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TECHNICAL MEMORANDUM

DATE:	June 3, 2022
TO:	Chad Centola Deschutes County Department of Solid Waste
FROM:	Dwight Miller, Parametrix
SUBJECT:	Site Selection Criteria
PROJECT NUMBER:	553-2509-009
PROJECT NAME:	Deschutes County Landfill Facility Siting

OVERVIEW

The consultant team has developed siting criteria based on County, state, and federal regulations, the County's 1990's siting criteria, our team's experience siting landfills in the Pacific Northwest, and specific natural environment characteristics of Deschutes County. These site selection criteria have been refined to address crucial considerations to avoid and minimize adverse impacts to natural and cultural resources and maintain consistency with County land use codes and existing infrastructure and scenic resources. Selection criteria have been developed in the following categories:

1. Site Characteristics/Engineering
2. Natural Environment
3. Land Use

Each of the categories (Level I) is further broken down into subcategories (Level II) and specific siting criteria (Level III). These criteria are assigned scores ranging from 0 (fatal flaw) to 5 (highly favorable). The use of criteria and scoring provides an objective, repeatable way to measure and compare different sites. A 0 score (fatal flaw) for a criterion is an exclusionary condition, which would remove a site from consideration even if it scores high under other criteria.

Knowing what is important to siting a new landfill and evaluating the characteristics of potential sites is not enough to make a final decision on the best sites. The decision-making process also considers and balances the relative importance, or weight, of each criterion. This can be demonstrated by asking the question, "How important is each criterion?" This question is more difficult to answer with rigor and accuracy because it is one of judgment and opinion. Although regulations specify minimum conditions that must be met, the characteristics of specific features or the appeal of exceeding basic requirements depends on experience and judgment.

The evaluation process will compare potential landfill sites. The fundamental purpose will be to combine the criteria (what is important), weights (how important), and measurements (scores) for each site to produce a single representative value. The values for each site will then be used to decide which prospective landfill sites should continue to be considered.

EVALUATION METHOD

Various techniques allow decision makers to make complex decisions involving multiple factors. For this study, a point distribution method was also used to develop criteria weights within a hierarchical framework. The functional hierarchical structure for this study is shown by Table 1 and Figure 1. The top of the hierarchy is a

single, overall objective—in this case, selecting the best landfill site. Each level below contains groups of considerations that can be compared. At the first level in the hierarchy, no issue is left out. Next, the hierarchy subdivides these basic considerations into their constituent parts, with greater specificity at each subsequent level. The complete hierarchy contains the full set of considerations (criteria) important to the decision.

As noted, the siting criteria developed for this project were organized using this hierarchy. Each essential consideration shown in the first level of Table 1 and Figure 1 is divided into its components, some of which may, in turn, have their own components. For example, the first-level Site Characteristics/Engineering consideration is composed of six second-level considerations, including Groundwater Protection/Hydrogeology, which is further composed of four third-level criteria, Depth to Groundwater, Proximity to Drinking Water Wells, Proximity to Wellhead Protection Areas, Site Hydrogeologic Framework. At each level and for each group, the question can be asked, "How important are these criteria compared to each other?" The hierarchy thus defines and focuses each set of comparisons. This simplifies the process of establishing values for all criteria by grouping similar considerations.

When all factors have been compared, this method produces weights for each group of considerations. For each site, these weights will be multiplied by the scores for each criterion at the lowest level of each branch of the hierarchy. The resulting values will be carried vertically up the hierarchy, with the appropriate weights applied at each level. The final value for a site will reflect both the objectively measured conditions on the site and the importance weighting of the combined criteria. Since the weights for all criteria are normalized to 100 percent, the final site values will have the same range as the criteria scores, from one to five.

The ability of the scoring and weighting process to produce a single value for each site does come at the expense of a more detailed understanding of each site because the criteria will focus on common characteristics that can be compared between sites. Consequently, this process does not include the unique characteristics of each site. Therefore, for the focused site evaluation, brief summaries will be prepared to describe the three first-level considerations for each site. These summaries will supplement the criteria scoring and weighting and more fully describe the unique characteristics of each site.

EVALUATION PROCESS

The site evaluation process has two discrete stages. The first stage includes developing the criteria hierarchy and weights, whereas the second stage evaluates potential landfill sites using those criteria scores and weights. To keep the process as objective as possible, the consultant team will not view any potential landfill sites until the first stage is fully completed. The purpose of this staging is to avoid any possible bias in the criteria hierarchy and weights that would tend to favor a particular site. During the second stage, sites will be evaluated in two approaches: an initial, broad site evaluation followed by a focused site evaluation.

