EXECUTIVE SUMMARY

Remedial Investigation/Feasibility Study

Olympic View Sanitary Landfill
Port Orchard, Washington

The Olympic View Sanitary Landfill (OVSL) is located at 10015 SW Barney White Road, Port Orchard, Washington in the Olympic View Industrial Park Complex. The landfill was used for disposal of solid wastes from 1963 through 2002. A Remedial Investigation/ Feasibility Study (RI/FS) was prepared for the Site pursuant to the Model Toxics Control Act (MTCA) to address the requirements of a 2001 Agreed Order between the Department of Ecology (Ecology) and Waste Management of Washington, the current owner of the facility.

SITE BACKGROUND

Solid waste disposal at the Landfill began in 1963 as a burning municipal garbage dump known as the Barney White Landfill. The landfill at that time was restricted to the southwestern portion of the Property and was unlined with a total area of approximately 25 acres. During the early operations at the Site, the landfill reportedly accepted U.S. Navy, industrial, putrescible, and self-hauled municipal wastes.

Brem Air Disposal, Inc., acquired the Site in 1970 (renaming it Brem Air Northwest Disposal) and expanded the landfilling operations to the northeast. Brem Air stopped burning at the landfill and in 1975 developed the landfill to comply with state regulations and permit requirements imposed by the Bremerton-Kitsap County Health District (BKCHD). After 1975, the site accepted mixed municipal solid waste, industrial waste, demolition waste, and special waste, which included coal ash, asbestos, septage, and sewage sludge.

The Brem Air Disposal shareholders formed a new corporation in 1975, named the Kitsap County Sanitary Landfill, Inc. (KCSL) to own and operate landfills. Envirofil purchased KCSL and its assets in 1993. KCSL continued to operate the landfill, although its name was changed in December 1995 to Olympic View Sanitary Landfill, Inc.

In 1985, the Landfill was expanded in accordance with the Development and Closure Plan which included two 20-acre cells, Phases I and II (Figure ES-1). In 1984/1985 the Old Barney White Landfill (OBWL) was closed and covered with 12-inches of low permeability silt covered with 2-feet of native soil and top soil. In 1991/1992, the OBWL was recapped with a flexible membrane cover, geocomposite drainage layer, soil and hydroseeding.

Pursuant to a Settlement Agreement approved by the Kitsap County Superior Court, the landfill ceased accepting waste in 2002 and was capped before its permitted capacity was reached. A new waste transfer station was constructed on an area adjacent to the landfill in 2002.

In January 2001, the landfill operator (Olympic View Sanitary Landfill [OVSL], Inc.) signed an Agreed Order with Ecology which required completion of a Remedial Investigation/Feasibility Study (RI/FS). The overall intent of the Agreed Order is to characterize the nature and extent of environmental impacts from the landfill through the completion of the RI/FS. Monitoring conducted pursuant to the Agreed Order also is required by the Solid Waste Landfill Post Closure Permit (KCHD, 2008) pursuant to the Solid Waste Regulations (Chapter 173-351 WAC). For the duration of the Agreed Order, the landfill was subject to dual regulation by Ecology and the KCHD. Ecology was responsible for ensuring compliance with the Agreed Order and enforcing MTCA. KCHD was responsible for permitting the landfill during the closure and post-closure periods.

PHYSICAL SETTING

The Site is located adjacent to the Olympic View Industrial Park which contains various industrial operations including the solid waste transfer station, cement plant, highway maintenance facility, boat building, storage and repair facility, among others. State Highway 3 and the Bremerton National Airport are located to the east of the Industrial Park. The Union River, Old Belfair Highway, various residential properties and the KB Archers facility are located to the west of the site. Residential and undeveloped properties are located to the north while the area to the south of the site is generally undeveloped.

The site is located on an upland area to the east of the Union River. The landfill itself is vegetated with grasses as part of the post-closure care of the landfill. The area surrounding the landfill is heavily vegetated and forested with Douglas Fir and Hemlock trees with a thick understory.

Several ephemeral unnamed streams are present in the area around the landfill which contain surface water flow in response to seasonal precipitation. These streams drain to the Union River located to the west of the Site. Groundwater is present in both shallow and deep units beneath the Site. Shallow groundwater discharges into various wetland areas located along the western margin of the site.

