

SITE HAZARD ASSESSMENT

Worksheet 1

Summary Score Sheet

SITE INFORMATION:

Genesee Landfill

Genesee St & 43rd Ave S

Seattle, King County, WA 98118

Cleanup Site ID: 97

Facility/Site ID: 2123

Section: 15

Latitude: 47.56392

Township: 24N

Longitude: -122.27963

Range: 4E

Tax/Parcel ID: 4154300585

*Site Scored/ranked for the Hazardous Sites List Publication: August 2015***SITE DESCRIPTION:**

The Genesee Landfill site (Site) is a former landfill and slough located in Seattle, King County, Washington. The 31.94-acre property is located approximately 960 feet from Lake Washington, and zoned for residential (SF 5000) use.

The parcel is bisected by Genesee Street, which divides the property into northern and southern sections. Adjacent properties include additional sections of Genesee Park and Playfield to the east and west of the southern section, Lake Washington to the north of the northern section, and single family residences surrounding the park to the east, west, and south.

The Site is currently operated as Genesee Park and Playfield by City of Seattle Department of Parks and Recreation.

Current activities at the Site include recreational activities, including the use of playfields, trails, picnic shelters, and a dog run.

The Genesee Landfill site is located on the old Genesee Landfill and Wetmore Slough fill area, though the landfill extends beyond the extent of the Site. The filling of Wetmore Slough began in approximately 1890, and the Site may have been used as a fill site since that time. In 1917, with the opening of the Lake Washington Ship Canal, the water level in Lake Washington dropped approximately 9 feet, which helped to drain the slough.

The landfill reportedly operated from approximately 1942 to 1963, and was closed in approximately 1968. The City of Seattle reportedly acquired the property in 1947. The old landfill and slough area includes the area south of Lake Washington between 43rd and 45th Avenue South to South Genesee Street, and south of South Genesee Street between South Conover Way, 46th Avenue South, South Snoqualmie Street, and South Alaska Street.

Ecology's Integrated Site Information System (ISIS) lists the site as tax parcel 4154300585. This parcel is composed of the central part of the former landfill and slough, from approximately South Dakota Street south to South Snoqualmie Street, between 42nd and 43rd Avenue South and 45th Avenue South. Tax parcel 4154300585 makes up approximately half of the total landfill and slough area. Other tax parcels that are also associated with the former landfill, but that are not included in Ecology's list of tax parcels associated with the Site, are parcels 4154301600, 4154301165, 7950304225, and 7950304230.

SITE BACKGROUND:

A summary of prior operations/tenants at the subject property is presented below.

<u>From</u>	<u>To</u>	<u>Operator/Tenant</u>	<u>Activity</u>
	1890	Wetmore Slough	Natural waterway
1942	1968	Genesee Landfill	Sanitary landfill
1968	2014	Genesee Park and Playfield	

SITE CONTAMINATION:

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In 1988 the Genesee Landfill site was reported to Washington State Department of Ecology (Ecology) and placed on the Confirmed and Suspected Contaminated Sites (CSCSL) list with ID number 97.

The landfill (total area) reportedly includes approximately 26 acres of solid waste fill. Landfill waste materials are reportedly unevenly distributed and range from 5 to 19 feet thick. The landfill cap covering the fill is also uneven, with some areas reportedly having a very thin cap. The actual cap thickness is unknown. A 1986 report regarding the Site also noted that standing water was observed on the surface of the landfill cap. Groundwater at the Site has reportedly been observed at 5.3 feet below ground surface (bgs). Some soils are reportedly present intermingled with solid waste fill, and include silty clays, clay, sandy clay, and brown sand. The nature of the waste disposed in the landfill consists of municipal solid waste and potentially industrial wastes based on the geographic areas serviced by the Site.

The Site was developed as a playfield following completion of landfilling operations. Reportedly, unstable fill was identified in 1965 during construction of tennis courts.

PAST REMEDIATION ACTIVITIES:

In 1984, a study was conducted by the Seattle-King County Department of Public Health regarding abandoned landfills in the City of Seattle. In June 1984, 13 borings were advanced at the Site, and landfill gases were field screened for methane and other organic vapors. Methane was observed to be present at concentrations above the Lower Explosive Limit (LEL) at six soil boring locations. The highest reported methane concentration was 55% (by volume), which was observed at a location near the east end of the park.

