Preliminary Groundwater Assessment Guidelines

Water Quality Groundwater Section

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State of Oregon
DEQ Department of Environmental Quality

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Executive summary

Successful protection of Oregon's groundwater depends upon an adequate evaluation of potential contamination by permitted facilities. This evaluation is based on review of appropriate technical information and reports [OAR 340-40-030(2)] submitted by the facility. Although some point source activities are clearly recognized as having a high potential to impact groundwater, the potential impacts from other activities may not be as clear. In these cases, DEQ has chosen to allow a phased approach in which the facility first provides available/easily obtainable information. This information is called a Preliminary Groundwater Assessment Report. Based on this information, DEQ will determine if a Hydrogeologic Characterization will be required. A Hydrogeologic Characterization requires the collection of site-specific information and involves a more detailed evaluation of site conditions and potential impacts. Requirements for Hydrogeologic Characterizations are discussed in the guidance document titled - Hydrogeologic Characterization Part B: Guidelines.

These guidelines offer a standardized approach for the submittal of a Preliminary Groundwater Assessment to minimize costs and ensure that needed information is received. It is DEQ's intent that the information required in a Preliminary Groundwater Assessment can be easily and relatively quickly obtained from published sources, public records, previous investigations, etc. It is not intended that the Preliminary Groundwater Assessment require extensive site-specific data collection, calculations, or modeling. In some instances, however, minimal data collection may be required (e.g. a wastewater analysis or the collection of water level data in existing wells).

DEQ recommends that reports follow the format outlined in these guidelines. The reporting format should be modified, expanded, or shortened, as appropriate, to ensure that the reports are more readable and understandable. Having reports written in a consistent format will allow DEQ groundwater specialists and hydrogeologists to more easily and quickly evaluate the information presented. Consultants can also use the format to assess whether their report includes the information needed by DEQ.

This guidance has been developed by and for DEQ's Water Quality Groundwater Point Source Program. Other DEQ programs may have different requirements.

All reports involving the collection and interpretation of geologic and hydrogeologic information should be prepared and signed by an Oregon Registered Professional Geologist, Registered Professional Engineer, or Certified Engineering Geologist qualified by training and/or experience to work on hydrogeologic investigations. That geologist or engineer is expected to have directed the study and to have visited the site.

Definitions

"Contaminant" - dredged spoil, solid waste, incinerator residue, sewage, garbage, sewerage sludge, munitions, chemical wastes, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand, cellar dirt, and industrial, municipal, and agricultural waste discharged to water, and includes any pollutant or other characteristic element which may result in pollution of the waters of the State (OAR 340-40-010).

"Point Source" - any confined or discrete source of pollution where contaminants can either enter - or be conveyed by the movement of water to - public waters (OAR 340-40-010).

"Pollution" - such alteration of the physical, chemical or biological properties of any water of the state, including change in temperature, taste, color, turbidity, silt or odor of the waters, or such discharge of any liquid, gaseous, solid, radioactive or other substance into any water of the state, which will or tends to, either by itself or in connection with any other substance, create a public nuisance or which will or tends to render such water harmful, detrimental or injurious to public health, safety or welfare, or to domestic, commercial, industrial, agricultural, recreational or other legitimate beneficial uses or to livestock, wildlife, fish or other aquatic life or the habitat thereof (OAR 340-40-010).

"Uppermost Aquifer" - the geologic formation, group of formations, or part of a formation that contains the uppermost potentiometric surface capable of yielding water to wells or springs and may include fill material that is saturated (OAR 340-40-010).

"Wastes" - sewage, industrial wastes, and all other liquid, gaseous, solid, radioactive, or other substances which will or may cause pollution or tend to cause pollution of any water of the state (OAR 340-40-010).

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1. Facility characterization

A comprehensive description of the facility is needed to fully understand the potential impacts to groundwater quality. Past and present uses of the facility, including storage and handling practices, are important to identify potential soil or groundwater contamination from previous activities. This information will help to avoid exacerbation of existing conditions by new wastewater discharges.

1.1. Facility description and location

Describe the facility, including the type of facility and how long the facility has been in operation.

Provide a written description of the location of the disposal/storage facility with respect to identifiable landmarks, and site access routes from the nearest US or State Highway. The description of the location of the waste disposal/storage site(s) should include:

- County;
- Section,
- Township,
- Range (to 1/4 1/4 1/4 Section);
- and latitude and longitude.