NATURE AND EXTENT OF CONTAMINATION

Groundwater beneath and downgradient of the landfill contains volatile organic compounds (VOCs), trace metals, and general water quality parameters at concentrations above state standards or risk-based levels. Table ES-1 presents a summary of the chemicals present in groundwater at concentrations above state standards or risk-based levels. The extent of groundwater contamination is primarily coincident with the landfill footprint and the on-site areas located immediately downgradient of the landfill.

Table ES-1: Chemicals Detected in Groundwater at Levels That Exceed Standards

Indicator Hazardous Substance [1]	Units [2]	Maximum Concentration at the Site [3]	Federal and State MCL [4]	Groundwater Quality Standards [5]	MTCA Method B Levels [6]		Background Prediction Limit [7]
					1×10^{-6} Cancer Risk	Noncancer Risk (HQ = 1)	
Trace metals							
Arsenic	mg/l	0.014	0.010	0.00005	0.000058	0.0048	0.000462 *
Iron	mg/l	40.5	0.3	0.30	NE	NE	0.23
Manganese	mg/l	4.3	0.05	0.050	NE	2.2	0.031
Volatile Organic Compounds							
1,4-dichlorobenzene	ug/l	1.3	75	4	1.8	NE	NA
1,1-dichloroethane	ug/l	1.7	NE	1	NE	1,600	NA
cis-1,2-dichloroethene	ug/l	2.1	70	70	NE	80	NA
ethyl ether	ug/l	9.8	NE	NE	NE	1,600	NA
trichloroethene	ug/l	2.3	5	3	0.49	2.4	NA
vinyl chloride	ug/l	2.1 J	2	0.02	0.029	24	NA
Other							
Ammonia	mg/l	7.2 J	NE	NE	NE	NE	0.19

Notes:
1 Only those chemicals identified as Indicator Hazardous Substances in the Human Health Risk Assessment are listed.
2 mg/l = milligrams per liter ug/l = micrograms per liter
3 Based on groundwater monitoirng results from 2005 through 2008 ("J" = estimated value)
4 MCL = maximum contaminant level as either a Federal/State primary or secondary drinking water standard.
5 Per W.A.C. 173-200
6 MTCA Method B Levels based on values calculated using CLARC Database
7 Background predicition limits based on 99% upper tolerance limt as presented in the 2008 Annual Monitoring Report, Olympic View Sanitary Landfill prepared by SCS Engineers March 2009 unless otherwise noted.
* Site background value 0.000462 mg/L (0.462 ug/L) based on non-parametric prediction limit value calculated from the EPA Method 200.8 arsenic analyses obtained from 2005 through 2008 from upgradient groundwater monitoring wells MW-13, MW-13A, MW-13B and MW-35 with a confidence level for passing initial test or one verification resample at all downgradient wells for a single constituent.
NE Not established
NA Not applicable; background for volatile organics is assumed to be zero, therefore no prediction limits are calculated

Components of landfill gas such as methane and carbon dioxide have historically been detected in monitoring probes located outside of the landfill area, but no gas has ever been detected off of the site. None of the probes located on the site currently have levels of landfill gas components that exceed regulatory standards.

No contaminants were detected in surface water samples obtained from the site area. The chemical concentrations and water quality of the surface waters receiving runoff or groundwater discharge from the landfill area are very similar to those observed in background (non-receiving) waters.

As part of the RI, private wells in the area surrounding the site were identified and many were sampled. Results of the sampling provide strong evidence that domestic wells are not impacted by the site.

FATE AND TRANSPORT

The site is located above relatively permeable recessional outwash sand and gravel deposits. In general, any chemicals released from the landfill would drain by gravity downward through these relative permeable soils until encountering groundwater. Chemicals dissolved in groundwater would migrate to the west-northwest with the bulk direction of groundwater flow. A portion of the shallow groundwater discharges to the wetland areas to the west. Volatile chemicals that may be present in groundwater that discharges to the wetland should volatilize (evaporate) to the atmosphere where they would be destroyed by sunlight. Trace metals present in water that may discharge to the wetlands would tend to precipitate in response to the change from reducing conditions beneath the landfill and the subsurface beneath the wetlands to oxidizing conditions within the surface water within the wetlands. Deeper groundwater will flow to the west-northwest towards the Union River valley where it joins the regional groundwater flow system associated with the Union River and flows to the south-southwest.