Composite soil samples were collected from the Site, and several samples contained arsenic at concentrations above the Model Toxics Control Act (MTCA) Method B (carcinogen) cleanup level, but below the MTCA Method A cleanup level for unrestricted land use. The highest arsenic concentration reported was 6.2 milligrams per kilogram (mg/kg) in soil sample I. Methylene chloride was detected in soil samples C,E,H, and I at concentrations above the MTCA Method A cleanup level, with the highest reported concentration detected in sample I (84 micrograms per kilogram [ug/kg]).

Landfill gas samples (gas samples B and D) contained benzene and vinyl chloride at concentrations above MTCA Method B cleanup levels for air quality at both locations. Chlorobenzene, tetrachloroethylene, trichloroethylene, and xylenes were also detected at concentrations above MTCA Method B cleanup levels in gas sample B. Olfactory evidence of landfill gas was reportedly evident after the probe installation at location D.

The presence of subsurface combustible gas was characterized at nine locations within the Site (samples 2, 8, 9, 14, 15, 16, 22, 23, and 24). All nine samples were tested at a probe depth of 36 inches bgs, except for sample 9, at 33 inches bgs. Of these samples, three contained more than 1% combustible gas (values presented in the report prepared by Seattle-King County Department of Public Health appear to be % LEL as methane equivalent values): sample 2 (25%), sample 9 (56%) and sample 16 (12%).

A follow-up study was reportedly conducted, and combustible gas was measured in several nearby residences. Reportedly, a low level of combustible gas was observed in the ambient air of one home (location unknown), and the source was expected to be from the sewer line. Combustible gas was also reportedly observed in the vicinity of a basement drain and floor crack.

An oily sheen was reportedly observed on pooled surface water on the east end of the park. Red stains on 46th Avenue South sidewalks, just east of the park boundary, were reportedly visible. A surface water sample was collected from water that had pooled on a playing field, reportedly sourced from a leaking irrigation system. The surface water sample was analyzed for priority pollutant metals, and lead (34 micrograms per liter [ug/L]), copper (3 ug/L), mercury (0.2 ug/L), and zinc (95 ug/L) were present at concentrations above the laboratory reporting limits. The concentrations of zinc and lead were above the Washington Administrative Code (WAC) Acute and Chronic Water Quality Criteria for Aquatic Life. Combustible gas was reportedly measured within the explosive range in one onsite sewer utility line. Combustible gas was also reportedly detected in the sewer line up to two block away from the Site.

A toxicity and hazard assessment of the Genesee Landfill was conducted in 1986. The landfill was given a designation of "Category 1," indicating that no chemical problems existed for the sections of the Site that were sampled. This report suggested that with the exception of a few specific problems, there was no reason to

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Summary Score Sheet

believe that the surface of the Site presented a health risk above background exposure risks to Site visitors or workers. Specifically, the report suggested periodic monitoring of combustible gas at the Site. The report also recommended institution of construction requirements for new buildings within 1,000 feet of the property, given that the landfill is a combustible gas generator, and suggested that onsite sewer or utility lines should be identified, monitored, and vented. The report also suggested that further testing of landfill leachate may be warranted, particularly for the potential for seepage into nearby residences.

CURRENT SITE CONDITIONS:

There is no report of samples collected at the Site since 1986, so current Site conditions have not been well characterized. Shallow groundwater was reportedly encountered, but not sampled, at the Site. There is no documentation of any soil excavation at the Site. The Site is currently used as a community park, playfield, and off-leash dog run. It is uncertain whether a landfill gas venting system or other mitigation measures have been implemented following the Health Department's report.

Methylene chloride was detected in soils at the Site at concentrations above MTCA Method A cleanup level. Arsenic was also detected in soil, but at a concentration below the natural background for the Puget Sound area. Combustible gas concentrations in 1984 were reported up to 56% at a depth of 36 inches bgs, and methane was reportedly present at the Site. Landfill gas at the Site contained benzene, vinyl chloride, chlorobenzene, tetrachloroethylene, trichloroethylene, and xylenes. Lead and zinc have been detected in surface water at the Site.