Table 1. Criteria Weighting

Criteria	Level I Weight	Level II Weight	Level III Weight
Site Characteristics/Engineering	**35%**		
Site Availability/Acquisition Potential		**40%**	
Ownership			*40%*
Number of Parcels			*20%*
Total Site Acreage			*40%*
Geotechnical Location Factors		**10%**	
Fault Hazards			*15%*
Seismic Impact Zones/Hazards			*20%*
Unstable Areas – Mass Movement			*25%*
Unstable Areas – Poor Foundation			*40%*
Floodplains		**5%**	
Groundwater Protection/Hydrogeology		**20%**	
Depth to Groundwater			*25%*
Proximity to Drinking Water Wells			*30%*
Proximity to Wellhead Protection Areas			*15%*
Site Hydrogeologic Framework			*30%*
Development		**15%**	
Soils			*45%*
Topography			*30%*
Distance from Arterials			*10%*
Capacity/Site Configuration			*15%*
Operation		**10%**	
Haul Distance to Waste Centroid			*50%*
Annual Precipitation			*25%*
Onsite Water Supply and Management			*25%*
Natural Environments	**35%**		
Wetlands and Waters		**10%**	
Wetlands and Waters Impacts			*50%*
Potential for On-Site Wetlands and Waters Mitigation			*50%*
Threatened and Endangered Species		**20%**	
Wildlife Area Combining Zone		**10%**	
Greater Sage-Grouse Area Combining Zone		**40%**	
Sensitive Bird and Mammal Habitat Combining Zone and Migratory Birds		**20%**	
Migratory Birds, Including Bald and Golden Eagles			*50%*
Sensitive Bird and Mammal Habitat Combining Zone			*50%*
Land Use	**30%**		
Proximity to Airports		**15%**	
Site Zoning		**20%**	
Adjacent Land Use Impacts		**20%**	
Existing Adjacent Use			*25%*
Planned Adjacent Use			*25%*
Distance to Nearest Residence			*25%*
Distance to Nearest Public Road			*25%*
Site Visibility/Aesthetic Impact		**10%**	
Visibility Based on Topography and/or Vegetation			*50%*
Remoteness			*50%*
Transportation System Needs/Opportunity		**5%**	
Haul Route Impacts		**5%**	
On-Site Land Use Impacts		**25%**	
Displacement			*40%*
Known Cultural Resources			*30%*
Potential for Buried Archaeological Sites			*30%*