Landfill gas can also cause impacts to groundwater. Contact of landfill gas with the surface of the underlying groundwater can result in transfer of volatile chemicals from the gas phase to the water phase. The anaerobic nature (lack of oxygen) of landfill gas can result in creation of reducing conditions in groundwater in contact with landfill gas. The presence of reducing conditions can increase the solubility of certain trace metals such as arsenic, iron and manganese, resulting in increased leaching and transport of these metals from the landfill wastes or the native soils.

HUMAN HEALTH AND ECOLOGICAL RISK ASSESSMENTS

As part of the RI/FS, assessments were conducted of potential impacts to human health and the environment in the vicinity of the landfill. The Human Health Risk Assessment indicates that potential risks to off-site recreational users and off-site residents were either within or below the risk range considered acceptable by U.S. EPA. The primary risk-driving exposure pathway and chemical is ingestion of arsenic in groundwater. However, the levels of arsenic in the deeper groundwater were either at or below the drinking water standard and thus the potential health risks associated with arsenic in the groundwater would be equivalent to a municipal drinking water supply containing an allowable level of arsenic. The concentrations of arsenic measured in the on-site monitoring wells were generally lower than the concentrations measured in the off-site domestic wells suggesting that the potential health risks associated with arsenic in the groundwater are indicative of natural occurrences of arsenic in the groundwater.

The Ecological Risk Assessment indicated that the site-related chemicals in the shallow emergent groundwater pose a negligible risk of adverse effects to ecological receptors in the aquatic and terrestrial habitat downgradient of the site.

FEASIBILITY STUDY PROCESS

The purpose of an FS under MTCA is to develop and evaluate cleanup action alternatives to enable a cleanup action to be selected for a site. The first step in an FS is the development of a reasonable number of cleanup alternatives that protect human health and the environment. The potential cleanup action alternatives are then evaluated using the MTCA-required criteria which consist of the following:

Threshold Requirements

- Protect human health and the environment
- Comply with cleanup standards
- Comply with applicable state and federal laws

- Provide for compliance monitoring

Other Requirements

- Use permanent solutions to the maximum extent practicable
- Provide for a reasonable restoration time frame
- Consider public concerns

If non-permanent cleanup alternatives are proposed, the last step in the FS process is to conduct a disproportionate cost analysis that compares the expected benefits associated with each alternative to the costs.

CLEANUP ACTION ALTERNATIVES CONSIDERED

Based on the FS evaluations described above, the following cleanup action alternatives were identified and evaluated for the OVSL:

Alternative 1 - Increased Inspection, Repair and Operational Improvements

Alternative 2 - Landfill Gas Collection System Upgrades

Alternative 3 - Vadose Zone Gas Investigation and Extraction

Alternative 4 - Air Sparge Wall

Alternative 5 - Excavation and Offsite Re-Disposal of OBWL

The various cleanup technologies included as part of each of these alternatives are listed on Table ES-2.