The approximate depth to groundwater is 5 feet below ground surface, with groundwater flowing to the north, towards Lake Washington (estimated based on surface topography). Subsurface soils are sanitary fill (solid waste) and sandy clay.

SPECIAL CONSIDERATIONS:

Checked boxes indicate routes applicable for Washington Ranking Method (WARM) scoring

Surface Water

Landfill leachate has the potential to impact surface water. Zinc and lead have been detected in one surface water sample (pooled water that may have been sourced from a leaky irrigation system).

Air

Volatile compounds are present in shallow subsurface soils, and have been documented in ambient air.

Groundwater

Contaminants of concern are present in soils at the Site, and have the potential for transport to shallow groundwater.

The Site is located within 1,000 feet of Lake Washington, so all drinking water and irrigation rights drawing from Lake Washington within two miles of the Site are included in the calculation of surface water scores. This includes many rights on Mercer Island.

ROUTE SCORES:

Surface Water/ Human Health:	30.2	Surface Water/ Environment:	50.5
Air/ Human Health:	51.7	Air/ Environment:	5.9
Groundwater/ Human Health:	33.6		

Overall Rank: 1

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REFERENCES:

- 1 Ecology Water Resources Explorer, accessed March 2014.
<https://fortress.wa.gov/ecy/waterresources/map/WaterResourcesExplorer.aspx>
 - 2 King County GIS Center iMAP application, Property Information, Groundwater Program, and Sensitive Areas mapsets. Accessed March 2014.
<http://www.kingcounty.gov/operations/GIS/Maps/iMAP.aspx>
 - 3 Missouri Census Data Center, Circular Area Profiles - 2010 census data around a point location. <http://mcdc.missouri.edu/websas/caps10c.html>. Accessed March 2014.
 - 4 National Climatic Data Center 2011 Local Climatological Data for Seattle, Seattle Tacoma Airport. <http://www1.ncdc.noaa.gov/pub/orders/IPS-90B1F39F-6CFA-4A6B-AA82-5ED1FF897CCC.pdf>
 - 5 Seattle-King County Department of Public Health, 1984, Abandoned Landfill Study in the City of Seattle. July 30, 1984.
 - 6 Seattle-King County Department of Public Health, 1986, Seattle-King County Abandoned Landfill Toxicity/Hazard Assessment Project. December 31, 1986.
 - 7 WARM Scoring Manual
 - 8 WARM Toxicological Database
 - 9 Washington Department of Transportation 24-hour Isopluvial Maps, January 2006 update.
<http://www.wsdot.wa.gov/publications/fulltext/Hydraulics/Wa24hrIsopluvials.pdf>
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SITE HAZARD ASSESSMENT

Worksheet 2

Route Documentation

Cleanup Site ID: 97

Genesee Landfill

Facility/Site ID: 2123

1. SURFACE WATER ROUTE

List those substances to be considered for scoring:

Lead, zinc, methylene chloride

Explain the basis for choice of substances to be used in scoring:

Prior detection in shallow soil or surface water

List those management units to be considered for scoring:

Surface water

Explain basis for choice of unit to be used in scoring:

There is evidence of surface impacts, or surface conditions at the Site may allow stormwater to impact soils and/or groundwater.

2. AIR ROUTE

List those substances to be considered for scoring:

Methylene chloride, benzene, vinyl chloride, chlorobenzene, tetrachloroethylene, trichloroethylene, and xylenes

Explain the basis for choice of substances to be used in scoring:

Prior detection in soil or soil gas above MTCA cleanup levels

List those management units to be considered for scoring:

Soil vapor

Explain basis for choice of unit to be used in scoring:

Potential for vapor transport

3. GROUNDWATER ROUTE

List those substances to be considered for scoring:

Methylene chloride, lead, zinc

Explain the basis for choice of substances to be used in scoring:

Prior detection in soil at concentrations above MTCA cleanup levels, or prior detection in pooled water at the Site at a concentration above the MTCA Method A cleanup level for groundwater

List those management units to be considered for scoring:

Groundwater

Explain basis for choice of unit to be used in scoring:

Potential for transport to groundwater

Worksheet 4
Surface Water Route

CSID: 97

Site Name: Genesee Landfill

1.0 Substance Characteristics

1.1 Human Toxicity

Substance	Drinking Water Standard Value	Acute Toxicity Value	Chronic Toxicity Value	Carcinogenicity Value
Lead	6	X	10	X
Methylene chloride	8	3	1	2
Zinc	2	X	1	X

Highest Value 10
 Bonus Points? 2
 Human Health Toxicity Value **12**

1.2 Environmental Toxicity

Substance	Acute Water Quality Criteria		Non-human Mammalian Acute Toxicity	
	ug/L	Value	mg/kg	Value
Lead	82	6	X	X
Methylene chloride	X	X	1600	3
Zinc	120	4	X	X

Environmental Toxicity Value **6**

1.3 Substance Quantity

Amount: Greater than 10 acres
 Basis: Estimated extent of impacted soil

Substance Quantity Value **10**

2.0 Migration Potential

2.1 Containment

Containment Value **10**

Explain Basis: Potential for impacted groundwater to discharge to surface water.
 Contaminated surface materials with unknown runoff controls may be present.

2.2 Surface Soil Permeability

Soil Permeability Value **5**

Silty sand with gravel

2.3 Total Annual Precipitation

Total Precipitation Value **3**

37 inches

2.4 Max 2-yr/24-hour Precipitation

2YR/24HR Precipitation Value **3**

2.4 inches

2.5 Floodplain

Floodplain Value **0**

Not in a floodplain

2.6 Terrain Slope

Slope Value **1**

Less than 2%

Worksheet 4
Surface Water Route

CSID: 97

Site Name: Genesee Landfill

3.0 Targets

3.1 Distance to Surface Water

Approximately 960 feet to Lake Washington

Surface Water Distance Value

3.2 Population Served within 2 miles

51 people

Population Value

3.3 Area Irrigated within 2 miles

33.58 acres

Irrigation Value

3.4 Distance to Nearest Fishery Resource

Approximately 960 feet to Lake Washington

Fishery Value

3.5 Distance to and Name of Nearest Sensitive Environment

Site is a city park

Sensitive Environment Value

4.0 Release

Explain basis for scoring a release to surface water

No confirmed release to surface water

Release to Surface Water Value

Pathway Scoring - Surface Water Route, Human Health Pathway

$$SW_H = (SUB_{SH} * 40/175) * [(MIG_S * 25/24) + REL_S + (TAR_{SH} * 30/115)] / 24$$

Where:

SUB_{SH} = (Human Toxicity Value + 3) * (Containment + 1) + Substance Quantity

MIG_S = Soil Permeability + Annual Precip + Rainfall Frequency + Floodplain + Slope

REL_S = Release to Surface Water

TAR_{SH} = Distance to Surface Water + Population Served by Surface Water + Area Irrigated

SUB_{SH}	175
MIG_S	12
REL_S	0
TAR_{SH}	21
SW_H	30.2

Pathway Scoring - Surface Water Route, Environmental Pathway

$$SW_E = (SUB_{SE} * 40/153) * [(MIG_S * 25/24) + REL_S + (TAR_{SE} * 30/34)] / 24$$

Where:

SUB_{SE} = (Env Tox Value + 3) * (Containment + 1) + Substance Qty

MIG_S = Soil Permeability + Annual Precip + Rainfall Frequency + Floodplain + Slope

REL_S = Release to Surface Water

TAR_{SE} = Distance to Surface Water + Distance to Fishery + Distance to Sensitive Environment

SUB_{SE}	109
MIG_S	12
REL_S	0
TAR_{SE}	34
SW_E	50.5

Worksheet 5

Air Route

CSID: 97

Site Name: Genesee Landfill

1.0 Substance Characteristics

1.1 Introduction (WARM Scoring Manual) - Please Review before scoring

1.2 Human Toxicity

Substance	Ambient Air Standard Value	Acute Toxicity Value	Chronic Toxicity Value	Carcinogenicity Value
Methylene chloride	9	3	1	4
Benzene	10	3	X	5
Vinyl chloride	10	1	X	X
Chlorobenzene	1	X	3	X
Tetrachloroethylene	9	X	X	X
Trichloroethylene	10	3	X	4
Xylenes	1	3	1	X

