FT WIDE, 3:1 SIDE
→ MAX FLOW W/ FULL DITCH = 8.93 CFS (2.98 FPS)

DITCH # 2 - ROAD DITCHES - < 1.0 AC.

→ USE TRIANGULAR DITCH, 1.0 FT DEEP, 6.0 FT WIDE, 3:1 SIDE

INTERCEPT DITCHES - LARGEST AREA (LANDFILL) - 14.7 AC.

→ ASSUME 2% SLOPE ON INTERCEPT DITCHES
→ PER ECOLOGY MANUAL, SIZE INTERCEPT DITCHES WITH 10-YR EVENT W/ 0.5 FT FREEBOARD.

BY SBUH - Qpeak (10YR) = 6.71 CFS

→ USE TRIANGULAR DITCH, 2.0 FT DEEP, 8.0 FT WIDE, 2:1 SIDESLOPES
→ MAX FLOW @ 2% SLOPE W/ 0.5 FT FREEBOARD = 9.07 CFS

POST CONSTRUCTION VEGETATIVE WATERWAY - 2% SLOPE TO POND

- BY SBUH METHOD

25 YR FLOW = 8.77 CFS
100 YR FLOW = 11.59 CFS

→ USE TRANGULAR DITCH, 2.0 FT DEEP, 12.0 FT WIDE, 3:1 SIDE SLOPES

ROAD CULVERT

- AREA WEST OF ROAD - 1.45 ACRES
- EVALUATE BY RATIONAL METHOD
  - ASSUME AREA IS HYDROSEEDED - CN = 0.25
  - PEAK RAINFALL (Pr)
    - 25 YR - 3.8 IN
    - 100 YR - 4.6 IN
  - TIME OF CONCENTRATION
    - L = 400
    - Kr = 10.1
    - S = 0.03 (AVE)

$V = K_r\sqrt{S} = 10.1\sqrt{0.03}$ → V = 1.74

$T_c = L/60V = 400/(60 \times 1.74)$ → T_c = 3.8 (26.3)

→ USE T_c = 6.3 MIN

Bainbridge Island Landfill

Triangular Ditch Flowrates

Slope (ft/ft) 0.02
Mannings n 0.08 (Vegetative Ditch)

Ditch Type	Side Slope (Z)	Total Depth of Ditch (ft) (H)	Width at Top (ft) (W)	Freeboard Calculations: Freeboard (ft)	Depth of Water (ft) (Y)	Flow Area (A)	Hyd. Rad. (R)	Full Flow (cfs)	Flow Velocity (fps)	Full Ditch Calculations: Depth of Water (ft) (Y)	Flow Area (A)	Hyd. Rad. (R)	Full Flow (cfs)	Full Flow Velocity (fps)
D-6A	2	1	4	0.5	0.5	0.5	0.224	0.48	0.97	1	2	0.894	4.89	2.44
D-6B	3	1	6	0.5	0.5	0.75	0.237	0.75	1.00	1	3	1.200	8.93	2.98
D-7A	2	2	8	0.5	1.5	4.5	0.671	9.07	2.02	2	8	0.434	12.04	1.51
D-7B	3	2	12	0.5	1.5	6.75	0.712	14.15	2.10	2	12	0.440	18.23	1.52
D-8A	2	3	12	0.5	2.5	12.5	1.118	35.49	2.84	3	18	0.239	18.18	1.01
D-8B	3	3	18	0.5	2.5	18.75	1.186	55.36	2.95	3	27	0.240	27.31	1.01

← DITCH #1, ROAD DITCHES C/AC
← INTERCEPT DITCHES
← POST CONSTRUCTION CHANNEL

Slope (ft/ft) 0.39
Mannings n 0.035 (Rock Ditch)

Ditch Type	Side Slope (Z)	Total Depth of Ditch (ft) (H)	Width at Top (ft) (W)	Freeboard Calculations: Freeboard (ft)	Depth of Water (ft) (Y)	Flow Area (A)	Hyd. Rad. (R)	Full Flow (cfs)	Flow Velocity (fps)	Full Ditch Calculations: Depth of Water (ft) (Y)	Flow Area (A)	Hyd. Rad. (R)	Full Flow (cfs)	Full Flow Velocity (fps)
D-6A	2	1	4	0.5	0.5	0.5	0.224	4.87	9.75	1	2	0.894	49.34	24.67
D-6B	3	1	6	0.5	0.5	0.75	0.237	7.60	10.14	1	3	1.200	90.12	30.04
D-7A	2	2	8	0.5	1.5	4.5	0.671	91.56	20.35	2	8	0.434	121.55	15.19
D-7B	3	2	12	0.5	1.5	6.75	0.712	142.86	21.16	2	12	0.440	183.95	15.33
D-8A	2	3	12	0.5	2.5	12.5	1.118	358.12	28.65	3	18	0.239	183.54	10.20
D-8B	3	3	18	0.5	2.5	18.75	1.186	558.80	29.80	3	27	0.240	275.64	10.21

Slope (ft/ft) 0.3
Mannings n 0.035 (Rock Ditch)

Ditch Type	Side Slope (Z)	Total Depth of Ditch (ft) (H)	Width at Top (ft) (W)	Freeboard Calculations: Freeboard (ft)	Depth of Water (ft) (Y)	Flow Area (A)	Hyd. Rad. (R)	Full Flow (cfs)	Flow Velocity (fps)	Full Ditch Calculations: Depth of Water (ft) (Y)	Flow Area (A)	Hyd. Rad. (R)	Full Flow (cfs)	Full Flow Velocity (fps)
D-6A	2	1	4	0.5	0.5	0.5	0.224	4.27	8.55	1	2	0.894	43.28	21.64
D-6B	3	1	6	0.5	0.5	0.75	0.237	6.67	8.89	1	3	1.200	79.04	26.35
D-7A	2	2	8	0.5	1.5	4.5	0.671	80.30	17.84	2	8	0.434	106.61	13.33
D-7B	3	2	12	0.5	1.5	6.75	0.712	125.30	18.56	2	12	0.440	161.34	13.44
D-8A	2	3	12	0.5	2.5	12.5	1.118	314.09	25.13	3	18	0.239	160.98	8.94
D-8B	3	3	18	0.5	2.5	18.75	1.186	490.10	26.14	3	27	0.240	241.75	8.95

Slope (ft/ft) 0.07
Mannings n 0.08 (Vegetative Ditch)

Ditch Type	Side Slope (Z)	Total Depth of Ditch (ft) (H)	Width at Top (ft) (W)	Freeboard Calculations: Freeboard (ft)	Depth of Water (ft) (Y)	Flow Area (A)	Hyd. Rad. (R)	Full Flow (cfs)	Flow Velocity (fps)	Full Ditch Calculations: Depth of Water (ft) (Y)	Flow Area (A)	Hyd. Rad. (R)	Full Flow (cfs)	Full Flow Velocity (fps)
D-6A	2	1	4	0.5	0.5	0.5	0.224	0.80	1.61	1	2	0.894	9.15	4.57
D-6B	3	1	6	0.5	0.5	0.75	0.237	1.41	1.88	1	3	1.200	16.70	5.57
D-7A	2	2	8	0.5	1.5	4.5	0.671	16.97	3.77	2	8	0.434	22.53	2.82
D-7B	3	2	12	0.5	1.5	6.75	0.712	26.48	3.92	2	12	0.440	34.10	2.84
D-8A	2	3	12	0.5	2.5	12.5	1.118	66.38	5.31	3	18	0.239	34.02	1.89
D-8B	3	3	18	0.5	2.5	18.75	1.186	103.57	5.52	3	27	0.240	51.09	1.89

- UNIT PEAK RAINFALL FACTOR (i_R)
  - $i_R = a_R (T_c)^{-b_R}$
  - $a_R = 2.66$ (25 YR)
  - $b_R = 0.65$ (25 YR)

$$i_{R(25)} = 2.66 (6.3)^{-0.65} = 0.80$$

  - $a_R = 2.61$ (100 YR)
  - $b_R = 0.82$ (100 YR)

$$i_{R(100)} = 2.61 (6.3)^{-0.63} = 0.82$$

- PEAK RAINFALL INTENSITY (I_R)
  - $I_{R(25)} = 3.8 \times 0.80 \Rightarrow I_{25} = 3.04$
  - $I_{R(100)} = 4.6 \times 0.82 \Rightarrow I_{100} = 3.77$

- COMPUTE PEAK RUNOFF FLOW
  - $Q_R = C_N I_R A$

25 YR → $Q_{25} = (0.31)(3.04)(1.45) = 1.37$ CFS
100 YR → $Q_{100} = (0.31)(3.77)(1.45) = 1.69$ CFS

→ ASSUME MINIMUM CULVERT SLOPE = 0.02

→ MANNINGS: $Q_{FULL} = \frac{1.49}{n} A R_{(FULL)}^{2/3} S^{1/2}$

→ USING CORRUGATED HDPE, $n = 0.018$ (MFR'S DATA)

USE 12" CULVER SECTION
- $A = \pi/4 = 0.7854$
- $R = 0.25$

$$Q_{FULL} = \frac{1.49}{0.018} (0.7854)(0.25)^{2/3} (0.02)^{1/2}$$

$$Q_{FULL} = 3.63 \text{ CFS}$$

→ 12" CULVERT WILL PASS THE 100 YR EVENT WITHOUT OVERTOPPING ROAD

→ PROVIDE 1'-0" MINIMUM COVER OVER CULVERT PER MFR'S RECOMMENDATIONS.

DRAIN BETWEEN CB-1 & MH-1

- AREAS OF INFLUENCE - AREAS A, B, AND D
- BY SBUH, PEAK 25 YR RUNOFF = 8.77 (COMBINED)
- INVERT ELEVATIONS - ASSUME MINIMUM SLOPE = 0.015
  - CB-1 - EL. 246.0 ± (INVERT 4 FT BELOW RIM OF EL. 250)
  - MH-1 - EL. 241.35
- LENGTH OF RUN = 310 FT
- SIZE DRAIN TO PREVENT SURCHARGE OF CB #1
- USE CORRUGATED HDPE - $n = 0.018$ (FROM MFR) 0.27

→ FULL PIPE FLOW - TRY 18" Ø ($A = 1.76$, $R = 0.375$)

$$Q_{FULL} = \frac{1.49}{0.018}(1.76)(0.375)^{2/3}(0.01)^{1/2}$$

$$Q_{FULL} = 9.25 \text{ CFS} \quad (> \underline{25 \text{ YR - OK}})$$

⇒ USE 18" C-HDPE.

DRAIN BETWEEN CB-1 & MH-2

- AREA OF INFLUENCE - AREA C
- BY SBUH, PEAK 25 YR RUNOFF = 4.91 CFS
- INVERT ELEVATIONS
  - CB-2 EL. 262.0 (6FT BELOW RIM EL. OF 268.0)
  - MH-1 EL. 241.85 (0.5 FT ABOVE INVERT OF CB-1 PIPE)
- LENGTH BETWEEN CB-2 AND MH-1 = 175 FT ; SLOPE = 0.115
- USE CORRUGATED HDPE - $n = 0.01$ (FROM MFR)

→ FULL PIPE FLOW - TRY 12" Ø ($A = 0.7854$, $R = 0.25$)

$$Q_{FULL} = \frac{1.49}{0.018}(0.7854)(0.25)^{2/3}(0.068)^{1/2}$$

$$Q_{FULL} = 8.71 \text{ CFS} \quad (> \underline{25 \text{ YR - OK}})$$

⇒ USE 12" - C-HDPE

DRAIN BETWEEN MH-1 & MH-2

- AREA OF INFLUENCE - COMB. CB-1 & CB-2
- BY SBUH - PEAK 25 YR RUNOFF = 13.68 CFS
- INVERT ELEVATIONS
  - MH-1 - 238.0 (6 FT BELOW RIM EL. 244.0)
  - MH-2 - 233.1 (ASSUME SLOPE OF 0.01)
- LENGTH BETWEEN MH-1 & MH-2 = 490 FT (DROP @ 0.01 = 4.9 FT

- FULL PIPE FLOW - TRY 24" HDPE (A = 3.14, R = 0.5)

$$Q_{FULL} = \frac{1.49}{0.018}(3.14)(0.5)^{2/3}(0.01)^{1/2}$$

$Q_{FULL} = 16.33$ (> 25YR - OK)

⇒ USE 24" C-HDPE

POND OUTFALL PIPE TO MH-2

- INVERT ELEVS
  - POND OUTFALL - EL. 240.5 (ASSUME 1.% DROP TO MH-2)
  - MH-2 - EL. 239.9 (L = 60 FT BETWEEN STRUCTURES)
- BY SBUH, (STORMSHED MODEL), PEAK OUTFLOW FROM POND

$Q_{PEAK(POND)} = 6.59$ CFS

- USE 18" CORRUGATED HDPE

$$Q_{PEAK} = \frac{1.49}{0.013}(1.76)(0.375)^{2/3}(0.01)^{1/2}$$

$Q_{PEAK} = 9.25$ CFS (> PEAK POND FLOW OK)

⇒ USE 18" C-HDPE

DRAIN PIPE BETWEEN MH-2 & OUTFALL

- INVERT ELEVATIONS
  - OUTFALL - EL. 230.0 (0.1 FT BELOW INVERT FROM MH)
  - OUTLET OF MH-2 - EL. 233.0 (SET FROM PLANS)

- PEAK FLOW = 13.68 + 6.59 = 20.27 CFS
- LENGTH OF DRAIN = 115 FT
- SLOPE = 3/115 = 0.026
- FULL PIPE FLOW - TRY 24" HDPE

$$Q_{FULL} = \frac{1.49}{0.018}(3.14)(0.5)^{2/3}(0.026)^{1/2}$$

$Q_{FULL} = 26.34$ CFS (> COMBINED PEAK FLOW OK)

⇒ USE 24" C-HDPE

CH2MHILL SUBJECT KITSAP COUNTY BY D. HICKS

BAINBRIDGE ISLAND LANDFILL SHEET NO. 1 of 2 DATE 2-1-01

TEMPORARY SEDIMENT TRAP (CONSTRUCTION) PROJECT NO. 158183

- FOR CONSTRUCTION, USE SEDIMENT POND BMP.
- LOCATE AT SITE OF PERMANENT DETENTION POND.
- ROUTE SPILLWAY OUTLET TO EXST DISHARGE POINT.
- DESIGN CRITERIA
  - AREA DRAINED = 3 ACRES (CONSTRUCTION/STOCKPILE AREA)
  - SIZE USING THE 2 YR, 24 HR STORM EVENT (P = 2.36 IN.) - SUMMER
  - USE RATIONAL METHOD, 3 AC TOTAL; 1 AC. IMP (CN=0.9); 2 AC. BARE (CN=0.8)
  - USE V_S = 0.00096 FT/SEC (0.02 mm PARTICLE - MEDIUM SILT)

RATIONAL METHOD FOR PEAK RUNOFF

COMPUTE AVERAGE CN

$$CN = \frac{CN_P * A_P + CN_{NP} * A_{NP}}{A} = \frac{(0.8 * 2) + (0.9 * 1)}{3}$$

$CN = 0.833$

COMPUTE TIME OF CONCENTRATION (T_C)

MEASURED LENGTH OF MAX FLOW = 880 FT

DESIGN CONSTRUCTION SLOPE = 2%

AVERAGE VELOCITY

- USE K_r = 10.1 (NEARLY BARE GROUND)

→ $V = K_r\sqrt{S_o} = 10.1 * \sqrt{0.02} = 1.42$ FPS

$T_C = L/60V = 880/(60)(1.42) = 10.27$ MIN (> 6.3 min)

COMPUTE PEAK UNIT RAINFALL FOR 10 YR STORM (i_R)

$a_R = 1.58$

$b_R = 0.58$

$i_R = a_R T_C^{-b_r} = 1.58 (10.27)^{-0.58}$ → $i_R = 0.41$

COMPUTE PEAK RAINFALL INTENSITY (I_R)

$I_R = (P_R)(i_R) = (2.36)(0.41)$

$I_R = 0.97$

COMPUTE PEAK FLOW

$Q_R = (CN)(I_R)(A) = (0.833)(0.97)(3) = 2.42$ CFS

COMPUTE SURFACE AREA OF SEDIMENT POND

$SA = FS(Q_R/V_S)$ USE SAFETY FACTOR (SF) = 2

$SA = 2(2.42 \text{ CFS}/0.00096 \text{ FPS})$ → SA = 5050 SF (MIN)

AVAILABLE AREA FOR POND (APPROXIMATE)

SA (AVAILABLE) = 4750 SF (MUST HAVE 50' SETBACK FROM SLOPE)