Table ES-2: Technologies Associated with Each Alternative

Technology	Alternative				
	1 Increased Inspection, Repair, and Operational Improvements	2 Landfill Gas Collection System Upgrades	3 Vadose Zone Gas Investigation and Extraction	4 Air Sparge Wall	5 Excavation and Offsite Re-Disposal of OBWL
Continued Post-Closure Care					
O&M of existing landfill source control and containment systems	X	X	X	X	X
Existing environmental monitoring	X	X	X	X	X
Compliance w ith State and Local regulations for landfill post-closure (WAC 173-351; KCHD Landfill Post Closure Permit)	X	X	X	X	X
Institutional controls: use of the landfill and restrictions on installation of w ater supply w ells near the landfill	X	X	X	X	X
Natural attenuation of site-related chemicals in groundw ater	X	X	X	X	X
Repair/modification of landfill cover system along landfill toe	X	X	X	X	X
Inspect (and repair if necessary) penetrations to cover system	X	X	X	X	X
Repair/replace landfill gas extraction w ells containing blockages	X	X	X	X	X
Repair/replace landfill gas extraction system conveyance piping	X	X	X	X	X
Repair/replace condensate collection equipment	X	X	X	X	X
Maintenance/repair of landfill gas system vacuum blow ers	X	X	X	X	X
Optimize operation of landfill gas collection system	X	X	X	X	X
Leachate collection system pumps: increased inspection, maintenance and adjustment	X	X	X	X	X
Repair/improve perimeter stormw ater drainage diversion and control system	X	X	X	X	X
Install floating cover on leachate pond to eliminate rainw ater accumulation	X	X	X	X	X
Permit alternate leachate disposal facilities	X	X	X	X	X
Install additional landfill gas collection w ells		X	X	X	See Note
Investigate landfill gas and VOC occurrences in soil gas outside of landfill			X		
Installation and operate Soil Vapor Extraction w ells			X		
Install/operate line of Air Sparge (AS) points dow ngradient				X	
Excavate OBWL and transport offsite for disposal					X

Note: Would only include the installation of one additional gas collection w ell in the Phase II landfill.

RESULTS OF ALTERNATIVE EVALUATION

MTCA, as implemented by Chapter 173-340 WAC, specifies criteria for evaluating cleanup action alternatives. The MTCA cleanup action alternative evaluation criteria are summarized below:

- Protection of human health and the environment;
- Compliance with Applicable or Relevant and Appropriate Requirements (ARARs);
- Short-term effectiveness;
- Long-term effectiveness;
- Permanent solutions (reduction in toxicity, mobility, and volume of site-related chemicals through treatment);
- Implementability (technical feasibility);
- Degree to which community concerns are addressed; and
- Cost.

The ultimate goal of MTCA is the selection of a permanent solution that achieves cleanup levels at the point of compliance identified for the Site to the maximum extent practicable. The FS considered Alternative 1 – Increased Inspection, Repair and Operational Improvements – to best satisfy the MTCA evaluation criteria and to provide the best balance of costs and benefits. Therefore, the FS identifies Alternative 1 as the preferred alternative. Table ES-3 presents a summary of the actions included in Alternative 1 – Increased Inspection, Repair and Operational Improvements.

Table ES-3: Components of the Proposed Alternative 1 - Increased Inspection, Repair and Operational Improvements

- Existing source control and containment system
    - Impermeable cap over the Phase I and II landfill cells and the Old Barney White Landfill to reduce precipitation infiltration and thereby reduce leachate generation;
    - Impermeable cap over the Phase I and II landfill cells and the Old Barney White Landfill to reduce precipitation infiltration and thereby reduce leachate generation;
    - Stormwater runoff diversion and control structures to reduce precipitation infiltration and leachate generation;
    - Impermeable liner beneath Phases I and II to contain leachate;
    - Leachate collection system from the Phase I and II landfill cells;
    - OBWL toe drain leachate collection system;
    - Leachate treatment and disposal systems;
    - Landfill gas extraction and treatment system; and
    - Fencing, gates, and berms to control trespass.
- Operations, maintenance, and monitoring activities
    - Inspection and maintenance of the landfill cover;
    - Control of growth of weeds and intrusive vegetation to reduce root penetration into and resultant damage to the cover;
    - Inspection and maintenance of stormwater runoff and control structures;
    - Extraction and collection of leachate from the collection system associated with the Phase I and II landfills and from the OBWL toe drain systems;
    - Storage and treatment of the collected leachate in the double lined and covered leachate pond;