Provide maps as needed to describe the facility's location and property boundaries.

1.2. Land use

General land use practices can have a direct influence on the underlying groundwater quality. Provide a discussion of and a map indicating land use within 1/2 mile of the boundaries of the site.

1.3. Wastes and materials treatment, disposal and storage

List the types and quantities of wastes and materials to be disposed of or stored at the facility. Provide a process flow diagram for the facility (if available) to identify the waste stream generation points and handling procedures. Also, provide a discussion of past waste disposal or storage practices.

Discuss the location, type, and dimensions of each waste or material storage area including lagoons, solids storage, etc. All historical and proposed waste or material storage areas should be identified on a site map. Provide a discussion of waste solids handling and management.

Indicate the historical and proposed types of waste discharges from the facility. This should include land application, drain fields, wetlands, seepage from storage impoundments, leaching from storage areas, etc.

Discuss the location and dimensions of each waste or wastewater disposal area at the site including ponds, lagoons, drain fields, irrigation sites, etc. All present and past waste disposal areas should be identified on a site map.

1.4. Wastewater discharge rates and frequencies

Discuss current or proposed wastewater discharge rates and frequencies to ponds, lagoons, drain fields, irrigation areas, etc. Discuss past wastewater disposal rates and frequencies.

Discuss seepage rates through lined or unlined ponds, lagoons, wetlands, etc.

2. Waste characterization

The character and strength of a facility's waste stream is used in evaluating the potential threat to groundwater quality.

2.1. Chemicals and materials

Many substances used by facilities may intentionally or inadvertently enter its waste stream.

List and identify the chemical composition of the chemicals and materials, including those previously used and those proposed for use in the facility's processes, maintenance, cleaning, etc. Identify the quantities and uses of the chemicals and materials. Provide Material Safety Data Sheets, where available.

2.2. Characterization of wastes and wastewater

The quality of a facility's wastewater can directly affect groundwater quality.

Provide an analysis and a discussion of the chemical characteristics of the existing and proposed wastewater stream(s).

Discuss sampling parameters, methods, locations, and frequencies used in the characterization of the wastewater.

If wastewater is not available for analysis, provide an evaluation of potential wastewater characteristics based on bench or pilot tests, analyses from comparable facilities, calculations, etc. Indicate how the predicted wastewater characteristics were determined.

2.3. Characterization of solids

The facility's solid waste stream(s) may also effect the underlying groundwater quality.

Discuss the quantities and characteristics of waste solids or materials historically stockpiled or stored and those proposed to be stockpiled or stored at the site. Discuss the leaching potential of the materials. If a material produces a leachate, estimate the volume and characteristics of the leachate.

Discuss sampling parameters, methods, locations, and frequencies used in the characterization of the solids.

3. Site characterization

Groundwater quality and movement are directly related to a variety of site factors including topography, climate, hydrology, geology, and hydrogeology. Potential impacts to groundwater quality need to be considered with the local setting.

3.1. Topography

Shallow groundwater movement may closely mirror surface water flow and the slope of the land surface.

Provide a general discussion of the topography of the site and the area adjacent to the site. Provide a site map indicating the topography of the site and an area within at least 1/4 mile of the site if available.

3.2. Climate

Rainfall recharges shallow aquifers and affects the quality of the shallow groundwater. Provide a general discussion of the climate of the area.

3.3. Groundwater and surface water use in the vicinity

By understanding where and how water is used we can gain a clearer picture of local groundwater movement and identify vulnerable receptors of contaminated groundwater.

Provide an inventory of water wells and surface water diversion points on site and within a 1/2 mile radius of the site boundary. The inventory should identify, to the extent practicable, all active and inactive water wells, irrigation wells, and surface water diversion points. At a minimum, the driller's log and other records of the Oregon Water Resources Department should be reviewed to identify wells and water diversion points within the area of investigation. Additionally, a door-to-door field survey should be made to identify wells in the area for which

logs may not be on file with the Oregon Water Resources Department or for which location information is not adequate. The following if possible:

- name and
- address of current well owner,
- driller's name and affiliation,
- date drilled,
- well location,
- aquifer,
- land surface elevation,
- depth of well,
- material and construction,
- use of well,
- static and pumping water levels and dates of measurement,
- and available water quality data.

Provide tables indicating the wells and surface water diversion points, their proximity, type of use, withdrawal rates, etc. Wells and surface water usage points should be shown on an area map indicating the facility's property boundaries. Well logs should be provided, where available, and referenced to the location map and the table.