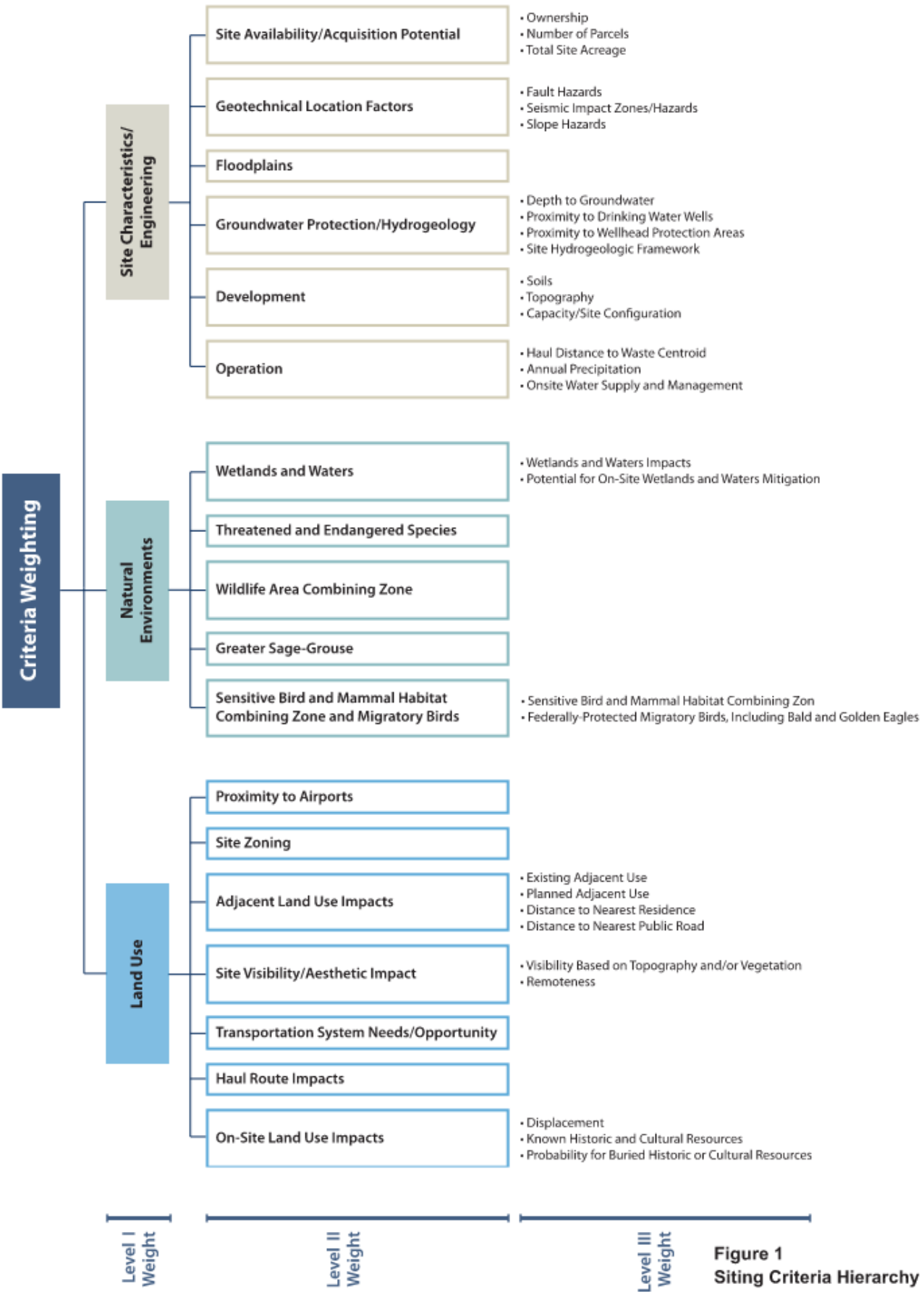

Figure 1
Siting Criteria Hierarchy

SITE SELECTION CRITERIA

Site Characteristics/Engineering

The criteria in this group evaluate how well a site would function as a landfill and what types of engineering issues or constraints would be involved in its development. The basic suitability of a site is very important, especially during the broad site evaluation. If a site has fundamental engineering problems, then other impacts or constraints are irrelevant.

Site Characteristics/Acquisition Potential

Ownership

Regulatory Requirements/Policies

No regulatory requirements directly relate to the site characteristics/acquisition potential criterion.

Description of Criterion and Criteria Scoring Categories

This criterion is intended to evaluate the potential ease of site acquisition. Sites currently owned by the County are the most preferred properties. Private ownership is also desirable because it provides opportunities for a negotiated acquisition or condemnation. Other kinds of potential ownership include state, municipal (including districts), and federal land. Federal property is generally undesirable due to the long acquisition/transfer process that can take over 10 years to complete. However, Bureau of Land Management (BLM) properties may be identified as surplus and available for trade. The County has had preliminary discussions with BLM and they are in support of applying use restrictions to lands under their jurisdiction that are adjacent to a potential landfill site.

Scoring	Criteria Categories
5	Deschutes County
4	State or Municipal
3	Private
2	Federal Surplus Properties
1	Federal

Data Sources

Information on site ownership will be obtained from the County Geographic Information System (GIS).

Number of Parcels

Regulatory Requirements/Policies

No regulatory requirements directly relate to the number of parcels criterion.

Description of Criterion and Criteria Scoring Categories

It would be most desirable to locate the landfill on a parcel or parcels of land owned by a single owner. The ease of acquisition, availability of information, communication, and mitigation would most likely vary, depending upon the number of property owners involved. The time involved in obtaining rights of entry for preliminary

investigations could also be significant during the siting process. This category compares the various sites relative to the ease with which the required parcel(s) for the landfill site could be acquired.

Scoring	Criteria Categories
5	1 or multiple parcels under a single owner
3	2 to 3 owners
1	4 or more owners

Data Sources

Information on site ownership and number of parcels will be obtained from the County GIS System.

Total Site Acreage

Regulatory Requirements/Policies

No regulatory requirements directly relate to the total site acreage criterion.

Description of Criterion and Criteria Scoring Categories

Site selection, acquisition, development, and closure measures are time-consuming, uncertain, and costly. Therefore, development of a larger site offering more capacity lowers the cost per ton of landfilled waste compared to a smaller site. Preliminary calculations indicate that the disposal area footprint will need to be a minimum of 250 acres to provide a 100-year disposal capacity for Deschutes County residents. The County prefers a minimum 500-foot-wide buffer between the disposal area and adjacent properties. Ideally, a 250-acre property would be surrounded and buffered by BLM or other public land with use restrictions in place. Properties bisected by large utility/access easements (powerlines, irrigation canals, roads) will be evaluated to determine if the infrastructure impacts the landfill active area or can be relocated to buffers or offsite. In addition, it is advantageous for the new facility to have areas for recycling, composting, and material recovery.

Scoring	Criteria Categories
5	Site size > 550 acres
4	Site size = 450 to 550 acres
3	Site size = 350 to 450 acres
2	Site size = 250 to 350 acres
1	Site size < 250 acres

Data Sources

Information on total site acreage will be obtained from the County GIS System.

Geotechnical Location Factors

Regulatory Requirements/Policies

Per Oregon Administrative Rules (OAR) 340-090-0030, the proposed solid waste management facility shall comply with location restrictions in Title 40 CFR, Part 258, Subpart B, which includes requirements relating to Fault Areas (258.13), Seismic Impact Zones (258.14) and Unstable Areas (254.15). The Oregon Department of Environmental

Quality (DEQ) Solid Waste Landfill Guidance document requirements in Sections 1.6-1.8 elaborate further on geologic hazards considerations, based on the federal 40 CFR 258.13-15.

