

Section 2: Phase I Landfill Site Characterization

2.1 Introduction

Characterizing the site Phase I Site Characterization, the initial stage of data collection, establishes a preliminary framework for understanding the soils, geology and hydrogeology and plans the Phase II Site Characterization. Phase II Site Characterization (see Section 3) will evaluate site-specific subsurface conditions in greater detail including the depth and extent of the uppermost (water bearing) geologic units and hydraulically interconnected units, the lithologic and hydraulic properties of these units, groundwater flow patterns, and other factors.

Regulatory reference OAR 340-93-130(4) requires a soils, geology and hydrogeology report and a feasibility study report for a new landfill or an expansion of an existing landfill. OAR 340-94-080, OAR 340-40 and 40 CFR Part 258 address groundwater hydrology, quality and groundwater monitoring.

Objectives of Phase I The main objectives of the Phase I site characterization study are to

- describe existing site conditions
- determine if the site is suitable for landfill construction
- provide sufficient base-line information for developing the facility design, construction program, operations plan and environmental monitoring program.

How to respond Prepare and submit to the Department a report describing the work performed in the Phase I Site Characterization. Geologic and hydrogeologic tasks should be performed by or under the direct supervision of an Oregon Registered Geologist with experience in conducting hydrogeologic investigations.

Report content The Phase I Site Characterization report should address, at a minimum, completion of the tasks described in this subsection and the location restrictions defined in Section 1. Following the organizational format of this guidance will expedite Department review of the report. The report should be stamped by the Registered Geologist who performed or supervised the investigation.

In this section This Section describes the recommended tasks that should be completed in preparation of Phase I Site Characterization study report. The following topics are addressed:

- existing conditions
- climate/meteorology
- hydrology
- water balance
- water use inventory
- geology and hydrogeology investigation, and
- phase II workplan

This guidance identifies the scope of investigations necessary to comply with the Solid Waste rules and provide the Department with sufficient data to evaluate the permit application or other submittals.

Related references

This Section focuses on technical guidance and format for the Phase I Site Characterization Report. Groundwater Monitoring requirements are addressed in more detail in Section 10 (Environmental Monitoring). Monitoring well construction standards are contained in a separate document ("Guidelines for Monitoring Well Drilling, Construction and Decommissioning," August 24, 1992).

2.2 Existing conditions

Site characterization task

Describe existing site conditions by providing the information in this subsection.

Site location

Describe the site location with respect to known or easily identifiable landmarks. Describe the site location in terms of the section, township, and range location for the site. Describe access to the site from the nearest U.S. or State Highway.

Legal description

Provide a legal description of the tract or tracts of land which have been or are proposed to be used for waste disposal activities.

Vicinity map

Prepare a map or series of maps showing the facility site and the area within at least a five-mile radius of the site boundary. The map(s) should clearly show the following:

- the site location
- the existing and proposed zoning and land uses
- residential areas
- public and private water supply wells
- surface waters and surface water intakes
- boundary of any municipal water supply service areas
- access roads, bridges, railroads, and airports
- historic sites
- other existing and proposed man-made or natural features relating to the facility, and
- the drawing date, a North arrow, and a bar scale

Map format: The map should be on a U.S. Geological Survey (USGS) 7 1/2 minute quadrangle base or, if such a map is not available, a substitute base such as an enlargement of a USGS 15 minute quadrangle map, an Oregon Department of Transportation county map or city map at a similar scale.

**Aerial
photographs**

Prepare a stereo pair of standard size (9 inches by 9 inches) recent vertical aerial photographs with a scale up to 1:40,000 which show the site and the area within at least a one-mile radius of the site boundary. Mark the site boundaries and actual fill areas on one of the photographs. Oblique aerial photographs or surface level photographs from various points around the site perimeter may also be submitted in support of the application. Photocopied reproductions of aerial photographs will not be accepted as fulfillment of this requirement.

Information concerning public agency sources for aerial photographs may be obtained by contacting:

Nature of Northwest
Oregon Dept. of Geology & Mineral Industries
800 NE Oregon Street #5, Suite 177
Portland, OR 97232
Phone: (503) 731-4444

**Adjacent
landowners**

Show on a location map or on County Tax Lot map(s), the names and mailing addresses of all landowners within one quarter mile of the property and any other landowners identified as being affected by the proposed facility. Summarize this information on a separate list cross-referenced to the location map or the County Tax Lot map(s). Cite the source for obtaining the names and mailing addresses of persons identified as affected parties.