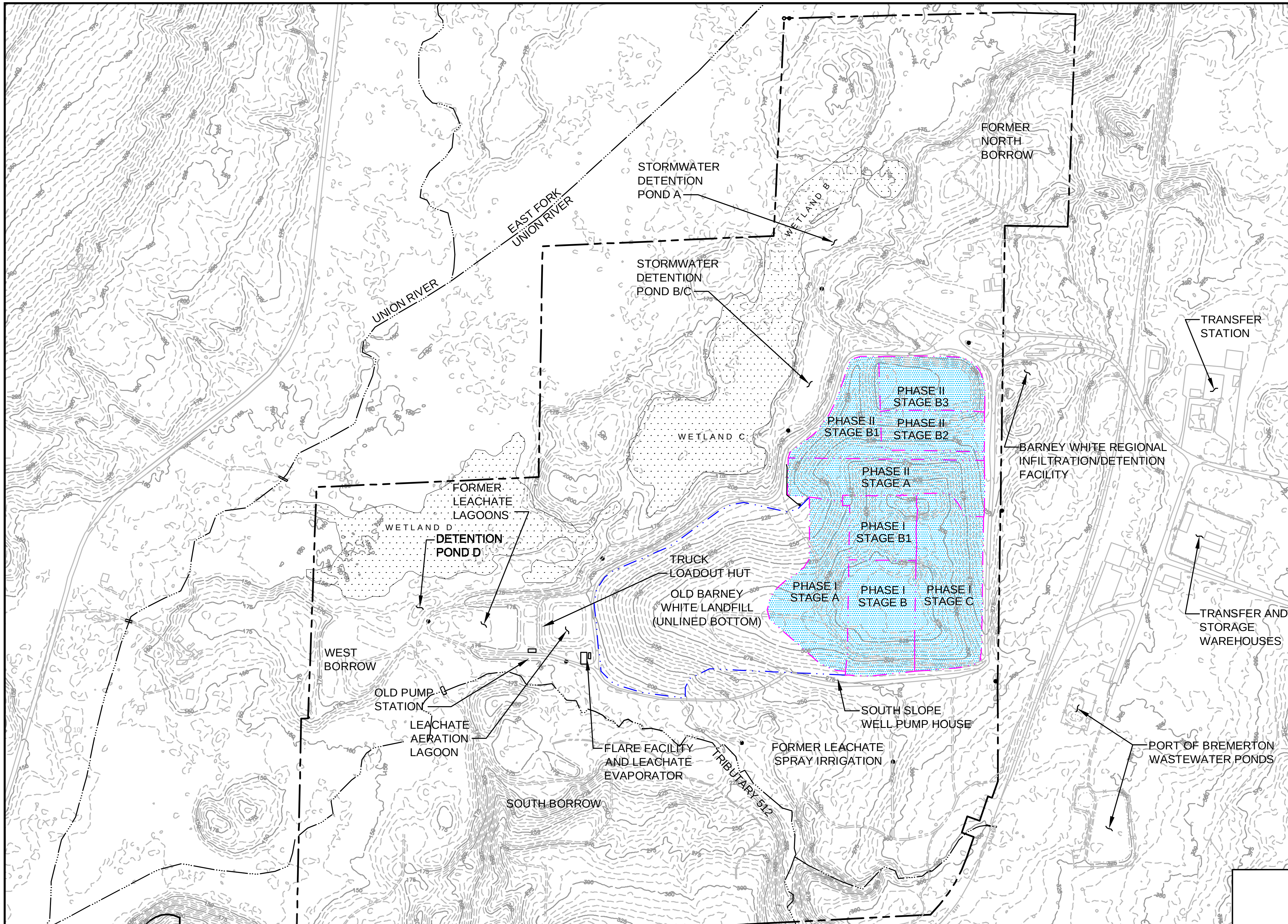
Table ES-3: Components of the Proposed Alternative 1 - Increased Inspection, Repair and Operational Improvements