Description of Criterion and Criteria Scoring Categories

Geologic hazards considerations will be adopted from the DEQ Solid Waste Landfill Guidance document requirements in Sections 1.6-1.8, which refer to the federal 40 CFR 258.13-15. Geologic hazards will be identified by publicly available GIS layers through Oregon Department of Geology and Mineral Industries (DOGAMI) HazVu.[1] The following geologic hazards will be adopted for screening purposes for potential landfill sites:

- Fault hazard
- Seismic hazard
- Slope hazard

Fault Hazards

For the purpose of this criteria, faults of Holocene age will be considered for weighing fault hazards. Fault hazards include proximity to a Holocene fault recognized within the United States Geological Survey (USGS) Quaternary Faults and Fold database[2] and the potential for fault rupture within the site.

Scoring	Criteria Categories
5	Mapped Holocene or Quaternary Fault >5 miles from site
3	Mapped Holocene or Quaternary Fault >0.5 miles from site
1	Mapped Holocene or Quaternary Fault >200 feet from site
0	Mapped Holocene Fault <200 feet from site

Seismic Impact Zones/Hazards

For the purpose of this criteria, seismic hazards shall be recognized as areas subjected to earthquake-induced soil liquefaction, ground shaking amplification, potential for slope failure, settlement, or surface faulting. Relative seismic hazard will be identified by historic seismicity, proximity to Holocene, and mapped liquefication hazards. A seismic impact zone shall be preliminarily characterized by an area with a 10 percent or greater probability that the maximum horizontal acceleration in lithified earth material, expressed as a percentage of the earth's gravitational pull (g), will exceed 0.10g in 250 years.

Scoring	Criteria Categories
5	Moderate shaking and low/no liquefaction hazard
3	Moderate shaking and moderate liquefaction hazard
1	Strong shaking and moderate liquefaction hazard
0	Strong shaking and high liquefaction hazard

Slope Hazards

Slope hazards will be preliminarily identified using DOGAMI open-file report O-16-02[3] and SLIDO: Statewide Landslide Information Layer for Oregon.[4]

Scoring	Criteria Categories
5	Low to no susceptibility
3	Moderate susceptibility
1	High susceptibility
0	Very high susceptibility

Data Sources

Information on geotechnical location factors will be obtained from sources noted for each hazard type:

[1] DOGAMI. Oregon HazVu: Statewide Geohazards Viewer. https://www.oregongeology.org/hazvu/

[2] USGS. Quaternary Faults and Folds Database of the United States. https://www.usgs.gov/programs/earthquake-hazards/faults

[3] DOGAMI. Landslide Susceptibility Overview Map of Oregon. Open-file report O-16-02. https://www.oregongeology.org/pubs/ofr/O-16-02_report.pdf

[4] DOGAMI. SLIDO: Statewide Landslide Information Layer for Oregon. https://gis.dogami.oregon.gov/maps/slido/

Floodplains

Regulatory Requirements/Policies

Federal (40 CFR 258.11) and state rules require that "owners or operators of new MSWLF units… located in 100-year floodplains must demonstrate that the unit will not restrict the flow of the 100-year flood, reduce the temporary water storage capacity of the floodplain, or result in washout of solid waste so as to pose a hazard to human health and the environment."

Description of Criterion and Criteria Scoring Categories

Locating a landfill in a floodplain can potentially be a very serious threat to public health. The hazard from floods is due primarily to potential erosion, washout of waste from the site, and reducing the water storage capacity of a watershed basin. A flood zone may require extraordinary protection measures to ensure containment of material such as solid waste and leachate that could potentially affect the environment.

Scoring	Criteria Categories
5	No apparent flood hazard
3	Active area located within the 500-year floodplain but outside the 100-year floodplain
1	Active area located in a 100-year floodplain, and demonstrations can be made according to the requirements of federal rule mitigating projected impacts
0	Active area located in a 100-year floodplain, and demonstrations mitigating projected impacts cannot be made according to the requirements of federal rule

Data Sources

Information on floodplains and flood hazards will be obtained from flood insurance rate maps (FIRM) and flood boundary and floodway maps published by the Federal Emergency Management Agency, as well as floodplain maps available through other agencies such as the U.S. Army Corps of Engineers (USACE), USGS, the U.S. Natural Resources Conservation Service, BLM, and state and local agencies.

Groundwater Protection/Hydrogeology

These criteria evaluate the ability of the local geology to provide groundwater protection and the potential for impacts to existing drinking water wells. These are among the most tightly regulated locational factors under state and federal laws.

Depth to Groundwater

Regulatory Requirements/Policies

OAR 340-094-0030 (4) states the following regulatory requirement related to this criterion:

(4) Sensitive Hydrogeological Environments. In addition to the requirements of 40 CFR, Part 258, Subpart B, no person shall establish or expand a landfill in a gravel pit excavated into or above a water table aquifer or other sensitive or sole source aquifer, or in a wellhead protection area, where the Department has determined that: (a) Groundwater must be protected from pollution because it has existing or potential beneficial uses (OAR 340-040-0020); and (b) Existing natural protection is insufficient or inadequate to minimize the risk of polluting groundwater.