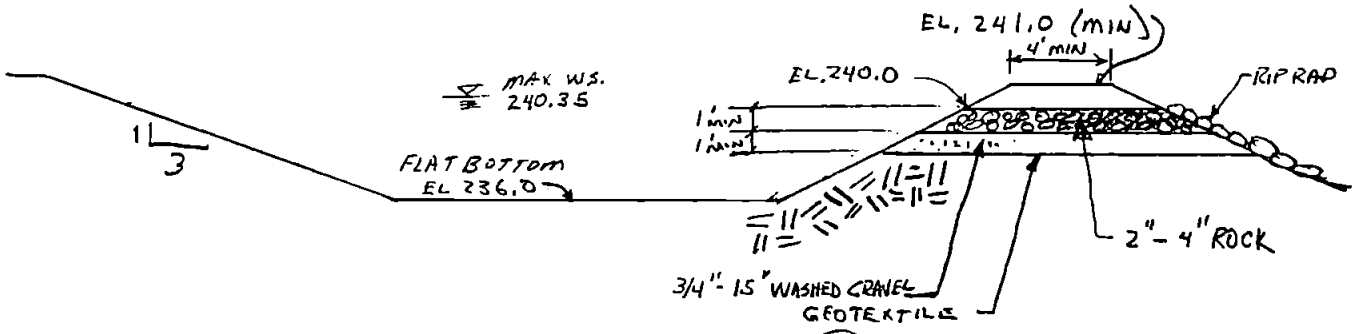
→ POND WILL ONLY HAVE SF OF 1.88 USE

CH2MHILL SUBJECT KITSAP COUNTY BY D. HICKS

BAINBRIDGE ISLAND LANDFILL SHEET NO. 2 of 2 DATE 2-1-01

TEMPORARY SEDIMENT TRAP PROJECT NO. 158183

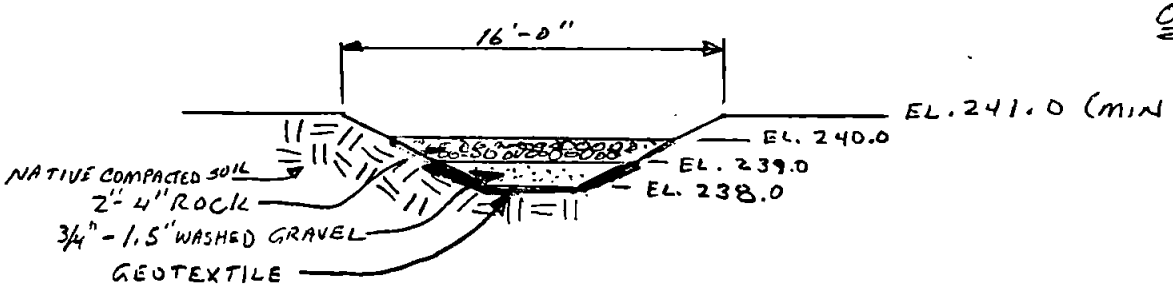
- SET ELEVATION OF OVERFLOW = EL. 240.0 (SITE CONSTRAINT)
- SET BOTTOM DEPTH @ EL. 236.0 (SITE CONSTRAINT TO MAINTAIN 3:1 SIDE SLOPE)



TRAP CROSS-SECTION

NTS

- SPILLWAY (TRAP OUTLET)
  - ASSUME TRAPEZOIDAL SECTION (ASSUME 2:1 SIDE SLOPE)
  - → Q_R = 2.42 CFS
  - → SET BOTTOM OF OUTLET WIDTH = 4 FT
    @ 3FT DEPTH, TOP WIDTH = 16 FT (>6 FT OK)
  - → CHECK DEPTH @ Q_R OVER CLOGGED ROCK
    BOTTTOM WIDTH OF FREEBOARD = 12 FT
    @ Q = 2.42 CFS, FLOW DEPTH = 0.35 FT (4.2 IN)
    OK



TRAP SPILL WAY (OUTLET)

NOTE: ① INSTALL PLYWOOD BAFFLE IN BOTTOM OF POND PER ECOLOGY STORMWATER MANUAL.

② INSTALL RIP RAP PROTECTION AT SEDIMENT TRAP INLET

CH2MHILL SUBJECT KITSAP COUNTY BY D. HICKS
BAINBRIDGE ISLAND LANDFILL SHEET NO. 1 of 1 DATE 1-18-01
POND CALCS - WEIRS PROJECT NO. 158183

OUTLET RISER

- 100 YR PEAK FLOW - 6.5905 CFS (FROM STORMSHED MODEL)
- RISER IS 15" DIAMETER (1.25 FT DIA)
  → L = πD = π(1.25) = 3.927 FT

- CALCULATE W.S. ABOVE RISER @ 100-YR PEAK FLOW
  → TREAT AS CIRCULAR WEIR - EQUATION $q = 0.0243 d h^{1.4}$

$$h = \left[q / 0.0243\, d\right]^{1/1.4} \qquad q = 6.5905 \text{ CFS}, \; d = 15 \text{ INCHES}$$

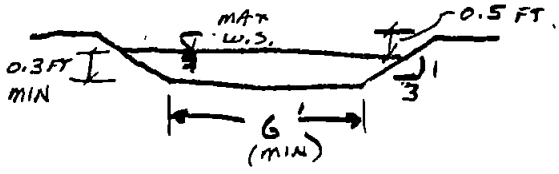
$$h = \left[6.5905 / \left[(0.0243)(15)\right]\right]^{1/1.4}$$

h = 7.91 INCHES = 0.66 FT

→ SET BOTTOM OF EMERGENCY SPILLWAY @ 0.66 FT ABOVE TOP OF RISER

EMERGENCY SPILLWAY

- 100 YR PEAK FLOW = 6.5905 CFS
- USE TRAPEZOID SECTION FOR WEIR (3:1 SIDE SLOPE
- USE BOTTOM LENGTH OF WEIR = 6.0 FT
- SCHEMATIC



- EQUATION

$$Q = 3.21\left(L H^{3/2} + 2.4 H^{5/2}\right) \quad \Rightarrow H = 0.2 \text{ FT, MINIMUM}$$

BY TRIAL & ERROR H = 0.34 FT WHEN L = 10 FT. (Q = 6.9 CFS)

→ **USE 10 FT BOTTOM WIDTH, 3:1 SIDE SLOPES**

→ ADD 0.5 FT OF FREEBOARD ABOVE MAX W.S. ELEV.

APPENDIX H

Performance Monitoring Sampling and Analysis Plan

APPENDIX H

Performance Monitoring Sampling and Analysis Plan

1 Introduction

This Sampling and Analysis Plan (SAP) describes the approach and procedures for obtaining samples during the Bainbridge Island Landfill cleanup action. The landfill and vicinity are shown in Figure H-1. The objective of this monitoring program is to demonstrate performance of cleanup actions at various areas of the landfill for compliance with MTCA (WAC 173-340-410(1)(b)).

In general, the landfill reclamation will be conducted by excavating waste from the main landfill and west end areas and will be separated into two fractions:

- Refuse fraction—material that is retained by a 1½-inch (nominal) screen, including bulky material separated at the excavation
- Inert fraction—material that passes a 1½-inch (nominal) screen

The bulky material and refuse fraction will be loaded into trucks and removed from the site. The inert fraction will be returned and graded within a portion of the footprint of the former main landfill area.

Samples will be obtained from soil in areas where waste will be excavated and no fill or cover will be replaced and future land use is expected to be unrestricted. Samples will be analyzed for contaminants of concern (COCs) and results will be compared to site cleanup levels. If sample results exceed cleanup levels, additional overexcation may be done and subsequent additional samples may be obtained for analysis. This sampling plan also covers obtaining samples from the inert material. The purpose of the inert sampling is to document concentrations of contaminants present in material that will remain onsite.

2 Sampling and Analysis Approach

Performance monitoring sampling will be conducted at four areas at the landfill (Figures H-2 and H-3):

- Area 1: five septage pits
- Area 2: two settling ponds
- Area 3: the northern and southern portions of the west end area
- Area 4: the portion of the main landfill area that remains uncovered by replaced inert fraction material

Discrete soil samples will be obtained from native soil at areas 1, 2, and 3 following excavation of waste material or sediment; and from area 4 after the entire inert fraction has

been replaced in the former main landfill area. Alternatively, some portions of area 4 may be sampled immediately following excavation if the area is needed for further site use (such as stockpile placement). After sample results have been obtained and compared to cleanup levels, if samples are not in compliance with cleanup levels, overexcavation and resampling may be required. Alternatively, in consultation with Kitsap County, the area may be left as is and covered with a minimum 2-foot thick layer of clean soil. This decision will be made in the field during the cleanup action.

Composite and discrete soil samples will be obtained from the inert material as it is generated by the screening process. Procedures for obtaining discrete and composite soil samples are described below under Section 3, Sampling Procedures.

Samples will be analyzed for COCs for each waste area or environmental medium as presented in the Feasibility Study Report (CH2M HILL, 2000d). Table H-1 lists analyte groups and COCs for each landfill area. Table H-2 lists the laboratory analytical methods and requirements for each analyte group. The sampling and analysis approach for each of the four areas and from the inert fraction material is described below.

2.1 Septage Pits

Table H-3 presents the approximate area of each septage pit and the approximate number of samples to be taken from beneath each of the five septage pits following excavation. Remedial Investigation (RI) data showed that the septage pit material is relatively homogenous. Sample locations will be based on a grid overlay of the final excavation at each septage pit area. The protocol for establishing the grid is included in Attachment A.

All septage pit soil samples will be analyzed for the septage pit COC list, with the exception of total petroleum hydrocarbons (TPH; Table H-1). It is assumed that if other COCs (SVOCs, VOCs, Pesticides/PCBs, and metals) have been removed to concentrations below cleanup levels, then TPH constituents (diesel- and heavy oil-range hydrocarbons) also will have been removed to concentrations below cleanup levels.

2.2 Settling Ponds

Sediment from the two settling ponds at the east end of the site will be removed to prevent COCs from reentering surface water discharging from the site. It is estimated that approximately 300 cubic yards of sediment will be removed from a total area of approximately 2,700 square feet. A total of three samples will be obtained from the excavated area. Sample locations will be based on a grid laid out over the final excavation at each settling pond area. The grid establishment protocol is included in Attachment A. The samples will be analyzed for the settling pond COC list (Table H-1).

2.3 West End Area

The west end area consists of two subareas. The southern west end area is less than 2 feet thick and covers an area of approximately 38,870 square feet for a total of about 2,900 cubic yards. Based on RI data, little or no refuse is evident in the waste and it appears to have been an area where primarily burning took place. The northern west end area is a laterally limited but deep pocket of solid waste that reportedly was placed in what was once a surface water detention pond. The northern west end area covers approximately 18,490

square feet and is about 18 feet deep at the deepest portion. It is estimated to include approximately 5,400 cubic yards. The excavation of waste will likely comprise a cone-shaped pit with a small base area and steep sides.

Seven samples will be obtained from each of the two west end area subareas. Due to the expected excavation configuration at the northern west end area, some of the samples will be obtained from sidewalls as well as at the base. All of the samples from the southern west end area will be obtained from the base of the shallow excavation. Native soil underlying the waste in the west end area typically consists of gray to brown, medium dense to dense, poorly graded sand with silt (up to 15 percent) and occasional fine to coarse gravel and cobbles. Sample locations will be based on a grid overlay of the final west end area excavation areas. The grid establishment protocol is included in Attachment A. Samples will be analyzed for the west end area COC list (Table H-1).

2.4 Main Landfill Area

Samples will be obtained from the main landfill area only in areas that will be left uncovered. Excavation and grading plans indicate that up to one-third of the original footprint of the main landfill area may be left uncovered (i.e., no inert fraction material or clean cover soil). Figure H-3 shows the approximate part of the main landfill area that will remain uncovered. Soil samples will be obtained from nodes on a grid. The grid will be rectangular, and nodes will be spaced approximately 50 feet by 100 feet apart (or approximately one sample per 5,000 square feet), for a total of approximately 18 samples.

Samples of the exposed undisturbed soil will be obtained. Native soil underlying the waste typically consists of gray to brown, dense, poorly graded sand with silt (up to 15 percent) and occasional fine to coarse gravel and cobbles. Timing of the sampling will be determined in the field in consultation with the remediation contractor.

Sample locations will be based on grid overlays of the parts of the main landfill area that remain uncovered; grid nodes that overlie the replaced inert fraction material will be removed so that samples will only be taken at grid nodes that overlie the part of the main landfill area remaining uncovered. The grid establishment protocol is included in Attachment A. Samples will be analyzed for the main landfill area COC list (Table H-1).

2.5 Inert Fraction Material

The inert fraction material will be sampled as it is separated from the waste by the screening plant in order to document concentrations of COCs that will remain onsite. The material consists predominantly of soil and fine gravel and also contains glass, ash, and remnants of refuse. During landfill excavation, the screen plant will produce an estimated 1,300 to 2,000 cubic yards of inert fraction material per day. Based on a 5-day workweek, the screen plant will operate over a period of 6 to 10 weeks to generate the estimated 66,000 cubic yards of inert fraction material. The inert fraction fill material will be replaced onto a portion of the main landfill area that was excavated. It will then be graded and covered with at least 2 feet of clean soil.

- Sample results will be used to provide documentation of average concentrations of COCs in the inert material. Therefore, sample compositing (with the exception of VOC

analyses) is appropriate. Grabs for compositing will be obtained from the screen plant at regular intervals. Discrete samples also will be obtained separately for VOCs analysis.

2.5.1 Composite Soil Samples

Because of the difficulty in accurately estimating stockpile volumes, process samples will be obtained as composite samples of the inert fraction material based on the duration of screen plant operation rather than on the volume of material processed. Composite sampling is described below under "Sampling Procedures." Two composite samples will be obtained each week. Based on the estimated period of screen plant operation, the total number of process samples will be about 12 to 20. The actual number of samples may vary because the duration of the screen plant operation is uncertain. Composite samples will be analyzed for the inert fraction material process samples COC list (Table H-1).

If any total metals concentration exceeds 20 times the respective dangerous waste screening level, a Toxicity Characteristic Leaching Procedure (TCLP) analysis for the exceeding metal will be performed. Dangerous waste screening levels are presented in the RI. Based on previous sampling results (CH2M HILL, 2000a,b,c,d), lead is the only metal in the inert fraction material that may be likely to exceed the dangerous waste screening level. Potential TCLP analysis requires that extra sample volume sufficient for TCLP analysis (two times the volume required for total metals analysis) be obtained for each process sample.

2.5.2 Discrete Soil Samples

Discrete samples will be obtained for VOCs analysis two times per week. Discrete sampling is described below under "Sampling Procedures." Although VOCs are not COCs for the inert fraction, they are COCs for groundwater. Further documentation of VOC concentrations in the inert fraction (or lack thereof) will demonstrate that the remedial action is protective of groundwater.

3 Sampling Procedures

This section describes the procedures for collecting discrete and composite soil samples. All soil samples collected will be discrete except for inert fraction samples not analyzed for VOCs.

3.1 Composite Soil Samples

Composite samples will consist of up to five individual portions ("grabs") that are mixed together as described in this section. The grabs will be obtained over a documented period of time to provide a representative characterization of the sampled medium. The origin of each grab should be documented, if possible. The grabs will be homogenized in a stainless steel bowl and quartered before being containerized. Sufficient volume will be retained for TCLP analysis and QC, as required. Composite soil samples will not be used for VOC analysis.

Additional sample information for composite samples that must be recorded in the field logbook includes:

- Date and time each grab was obtained

- The sample identification number the grab was combined into (no more than five grabs can be combined)

3.2 Discrete Soil Samples

Discrete soil samples will be obtained with stainless steel scoops or trowels and placed directly in a laboratory-prepared sample container. The surface soil samples will be obtained from the ground surface to 6 inches below ground surface (bgs). Glass jars with Teflon lids (as outlined in Table H-2), or equipment compatible with the chemical analyses proposed and provided by the analytical laboratory, will be used to containerize samples.

Discrete soil sample should be obtained by the following procedure:

- The sampler will don clean gloves.
- An inverted, clean plastic bag will be placed over one hand.
- The laboratory-prepared sample jar will be placed in the hand with the plastic bag, and the jar lid will be removed with the other hand.
- The glass jar should be filled by directly scooping the soil sample into the jar. The jar should be tapped gently on the side to settle the sample. The sample jar should be filled completely as quickly as possible. Aboveground plant parts and debris will be excluded from the samples.
- The threads of the jar may be wiped with a clean paper towel or gloved fingers, if necessary. The lid should be tightly fastened on the sample jar.
- The inverted bag will then be reinverted around the sample jar and sealed. The sample will then be placed directly in the sample cooler.

4 Quality Assurance and Quality Control

4.1 Field Documentation

Specific information and observations will be recorded in the field during performance monitoring activities. Task-specific data sheets may be used to record observations for soil sampling activities by subarea and the inert fraction material sampling activities.

Other field observations will be made in a bound, weatherproof field notebook. At the discretion of the field investigator, a field notebook may be used in place of task-specific data sheets during inclement weather. The minimum information to be documented in the field notebook and/or on the data sheets includes the following:

- Names of field team personnel
- Date and times of entries
- Physical/environmental conditions during field activities, including temperature and precipitation
- Names and associations of any site visitors who observe sampling or obtain splits

- Photographic log, if appropriate
- The make, model number, serial number, and calibration information for each meter used in the field (i.e., temperature, conductivity, etc., and all health and safety monitoring equipment)
- Identification and location (including depth) of all samples obtained and sample times
- Miscellaneous field observations including general physical changes since previous visit
- Decontamination procedures and times when specific equipment was cleaned should be recorded in the decontamination section of the field sampling logbook

4.2 Sample Management

The management of samples obtained in the field must follow specific procedures to ensure sample integrity. Sample management includes maintaining chain-of-custody and following proper procedures for packaging and shipping to ensure sample quality and minimize breakage of samples during transport to the laboratory.