Indicate if the site is located within a well head protection area; the recharge zone of a principal or primary water supply aquifer; or within the zone of influence of a public water supply well or well field at maximum pumping rate(s).

3.4. Soil characterization

Soil is a very important link between the surface and subsurface; and between activities above ground and the quality and quantity of groundwater below ground.

Based on existing information and previous investigations provide a general discussion of soils within the site boundaries including soil type, soil texture, vertical and horizontal distribution of soils. All sources of information used in the discussion of soils should be cited in the reference section.

3.5. Geological characterization

Groundwater's occurrence, movement and natural quality are directly related to the geologic environment. Geology can also affect the groundwater' s vulnerability to contamination.

3.5.1 Regional geology

Describe regional geology based on existing publications and reports, public records, and from previous investigations. Geologic studies may have been conducted by DEQ, the United States Geologic Society, the Oregon Water Resources Department, or through a university or

independent research. The discussion of regional geology should include the age, areal and subsurface distribution, thickness, physical description and genesis of major lithologic units; and the age, occurrence, orientation and physical description of major structural features.

3.5.2 Local geology

Characterize the local site-specific geology based on publications reports, public records, existing site-specific information, etc. Sources for site-specific information may include previous geologic borings, test pits, well logs, etc. The discussion should include, but should not necessarily be limited to, identification of the horizontal and vertical extent of subsurface materials, the types of materials, structural features, and the geological influences that may control groundwater flow (such as high permeability zones, fractures, fault zones, buried stream deposits, etc.).

If existing information includes previously collected site-specific geologic data, then the following should be included in the report, where available:

- A description of previous surface geologic investigations.
- A description of previous subsurface investigations including:
    - Number
    - Location, and depth of borings and test pits
    - The drilling and soil/rock sampling methods used to collect soil and rock samples
    - The procedures and methods used to characterize the soil and rock material samples obtained from the boring and tests pits (e.g. grain-size analysis, etc.)
- A discussion of supplementary techniques such as geophysics, cone penetrometer investigation, aerial imagery, etc. used in previous investigations at the site.

The following supporting information should be included in the report, if available:

- Copies of existing boring/geologic logs. Logs should include existing results from laboratory analysis, field identifications, descriptive text, and graphical display.
- Results and appropriate tables and graphs resulting from previous field or laboratory testing of geologic materials.
- A map showing the locations of existing borings, trenches and other sampling locations.
- A map indicating the surficial geology of the site.
- Cross-sections and/or fence diagrams constructed from existing information that depict the geology of the site. The cross-sections or fence diagrams should be referenced to a site map.

- All sources of information used in characterizing the regional and local geology should be cited in the reference section.

3.6. Hydrogeologic characterization

Groundwater movement is dynamic and complex. It is affected by geologic structure and the type of material through which the water flows. How contaminants reach groundwater and move in it is equally complex. Hydrogeologic data and information are basic to understanding the potential for groundwater quality impacts.

3.6.1. Regional hydrogeology

The regional hydrogeology should be described based on existing information. These information sources might include publications, reports, public records, previous investigations, etc. The description should include 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.

3.6.2. Local hydrogeology

Provide a discussion of site-specific hydrogeology based on existing information. If sufficient information is available, the discussion should include depth to groundwater; depth, thickness, lateral and vertical extent of aquifers and confining layers; presence of perched aquifers; groundwater levels and gradients; groundwater flow directions and fluctuations; groundwater flow rates; inter-connection between aquifers and between groundwater and surface water; groundwater quality; and human-induced influences.

If existing information includes the previous collection of site-specific hydrogeologic data, then the following should be included in the report, where available:

- Number, location, and depth of previous borings and existing monitoring wells or piezometers,
- Information on existing well and piezometer construction and development,
- The methods and equipment previously used to define the saturated zones, gradients, groundwater flow directions, etc.,
- The field and laboratory methods and tests used to define aquifer properties (e.g., laboratory permeability testing, slug tests, aquifer tests, etc.),
- A description of indirect methods used, such as geophysics,
- Formulas used for calculations (e.g., calculations of groundwater flow velocities) should be cited.