Site map

Prepare a detailed site map scaled at not more than one inch equals 200 feet (or other scale approved by the Department) that shows the following:

- the geographical location and boundaries of the disposal site
- the topography of the site and area within at least 1/4 mile of the site with contour intervals not to exceed five feet for slopes greater than five percent, or two feet if slopes are less than five percent
- natural features of the land including seeps, springs, streams, ponds and wetlands
- man-made features, including buildings, excavations, pipelines, utilities, recycling facilities, fences, roads, parking areas, drainage culverts, ditches, ponds, berms and dikes
- boundaries of all proposed, active, and closed waste disposal areas, and boundaries of all existing and proposed soil borrow areas
- locations of all existing and proposed borings, piezometers, monitoring wells, test pits, water supply wells, and any other facility monitoring or sampling points or devices
- benchmarks and permanent survey markers, and
- the drawing date, a north arrow, a bar scale, and an explanation of all map symbols

Use the National Geodetic Vertical Datum of 1929 as the vertical elevation datum, and the Oregon State Plane Coordinate System (ORS 93.330) as the horizontal control.

Map preparation: The map(s) should be prepared and stamped by a registered land surveyor or civil engineer. Surveyed well locations should:

- provide a horizontal accuracy of 0.2 feet (0.06 meters)
 - provide the elevation of the land surface with a vertical accuracy of 0.1 feet (0.03 meters)
 - provide the marked level at the top of the well casing with a vertical accuracy of 0.01 feet (0.003 meters)
 - use National Geodetic Vertical Datum of 1929 as the vertical elevation control, and the Oregon State Plane Coordinate System (ORS 93.330) as the horizontal control
 - describe the location in either latitude and longitude coordinates accurate to 0.1 seconds in latitude and longitude or UTM coordinates
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2.3 Climate/Meteorology

**Site
characterization
task**

Provide current information based on or extrapolated from data collected at the closest reporting weather station or stations including:

- average annual precipitation and monthly distribution of precipitation
 - average annual evaporation and monthly distribution of evaporation
 - average annual prevailing wind direction and monthly variation in wind direction
 - average and maximum wind velocities and monthly variations in wind velocity, and
 - average annual temperature and monthly variations in temperature
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**Obtaining
information**

This information can be obtained from the National Oceanic and Atmospheric Administration (NOAA), or other federal or state agencies reporting meteorological data.

On-site station

A site-specific station may need to be created if data from the nearest established meteorological station is not representative of site conditions.

2.4 Hydrology

**Site
characterization
task**

Evaluate and describe the surface water drainage of the site and of the surrounding area within at least a one-mile radius of the site. This information should include a map or maps at a scale of 1:24,000 showing major perennial, ephemeral and intermittent drainage channels, and their tributaries.

Map content

The maps should identify all existing wetlands and estuaries, and show the boundaries of the 100-year floodplain, based on data collected by the Federal Emergency Management Agency or other federal or state agencies reporting flood management data. Provide the minimum, maximum and average annual flow rates including monthly variations for all major streams. Values should be based on stream gauging data collected by the U.S. Geological Survey or other federal or state agencies reporting stream gauging data.

2.5 Water balance

**Site
characterization
task**

Analyze the average annual site water budget including precipitation, runoff, infiltration and evapotranspiration. Determine the monthly variations of each of these parameters for a one-year period.

Methods

Acceptable water balance methods include Thornthwaite-Mather (1957), the EPA Water Balance (1975), the EPA Help Model (1984), and/or other methods approved in advance by the Department.

2.6 Water Use Inventory

**Site
characterization
task**

Inventory and identify all water wells and water usage on-site and within a one-mile radius of the site boundary. Prepare a water well inventory report.

Well inventory

Identify all active and inactive water wells, irrigation wells, and surface water usage points within the targeted radius. Identify and field check all water usages within this radius which are listed in the drillers' log files or other records of the Oregon Water Resources Department (OWRD). Areas within the radius of investigation that are served by a municipal water supply should be included in the OWRD well records search.