In the criteria and scoring presented below for depth to groundwater, the intent of OAR 340-90-030(4)(a) is being applied to prioritize sites that have a greater depth to groundwater.

Description of Criterion and Criteria Scoring Categories

Deeper groundwater aquifers are afforded greater protection from leachate contamination because the soil has some ability to absorb and disperse the leachate. It also provides a greater flexibility for placement of liner and leachate collection systems, as these systems must be above the seasonal high groundwater aquifer elevation.

Scoring	Criteria Categories
5	Groundwater aquifer anticipated to be deeper than 500 feet below ground surface
3	Groundwater aquifer anticipated to be between 300 and 500 feet below ground surface
1	Groundwater aquifer anticipated to be between 100 and 300 feet below ground surface
0	Groundwater aquifer anticipated to be less than 100 feet below ground surface

Data Sources

Oregon Water Resources Department (OWRD) well logs, USGS water supply papers and reports, college research papers, and field reconnaissance will be used to estimate groundwater depths.

Proximity to Drinking Water Wells

Regulatory Requirements/Policies

Section 1.9 (Sensitive Hydrogeologic Environments) of DEQ's Solid Waste Landfill Guidance cites OAR 340-90-030(4), which says the following:

(4) Sensitive Hydrogeological Environments. In addition to the requirements of 40 CFR, Part 258, Subpart B, no person shall establish or expand a landfill in a gravel pit excavated into or above a water table aquifer or other sensitive or sole source aquifer, or in a wellhead protection area, where the Department has determined that: (a) Groundwater must be protected from pollution because it has existing or potential beneficial uses (OAR 340-040-0020); and (b) Existing natural protection is insufficient or inadequate to minimize the risk of polluting groundwater.

In the criteria and scoring presented below for proximity to drinking water wells, the intent of OAR 340-90-030(4)(a) is being applied to maximize the distance to the nearest existing water supply well(s).

Description of Criterion and Criteria Scoring Categories

Proximity to existing water supply wells increases the potential to impact the yield of the well as well as its susceptibility to impacts if leachate did migrate away from the site. Providing a buffer is required in the landfill siting rules.

Scoring	Criteria Categories
5	Nearest well greater than 1 mile from the site
3	Nearest well between 1 mile and 0.5 mile from the site
1	Nearest well between 0.5 mile and 0.25 mile from the site
0	Nearest well less than 0.25 mile from the site

Data Sources

OWRD well logs, USGS water supply papers and reports, college research papers, and field reconnaissance will be used to locate groundwater supply wells.

Proximity to Wellhead Protection Areas

Regulatory Requirements/Policies

OAR 340-094-0030 (4) states the following regulatory requirement related to this criterion:

(4) Sensitive Hydrogeological Environments. In addition to the requirements of 40 CFR, Part 258, Subpart B, no person shall establish or expand a landfill in a gravel pit excavated into or above a water table aquifer or other sensitive or sole source aquifer, or in a wellhead protection area, where the Department has determined that: (a) Groundwater must be protected from pollution because it has existing or potential beneficial uses (OAR 340-040-0020); and (b) Existing natural protection is insufficient or inadequate to minimize the risk of polluting groundwater.

In the criteria and scoring presented below for proximity to wellhead protection areas, the intent of OAR 340-90-030(4)(a) is being applied to prioritize sites that are located outside any known wellhead protection areas.

Description of Criterion and Criteria Scoring Categories

Wellhead protection areas are used for public water supply systems (public and private) to identify the source area and the geographic pathway associated with the groundwater that will eventually migrate from the source area to a given well. Wellhead protection areas are modeled based on several hydrogeologic factors and well yield and can vary considerably in size.

Scoring	Criteria Categories
5	Outside of any known wellhead protection areas
3	Within a drinking water source area but outside of 2-year time of travel zone
0	Within a drinking water source area and a 2-year time of travel zone

Data Sources

Use of DEQ Facility Profiler and Oregon Health Division Drinking Water Protection Program Source Area databases will be used to identify wellhead protection and source area boundaries.

Site Hydrogeologic Framework

Regulatory Requirements/Policies

OAR 340-094-0030 (4) states the following regulatory requirement related to this criterion:
(4) Sensitive Hydrogeological Environments. In addition to the requirements of 40 CFR, Part 258, Subpart B, no person shall establish or expand a landfill in a gravel pit excavated into or above a water table aquifer or other sensitive or sole source aquifer, or in a wellhead protection area, where the Department has determined that:
(a) Groundwater must be protected from pollution because it has existing or potential beneficial uses (OAR 340-040-0020); and (b) Existing natural protection is insufficient or inadequate to minimize the risk of polluting groundwater.