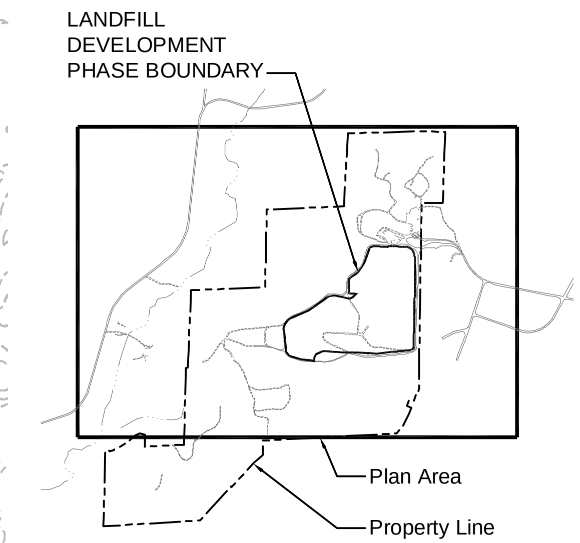
  - Disposal of leachate using the Leachate Evaporator Unit (LEU) or through offsite disposal at the public owned treatment work (POTW) pursuant to the terms of the National Pollution Discharge Elimination System (NPDES) permit;
  - Inspection, maintenance, and any required repair of the leachate collection system pumps, piping, transfer and truck load out pumps and the leachate pond liner and cover;
  - Operation and maintenance of the landfill gas vacuum blowers, landfill gas extraction wells, and lateral and header piping to extract and collect landfill gas from the Phase I and II landfills and OBWL;
  - Destruction of the landfill gas in the LEU and/or landfill gas flare;
  - Operation of the landfill gas condensate traps to collect landfill gas condensate and disposal of the condensate in conjunction with leachate disposal;
  - Inspection, maintenance, and any required repair of the landfill gas extraction wells, lateral and header pipes, vacuum blowers, condensate traps, LEU, and landfill gas flare;
  - Inspection and maintenance of the perimeter fencing to limit trespass potential;
  - Inspection and maintenance of existing berms and, if necessary, construction of additional berms across roads or trails to limit trespass potential;
  - Performance of environmental monitoring of leachate, groundwater, stormwater, and soil gas; and
  - Inspection, repair and maintenance of the environmental monitoring points and systems.
- Institutional Controls
  - Restrictions on use of the landfill surface;
  - Signage and deed restrictions regarding the presence of the landfill; and
  - Existing regulatory prohibitions on installation of water supply wells on land within 1,000 ft of the waste management unit boundaries of a solid waste landfill.
- Monitored Natural Attenuation
  - Natural attenuation processes within the context of controlled and monitored Site conditions to achieve the groundwater cleanup standards in downgradient groundwater.
- Repair/modification/upgrades of the landfill systems
  - Repair/modification of the landfill cover system along the landfill toe to reduce potential for stormwater infiltration and resultant leachate generation and to reduce potential for atmospheric air intrusion and resultant increased oxygen levels and loss of vacuum applied by the landfill gas system;
  - Inspection, and repair if necessary, of penetrations to cover system to reduce potential for atmospheric air intrusion and resultant increased oxygen levels and loss of vacuum applied by the landfill gas system;
  - Repair/replacement of landfill gas extraction wells containing blockages that restrict gas extraction and flow;
  - Repair/replacement of landfill gas extraction system conveyance piping as needed to eliminate blockages that restrict gas extraction and flow;
  - Repair/replacement of condensate collection equipment as needed to reduce condensate accumulation in the piping that causes blockages, thereby restricting gas extraction and flow;
  - Maintenance/repair of landfill gas system vacuum blowers to optimize gas extraction and flow;
  - A program of optimization of the landfill gas collection system (wellfield balancing) to insure that all portions of the landfill are subject to vacuum thereby minimizing the potential for gas migration from the landfill;
  - Increased inspection, maintenance and adjustment of the leachate collection system

Table ES-3: Components of the Proposed Alternative 1 - Increased Inspection, Repair and Operational Improvements

pumps to insure optimum performance of the leachate extraction system;

- Repair and improvement of the perimeter stormwater drainage diversion and control system to minimize the potential for stormwater infiltration into the landfill and resultant leachate generation;
- Installation of a floating cover to eliminate rainwater accumulation in the leachate pond to reduce the amount of leachate requiring treatment or disposal; and
- Permitting of alternate leachate disposal facilities to insure sufficient capacity for leachate collection and disposal.





KEY MAP

NO SCALE

NOTES:

1. Contour data based on topographic survey data supplied by Space Imaging LLC & Kitsap County GIS Aerial Imagery, June 2001.
2. Additional property to south (see Key Map).

N

600 0 600

SCALE IN FEET

Figure ES-1

Overall Site Plan

Olympic View Sanitary Landfill

EMSI Engineering Management Support, Inc.

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