Survey

Conduct a door-to-door field survey to identify wells not accounted for in OWRD files. For all wells identified in the OWRD files and the door-to-door survey, record the following information:

- name and address of the well owner
 - name and address of the driller
 - date of drilling
 - well location
 - aquifer screened
 - approximate land surface elevation
 - depth of well
 - materials and construction (including casing, screen and annular seal depths and intervals)
 - reported yield
 - use of the water
 - reported or measured static and pumping water levels (or well drawdown) and dates of measurement, and
 - any available water quality data
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Alternative to survey

In lieu of the door-to-door survey, provide the following information for areas served by a municipal supply:

- a map scaled at 1:24,000 or larger showing the boundary of the service area and the raw water intake location
 - a record search for any other water usage within the radius of investigation
 - a description of surface water supplies including the intake location, average daily and yearly withdrawal rates, and monthly distribution of withdrawals, and
 - a description of groundwater supplies including their location, geologic logs and construction, average daily and yearly pumpage, monthly distribution of pumpage, and static and pumping water levels by well and aquifer
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Report content

The water well inventory report should include a map at a scale of 1:24,000 or larger showing the location and use of each well/surface water use point, and a table presenting the required information for each point. The report should include a copy of each available drillers' log, and cross-reference the logs to the well inventory maps and forms.

2.7 Geology and Hydrogeology Investigation

Site characterization task

Conduct a preliminary geology and hydrogeology investigation. Evaluate the regional geology and hydrogeology based on geological reconnaissance field mapping and existing published or unpublished reports and data from state and federal agencies, universities, consultants or other sources.

Investigation report

In the Phase I Site Characterization report:

- describe the regional geology including the age, areal and subsurface distribution, thickness, physical properties and genesis of major stratigraphic units; and the age, occurrence, orientation and physical description of major structural features
 - describe the regional hydrogeology including the depth, thickness, physical characteristics and lateral persistence of major and minor aquifers and aquitards, rates and directions of groundwater flow, areas of recharge and discharge (including water wells), hydrologic boundaries, seasonal variations in groundwater levels and flow, and chemical quality of the groundwater
 - describe the thickness, lateral extent, hydraulic conductivity and attenuative capacity of all in-situ geologic materials between the proposed base excavation for the landfill and the uppermost aquifer
 - evaluate and explain the degree of protection afforded by the properties and extent of geologic materials described above
 - prepare a hydrogeologic map of the site and the area within at least a one-mile radius of the site scaled at not more than one inch equals 2,000 feet that shows the surficial geology, the elevation of the water table or potentiometric surface and the regional groundwater flow direction (from published sources or field measurements), and the locations of known discharging wells
 - prepare two cross-sections oriented at approximately right angles to each other, which illustrate the regional geology and hydrogeology of the site and vicinity, and
 - list sources used to prepare descriptions
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Geologic hazards

Geologic hazards may include seismic impacts, mass movement (e.g., landslides), unstable soils, flood inundation, shallow groundwater levels, tsunamis, and volcanic eruptions. Location restrictions under OAR 340-94-030 address considerations such as Holocene fault zones, seismic impact areas and unstable areas.

Earthquake safety

Evaluate the earthquake safety of the site. The analysis should include

- a description of the seismo-tectonic setting and seismic history of the area, including size, frequency, and location of historic earthquakes
- potential for area to be affected by surface rupture, including sense and amount of displacement, and width of surface deformation zone
- probable response of site to likely earthquakes, including estimated ground motion, maximum ground acceleration, velocity and displacement
- potential for area to be affected by earthquake-induced landslides or soil liquefaction, and
- potential for area to be affected by regional tectonic deformation (subsidence or uplift)

To the extent possible, identify and evaluate all other known or suspected geologic hazards which may affect the design, construction, and operation of the facility.

2.8 Phase II Workplan

**Propose
workplan**

Prepare a proposed work plan and schedule for conducting the Phase II Site Characterization Study and preparing a final report.

**Workplan
approval**

This work plan should receive Department approval prior to the actual onset of site work. Section 3 of this guidance describes Phase II Site Characterizations.

2.9 Additional Resources

Reference “Location Information Needed for the Groundwater Database,” March 8, 1992 (DEQ)

Contacts Oregon Maps and Aerial Photography, Oregon Department of Geology and Mineral Resources

Driller’s log files, Oregon Water Resources Department

Methods to determine water balance Thornthwaite-Mather (1957)
U.S. EPA Water Balance (1975)
U.S. EPA “Hydrologic Evaluation of Landfill Performance (HELP) Model” (1984)