In the criteria and scoring presented below for geologic-hydrogeologic properties, the intent of OAR 340-90-030(4)(b) is being applied to prioritize sites with geologic and hydrogeologic properties that provide natural groundwater protection from pollution.

Description of Criterion and Criteria Scoring Categories

The interaction and juxtaposition of subsurface geology with the primary aquifer can provide varying degrees of protection to the groundwater resource. If the geology is highly porous or fractured with little to no low permeability zones, the groundwater is more susceptible to impacts from surface activities.

Scoring	Criteria Categories
5	Multiple layers of low permeability geologic units above aquifer
3	Fractured or porous geologic units with limited low permeability units above aquifer
0	Fractured or porous geologic units with no known low permeability units above aquifer

Data Sources

Oregon Water Resources Department well logs, USGS water supply papers and reports, college research papers will be used to characterize hydrogeologic conditions.

Development

For the Development criteria category, potential sites will be evaluated in terms of three sub-categories including Soils, Topography, and Capacity/Site Configuration. Other important considerations related to development include weather factors (i.e. prevailing winds, precipitation), access to utilities such as electricity, communications, and natural gas, and potential for renewable energy development (solar, wind, renewable natural gas). These factors will be considered later in terms of the relative construction and operations costs between the top three sites.

Soils

Regulatory Requirements/Policies

For landfills developed in Oregon, liner systems are required to meet the requirements of OAR 340-094-0060 and 40 Code of Federal Regulations (CFR) Part 258, Subpart D. The lower layer is typically a geosynthetic clay liner placed over a prepared subgrade of silt to sand sized soil. The upper component of the liner system is typically a 60-millimeter, high-density polyethylene (HDPE) geomembrane. At least 1 foot of drainage material (gravel) is typically placed over the HDPE bottom liner to provide for leachate collection and liner protection.

OAR 340-094-0060 and 40 CFR Part 258, Subpart D require a final cover that has a permeability that is less than the bottom liner system. For landfills located east of the Cascades, in areas where precipitation is less than 12 inches per year, an alternative final cover is typically constructed that includes 4 to 6 feet of on-site, low-permeable soils.

Description of Criterion and Criteria Scoring Categories

Soil and other on-site earth materials are used in landfill construction and operation for bottom liners, caps, final cover, daily and intermediate cover, berms, and roads. The availability of these materials on site influences the cost of site development and operation. Fine-grained materials (silt and clay) are useful for liners and final covers, while coarse-grained materials (sand and gravel) are useful for landfill gas control systems and leachate collection systems.

Underlying soils influence groundwater protection at a particular site. Sites underlain by silt and clay soil generally rate higher than other sites because of the low permeability of these soils. Sites containing only sand and gravel rate lower because these sites would need extensive engineering to provide a similar level of groundwater protection. Sites with both coarse- and fine-grained materials could rate higher than either of those mentioned above, depending on the quantities and the order in which the different layers of material are found at the site (stratigraphy). Coarse-grained materials layered above fine-grained materials are desirable because the upper layer could be excavated for roads and daily cover, leaving the fine-grained materials in place for groundwater protection.

The U.S. Department of Agriculture Natural Resources Conservation Service (NRCS) has delineated over 100 different soil types in the planning area. These soil types, which can be grouped into seven major associations, are distributed throughout the County. A description of these associations, with additional information on the potential for available fine- and coarse-grained soil types, is provided below. The potential for fine- and coarse-grained soil materials is also rated by categories, which include excellent, very good, good, and poor. These seven associations are described as follows:

Gosney-Rock Outcrop-Descamp Complex: Moderately deep and shallow, somewhat excessively drained, stony loamy sand and loamy sand that formed in ash; found on lava plains. Depth to bedrock ranges from 10 to

20 inches with rapid permeability. Water capacity is about 1 inch. This soil unit has poor to good potential for fine-grained material and good to very good potential for coarse-grained material.

Dester Gravelly Loamy Sand, 0 to 3 Percent Slopes: Moderately deep and very deep, excessively drained to well-drained soils. Gravelly loamy sand and gravelly clayey loam that formed in ash over old alluvium; found on lava plains. Depth to bedrock ranges from 20 to 40 inches with moderately slow permeability. Water capacity is about 5 inches. This soil unit has poor to good potential for fine-grained material and good to very good potential for coarse-grained material.

Beden Sandy Loam, Dry, 1 to 8 Percent Slopes: Shallow, well-drained soils that formed in residuum with ash on the surface; found on lava plains. Sandy loam with lesser amounts of clay loam that formed in ash over residuum derived from basalt or welded tuff. Depth to bedrock ranges from 10 to 20 inches with moderately slow permeability. Water capacity is about 3 inches. This soil unit has poor to good potential for fine-grained material and good to very good potential for coarse-grained material.