Highest Value 10
 Bonus Points? 2
 Toxicity Value 12

1.3 Mobility

Gaseous Mobility	Max Value:	4
Particulate Mobility	Soil Type:	
	Erodibility:	
	Climatic Factor:	

Mobility Value 4

1.4 Final Human Health Toxicity/Mobility Matrix Value

HH Final Matrix Value 24

1.5 Environmental Toxicity/Mobility

Substance	Non-human Mammalian Inhalation Toxicity (mg/m3)	Acute Value	Mobility Value	Table A-7 Matrix Value
Methylene chloride	88000	3	4	6
Benzene	31947	3	4	6
Vinyl chloride	460123	1	4	2
Chlorobenzene	X	X	4	X
Tetrachloroethylene	4000	5	4	10
Trichloroethylene	15583	3	4	6
Xylenes	21714	3	3	5

Env. Final Matrix Value 10

1.6 Substance Quantity

Amount: 31.94 acres

Basis: Entire site is a landfill; variable levels of these gases present throughout the site

Substance Quantity Value 8

Worksheet 5

Air Route

CSID: 97

Site Name: Genesee Landfill

2.0 Migration Potential

2.1 Containment

Containment Value

Explain Basis: Generally at least 2 feet of cover (varies)
but no vapor collection system present

3.0 Targets

3.1 Nearest Population

Population Distance Value

<200 feet to the nearest dwelling

3.2 Distance to and name of nearest sensitive environments

Sensitive Environment Value

The site is currently used as a municipal park

3.3 Population within 0.5 miles

Population Value

4,706 population

4.0 Release

Release to Air Value

Explain basis for scoring a release to air:

Confirmed release to air

Pathway Scoring - Air Route, Human Health Pathway	
$AIR_H = (SUB_{AH} * 60 / 329) * [REL_A + (TAR_{AH} * 35 / 85)] / 24$	
Where:	
$SUB_{AH} = (\text{Human toxicity} + 5) * (\text{Containment} + 1) + \text{Substance Qty}$	SUB_{AH} 182
$REL_A = \text{Release to Air}$	REL_A 5
$TAR_{AH} = \text{Nearest Population} + \text{Population within 1/2 mile}$	TAR_{AH} 79
	AIR_H 51.7

Pathway Scoring - Air Route, Environmental Pathway	
$AIR_E = (SUB_{AE} * 60 / 329) * [REL_A + (TAR_{AE} * 35 / 85)] / 24$	
Where:	
$SUB_{AE} = (\text{Environmental Toxicity Value} + 5) * (\text{Containment} + 1) + \text{Substance Qty}$	SUB_{AE} 98
$REL_A = \text{Release to Air}$	REL_A 5
$TAR_{AE} = \text{Nearest Sensitive Environment}$	TAR_{AE} 7
	AIR_E 5.9

Worksheet 6
Groundwater Route

CSID: 97

Site Name: Genesee Landfill

1.0 Substance Characteristics

1.1 Human Toxicity

Substance	Drinking Water Standard Value	Acute Toxicity Value	Chronic Toxicity Value	Carcinogenicity Value
Methylene chloride	8	3	1	2
Lead	6	X	10	X
Zinc	2	X	1	X

Highest Value 10
 Bonus Points? 2
 Toxicity Value

1.2 Mobility

Cations/Anions Max Value: 3
 Solubility Max Value: Mobility Value

1.3 Substance Quantity

Amount: 154,590 cubic yards
 Basis: Estimated volume of contaminated soil

Substance Quantity Value

2.0 Migration Potential

2.1 Containment

Explain Basis: Contaminated soil

Containment Value

2.2 Net Precipitation

>10 to 20 inches

Net Precipitation Value

2.3 Subsurface Hydraulic Conductivity

Silty sand with gravel

Conductivity Value

2.4 Vertical Depth to Groundwater

5 feet

Confirmed release: No

Depth to Aquifer Value

3.0 Targets

3.1 Groundwater Usage

Private supply, but alternate sources available with minimum hookup requirements

Aquifer Use Value

3.2 Distance to Nearest Drinking Water Well

8,460 feet

Well Distance Value

3.3 Population Served within 2 Miles

3 people

Population Served Value

Worksheet 6
Groundwater Route

CSID: 97

Site Name: Genesee Landfill

3.4 Area Irrigated by GW Wells within 2 miles

Area Irrigated Value

1 acres

4.0 Release

Release to Groundwater Value

Explain basis for scoring a release to groundwater:

No confirmed release to groundwater

Pathway Scoring - Groundwater Route, Human Health Pathway

$$GW_H = (SUB_{GH} * 40 / 208) * [(MIG_G * 25 / 17) + REL_G + (TAR_{GH} * 30 / 165)] / 24$$

Where:

$SUB_{GH} = (\text{Human toxicity} + \text{mobility} + 3) * (\text{Containment} + 1) + \text{Substance Qty}$

$MIG_G = \text{Depth to Aquifer} + \text{Net Precip} + \text{Hydraulic Conductivity}$

$REL_G = \text{Release to Groundwater}$

$TAR_{GH} = \text{Aquifer Use} + \text{Well Distance} + \text{Population Served} + \text{Area Irrigated}$

SUB_{GH}	205
MIG_G	13
REL_G	0
TAR_{GH}	7.5
GW_H	33.6

Washington Ranking Method

Route Scores Summary and Ranking Calculation Sheet

Site Name: Genesee Landfill **CSID:** 97

Site Address: Genesee Street and 43rd Avenue South **FSID:** 2123

HUMAN HEALTH ROUTE SCORES

Enter Human Health Route Scores for all Applicable Routes:

Pathway	Route Score	Quintile Group
Surface Water	30.2	4
Air	51.7	5
Groundwater	33.6	3

H=	5
M=	4
L=	3

$$\begin{array}{ccccccc}
 & H^2 & + & 2M & + & L & \\
 \hline
 & 25 & + & 8 & + & 3 & \\
 \hline
 & & & 8 & & &
 \end{array}$$

**Human Health
Priority Bin Score:**
5
 rounded up to next whole number

ENVIRONMENT ROUTE SCORES

Enter Environment Route Scores for all Applicable Routes:

Pathway	Route Score	Quintile Group
Surface Water	50.5	4
Air	5.9	2

H=	4
L=	2

$$\begin{array}{ccccccc}
 & H^2 & + & 2L & & & \\
 \hline
 & 16 & + & 4 & & & \\
 \hline
 & & & 7 & & &
 \end{array}$$

**Environment
Priority Bin Score:**
3
 rounded up to next whole number

Comments/Notes:

**FINAL MATRIX
RANKING**

1

FOR REFERENCE:

Final WARM Bin Ranking Matrix

Human Health Priority	Environment Priority					
	5	4	3	2	1	N/A
5	1	1	1	1	1	1
4	1	2	2	2	3	2
3	1	2	3	4	4	3
2	2	3	4	4	5	3
1	2	3	4	5	5	5
N/A	3	4	5	5	5	NFA

Quintile Values for Route Scores - February 2015 Values

Quintile	Human Health			Environment	
	Surface Water	Air	Ground Water	Surface Water	Air
5	>= 30.7	>= 37.6	>= 51.6	>= 50.9	>= 29.9
4	>= 23.1	>= 23.8	>= 40.9	>= 31.2	>= 22.5
3	>= 14.1	>= 15.5	>= 33.2	>= 23.6	>= 14.0
2	>= 7.0	>= 8.5	>= 23.5	>= 11.0	>= 1.6
1	<= 6.9	<= 8.4	<= 23.4	<= 10.9	<= 1.5

Quintile value associated with each route score entered above



Legend:

- Property location (approximate)
- Gas sample (approximate)
- Soil sample (approximate)

Notes:

1. All locations are approximate, and not to scale.



Genesee Landfill
Genesee Street & 43rd Avenue South
Seattle, WA 98118



Site Overview Map

CSID 97
 CSID97.vsd