4.2.1 Sample Identification

Septage Pits, Settling Ponds, West End Area, Main Landfill Area

The sample identification for the septage pit, settling ponds, west end area, and main landfill area will use the following system.

SEP-#-x	Where **SEP** identifies a septage pit sample, **#** denotes the unique septage pit identification number, **x** denotes the sequential number of the sample from the specified septage pit.
SPD-#-x	Where **SPD** identifies a settling pond sample, **#** denotes the unique settling pond identification number, **x** denotes the sequential number of the sample from the specified settling pond.
WEA-α-x	Where **WEA** identifies a west end area sample, α denotes the letter designation of the subarea (**N** for northern subarea, **S** for southern subarea), **x** denotes the sequential number of the sample from the specified subarea.
MLF-x	Where **MLF** identifies a sample from the uncovered portion of the main landfill area final grid, **x** denotes the sequential number of the sample on the final grid.

Inert Fraction Material Composites

The sample identification for the inert fraction material samples will use the following system.

IFC-d-x	Where **IFC** identifies a composite inert material sample, **d** is the six digit date the sample was homogenized, and **x** denotes the sequential number of the sample for the specific date.
IFD-d-x	Where **IFD** identifies a discrete inert material sample, **d** is the six-digit date on which the sample was obtained, and **x** denotes the sequential number of the sample for that date.

4.2.2

Sample Labeling

The following information will be recorded on the sample label at the time the sample is obtained:

- Unique sample identification as described above
- Initials of person(s) collecting the sample
- Time of sample collection to the nearest minute
- Requested laboratory analyses
- Date of sample collection
- Preservative used (if any)

4.2.3 Sample Chain-of-Custody

The possession of samples must be traceable from the time they are obtained through the time they are analyzed by the laboratory. Chain-of-custody forms will be used for this purpose.

Custody of a sample is defined by the following criteria:

- The sample is in a person's view while in his/her possession
- Any sample in a person's possession and not in view is locked up and custody sealed or transferred to a designated secure area

Each time the samples change hands, both the sender and receiver sign and date the chain-of-custody form. When a sample shipment is sent to the laboratory, the top signature copy is enclosed in plastic and secured to the inside of the lid of the cooler used to ship the samples. The second copy of the chain-of-custody form must be retained in the project files. A chain-of-custody record must be completed for each shipping container (cooler). The information on the form must be consistent with the sample identification matrix and labels of bottles contained within the cooler.

The following information is to be included in the chain-of-custody form:

- Sample number
- Signature of sampler
- Date and time of collection
- Place of collection
- Type of sample
- Sample identification number
- Analysis
- Air bill number (if shipped)
- Inclusive dates of possession
- Signature of receiver

In addition to the labels, seals, and chain-of-custody form, other components of sample tracking include the field data sheets, sample shipment receipt, and laboratory logbook.

4.2.4 Sample Packaging

Before packaging samples, check that the exterior of the sample bottle is clean and that the sample identification number is legible. If samples are to be shipped, the sample shipping containers should be constructed and packed to meet the following requirements:

- There will be no release of materials to the environment
- Inner containers that are breakable (glass bottles) must be packaged to prevent breakage and leakage per Step 3 below. Packaged samples must be capable of withstanding a 4-foot drop on solid concrete in the position likeliest to cause damage. The cushioning and absorbent material must not be reactive with the sample contents.

Only waterproof ice chests and coolers are acceptable shipping containers. The contract laboratory may provide coolers.

After documentation, samples should be handled as follows:

1. Seal drain plug in cooler
2. Place vermiculite or similar cushioning and absorbent material in bottom
3. Wrap glass bottles with bubble wrap, seal the wrapped glass bottles in Ziploc-type plastic bags, and place in cooler that is partially filled with vermiculite. If bubble wrap is not available, place the containers in resealable plastic bags and set in waxed cardboard holders that have been set up inside the cooler. Bottles containing water samples should be set upright inside the cooler.
4. Add double-bagged ice as necessary to maintain an internal cooler temperature of 4°C or lower
5. Place the chain-of-custody form(s) in a plastic bag attached to the inside of cooler lid
6. Attach chain-of-custody seals at both the front and back of container so that the seals must be broken if the cooler is opened
7. Place name and address of receiving laboratory in a position clearly visible on the outside of the cooler
8. Secure the lid and custody seals with fiber tape. Tape over custody seals so that they will be cut if the fiber tape is cut.

If samples are to be hand-delivered to the laboratory, the following sample packing protocol should be followed:

1. Wipe the outside of any wet sample bottles with paper towels wetted with distilled or deionized water
2. Pack the cooler(s) to minimize movement during transport; all glass bottles containing water must be packed vertically
3. Add double-bagged ice as necessary to maintain an internal cooler temperature of 4°C or lower

4.2.5 Sample Shipment

Samples should be hand-delivered or shipped via overnight courier to the contract laboratory for analysis. All air bills should be kept on file as part of chain-of-custody documentation, and the laboratory should be informed by telephone that samples are being shipped each day during sampling. The laboratory should be called on the following day to confirm the number and condition of the samples received.

4.3 Quality Control Sample Requirements

The types of quality control (QC) samples to be obtained during performance monitoring include field duplicates, equipment blanks, trip blanks and matrix spike/matrix spike duplicates (MS/MSDs). The frequency of collection for each QC sample type will be as follows:

- Field duplicates will be obtained at a frequency of 10 percent of normal samples.
- Equipment blanks will be obtained at a frequency of 5 percent of normal samples or a minimum of one set per week.
- One trip blank will be provided for each cooler containing samples for VOC analysis (or a maximum of two per day).
- MS/MSD samples will be provided at a frequency of 5 percent of normal samples.

5 Data Management

This section describes the general data management approach for data collected as part of the landfill reclamation actions. Additional data management information is available from the RI/FS Work Plan and Work Plan Addenda (CH2M HILL undated) that are not included in this SAP. Updates to data management procedures may be prepared in the form of memorandums if significant changes to the type of data to be acquired occur as the investigation proceeds.

Data management includes the functions of storing and accessing data, enforcing data storage conventions, and regulating database input and output. The stored data will include chemical parameters measured in environmental media samples obtained during remedial action.

Data management will involve the use of an electronic environmental data management system. The system will provide a centralized, secure location for environmental data of known quality that can be shared and used for multiple purposes. The data management system will assist in the information flow for the project by providing a means of cataloging, organizing, archiving, and accessing information. This information may then be used with other software for analysis, plotting, and presentation.

The data management system that is used to store and communicate historical and new data collected for the Bainbridge Island Landfill uses a CH2M HILL-developed environmental database. Data are stored in Paradox® Version 4.0 format, and reports are generated using MS Access Version 8.0.

6 Data Analysis

Ecology guidance recommends using the following statistical procedures to evaluate whether cleanup levels have been met when grid sampling an area following remediation:

1. The upper 95-percent confidence limit on the true population mean, calculated from the sampling data, cannot exceed the cleanup level;
2. No sample concentration can exceed twice the cleanup level; and
3. Less than 10 percent of the samples can exceed the cleanup level.

It is unlikely that enough samples will be obtained from any one area to perform the first statistical procedure, so the second two statistical procedures will be used. Samples with concentrations that exceed twice the cleanup level will be overexcavated and at least one new sample will be obtained. The new sample concentrations will then be used in a re-evaluation of compliance.

7 Decontamination Procedures

The objectives of decontamination are as follows:

- To prevent the introduction of contaminants into samples from sampling equipment or other samples
- To prevent contamination from leaving the sampling site by way of sampling equipment, personnel, or construction materials
- To prevent exposure of field personnel to contaminated materials

This section outlines procedures that will be followed to meet decontamination objectives. Any non-dedicated sampling equipment that comes into contact with soil, sediment, surface water, or groundwater should be decontaminated before and after each use. Contractors' heavy equipment should also be decontaminated prior to use at each sample area and prior to leaving the site. Equipment probes that come into contact with sample water should be cleaned by thoroughly rinsing with distilled water.

7.1 Heavy Equipment Used in Sampling

If heavy equipment is to be used to obtain samples, care should be taken to obtain soil from the center of the bucket. Decontamination of the equipment between samples will not be completed.

7.2 Hand Sampling Equipment

Recommended procedures for decontamination of sampling equipment are presented below. Step 1 (setup of the decontamination station) will take place at the beginning of each workday that decontamination of sampling equipment will be required.

1. Set up a decontamination station using two wash basins containing the wash water used to decontaminate equipment. It may be useful to set up a small table to make it easier to handle the equipment once it has been cleaned.
2. The first wash basin should be half-filled with a detergent and water solution. A half-cup of Liquinox or Alconox should be used per 10 gallons of potable water. The second basin should be filled with potable water only.
3. The sampling equipment should be decontaminated by disassembling and washing each part thoroughly in the detergent solution.
4. Rinse equipment thoroughly in the potable tap water basin.
5. Rinse using distilled or deionized water.
6. Rinse with spectra-grade isopropyl alcohol.
7. Final spray rinse with distilled or deionized water.
8. Air-dry, if possible, then completely wrap equipment in unused aluminum foil (shiny side out) for the next use.

8 Waste Management

Waste materials will be generated during the performance monitoring fieldwork in the form of:

- Excess sample soil
- Decontamination water
- Disposable materials (e.g., personal protective equipment or plastic sheeting)

Materials excavated from individual soil sampling locations that are used as sample material will be returned to the inert material stockpile when sampling is completed. Decontamination water will be managed in accordance with the Stormwater Management section of the Engineering Design Report. Disposable materials will be placed in outgoing waste (refuse fraction and bulky material) containers for disposal.

9 Documentation

Results of the performance monitoring will be summarized in the Landfill Closure Report.

10 References

CH2M HILL. 1996. *Bainbridge Island Landfill Remedial Investigation/Feasibility Study Work Plan* (and Addenda). Prepared for Kitsap County Department of Public Works, Solid Waste Division.

CH2M HILL. 2000a. *Final Bainbridge Island Landfill Remedial Investigation Report.* Prepared for Kitsap County Department of Public Works, Solid Waste Division. November 1.

CH2M HILL. 2000b. *Final Bainbridge Island Landfill Remedial Investigation Report Supplement 1.* Prepared for Kitsap County Department of Public Works, Solid Waste Division. November 1.

CH2M HILL. 2000c. *Final Bainbridge Island Landfill Remedial Investigation Report Supplement 2.* Prepared for Kitsap County Department of Public Works, Solid Waste Division. November 1.

CH2M HILL. 2000d. *Final Bainbridge Island Landfill Feasibility Study Report.* Prepared for Kitsap County Department of Public Works, Solid Waste Division. November 1.

Attachment A

Grid Protocol

Grid Protocol

A systematic grid (i.e., regular spacing between nodes) with random start-point method will be applied for determining certain sampling locations in site subareas as specified in Section 2 of the Performance Monitoring Sampling and Analysis Plan (SAP). Systematic grid sampling from a random start point ensures that each point within the area to be characterized has an equal probability of being selected. The starting point of the grid will be chosen by a random process. This protocol will describe the grid start-point determination, grid construction, and the selection of sampling points on the grid in a way that is unbiased and ensures that each point within the area to be characterized will have an equal probability of being selected.

Grids will be rectangular, with a spacing of either 5, 10, or 25 feet between nodes to ensure that a sufficient number of nodes will fall within the area to be characterized. The grid spacing will be determined by the size of the area to be characterized (small areas will have smaller spacing, large areas will have larger spacing). Because the objective of systematic grid sampling for this project does not involve characterizing a directional component of contamination (e.g., a plume), orienting the grid at a random angle will not be necessary.

The grid start point will be established by obtaining random X (east-west) and Y (north-south) coordinates originating from the southwestern-most point on the perimeter of the area to be characterized. The random coordinates will be obtained by multiplying the respective maximum linear distances in the X and Y directions by a randomly determined fraction from 0 to 0.999. From the grid start point, a rectangular pattern of cells will be established around the area to be characterized based on the determined grid spacing. Nodes (i.e., cell corners) that fall outside the area to be characterized will not be included on the grid.

Once the grid is established, the nodes will be numbered in serial order. Nodes to be sampled will be determined by generating random numbers that correspond to grid node numbers until the required number of samples as specified in the SAP has been reached.

Loose soil or surface debris that can be safely moved by hand may be moved aside to allow access to the immediately underlying soil. In the event that a sample cannot be obtained from a 2-foot radial vicinity of a node determined for sampling due to field conditions, that node will be voided and a new node will be randomly determined for sampling as described above.

TABLE H-1
BAINBRIDGE ISLAND LANDFILL ENGINEERING DESIGN REPORT
COCs by Area, Performance Monitoring Plan

Analyte Group	Parameters	Comments
Septage Pits[a]		
VOCs	1,4-dichlorobenzene	
SVOCs (includes PAHs)	carbazole	
	pentachlorophenol	
	benzo(a)anthracene	Soil samples collected following excavation.
	benzo(a)pyrene	
	benzo(b)fluoranthene	
	benzo(k)fluoranthene	
	chrysene	
Metals	arsenic	
	cadmium	
	copper	
	lead	
	mercury	
	selenium	
	zinc	
Pesticides/PCBs	4,4'-DDD	
	Dieldrin	
	Aroclor 1254	
	Total PCBs	
TPH	Diesel-range	
	Heavy oil-range	
Settling Ponds		
SVOCs (includes PAHs)	carbazole	
	pentachlorophenol	
	benzo(a)anthracene	Soil samples collected following excavation.
	benzo(a)pyrene	
	benzo(b)fluoranthene	
	chrysene	
	dibenzo(a,h)anthracene	
	indeno(1,2,3-cd)pyrene	
TPH	heavy oil-range	
Metals	arsenic	
	beryllium	
	iron	
West End Area[b]		
SVOCs (includes PAHs)	carbazole	
	pentachlorophenol	
	benzo(a)anthracene	Soil samples collected from base and or sidewalls of excavation.
	benzo(a)pyrene	
	benzo(b)fluoranthene	
	benzo(b)fluoranthene	
	chrysene	
	dibenzo(a,h)anthracene	
	indeno(1,2,3-cd)pyrene	
	naphthalene	

TABLE H-1
BAINBRIDGE ISLAND LANDFILL ENGINEERING DESIGN REPORT
COCs by Area, Performance Monitoring Plan

Analyte Group	Parameters	Comments
Metals	arsenic	
	chromium	
	copper	
	iron	
	lead	
	mercury	
	selenium	
	zinc	
Pesticides/PCBs	Aldrin	
	Aroclor 1254	
	Total PCBs	
Main Landfill		
SVOCs (includes PAHs)	carbazole	
	pentachlorophenol	
PAHs	benzo(a)anthracene	Soil samples collected following landfill excavation from areas of original landfill footprint that will remain uncovered. Sampling frequency will be approximately one sample per 5,000 square feet.
	benzo(a)pyrene	
	benzo(b)fluoranthene	
	benzo(b)fluoranthene	
	chrysene	
	dibenzo(a,h)anthracene	
	indeno(1,2,3-cd)pyrene	
	naphthalene	
Metals	arsenic	
	chromium	
	copper	
	iron	
	lead	
	mercury	
	selenium,	
	zinc	
Pesticides/PCBs	Aldrin	
	Aroclor 1254	
	Total PCBs	
Inert Fraction Material, Composite Samples		
SVOCs	carbazole	
	pentachlorophenol	
PAHs	benzo(a)anthracene	Sample number based on collection ten grabs per week at the screen plant to be composited into 2 samples; assumed 6-10 weeks of operation
	benzo(a)pyrene	
	benzo(b)fluoranthene	
	benzo(b)fluoranthene	
	chrysene	
	dibenzo(a,h)anthracene	
	indeno(1,2,3-cd)pyrene	
	naphthalene	
Metals	arsenic	
	chromium	
	copper	
	iron	
	lead	
	mercury	
	selenium	
	zinc	

TABLE H-1
BAINBRIDGE ISLAND LANDFILL ENGINEERING DESIGN REPORT
COCs by Area, Performance Monitoring Plan

Analyte Group	Parameters	Comments
Pesticides/PCBs	Aldrin Aroclor 1254 Total PCBs	
Inert Fraction Material, Discrete Samples		
VOCs	1,1-dichloroethene vinyl chloride	Sample number based on collection of 2 samples per week; assumed 6-10 weeks of operation

[a] Septage Pits Located: South, West Central, East Central, and West.
[b] West End Area: Southern Area, Northern Area.