Dester Sandy Loam: Moderately deep and very deep, excessively drained to well-drained soils. Sandy loam, clay loam, and gravelly clayey loam that formed in ash over old alluvium; found on lava plains. Depth to bedrock ranges from 20 to 40 inches with moderately slow permeability. Water capacity is about 5 inches. This soil unit has poor to good potential for fine-grained material and good to very good potential for coarse-grained material.

Wanoga-Femkle-Rock Outcrop Complex: Moderately deep and shallow, well-drained soils. Sandy loam underlain by weathered tuff that formed in ash; found on hills. Depth to bedrock ranges from 20 to 40 inches with moderately rapid permeability. Water capacity is about 4 inches. This soil unit has poor to good potential for fine-grained material and good to very good potential for coarse-grained material.

Shanahan Loamy Coarse Sand, Low, 0 to 3 Percent Slopes: Very deep, somewhat excessively drained soils that formed in ash and pumice over colluvium and older alluvium. Loamy coarse sand and coarse sand with depth to bedrock at 60 inches or more with moderately rapid permeability. Water capacity is about 7 inches. This soil unit has poor potential for fine-grained material and very good to excellent potential for coarse-grained material.

Stukel-Rock Outcrop-Deschutes Complex: Moderately deep and shallow, well-drained sandy loam that formed in volcanic ash; found on lava plains. Depth to bedrock ranges from 10 to 20 inches with moderately rapid permeability. Water capacity is about 2 inches. This soil unit has poor potential for fine-grained material and very good potential for coarse-grained material.

Scoring	Criteria Categories
5	Active area can provide all the required drainage layer material, all well-graded daily and intermediate cover soils, and all final cover topsoil
4	Active area can provide 50% of the required drainage layer material, 100% of the well-graded daily and intermediate cover soils, and 100% of the final cover topsoil
3	Fine-grained soils only, greater than 40 feet thick, all dry-weather daily and intermediate cover soils, and all final cover topsoil are available as fine-grained soils
2	Fine-grained soils only, greater than 20 feet thick, all dry-weather daily and intermediate cover soils, and all final cover topsoil are available as fine-grained soils
1	Rock is predominant at ground surface over majority of site

Data Sources

A digital soils coverage based on NRCS/DOGAMI soil types was included in the GIS data obtained from Deschutes County, and soil-related characteristics were used in developing several other screening criteria. At the site-specific level, the GIS data will be used to produce detailed maps of potential site areas for evaluation of soil characteristics of all types.

Topography

Regulatory Requirements/Policies

No regulatory requirements relate to this criterion, except for site topography with severe slopes that may be unstable (see the unstable areas criterion).

Description of Criterion and Criteria Scoring Categories

The topography of a potential landfill site is important because of its effect on site access, material movement, and the excavation-to-volume (E/V) ratio. Site access is also important in refuse delivery and movement of borrow soil. The E/V ratio refers to the volume of on-site soil that must be excavated for every equivalent volume of in-place compacted refuse.

For example, a flat site might have a poor E/V ratio because an equivalent volume of soil must be excavated for every unit volume of refuse placed, if the site cannot be mounded. On this site, access for truck movement would be excellent. Conversely, a typical hillside or upland site may have a good E/V ratio because a smaller volume of soil must be excavated for the placement of refuse. However, that same site may have poor access because of uneven topography, steep haul grades, or an excessive number of small drainages that must be bridged.

Scoring	Criteria Categories
5	E/V ratio excellent (site has slopes and relief that greatly benefit site capacity)
3	E/V ratio good (site has slopes and relief that benefit site capacity)
1	E/V ratio poor (site has slopes and relief that do not benefit site capacity)

Data Sources

At the broad level, data sources to determine topography include USGS and DOGAMI GIS mapping and general field reconnaissance at potential site areas. During focused evaluations, the conceptual site plan will be used to evaluate excavation needs and possible site access routes.

Capacity/Site Configuration

Regulatory Requirements/Policies

The Deschutes County Solid Waste Management Plan states that a new landfill facility should be sited, designed, and operated such that it has at least a 100-year life, based on assumed future waste stream rate projections, in-place density, and total daily cover volume.

Description of Criterion and Criteria Scoring Categories

Landfill capacity will primarily depend on the projected waste stream for Deschutes County over a 100-year period. In addition, the waste density (weight per unit volume) after it has been landfilled and the amount of daily cover used determines the total volume needed to deposit 100 years of waste. The landfill shape is a function of many criteria described in this report, including siting and design criteria; borrow sources; buffers; aesthetics; and topographic, geologic, and hydrogeologic conditions. Based on the factors noted above, a minimum site capacity of 50 million cubic yards is required. A typical landfill of this size requires a site area of approximately 350 to 600 acres depending upon average landfill depth and buffer requirements. Larger sites with fewer barriers to footprint expansion also provide design flexibility and the opportunity for additional landfill capacity. Consequently, the criteria categories consider both size and use efficiency.