The following information should be provided in the report where possible:

- Logs from existing supply wells, monitoring wells, piezometers, and geologic borings should be provided.
    - Logs should include results of laboratory analysis, field identifications, descriptive text, and graphic display, if available.
    - In addition, logs for any water supply wells within 1/2 mile of the site should also be provided.
- A map showing the locations of wells, borings, etc.
- Existing data from previous in-situ hydraulic tests and a discussion of the methods used, if known.
- A table listing the elevations, depths and screened/open intervals for the existing wells and piezometers.
- Water level measurements in appropriate surface water bodies and existing wells and piezometers. This may require the collection of data. The measurements should be referenced to common datum, if possible. The dates of the measurements should be indicated.
- If sufficient water level data can be collected on or near the site, then contour map(s) of the potentiometric surface(s) of the aquifer(s) present at the site should be presented.
    - Surface water level data should be incorporated into the contour map, when appropriate.
    - The contour map(s) should indicate the measuring points, water level values, and measurement date(s).
    - Contour lines within the actual area represented by the data should be represented with a solid line.
    - Any interpretation outside the field data should be represented with a dotted or dashed line.
    - Flow directions also should be indicated on the contour maps.
    - The water level measurements dates should be indicated on the map.
- If sufficient information is available, provide cross-sections that depict the hydrogeologic environment at the site. Reference the cross-section(s) orientations on a location map.
- All sources of information used in characterizing the regional and local hydrogeology should be cited in the reference section.

3.6.3. Groundwater quality

Based on existing information provided, a discussion of the existing water quality at or near the site. Discuss sampling methods and analytical methods, if known, and provide laboratory reporting sheets, if available.

Describe any existing groundwater monitoring programs at the facility. Indicate if the facility is located in a Groundwater Management Area and identify the parameter(s) of concern.

3.7. Surface hydrologic characterizations

Groundwater and surface water are interconnected in the hydrologic cycle. Consideration of groundwater's impacts on surface water bodies (and vice versa) provides a holistic evaluation of a facility's potential impacts on general water quality.

Describe any surface water bodies including:

- seeps,
- springs,
- wetlands,
- ponds,
- lakes,
- rivers,
- streams, or
- other surface water features on-site or within a 1/2 mile radius of the facility.
    - The locations of surface water bodies should be shown on the site map or the location map, whichever is appropriate.
    - Indicate surface water elevations, if known.

Describe the site's surface water drainage conditions and susceptibility to flooding.

Provide a discussion of existing surface water quality data at or near the site. Discuss sampling and analytical methods if available. Provide laboratory water quality data sheets if available.

Identify streams/water bodies classified as "water quality limited". Identify parameters of concern.

4. Evaluation of potential water quality impacts

The need to monitor groundwater, establish regulatory limits and/or conduct other activities aimed at protecting groundwater quality is linked to a facility's potential impacts on water quality.

Based on the information discussed above, provide any appropriate conclusions on the potential for water quality impacts from the facility.

5. Supporting information

5.1. References

Provide references for publication(s) and other information sources used in the preparation of this report.

5.2. Figures, tables, and maps

Provide figures, tables and maps as needed to support and clarify the information presented in the text of the report.

Provide a series of maps to describe the facility location, site conditions, sampling locations, land use, etc. All maps should have a north arrow, bar scale, a drawing date and an explanation of all map symbols.

5.3. Location maps

Submit a map or a series of maps showing the disposal/storage facility and the area within at least a three-mile radius of the site boundary. Provide two USGS 7.5 min. (1:24,000) topographic maps. If 7.5 min. maps are not available, then provide two enlargements of 15 min. (1:62,500) USGS topographic maps.

- One of the maps should indicate land ownership and use adjacent to the site.
- The other map should indicate the following information:
    - site boundaries,
    - an area at least three miles around site boundary,
    - locations of all wells within 1/2 mile of wastewater disposal site,
    - surface water bodies, etc.

5.4. Site maps

Provide a series of site maps of an appropriate scale (scale of 1 inch = 200 feet recommended) to show the following information:

1. Buildings, other structures, and property lines,
2. Topography of the site and an area within at least 1/4 mile of the site if available,
3. Locations of wells, borings, or sampling points,
4. Location of the 100-year flood plain,
5. Surface water bodies (seeps, springs, streams, ponds and wetlands), drainage ditches, etc.,
6. All active and closed wastewater disposal / storage / application sites, and

7. All material storage areas.

Provide other maps as necessary to describe soils, geology, hydrogeology, land use, etc.

5.5. Appendices

Provide appendices as needed to include such items as well logs, laboratory reports, MSDS sheets, calculations, etc.