TABLE H-2
BAINBRIDGE ISLAND LANDFILL ENGINEERING DESIGN REPORT
Soil and Inert Fraction Analytical Methods and Requirements

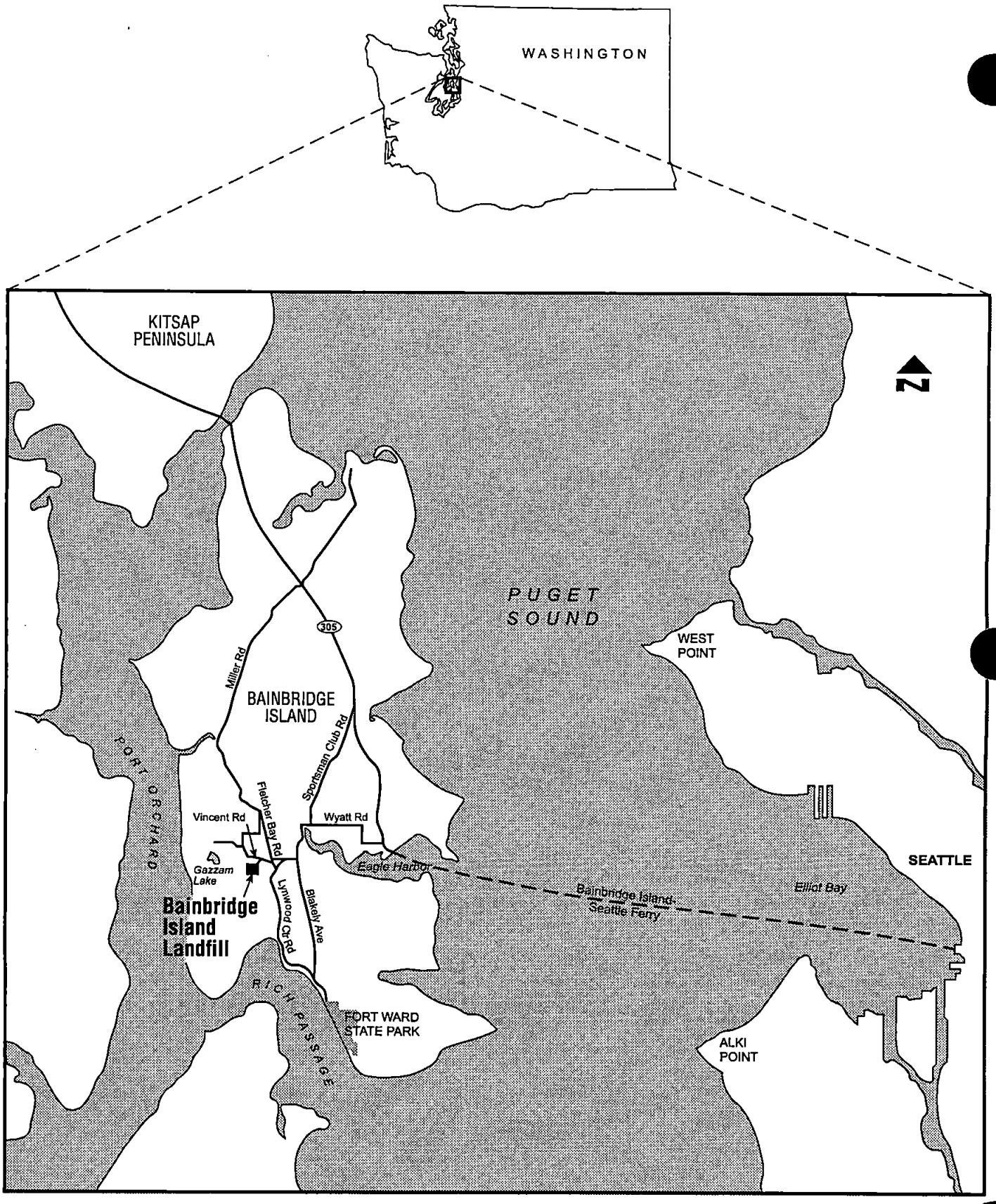
Analyte Group	Method	Sample Container	Preservative	Holding Time	Applicable Areas
VOCs	8260B	4 oz. CWM w/septum	keep cool *	14 days	Septage Pits, Inerts
SVOCs	8270C	8 oz. CWM	keep cool *	14 days[a]	Main Landfill & West End Area, Septage Pits, Settling Ponds, Inerts
TPH	WTPH-Diesel Ext	8 oz. CWM	keep cool *	14 days	Settling Ponds
Metals	6010B/7000	8 oz. CWM	none	6 months	Main Landfill & West End Area, Septage Pits, Settling Ponds, Inerts
PCBs and Pesticides	8081	8 oz. CWM	keep cool *	14 days[a]	Main Landfill & West End Area, Septage Pits, Settling Ponds, Inerts

Notes:
a - 14 days to extraction; 40 days to analysis

TABLE H-3
BAINBRIDGE ISLAND LANDFILL ENGINEERING DESIGN REPORT
Septage Pit Sampling

Septage Pit	Approximate Square Footage[a]	Approximate Number of Normal Field Samples	Field Duplicates	MS/MSD	Equipment Blanks
South	13,650	5	1	0	1 per week
West Central (2 pits combined)	6,255	3	0	0	1 per week
East Central	3,740	3	1	0	1 per week
West	5,250	3	0	1/1	1 per week

[a] From the Feasibility Study Table 5-1 (CH2M HILL, 2000).



E012001015SEA • 158183.01.ER • H-1 Site Location Map • 2/26/01 • JG/gr

Figure H-1

Site Location Map

Bainbridge Island Landfill

E012001015SEA • 158183.01.ER • H-2 Site Plan • 2/7/01 • JG

MW15/GP15
MW14/GP14
MW13/GP13
Vincent Road
Access Road
Property Line
Bainbridge Disposal Transfer Station Area
Northern West End Area
SW-U
Main Landfill
New catch basin (Aug '98)
New Erosion Control
SW-D
Catch Basin
Drainage Outfall
Outfall Control Structure
Stormwater Detention Pond
West Septage Pit
Southern West End Area
Central Septage Pits
MW12
South Septage Pit

LEGEND

- MW6/GP6 — Combination monitoring well and gas probe
- MW12 — Monitoring well
- SW5 — RI surface water sampling location
- Approximate extent of main landfill mass
- Surface water drainage channel
- Surface water diversion pipe (buried)
- Approximate outline of pond
- Approximate outline of waste source area
- Gravel or paved roads
- 220 — Elevation in feet (contour interval = 2 feet)

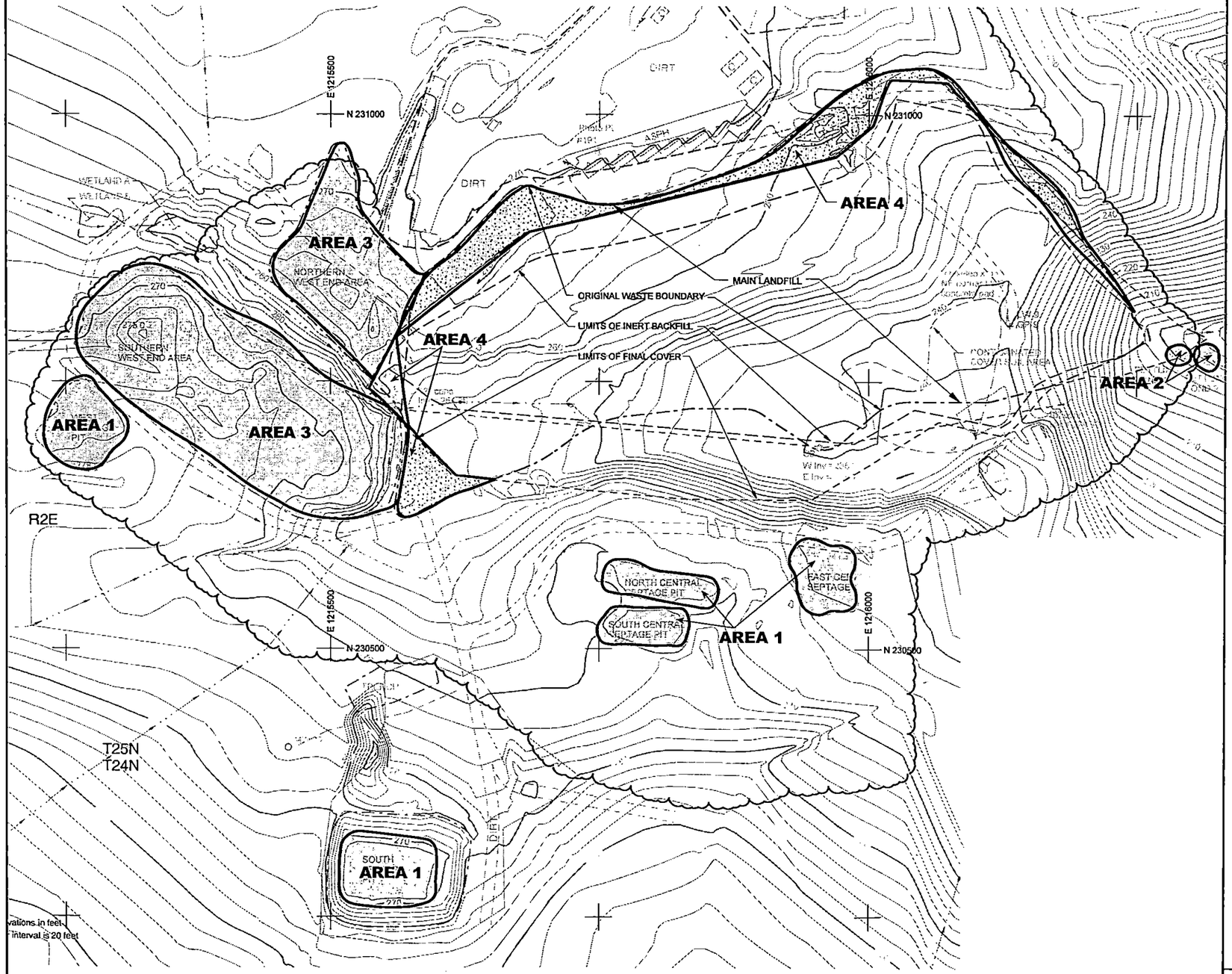
Scale: 1" = 150'
0 50 100 150

N

Note: Outlines of waste areas and transfer station are approximate.

Figure H-2
Site Plan
Bainbridge Island Landfill

E012001015SEA • 158183.01.ER • H-3 ePerformance Monitoring Sampling Areas • 3/9/00 • JG



LEGEND

Performance Monitoring Sampling Area

0 50 100 150
Scale In Feet

N

Figure H-3

Performance Monitoring Sampling Areas

Bainbridge Island Landfill

APPENDIX I

Confirmation Monitoring Sampling and Analysis Plan

APPENDIX I

Confirmation Monitoring Sampling and Analysis Plan

1 Introduction

This Sampling and Analysis Plan (SAP) describes the approach and procedures for post-closure monitoring of groundwater and surface water at the Bainbridge Island Landfill. The purpose of this sampling is to demonstrate the long-term effectiveness of the cleanup action, including natural attenuation (NA) of groundwater, and other remediation processes for compliance with MTCA (WAC 173-340-410(1)(c)). The landfill and vicinity are shown in Figure I-1.

Groundwater at the landfill occurs in unconsolidated glacial deposits consisting of recessional outwash, glacial till, and advance outwash of the Vashon glaciation underlain by older glacial and interglacial sediments. Three aquifers are delineated beneath the site and surrounding vicinity: the upper, lower, and perched aquifer. The perched aquifer is approximately 100 feet above and hydraulically isolated from the upper aquifer, is not affected by the landfill, and will not be monitored. The upper aquifer is unconfined; the water table is about 120 to 155 feet below the ground surface (approximately 60 feet below the depth of excavation of the main landfill) and does not show large seasonal fluctuations. Groundwater generally flows from south to north in the upper aquifer at approximately 0.5 foot per day. The five wells included in this SAP are completed in the upper aquifer. The upper and lower aquifers are separated by a very low permeability interglacial lacustrine silt and clay unit that is approximately 145 feet thick (CH2M HILL, 2000d). The lower aquifer will not be monitored.

Surface water at the landfill consists only of seasonal stormwater flow (CH2M HILL, 2000d) that drains eastward to a large lowland about ½ mile east of the site. Surface water originates just west of the western property boundary and originally flowed east through the ravine in which landfill refuse was placed. A surface water divide separates the site from Gazzam Lake, located approximate 1/3 mile west of the property boundary, which drains to the west. The cleanup action will restore the west to east flow of the drainage through a series of open channels, a detention pond, and outlet structures.

2 Sampling and Analysis Approach

Groundwater monitoring will be conducted twice per year in winter and summer. Surface water monitoring will be conducted once per year in the winter when the surface water is flowing. Sample collection and chemical analytical procedures are described in the following section. Quality assurance/quality control, and data management are described in subsequent sections. Specific monitoring stations for groundwater and surface water are described in the following sections.

2.1 Groundwater

Four onsite monitoring wells (MW-12 through MW-15, Figure I-2) and one offsite water well (Stetson Acres (BOW-37); Figure I-3) comprise the post-closure groundwater confirmation network. Three of the wells, MW-13, MW-14, and MW-15, are located on the northern property boundary downgradient of the waste sources that existed prior to remediation. One well, MW-12, is located upgradient of these waste sources. All other monitoring wells were decommissioned at the time of remediation in accordance with Chapter 173-160 WAC. The offsite water well is located approximately 700 feet northeast (Stetson Acres) of the northeast corner of the site (Figure I-3).

Each of these wells is to be sampled twice per year at roughly 6-month intervals: once during the wet season (October to April) and once during the dry season (May to September).

2.2 Surface Water

Two surface water monitoring stations (Figure I-2) compose the post-closure surface water confirmation network. The first station (SW-U) is in the upstream (western) portion of the site; the second (SW-D) is in the downstream (eastern) portion of the site downstream of the detention pond outlet structure and near the eastern property boundary.

Each of these stations is to be sampled once per year during the wet season, in conjunction with the wet season groundwater monitoring event. Because surface water at the landfill occurs only as seasonal stormwater flow, sampling during the wet season is necessary to ensure that adequate water for sampling exists at the surface water stations.

3 Sample Collection Procedures

3.1 Water Level Measurements and Flow Reconnaissance

For each sampling event, groundwater levels in each well will be measured and surface water flow at each station will be estimated prior to obtaining any samples. These observations and the time of each observation will be recorded in the field notebook. Groundwater level measurements will be made as close in time to each other as possible.

3.2 Sampling Procedures

3.2.1 Groundwater

Onsite Monitoring Wells

Dedicated Grundfos *Redi-Flo2*® submersible pumps with Teflon-lined ½-inch polyethylene discharge hose are installed in all the onsite monitoring wells. The pump intake in each well is near the midpoint of the well screen. Grundfos pump operating instructions are included in Attachment A. Water will be purged from each well using the dedicated pumps at a rate that results in no more than 0.2 foot of drawdown in the well. The target rate for well purging is 2 liters per minute (Lpm). Table I-1 shows the approximate controller frequencies that should achieve the target pumping rate for each sampling activity (i.e., purging,

sampling VOCs, sampling other analytes). Actual frequencies required in the field will vary from the tabulated values due to changes in hydraulic head above the pump intake.

Purged water will be streamed through a plastic field beaker, then to a 55-gallon drum for temporary holding pending analysis of the samples. Water flowing through the field beaker will be monitored continuously for field parameters (temperature, pH, specific conductance, dissolved oxygen, turbidity, and oxidation/reduction potential), with values recorded at about 1-minute intervals. Field parameters will be used to determine when purging is complete. Purging will be complete when three successive readings of field parameters stabilize to within tolerance limits:

- ±0.1 pH unit
- ±3 percent for specific conductance
- ±10 mV for oxidation/reduction potential
- ±10 percent for dissolved oxygen and turbidity

The water temperature at the end of purging will be recorded in the field notebook; immediately thereafter the flow rate will be reduced 0.5 Lpm or less to sample VOC constituents. After VOCs have been sampled, the water temperature will be recorded in the field notebook and the flow rate will be increased to about one Lpm to sample for remaining analytes. Groundwater samples for dissolved manganese will not be field-filtered. Filtering will be conducted by the analytical laboratory upon receipt of the samples, if necessary.

Stetson Acres Well

The Stetson Acres well is a 98-foot-deep, 6-inch-diameter domestic water supply well that has a submersible pump installed in it. The pump supplies water to an underground cistern and is activated by a float switch in response to declining water level in the cistern. Well water is pumped into the cistern via an inlet at the top of the cistern. The method of purging and sampling this well has been empirically determined by previous fieldwork. It is described below in some detail to facilitate consistency with past sampling work at the well.

Well water must be flowing into the cistern. In order to activate the pump, the water level in the cistern must be dropped. This is accomplished by emptying the cistern from the auxiliary discharge hose bib using a garden hose to direct discharging purge water overland to a desired drainage location. The discharge from the well into the cistern is not metered; therefore, in order to approximate the total volume purged from the well, the volume of water drained from the cistern must be monitored. This can be done with a graduated 5-gallon bucket and stop watch.

The total desired volume to be purged from the well prior to sampling is approximately 350 gallons. Once the cistern has been drained of the required volume and well water is flowing into the cistern, parameter monitoring in the cistern inlet stream can begin. Samples of water for measuring field parameters can be obtained in a field beaker attached to a pole that can be extended into the cistern inlet stream. Parameters are measured at approximately every 110 gallons, and once at 350 gallons, for a total of four times, after which point samples for laboratory analysis may be obtained. Typical parameter values for the well are: pH 6.4, specific conductance 0.047 mS/cm, turbidity 0, dissolved oxygen 5 mg/L, temperature 9°C. However, because of the nature of the well, large purge volume, and high purge rate, the stability criteria for field parameters do not apply to this well.

Samples may be obtained by extending a new unpreserved sample bottle into the cistern inlet stream in the same fashion as obtaining water for field parameters.

3.2.2 Surface Water

Surface water will be sampled by decanting water obtained from the surface water station with a new, unpreserved, laboratory-prepared bottle into appropriate sample containers. Immediately prior to and after obtaining the surface water sample at each station, field parameters (pH, temperature, specific conductance, dissolved oxygen, turbidity, and oxidation/reduction potential) will be measured and recorded in the field notebook.

Other observations to be recorded include:

- Estimated flow rate
- Estimated maximum water depth
- Water appearance
- Odors, sediment material, particulate organic material
- Surrounding environment and weather

In general, surface water stations should be sampled in order from upstream to downstream to minimize the potential for cross contamination of upstream stations from downstream operations.

3.3 Decontamination

The objectives of decontamination are as follows:

- To prevent the introduction of contaminants into samples from sampling equipment or other samples
- To prevent contamination from leaving the sampling site by way of sampling equipment, personnel, or materials
- To prevent exposure of field personnel to contaminated materials

Any non-dedicated-use or non-single-use sampling equipment that comes in contact with surface water or groundwater should be decontaminated before and after each use. Equipment probes that come in contact with sample water should be cleaned by thoroughly rinsing with distilled water.

With the exception of water level sounders (see below), the sampling procedures of this SAP make exclusive use of dedicated or single-use sampling equipment; or equipment that does not contact sampled water (e.g., field parameter measuring equipment). Therefore, decontamination is only necessary to achieve the last two objectives listed above. Decontamination of re-usable field equipment (e.g., field parameter measuring equipment) with soap (e.g., Liquinox) and water only will be required at the end of each field day. Decontamination procedures for site workers (e.g., hand washes) as specified in the Health and Safety Plan will be followed. Because of the very low volumes of water generated during this type of decontamination and the very low potential concentrations of contaminants in this type of decontamination water, containment of the decontamination water is not required.

Water level sounders will be decontaminated at the start and end of each field day with soap (e.g., Liquinox) and distilled water, and after use in each well with a spray rinse of distilled water.

3.4 Chemical Analytes and Methods

3.4.1 Groundwater

Groundwater samples will be analyzed at the laboratory for 1,1-dichloroethene, vinyl chloride, manganese (total and dissolved), alkalinity, chloride, nitrate (plus nitrite/nitrate), and sulfate. Table I-2 shows the chemical analytical requirements, methods, and recommended sample containers and preservatives for groundwater samples.

3.4.2 Surface Water

Surface water samples will be analyzed at the laboratory for iron (total and dissolved), dissolved copper, dissolved zinc, alkalinity, and coliform (fecal and total). Field measurements of turbidity and dissolved oxygen will be compared to site cleanup levels. Table I-2 shows the chemical analytical requirements, methods, and recommended sample containers and preservatives for surface water samples.

4 Quality Assurance and Quality Control

4.1 Field Documentation

Specific information and observations will be recorded in the field during monitoring activities. Task-specific data sheets may be used to record observations for instrument calibration, water level and flow observations, and groundwater and surface water sampling activities. Examples of task-specific data sheets for groundwater and surface water monitoring are in Attachment B.

Other field observations will be made in a bound, weatherproof field notebook. At the discretion of the field investigator, a field notebook may be used in place of task-specific data sheets during inclement weather. The minimum information to be documented in the field notebook and/or on the data sheets includes the following:

- Names of field team personnel
- Date and times of entries
- Physical/environmental conditions during field activities, including temperature and precipitation
- Names and associations of any site visitors, contractors and subcontractors, purpose of the visit, and the times of their arrival and departure
- Photographic log, if appropriate

- The make, model number, serial number, and calibration information for each meter used in the field (i.e., temperature, specific conductance, etc., and all health and safety monitoring equipment)
- Identification and location of all samples collected and sample times
- Miscellaneous field observations including physical changes since previous visit
- Decontamination procedures and times when specific equipment was cleaned should be recorded in the decontamination section of the field sampling logbook.

4.2 Calibration of Field Equipment

Numerous commercially available meters exist for measuring water levels and field water quality parameters (pH, temperature, dissolved oxygen, specific conductance, turbidity, oxidation/reduction potential). Each type of meter required for monitoring is listed below with some examples of commercially available models or methods.

- Water level sounder—Slope Indicator Model 51453, Solinst Model 101, Heron Instruments Dipper series
- pH meter—Horiba U-10 multimeter, Orion Model 1230 multimeter, Orion Model 230 series or higher
- Temperature—Conventional thermometer, or temperature mode on Horiba U-10 multimeter, Orion Model 1230 multimeter, pH meter or S-C-T meter (see below)
- Dissolved oxygen—Horiba U-10 multimeter, Orion Model 1230 multimeter, YSI Model 51B
- Specific conductance—Horiba U-10 multimeter, Orion Model 1230 multimeter, YSI Model 33 S-C-T meter. Because specific conductance exhibits temperature dependence, a temperature-compensating meter is preferred.
- Turbidity—Spectrophotometer, Horiba U-10 multimeter
- Oxidation/reduction potential—Orion Model 290 series or higher

Water level sounders do not require numerical calibration; however, they should be periodically checked in a cup of water to ensure that the sensitivity of the probe is suitable and appropriate. Dying batteries or moisture in the water level sounder components can decrease the instrument's sensitivity, which in turn could result in erroneously low depth to water readings.

Calibration of water-quality meters should be done at the beginning of each day of use and according to manufacturer specifications and recorded in the field notebook. Items to be recorded include: make, model, serial number, calibration medium, meter reading (actual and expected), slope factor (pH only), and any anomalies in the calibration. Periodic calibration of pH meters after initial calibration may be necessary if drift is observed. Drift is the tendency of pH meters to become less accurate as the range of tested pH values increases.

Some specific conductance meters cannot be calibrated in the field (e.g., YSI Model 33 S-C-T meter). These meters should be field-checked to evaluate their accuracy. Field-checking is done by recording the readings on standard solutions of known specific conductance in the expected range of samples to be tested. Fresh standard solutions must be used for each sampling event. Calibration check results should be recorded in the field notes. Additional periodic calibration checks are recommended during sampling to check that each meter is operating as required.

Field equipment that is out of calibration and cannot be calibrated or that malfunctions during use should be removed from service and repaired by a qualified technician.

4.3 Sample Management

The management of samples collected in the field must follow specific procedures to ensure sample integrity. Sample management includes maintaining chain-of-custody and following proper procedures for packaging and shipping to ensure sample quality and minimize breakage of samples during transport to the laboratory.

4.3.1 Sample Labeling

The following information will be recorded on the sample label at the time the sample is obtained:

- Unique sample identification as described above
- Initials of person(s) collecting the sample
- Time of sample collection to the nearest minute
- Requested laboratory analyses
- Date of sample collection
- Preservative used (if any)

4.3.2 Sample Chain-of-Custody

The possession of samples must be traceable from the time they are collected through the time they are analyzed by the laboratory. Chain-of-custody forms will be used for this purpose.

Custody of a sample is defined by the following criteria:

- The sample is in a person's view while in his/her possession
- Any sample in a person's possession and not in view is locked up and custody-sealed or transferred to a designated secure area

Each time the samples change hands, both the sender and receiver sign and date the chain-of-custody form. When a sample shipment is sent to the laboratory, the top signature copy is enclosed in plastic and secured to the inside of the lid of the cooler used to ship the samples. The second copy of the chain-of-custody form must be retained in the project files. A chain-of-custody record must be completed for each shipping container (cooler). The information on the form must be consistent with the sample identification matrix and labels of bottles contained within the cooler.

The following information is to be included in the chain-of-custody form:

- Sample number
- Signature of sampler
- Date and time of collection
- Place of collection
- Type of sample
- Sample identification number
- Analysis
- Air bill number (if shipped)
- Inclusive dates of possession
- Signature of receiver

In addition to the labels, seals, and chain-of-custody form, other components of sample tracking include the field data sheets, sample shipment receipt, and laboratory logbook.

4.3.3 Sample Packaging

Before packaging samples, check that the exterior of the sample bottle is clean and that the sample identification number is legible. If samples are to be shipped, the sample shipping containers should be constructed and packed to meet the following requirements:

- There will be no release of materials to the environment
- Inner containers that are breakable (glass bottles) must be packaged to prevent breakage and leakage per Step 3 below. Packaged samples must be capable of withstanding a 4-foot drop on solid concrete in the position likeliest to cause damage. The cushioning and absorbent material must not be reactive with the sample contents.

Only waterproof ice chests and coolers are acceptable shipping containers. The contract laboratory may provide coolers.

After documentation, samples should be handled as follows:

1. Seal drain plug in cooler.
2. Place vermiculite or similar cushioning and absorbent material in bottom.
3. Wrap glass bottles with bubble wrap, seal the wrapped glass bottles in Ziploc-type plastic bags, and place in cooler that is partially filled with vermiculite. If bubble wrap is not available, place the containers in resealable plastic bags and set in waxed cardboard holders that have been set up inside the cooler. Bottles containing water samples should be set upright inside the cooler.
4. Add double-bagged ice as necessary to maintain an internal cooler temperature of 4°C or lower.
5. Place the chain-of-custody form(s) in a plastic bag attached to the inside of cooler lid.
6. Attach chain-of-custody seals at both the front and back of container so that the seals must be broken if the cooler is opened.
7. Place name and address of receiving laboratory in a position clearly visible on the outside of the cooler.

8. Secure the lid and custody seals with fiber tape. Tape over custody seals so that they will be cut if the fiber tape is cut.

If samples are to be hand-delivered to the laboratory, the following sample packing protocol should be followed:

1. Wipe the outside of any wet sample bottles with paper towels wetted with distilled or deionized water.
2. Pack the cooler(s) to minimize movement during transport. All glass bottles containing water must be packed vertically.
3. Add double-bagged ice as necessary to maintain an internal cooler temperature of 4°C or lower.

4.3.4 Sample Shipment

Samples should be hand-delivered or shipped via overnight courier to the contract laboratory for analysis. All air bills should be kept on file as part of chain-of-custody documentation, and the laboratory should be informed by telephone that samples are being shipped each day during sampling. The laboratory should be called on the following day to confirm the number and condition of the samples received.

4.4 Quality Control Sample Requirements

The quality control (QC) samples to be collected during confirmation monitoring include field duplicates, trip blanks, and matrix spike/matrix spike duplicates (MS/MSDs). The frequency of collection for each type of QC sample will be as follows:

- One field duplicate of each matrix (surface water and groundwater) will be collected per sampling event
- One trip blank will be provided for each cooler
- Extra matrix for one MS/MSD sample per sampling event will be provided for each matrix

4.5 Data Quality Review

While the RI/FS data were subject to full and partial data validation, that level of data validation is no longer necessary. Data quality objectives required comprehensive data review in order to establish an accurate, complete, and legally defensible data set. That data set is now well established and a reduced level of data validation or review is appropriate for subsequent data collected. The following procedures will be used for review of surface water and groundwater laboratory data during the confirmation monitoring period.

Data quality assurance will be based on an overall review of the laboratory deliverable rather than systematic validation following EPA/Ecology guidance. The level of review is reduced over that done for the RI/FS because the existing database provides a basis for comparison of the results (reasonableness checks). Laboratory data will be reviewed in general for technical soundness. Laboratory-provided QC data such as blanks, surrogates, duplicates, matrix spikes, and laboratory control samples will be reviewed for conformance

with tolerance limits. Individual data points will only be flagged if the review indicates a need for further validation. The review findings will be summarized in a memo to the project files.

5 Data Management

This section describes the general data management approach for data collected as part of the landfill reclamation actions. Additional data management information is available from the RI/FS Work Plan and Work Plan Addenda (CH2M HILL undated) that are not included in this SAP. Updates to data management procedures may be prepared in the form of memorandums if significant changes to the type of data to be acquired occur as the investigation proceeds.

Data management includes the functions of storing and accessing data, enforcing data storage conventions, and regulating database input and output. The stored data will include chemical parameters measured in environmental media samples obtained during remedial action.

Data management will involve the use of an electronic environmental data management system. The system will provide a centralized, secure location for environmental data of known quality that can be shared and used for multiple purposes. The data management system will assist in the information flow for the project by providing a means of cataloging, organizing, archiving, and accessing information. This information may then be used with other software for analysis, plotting, and presentation.

The data management system that is used to store and communicate historical and new data collected for the Bainbridge Island Landfill uses a CH2M HILL-developed environmental database. Data are stored in Paradox® Version 4.0 format, and reports are generated using MS Access Version 8.0.

6 Data Analysis and Reporting

6.1 Groundwater and Surface Water Compliance

Groundwater and surface water data for parameters with established cleanup levels will be used to determine the progress of each parameter relative to its cleanup level at each monitoring well in accordance with MTCA. MTCA criteria for compliance will be met when results from four consecutive sampling events have met cleanup levels for all parameters.

The process to be used to demonstrate progress is based on MTCA regulations (WAC 173-340-720) . The process is designed to meet requirements of the project Cleanup Action Plan (CAP; 2001). In accordance with the CAP, if progress toward cleanup cannot be demonstrated after 30 years, active groundwater remediation will be implemented at the site. The parameters with established cleanup levels for the landfill are:

- Groundwater—1,1-dichloroethene, vinyl chloride, and manganese
- Surface Water—iron (total and dissolved), dissolved copper, dissolved zinc, alkalinity, dissolved oxygen, coliform (fecal and total), and turbidity

6.2 Reporting

Groundwater and surface water monitoring data will be reviewed as soon as they are received from the lab. If any problems are noted with the data such as outliers to recent trends or a change in a trend, Ecology and the Bremerton-Kitsap County Health District will be notified.

Written reports will be prepared every five years after the start of post-remediation monitoring. Reports will include:

- Table of depth to water, casing elevations, and calculated groundwater elevation for the four monitoring wells
- Table of analytical monitoring data for the four monitoring wells, including the established cleanup levels for each parameter
- Groundwater elevation contour map showing groundwater flow directions
- Time series plot of each analytical parameter (data may be shown in more than one time series plot, if necessary, to clearly present the data). Time series plots will begin with the earliest data obtained for each well or station; and the established cleanup levels will be shown on the plots
- Tables presenting the results, including the number of samples in each data set and the frequency of detection, and whether or not the concentrations exceed the cleanup levels

Data will be accompanied by text that describes the groundwater monitoring system at the landfill and the equipment and procedures used to collect the data. Deviations from the monitoring program or problems encountered during monitoring will be noted. The report will also include a brief summary of changes in groundwater flow direction over time, trends in parameter values over time, as shown in the time series plots, and parameters that exceed the cleanup in at least one well. If any response actions have been taken during the monitoring period, they will be described along with the results of such actions. Text will summarize the progress toward cleanup levels.

7 References

CH2M HILL. Undated. *Bainbridge Island Landfill Remedial Investigation/Feasibility Study Work Plan* (and Addenda). Prepared for Kitsap County Department of Public Works, Solid Waste Division.

CH2M HILL. 2000d. *Final Bainbridge Island Landfill Feasibility Study Report.* Prepared for Kitsap County Department of Public Works, Solid Waste Division. November 1.

Ecology (Washington Department of Ecology). 1992. *Statistical Guidance for Ecology Site Managers.* Publication No. 92-54.

Ecology (Washington Department of Ecology). 1995. *Guidance on Sampling and Data Analysis Methods.* Publication No. 94-49.

TABLE I-1
BAINBRIDGE ISLAND LANDFILL ENGINEERING DESIGN REPORT
Groundwater Sampling Pump Rates and Controller Frequencies

Well	Date of Measurement	Depth to Water (feet below top of casing)	Estimated Pump Rate (liters per minute)	Controller Frequency (hertz)	Activity
MW12	03/05/1997	142.12	2.5	265	Purge
			0.2	256	Sample VOC
			1.5	261	Sample other analytes
MW13	04/09/1997	124.23	2.5	252	Purge
			0.5	245	Sample VOC
			1	248	Sample other analytes
MW14	04/09/1997	140.79	2.3	267	Purge
			0.5	260	Sample VOC
			1	262	Sample other analytes
MW15	04/09/1997	147.88	2.3	277	Purge
			0.3	267	Sample VOC
			1	269	Sample other analytes

Note: Target purge rate is 2 liters per minute.

TABLE I-2
BAINBRIDGE ISLAND LANDFILL ENGINEERING DESIGN REPORT
Groundwater and Surface Water Sampling

Medium	Class	Analyte	Method	Sample Container	Preservative[a]	Holding Time
Groundwater						
	VOCs	1,1-dichloroethene	8260B/SIM/CLP	2-40 mL glass vials	ice, 4°C, HCl	14 days
		vinyl chloride	8260B/SIM/CLP			
	Metals, Total	manganese	6010B/7000/CLP	1-500 mL HDPE bottle	ice, 4°C	6 months
	Metals, Dissolved	manganese	6010B/7000/CLP	1-500 mL HDPE bottle	ice, 4°C	6 months
	Conventionals	Nitrate-N and Nitrite-N	300	1-500 mL HDPE bottle	ice, 4°C	48 hours
		sulfate	375.2	1-500 mL HDPE bottle	ice, 4°C	28 days
		alkalinity	SM2320			24 hours
		chloride	325.2			28 days
Surface Water						
	Metals, Total	iron	6010B/7000/CLP	1-500 mL HDPE bottle	ice, 4°C	6 months
	Metals, Dissolved	iron, copper, zinc	6010B/7000/CLP	1-500 mL HDPE bottle	ice, 4°C	6 months
	Conventionals	alkalinity	SM2320	1-500 mL HDPE bottle	ice, 4°C	24 hours
		fecal coliform	SM9222D	4 oz. sterile HDPE bottle	ice, 4°C, $Na2S2O_3$	24 hours
		total coliform	SM 9222B	4 oz. sterile HDPE bottle	ice, 4°C, $Na2S2O_3$	24 hours
Field Parameters for Groundwater and Surface Water						
	Conventionals	pH	Measured in the field			
	Conventionals	dissolved oxygen	Measured in the field			
	Conventionals	oxidation/reduction potential	Measured in the field			
	Conventionals	temperature	Measured in the field			
	Conventionals	specific conductance	Measured in the field			
	Conventionals	turbidity	Measured in the field			

[a] Aliquots for dissolved metals to be filtered and preserved at analytical laboratory.

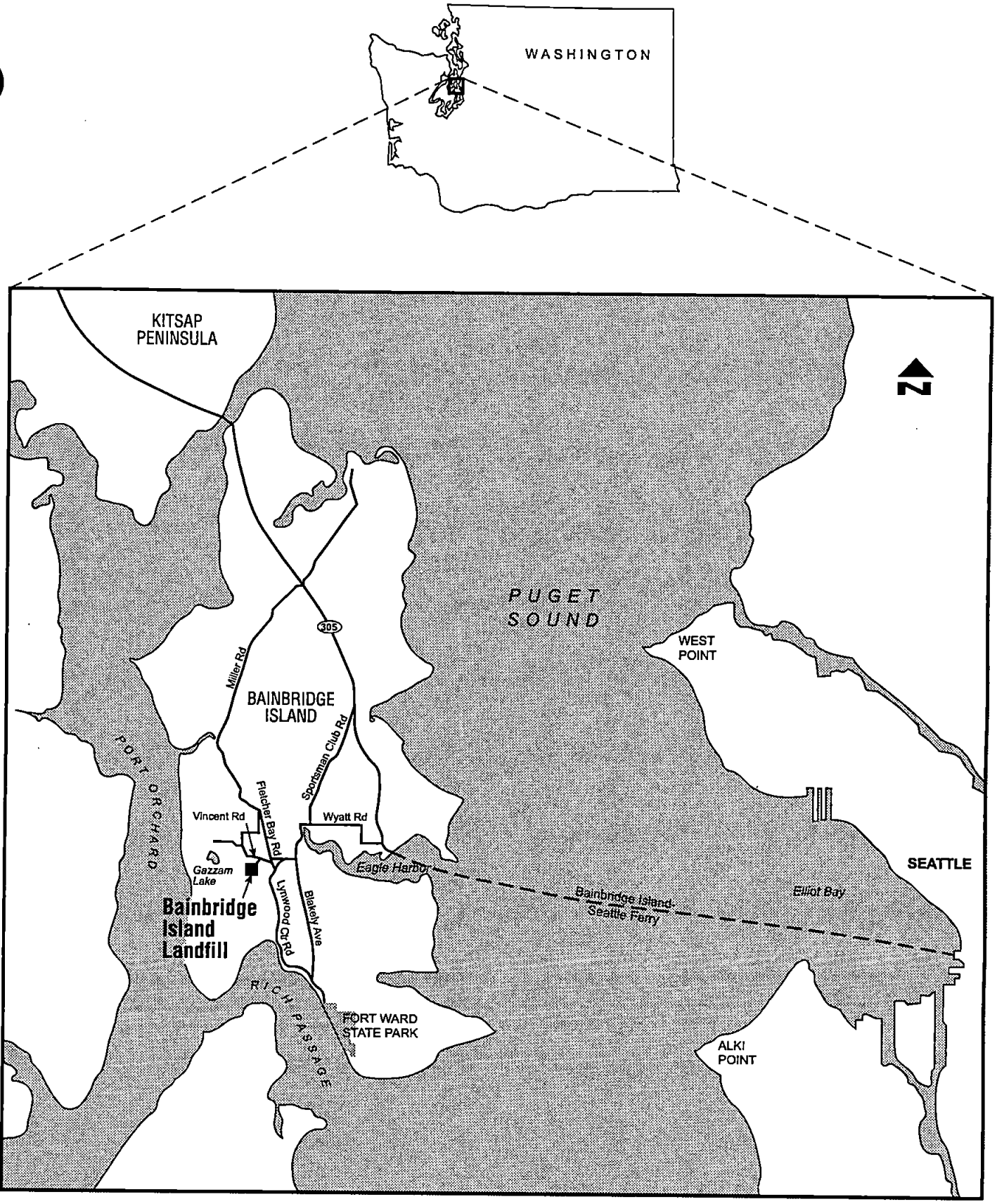


Figure I-1

Site Location Map

Bainbridge Island Landfill

ED120010155EA • 158183.01.ER • I-2 Site Plan • 2/7/01 • JG

MW15/GP15
MW14/GP14
MW13/GP13
Vincent Road
Access Road
Property Line
Bainbridge Disposal Transfer Station Area
Northern West End Area
SW-U
Main Landfill
New catch basin (Aug '98)
New Erosion Control
SW-D
Catch Basin
Drainage Outfall
Outfall Control Structure
Stormwater Detention Pond
West Septage Pit
Southern West End Area
Central Septage Pits
MW12
South Septage Pit

LEGEND

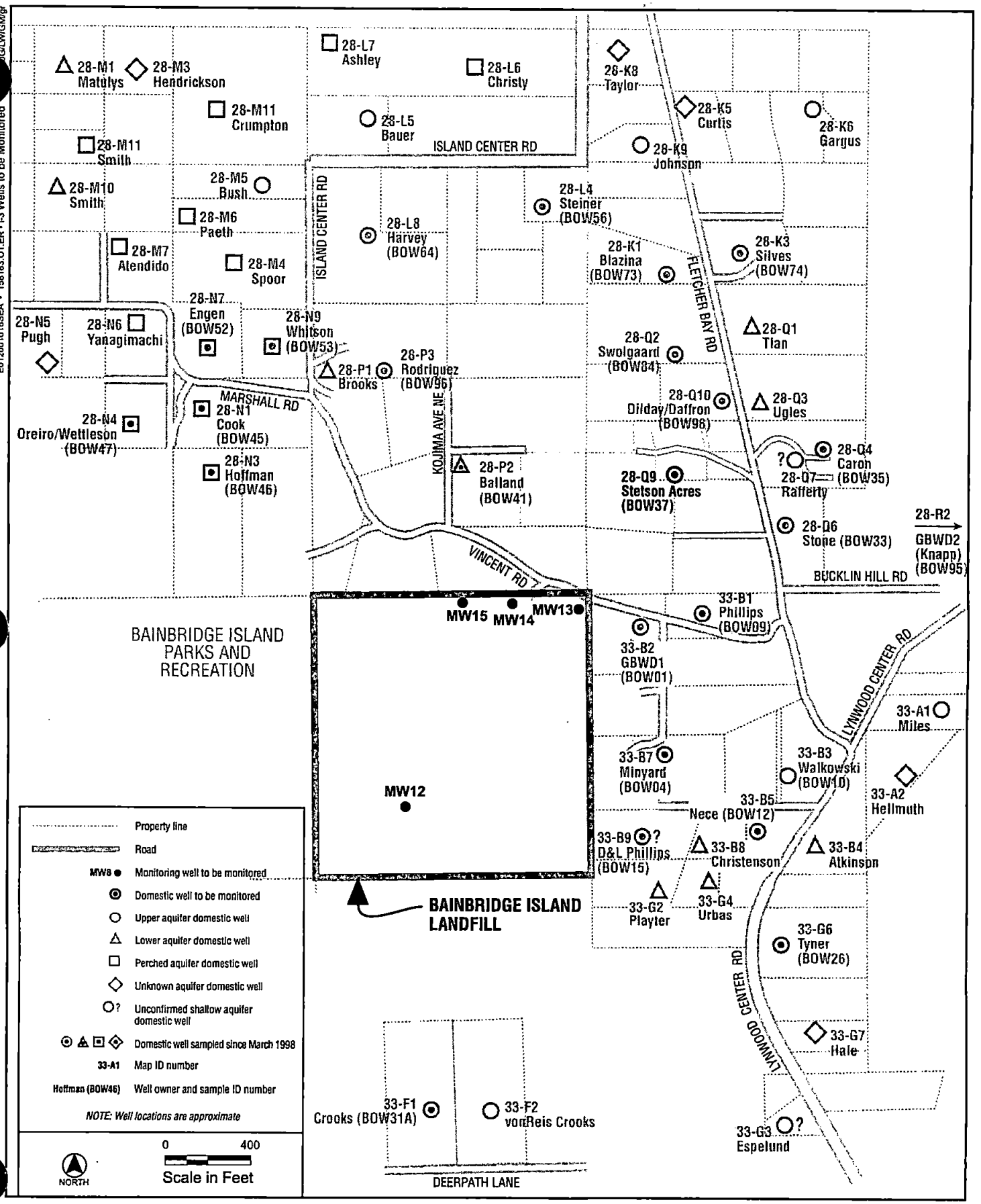
- MW6/GP6 — Combination monitoring well and gas probe
- MW12 — Monitoring well
- SW5 — RI surface water sampling location
- Approximate extent of main landfill mass
- Surface water drainage channel
- Surface water diversion pipe (buried)
- Approximate outline of pond
- Approximate outline of waste source area
- Gravel or paved roads
- 220 — Elevation in feet (contour interval = 2 feet)

Scale: 1" = 150'
0 50 100 150

N

Note: Outlines of waste areas and transfer station are approximate.

Figure I-2
Site Plan
Bainbridge Island Landfill



Reference Maps:

Kitsap County Tax Assessor Lot Maps, October 28, 1992.

(Sec. 33-25-2E North Half, Sec. 33-25-2E South Half, Sec. 25-25-2E South Half)

Figure I-3

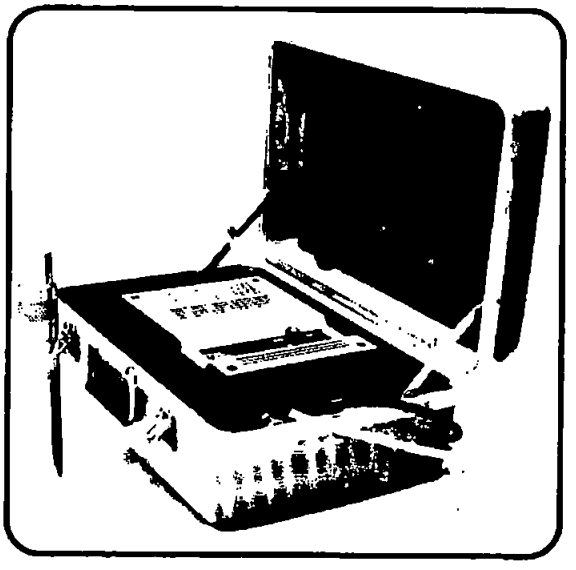
Wells to be Monitored

Bainbridge Island Landfill

Attachment A

Redi-Flo 2 Sampling Pump Installation and Operating Instructions

Redi-Flo2



Installation and Operating Instructions

GRUNDFOS®

"Leaders in Pump Technology"

SAFETY WARNING

Adherence To Environmental Regulations

When handling and operating the Redi-Flo2 system, all environmental regulations concerning the handling of hazardous material must be observed. When the pump is taken out of operation, great care should be taken to ensure that the pump contains no hazardous material that might cause injury to human health or to the environment.

Motor Fluid

The pump motor is filled with approximately .85 ounces (25 milliliters) of contaminant-free water. During operation, it is possible that a very small portion of this water could be replaced by the fluid being pumped. Therefore, there is a potential risk for cross contamination if used in portable applications. A filling syringe is provided with each pump to simplify the replacement of this water with clean water. Refer to page 6 for complete instructions.

Returning A Pump For Service

Only pumps that are certified as uncontaminated will be accepted by GRUNDFOS for servicing. GRUNDFOS must receive this certification prior to receiving the pump. If not, GRUNDFOS will refuse to accept delivery of the pump. In these cases, all costs incurred in returning the product to the customer will be paid by the customer.

Electrical Hazards

The Redi-Flo2 pumping system is not approved for Class I, Division I, Group D locations as specified by the National Electrical Code (NEC). Consult local authorities and regulations if you have any doubt about its suitability for a specific application.

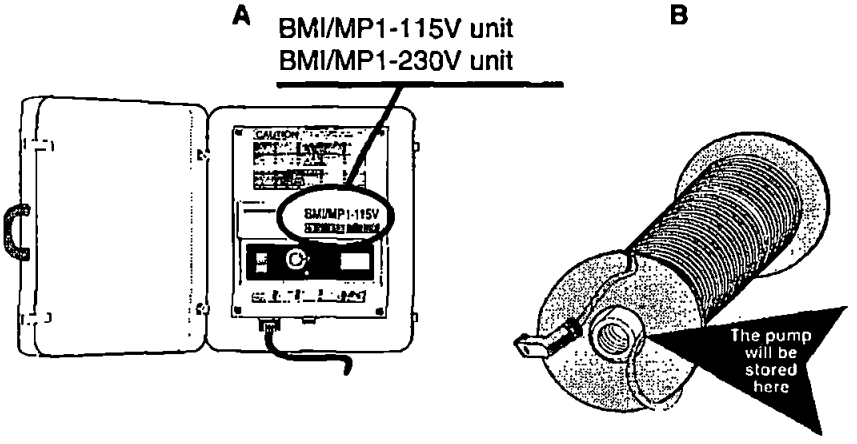
WARNING: To reduce the risk of electric shock during operation of this pump requires the provision of acceptable grounding. If the means of connection to the supply connected box is other than grounded metal conduit, ground the pump back to the service by connecting a copper conductor, at least the size of the circuit supplying the pump, to the grounding screw provided within the wiring compartment.

PRE-INSTALLATION CHECKLIST

Components of Your Redi-Flo2

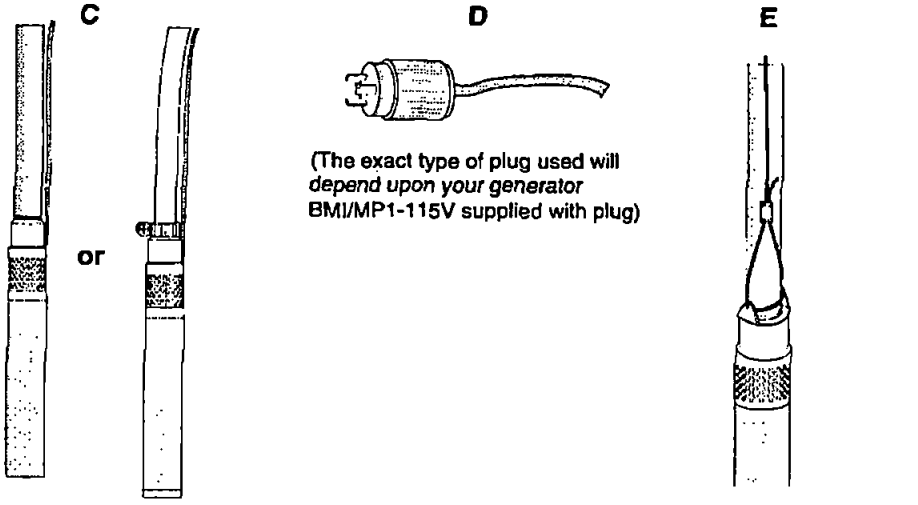
Your Redi-Flo2 Environmental Pumping system should contain the following components:

A. Converter in a protective carrying case with splash guard.
B. *MP1 pump and motor with motor lead.*



To operate the system you will also need:

C. Hose or pipe to connect to the pump and lower it into the well
D. An electrical plug to connect the converter power cord to your portable generator or other power source (BMI/MP1-230 only- plug supplied on BMI/MP1-115V).
E. Some type of safety cable (and attachments) for lowering and lifting the pump



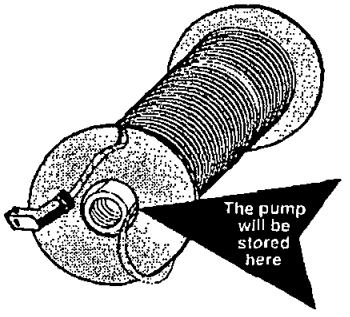
(The exact type of plug used will *depend upon your generator* BMI/MP1-115V supplied with plug)

ASSEMBLING THE Redi-Flo2

Assembly Instructions

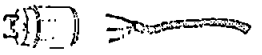
All electrical work should be performed by a qualified electrician in accordance with the latest edition of the National Electrical Code, local codes and regulations.

1

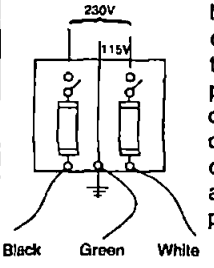


Unpack the components of the Redi-Flo2 system. The MP1 pump will be packed in the center of the motor lead roll.

2

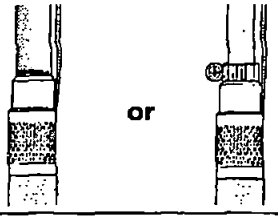


(For BMI/MP1-230V only) Strip the cord jacket and insulation from the ends of the converter power cord. Consult your local electrician to connect the leads to the electrical plug. (The ground wire should be connected to the elongated plug terminal and single phase 230 volt power should be measured across the black and white leads.)



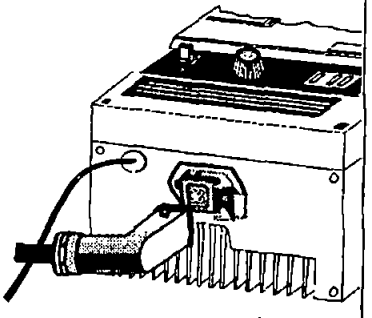
If the converter connects directly to a permanent power supply, consult your local electrician to connect the wires as shown on page 18.

3



Connect the MP1 pump to the pipe or hose through which the fluid will be pumped. If a hose is connected, a compression coupling should be used to ensure a strong, watertight fit. A safety cable may be attached to the pump (using a special bracket, sold seperately), as well as a plastic spiral flex clamp to secure the wire. A check valve may also be fitted to prevent liquid from flowing back into the pump after it is turned off (backflow prevention).

4

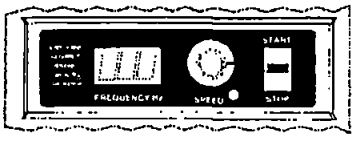


Fit the motor lead plug to the converter. Fit the converter plug to the generator (or other power source).

OPERATING THE Redi-Flo2

Starting

BMI/MP1 Panel
115 Volt



The Redi-Flo2 is easy to operate. Simply:

1. Submerge the pump in water.
2. Start the generator and allow to warm up.
3. If the generator has a circuit breaker, close the breaker and check the output voltage from the generator. The output voltage must be within specified ranges (refer to "Operating Conditions" above) to ensure proper operation and prevent damage to the converter and the pump, If voltage is too high or too low adjustments to the generator must be performed to allow the unit to run.
4. Plug the converter into the generator or connect to power supply in accordance to the National Electrical Code, local codes and regulations..
5. Check the frequency display on the converter. It should read "0" (zero). If it doesn't, refer to the Troubleshooting section on pages 13-14.
6. If this is the first time the converter is being used or it has not been used for more than six months,
   leave the converter on for at least 15 minutes before proceeding to step 6.
7. Set the converter's speed dial near the middle of the dial (12 o'clock position).
8. Start the pump by pressing the **Start/Stop** switch into the "Start" position.
9. Adjust the pump performance by turning the speed dial.

Stopping

To stop the pump, press the **Start/Stop** switch on the converter to the "Stop" position. There is no need to reduce the pump speed first. Unplug converter from generator ***BEFORE*** removing the motor lead from the converter or turning off the generator.

Operating Conditions

To ensure the Redi-Flo2 operates properly, follow these guidelines:

- The MP1 pump must be installed vertically with the discharge end pointing upwards.
- The electrical voltage to the converter must always be +or-10% of the specified power supply
- SPECIFIED POWER SUPPLY- BMI/MP1-230 Volts, single phase, AC.(198 to 253 Volts)
  BMI/MP1- 115 Volts, single phase, AC. (103.5 to 126 Volts)
- The motor and pump must always be completely submerged in fluid to ensure lubrication of the shaft seal and cooling of the motor.
- While the pump is pumping, the distance down from the ground level to the level of the water in the well must not be greater than 250 feet.
- If the pump is used in a well larger than 4" in diameter, a shroud should be used around it to ensure proper motor cooling.
- The temperature of the water being pumped should be between 34°F and 86°F (1°C and 30°C).

Purging A Well

If the pump is being used to purge a well, start it at the maximum speed. Do not stop the pump until the pumped water contains no visible particles (to avoid blockage within the pump).

Thawing A Frozen Pump

If the liquid in the pump is frozen so the motor shaft cannot rotate, lower it into water and start it at the slowest speed. Continue to operate the pump at this speed for about 10 minutes, at which time it will be thawed and ready for operation.

MAINTENANCE AND CARE

Dismantling & Reassembling

The MP1 pump can be dismantled and reassembled quickly and easily by referring to the diagram on page 11 and following these steps:

DISMANTLING

1. Shut the pump off using the converter's Start/Stop switch.
2. Disconnect converter from power supply or generator.
3. Disconnect the motor lead from the converter.
4. Remove the pipe or hose connected to the pump (OPTIONAL).
5. Remove the Set Screw (position 12 in the diagram on page 11). Grasp the Inlet Screen (position 1) and slowly but forcefully pull it up over the Pump Housing (position 2).

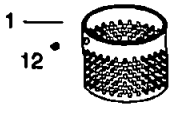
DO NOT ALLOW THE INLET SCREEN TO SCRAPE THE INSULATION FROM THE MOTOR LEADS.

6. Unscrew and remove the Pump Housing (counterclockwise when viewed from the top). This will expose the impeller assembly (guide vanes, wear rings, etc.), which can now be removed by hand for extended cleaning or replacement.

REASSEMBLY

To reassemble the MP1 pump, refer to the diagram on page 11 and:

1. Make sure the motor lead is not connected to the converter.
2. Return the impeller assembly components (guide vanes, wear rings, etc.) to the shaft in the proper order.
3. Screw the Pump Housing (position 2) back onto the top of the pump. If all of the impellers and chambers were replaced correctly, the Pump Housing should screw on easily. Hand tighten.
4. Slip the Inlet Screen (position 1) back over the Pump Housing. Screw the Set Screw (position 12) back into the Inlet Screen.

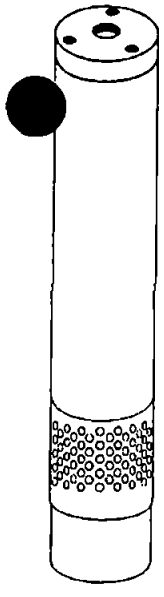


MAKE SURE YOU LINE UP THE MOTOR LEAD WITH THE RECESSED AREA IN THE PUMP HOUSING TO AVOID SCRAPING THE INSULATION FROM THE LEADS

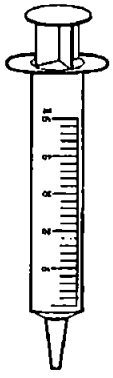
Replacement Of Motor Fluid

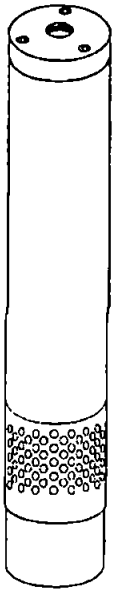
If the pump is moved from well to well, it should be thoroughly decontaminated prior to being installed in the next well. In addition to cleaning the individual components inside and outside, the water in the pump motor should be replaced using the syringe that came with your pump. This can be accomplished through the following steps:

1. Turn off the pump using the converter's Start/Stop switch and unplug power cord from the generator.
2. Unplug the motor lead from the converter.
3. Remove the discharge tubing and the pump end (follow dismantling procedure page 5).
4. Turn the pump and motor upside down.



5. Use a flat blade screwdriver to remove the filling screw on the bottom of the motor.
6. Remove the three Allen head set screws at the bottom of the motor with 2.5mm Allen wrench.
7. Push gently on the motor shaft to move bearing housing out of the stator housing.
8. Continue to remove bearing housing and motor shaft from stator housing.
9. Clean motor shaft with a brush.
10. *Empty the water from* the motor.
11. Clean inside of stator housing with a brush.
12. Replace motor shaft into stator housing.





13. Refill motor using contaminant-free water using the syringe that came with your MP1 pump.
14. Replace bearing housing and tighten Allen screws.
15. Continue to add water until the level is even with the bottom edge of the screw hole.
16. Replace and tighten the filling screw.
17. Turn the pump over several times, then remove the filling screw again to let any trapped air escape (if air is left inside the motor, the life of the motor will be shortened). Add more water, if necessary.
18. Replace and tighten the filling screw.
19. *Replace pump end and piping* (see reassembly page 5).

Replacing the Motor Lead

To replace the motor lead, refer to the diagram on page 11 and follow these steps:

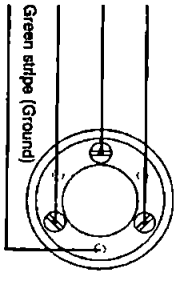
REMOVING THE OLD MOTOR LEAD

1. Make sure the power is turned **OFF**, the converter is turned **OFF**, and the motor lead is not connected to the converter.
2. Loosen and remove the Set Screw (position 12) from the Inlet Screen (position 1).
3. Slide the Inlet Screen off the pump. If you plan to use this motor lead again, be careful not to scrape insulation from it as the Inlet Screen is removed.
4. Loosen and remove the Pump Housing (position 2). Remove the Impeller assembly (impellers, guide vanes, etc.).
5. Refer to the illustration on page 8. Use the special Motor Lead Screwdriver (shown at right) that came with your new motor lead to loosen and remove the Motor Lead Screw (position 14) for the ground lead (green/yellow wire).
6. Pull up on the ground lead to remove it. Using a small screwdriver and precision electronics pliers, pry up and remove the Teflon® Washer (position 15) and Brass Washers (position 16) from inside the enlarged Ground Motor Screw (position 13). Remove the Ground Motor Screw.
7. Use an allen wrench (2.5 mm) to remove the two Motor Screws (position 19) holding the Suction Interconnector (position 10) in place. Remove the Suction Interconnector but be very careful to note which of its slots is lined up with which motor lead -- this will be very helpful during reassembly. You may wish to scratch a mark on both the Suction Interconnector and the motor to aid in matching them up later.
8. Refer to the illustration at the bottom of this page. Use the special Motor Lead Screwdriver to loosen and remove the remaining Motor Lead Screws (position 14).
9. Pull up on each of the leads to remove them. Make a note which color conductor comes out of each hole -- **this is a MUST** when installing the new motor lead. Using a small screwdriver and precision electronics pliers, unscrew and remove the Teflon ® Washer (position 15) and the Grommet (position 17).

INSTALLING THE NEW MOTOR LEAD

10. Ensure the motor lead holes are clean and free of moisture.
11. String the Inlet Screen (position 1) onto the motor lead.
12. String the motor lead components (shown at right) onto the end of each motor lead wire (except the yellow/green ground wire).
13. For each wire, place the Crimped Pin (position 18) down into the motor lead hole. Press the Grommet (position 17) and Teflon ® Washer (position 15) down around the lead.

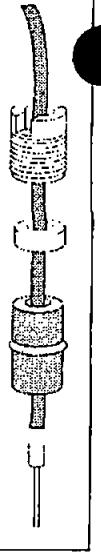
Motor Leads



Be sure to reconnect the lead wires in their previous pattern shown at left so that in clockwise order they are **grey (or clear).**

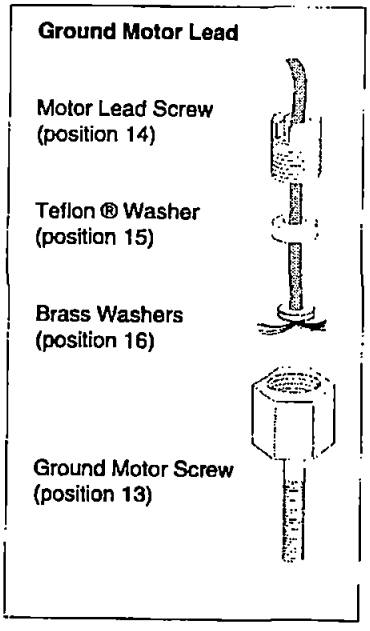
For Tefzel motor lead, use the following wiring pattern: Green stripe (Ground), 1st wire to the right (previously black), 2nd wire to the right (previously blue), third wire to the right (previously brown).

Power Conducting Motor Leads



14. While pushing the lead down into the motor lead hole, use the special Motor Lead Screwdriver to tighten the Motor Lead Screw (position 14) into place. Repeat for the other two lead wires.
15. Replace the Suction Interconnector (position 10). Replace the Ground Motor Screw (position 13). Since the ground wire will be attached to this screw, you will want to put it into the hole that will cause the least amount of twisting to the wire.
16. Replace and tighten the two Motor Screws (position 19) with an allen wrench.
17. Repeat steps 12-14 for the ground motor lead. Note on the illustration (at right) that the ground lead uses two Brass Washers (position 16) instead of a Grommet and Crimped Pin.
18. Return the impeller assembly to the top of the Suction Interconnector (position 10). Refer to the diagram on page 11 for the proper sequence.
19. Screw the Pump Housing (position 2) back onto the Suction Interconnector.
20. Position the motor lead in the recessed area of the Pump Housing.
21. Carefully push the Inlet Screen (position 1) over the Pump Housing and the Suction Interconnector.

BE VERY CAREFUL TO AVOID SCRAPING THE INSULATION FROM THE MOTOR LEAD AS THE INLET SCREEN IS FITTED.



22. Line up the screw hole in the Inlet Screen with the screw hole in the Pump Housing. Fit and tighten the Set Screw (position 12).
23. Connect the motor lead to the converter and test the rotation of the pump. Submerge the pump in water, start it at its slowest speed and make sure the pump shaft is turning counterclockwise (when viewed from the top). If the rotation is incorrect, switching any two power leads (with POWER OFF) will correct the problem.

24. Reconnect the hose or pipe.

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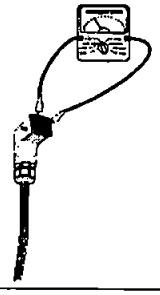
Periodic Motor Inspection

If the pump is operating at a decreased capacity and the impeller assembly components (impellers, guide vanes, etc.) do not appear to be the cause, the motor should be checked. A checklist of things to examine includes:

- ❑ Check the fluid level inside the motor (refer to page 6). Replace and refill as necessary.
- ❑ Inspect the outside of the motor for cracks, dents, etc.
- ❑ Remove the Inlet Screen (position 1), Pump Housing (position 2), and the impeller assembly (guide vanes, wear rings, etc.). Try to spin the motor shaft by hand. It should spin freely. If it does not, the motor must be replaced.
- ❑ Check the winding and insulation resistance of the motor and lead.

Winding Resistance



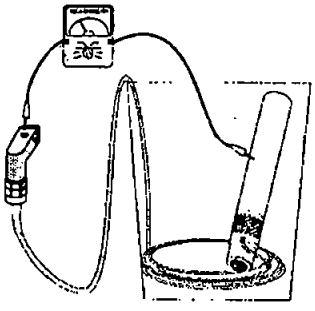
Turn the power off and disconnect the motor lead from the converter. Using an ohmmeter, set the scale to R X 1. Zero-adjust the meter and measure the resistance between any two power conducting leads (prongs on the motor lead plug).

If the ohm value is too low, the motor may be shorted. If too high, the motor windings or the leads may be open.

Lead Length	Ohm Value
0 ft	3.0 - 3.5 Ω
50 ft	3.6 - 4.1 Ω
75 ft	3.9 - 4.4 Ω
100 ft	4.2 - 4.7 Ω
125 ft	4.5 - 5.0 Ω
150 ft	4.8 - 5.3 Ω
175 ft	5.1 - 5.6 Ω
200 ft	5.4 - 5.9 Ω
250 ft	6.0 - 6.5 Ω
300 ft	6.6 - 7.1 Ω

Insulation Resistance

Turn the power off and disconnect the motor lead from the converter. Use a 500V megohmmeter or megger (1 Meg = 1 M = 1 million). Zero-adjust the meter and measure the resistance between any power conducting leads (prongs on the motor lead plug) and ground. A good way to accomplish this (as shown at right) is to submerge the motor lead and MP1 pump in a bucket of water. Touch one lead of the megohmmeter to the pump and one to a motor lead.

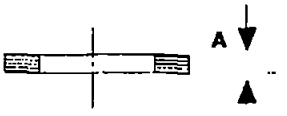


If the ohm value is lower than 1.5MΩ, the motor is defective and must be replaced.

Checking Components For Wear

The pump components should be periodically checked to ensure they are still within their minimum operating tolerances (illustrated below).

Impeller (position 5) ..... The impellers should show no visible wear.
Guide Vane (position 3) ..... The guide vanes should show no visible wear
Wear Ring (position 4) ..... The minimum thickness ("A" in the illustration) should never be less than 1.0 mm



In addition, visually check all components for cracks, corrosion, or wear.

Storage Requirements

The pump should be thoroughly cleaned before storage to ensure no contamination is present. Both the pump and the converter should be stored in a clean and dry area in the following temperature range:

- 20° C to +50° C
or
0° F to 120° F

PARTS LIST

Pump Components

Position No.	Part Description	No. Used Per Pump	Part Number
1	Inlet Screen	1	1A0004
2	Pump Housing 1/2" NPT	1	1A0044
3	Guide Vane	2	see Service Kits
4	Wear Ring	2	"
5	Impeller	2	"
6	Spacer Ring	2	"
7	Wear Plate	2	"
8	Motor Lead Assembly	4	see Pos. 13 - 18
9	Shaft	1	not available *
10	Suction Interconnector	1	1A5004
11	Stator Housing	1	not available *
12	Set Screw	1	see Service Kits
13	Ground Motor Screw	1	"
14	Motor Lead Screw	4	"
15	Teflon® Washer	4	"
16	Brass Washer	2	"
17	Grommet	3	"
18	Crimped Pin	3	"
19	Motor Screw (long)	2	"
20	Motor Screw (short)	6	"
21	Filling Screw w/ O-Ring	1	"
22	Motor Thrust Washers	2	"
23	Lip Seal	1	ID5566
24	Bearing Housing O-Ring	2	see Service Kits

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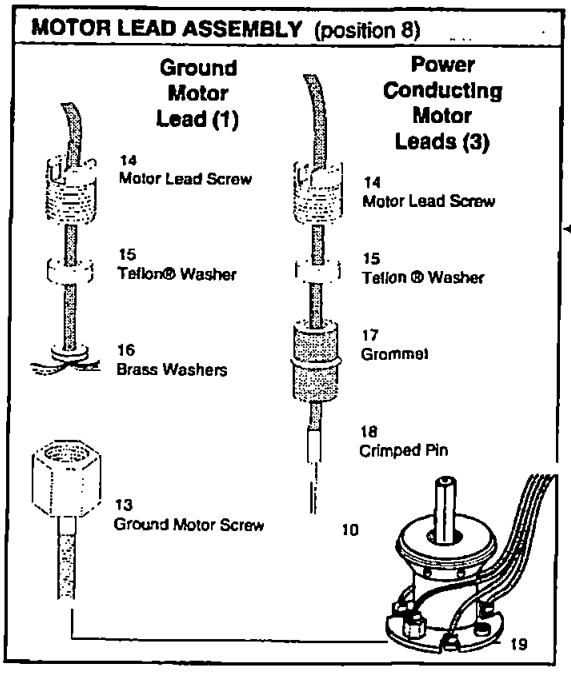
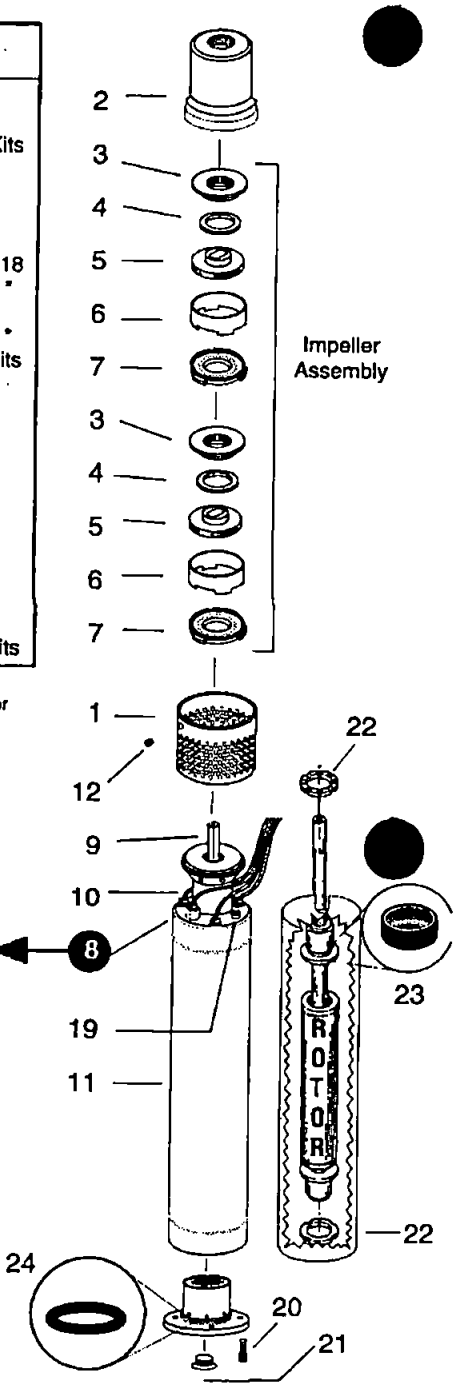
*Not economical to replace. Must purchase complete pump/motor

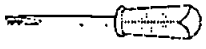
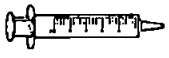


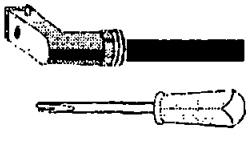


Service Kits, Tools, and Motor Leads

Replacement parts, service tools, and motor leads are available using the following part numbers:

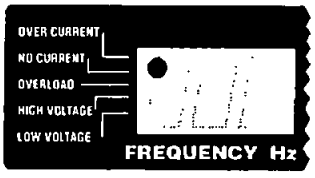
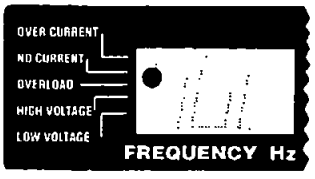
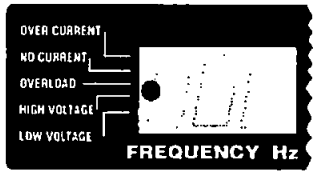
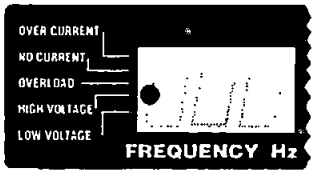
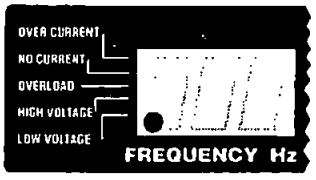
Service Kits			Part Number
Position No. In Diagram	Part Description	No. In Kit	
3	Guide Vane	2	125061
4	Wear Ring	2	
5	Impeller	2	
6	Spacer Ring	2	
7	Wear Plate	2	
4	Wear Ring	4	1A5050
7	Wear Plate	4	
13	Ground Motor Screw	1	1A00028
14	Motor Lead Screw	4	
15	Teflon Washer	4	
16	Brass Washer	2	
17	Grommet	3	
18	Crimped Pin	3	
5	Impeller	2	1A00018
12	Set Screws	25	1A00038
14	Motor Lead Screws	12	1A00048
15	Teflon Washer	25	1A00058
16	Brass Washer	25	1A00068
17	Grommet	25	1A00078
18	Crimped Pin	50	1A00088
19	Motor Screw (long)	25	1A00098
20	Motor Screw (short)	25	1A00108
21	Filling Screw with O-Ring	5	1A00118
22	Motor Thrust Washers	4	1A00128
24	Bearing Housing O-Ring	10	IA5117

Service Tools	Part Number
Special Motor Lead Screwdriver 	SV0370
Syringe (to refill motor) 	ID6066
Crimping Tool Kit (Required to crimp, "crimped pin"). 	1A00141

Motor Leads		Part Number
All motor leads come with a Converter Plug attached and a special Motor Lead Screwdriver 	30 foot length	1A 5100
	50 " "	1A 5101
	75 " "	1A 5102
	100 " "	1A 5103
	125 " "	1A 5104
	150 " "	1A 5105
	175 " "	1A 5106
	200 " "	1A 5107
	250 " "	1A 5108
	300 " "	1A 5109

TROUBLESHOOTING

The converter will shut itself off if any major faults occur, and signal (on the converter display) the casue of the fault. These include:

If the display shows this:	The fault is:	Which may be caused by:
		• Power consumption too high. • Mp1 is pumping a liquid with too high a density.
	**Overcurrent**	• Motor cable defective. • Internal converter fault.
	**No Current**	• Motor disconnection • MP1 thermal cut-out due to excess motor temperature.
	**Overload**	• The converter is thermally overloaded. • The converter is overloaded.
	**High Voltage**	• Supply voltage to BMI\MP1 is too high.
	**Low Voltage**	• Supply voltage to BMI\MP1 is too low.

To correct, simply:
Reduce the frequency
Check the motor cable and MP1 with megohmmeter. The insulation resistance must be higher than 1.5 M at 500VDC. **Please Note:** When measuring the resistance, the BMI/MP1 motor cable plug must be disconnected.
Send away converter for repair.
Connect and lock the plug.
Wait until the MP1 has cooled. Reset the converter and start up pump.
Check that the converter is placed in a sufficiently cool place with ample ventilation.
Reduce the converter load.
Reset the converter. If it cuts out again reduce the voltage.
Reset the converter. If it cuts out again increase the voltage.

TECHNICAL SPECIFICATIONS

Converter Specifications - BMI/MP1 230 Volt

Power

Supplied By Generator/Power Supply

Voltage:	Single phase, 220-230 volt (+ or - 10%)
Frequency:	50-60 Hz (+ or - 2%)
Maximum Current:	10 amps
Minimum Generator Sizing:	For generators ***with*** voltage regulation: 2500 Watts @ 230 Volt AC, Single Phase. For generators ***without*** voltage regulation: 5000 Watts @ 230 Volts AC, Single Phase

Produced By Converter

Output Voltage:	3 phase 25-220 volts
Frequency:	46 - 400 Hz
Maximum Current:	6 amps

Connections

Motor Lead Connector:	Housing: Harting 09200031440 Female Insert: Harting 09200032711
Power Cable:	Type SJOW-A, 14-3 AWG, 10' long

Dimensions and Weight

Dimensions:	Case is 9"x14"x18.5"
Net Weight:	18 lbs

Operating Conditions

Ambient Temperature:	32°F to 104°F (0° to 40° C)
Relative Air Humidity:	Maximum 95%
Radio Noise Filter:	Noise may occur when the converter is connected to the municipal electrical supply. It can be reduced by adding a suitable sized line reactor.

Storage Conditions

Ambient Temperature:	-13°F to 149°F (-25° to 65°C)
Relative Air Humidity:	Maximum 50% at 104°F (40°C) unlimited Maximum 90% at 68°F (20°C) for periods not exceeding 30 days per year. 75% annual average Non-condensing

Performance

Acceleration Time:	0 to 400 Hz in 6 seconds
Deceleration Time:	400 to 0 Hz in 6 seconds

Converter Specifications - BMI/MP1 115 Volt

Power

Supplied By Generator/Power Supply

Voltage:	Single phase, 115 volts (+ or - 10%)
Frequency:	50-60 Hz (+ or - 2%)
Maximum Current:	16 amps
Minimum Generator Sizing:	For generators ***with*** voltage regulation: 2500 Watts @ 115 Volt AC, Single Phase. For generators ***without*** voltage regulation: 5000 Watts @ 115 Volts AC, Single Phase

Produced By Converter

Output Voltage:	3 phase 25 - 220 volts
Frequency:	50 - 400 Hz
Maximum Current:	6 amps

Dimensions and Weight

Dimensions:	Case is 9"x14"x18.5"
Net Weight:	18 lbs

Storage Conditions

Ambient Temperature:	-40°F to 149°F (-40°C to 65°C)
Relative Air Humidity:	5% up to 95% relative air humidity

Performance

Acceleration Time:	0 to 400 Hz in 6 seconds
Deceleration Time:	400 to 0 Hz in 6 seconds

Connections

Motor Lead Connector:	Housing: Harting 09200031440 Female Insert: Harting 09200032711
Power Cable:	Type SJTW-A, 14-3 AWG, 10' long with 2 blade, U-Ground, male plug

Operating Conditions

Ambient Temperature:	32°F to 104°F (0° to 40° C)
Relative Air Humidity:	Maximum 95%
Radio Noise Filter:	Noise may occur when the converter is connected to the municipal electrical supply. It can be reduced by adding a suitable sized line reactor.

Motor/Pump Specifications

Power

Input Power:	1.5 Kw (2 Horsepower)
Voltage:	3 phase, 220 volts at 400 Hz
Maximum Current:	6 amps
Motor Protection:	Thermal overload - Thermik Geratebau, Series SY6 Disconnect Temperature: 176°F (80°C) Rate Current: 5 amps Current Overload - Incorporated into converter

Connection

Discharge Port:	1/2" Female NPT
Standard Lead Lengths:	30, 50, 75, 100, 125, 150, 175, 200, 250, and 300 feet
Custom Lead Lengths:	Available in 1 foot increments from 30-300 feet

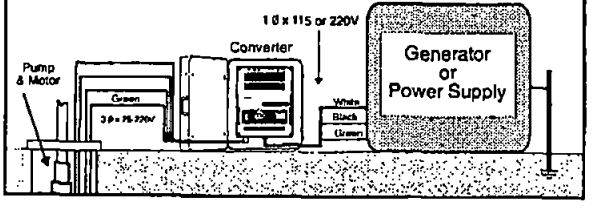
Operating Conditions

Max. Fluid Temp.:	86°F (30°C)
Min. Fluid Temp.:	34°F (1°C)

Dimensions and Weight

Dimensions:	(Including pump and motor) 11.3" length x1.81" dia.
Net Weight:	5.5 lbs., excluding motor lead

Redi-Flo2 Wiring Diagram



NOTES

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LIMITED WARRANTY

Redi-Flo2 pumps manufactured by GRUNDFOS are warranted to the original user only to be free of defects in material and workmanship for a period of 12 months from the date of installation or 18 months from the date of manufacture. GRUNDFOS' liability under this warranty shall be limited to repairing or replacing at GRUNDFOS' option, without charge, F.O.B. GRUNDFOS' factory or authorized service station, any product of GRUNDFOS manufacture. GRUNDFOS will not be liable for any costs of removal, installation, transportation, or any other charges which may arise in connection with a warranty claim. Products which are sold but not manufactured by GRUNDFOS are subject to the warranty provided by the manufacturer of said products and not by GRUNDFOS' warranty. GRUNDFOS will not be liable for damage or wear to products caused by abnormal operating conditions, accident, abuse, misuse, unauthorized alteration or repair, or if the product was not installed in accordance with GRUNDFOS' printed installation and operation instructions.

To obtain service under this Warranty, contact the Distributor or Dealer from which it was purchased to obtain instructions. **Under no circumstances should defective product be returned to the Distributor, Dealer, or GRUNDFOS without specific instructions from them to do so.**

GRUNDFOS WILL NOT BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES, LOSSES, OR EXPENSES ARISING FROM INSTALLATION, USE, OR ANY OTHER CAUSES. THERE ARE NO EXPRESS OR IMPLIED WARRANTIES,INCLUDING MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, WHICH EXTEND BEYOND THOSE WARRANTIES DESCRIBED OR REFERRED TO ABOVE.

Some jurisdictions do not allow the exclusion or limitation of incidental or consequential damages and some jurisdictions do not allow limitations on how long implied warranties may last. Therefore, the above limitations or exclusions may not apply to you. This warranty gives you specific legal rights and you may also have other rights which vary from jurisdiction to jurisdiction.

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Attachment B

Example Field Data Sheets

CH2M HILL
106211.T8.ZZ

BAINBRIDGE ISLAND LANDFILL RI/FS
GROUNDWATER SAMPLING FIELD DATA SHEET

Well Number _____ **Date** _____

Sample Number _____ **Sample Time** _____

WELL PURGING

Time	Well Depth	Depth to Water	Measuring Point Elevation	1 GPM Cont. Freq.	1 LPM Cont. Freq.	0.4 LPM Cont. Freq.	

Purge Start Time: **Purging Method:** Dedicated Grundfos Rediflo-2 pump

Time	Purged Vol.(Gal)	pH	Conductivity (mS/cm)	Turbidity (NTU)	DO (mg/L)	Temperature (°C)	Appearance

Time	Appx. Purge Rate (gpm or lpm)	Controller Frequency (hz)	Drawdown (feet)	Comments

Purge End Time:

WELL SAMPLING **Sampling Method:** Dedicated Grundfos Rediflo-2 pumps

Sample start time: _____

Sample end time: _____

Sample time (recorded on bottles & COC): _____

Notes: _____

FINAL PARAMETERS

Time	Purged Vol.(Gal)	pH	Conductivity (mS/cm)	Turbidity (NTU)	DO (mg/L)	Temperature (°C)	eH (mV)	Appearance

NOTES: _____

Sample Team Names: _____

Signatures: _____

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BAINBRIDGE ISLAND LANDFILL RI/FS
GROUNDWATER SAMPLING FIELD DATA SHEET

Station Number _____ **Date** _____

Sample Number _____ **Sample Time** _____

Weather (today and last 24 hrs) _____

FIELD OBSERVATIONS

Estimated Flow Rate (GPM): _____

Maximum Water Depth: _____

Water Depth at Sample Location: _____

Water Appearance: _____

Other Water Observations (odor, bed material, presence/absence of organic matter): _____

Surrounding Environment (vegetation presence/absence, sediment staining, debris, etc.): _____

WATER QUALITY PARAMETERS

Time	pH	Conductivity (mS/cm)	Temperature (°C)	eH (mV)	Turbidity (NTU)	DO (mg/L)	Appearance

WELL SAMPLING **Sampling Method:** Grab

Sample start time: _____

Sample end time: _____

Sample time (recorded on bottles & COC): _____

Notes: _____

NOTES: _____

Sample Team Names: _____

Signatures: _____