Scoring	Criteria Categories
5	The active area can provide a minimum capacity of 50 million cubic yards, is unrestricted by physical or natural features, requires an average depth of less than 50 feet, a maximum height that is less than the nearest high point, in a configuration that matches the surrounding terrain
4	The active area can provide a minimum capacity of 50 million cubic yards, is restricted by a physical or natural feature on one boundary, requires an average excavated depth of less than 50 feet, a maximum height that is less than the nearest high point, in a configuration that matches the surrounding terrain
3	The active area can provide a minimum capacity of 50 million cubic yards, is restricted by a physical or natural feature on more than one boundary, requires either an average excavated depth greater than 50 feet or a maximum height greater than the nearest high point, in a configuration that matches the surrounding terrain
2	The active area can provide a minimum capacity of 50 million cubic yards, is restricted by a physical or natural feature on more than one boundary, requires an average excavated depth greater than 50 feet, and a maximum height greater than the nearest high point, in a configuration that does not match the surrounding terrain
1	The active area cannot provide a minimum capacity of 50 million cubic yards, is restricted by physical or natural features on more than one boundary, in a configuration that does not match the surrounding terrain

Data Sources

Information on topography to be obtained from the County GIS System. During focused screening, a conceptual site plan will be developed for each site, including initial evaluation of footprint size, depth of excavation, and final grading.

Operation

Haul Distance to Waste Centroid

Regulatory Requirements/Policies

No regulatory requirements directly relate to the haul distance to waste centroid criterion.

Description of Criterion and Criteria Scoring Categories

Due to the cost of labor, fuel, and vehicle maintenance, the distance between the waste source and the landfill has a significant effect on disposal costs. In addition, greater travel distances increase air quality and greenhouse gas emissions impacts. It is desirable, therefore, to locate the landfill closer to the waste generation source. Note that a site closer to the waste centroid is likely to score lower on some criteria due to closer proximity to residents.

Scoring	Criteria Categories
5	Less than 10 miles from waste centroid
3	Between 10 and 20 miles from waste centroid
2	Between 20 and 30 miles from waste centroid
1	More than 30 miles from waste centroid

Data Sources

At the broad level, County GIS maps and general field reconnaissance at potential site areas will be used to determine the haul distance to waste centroid.

Annual Precipitation

Regulatory Requirements/Policies

No regulatory requirements in the OARs directly relate to the annual precipitation criterion.

Description of Criterion and Criteria Scoring Categories

The amount of precipitation in a given landfill location generally determines the amount of leachate generated and operational costs at the site. The greater the amount of leachate, the more effort required for processing or disposing of this material and the greater the possibility that leachate from the site could affect the surrounding environment. In terms of annual precipitation, the most desirable site has the least precipitation. Further, sites that have low precipitation generally have less snow in the winter, which improves site access and onsite operations.

Scoring	Criteria Categories
5	10 inches or less of precipitation annually
4	Between 11 and 15 inches of precipitation annually
3	Between 16 and 20 inches of precipitation annually
2	Between 21 and 25 inches of precipitation annually
1	More than 25 inches of precipitation annually

Data Sources

Precipitation data will be obtained from the National Oceanic and Atmospheric Administration's National Weather Service.

Onsite Water Supply and Management

Regulatory Requirements/Policies

No regulatory requirements in the OARs directly relate to onsite water supply and management for facility development and operations. An onsite groundwater supply well can be installed, which would have an exempt use of groundwater provision not exceeding 5,000 gallons per day (gpd). Water needs beyond this amount would require a water right or permit. While it is difficult to forecast regulatory impacts or restrictions that may result from future climate change initiatives that affect water rights and availability, the need to expand or procure future water rights will result in lower scoring due to potential challenges associated with those additional needs.

Description of Criterion and Criteria Scoring Categories

If the future landfill site will need a water permit from the Oregon Water Resources Department, new groundwater uses are required to mitigate their impacts on surface flows per the Deschutes Groundwater Mitigation Program. If a water permit is required, the landfill's consumptive use must be identified. Sites with existing water rights are valued higher than those lacking existing water rights that can be used for landfill operations. The scoring also accounts for the potential obligation to obtain available mitigation credits in certain zones of impact.

Scoring	Criteria Categories
5	Water right permits exist and are sufficient for landfill water needs
3	Water right permits exist, but require expansion and/or mitigation to meet landfill water needs
1	No water right permits exist and mitigation is required for landfill water needs

Data Sources

Water right permit information and Deschutes Groundwater Mitigation Program requirements will be obtained from the OWRD website and Water Right Information System database.

Natural Environment

County lands contain sensitive cultural resources and a diversity of flora, fauna, and habitats that the County and other state and federal agencies have identified for protection. The County's land use code affords protections to these resources while balancing the community's needs for infrastructure development. The criteria address key considerations for avoidance and minimization of impacts to essential, irreplaceable, and limited natural and cultural resources. Natural resources for consideration include state and federal threatened and endangered species and species of concern; riparian and wetland areas; Oregon spotted frog; shrub-steppe habitat; greater sage-grouse habitat; sensitive bird and mammal sites; game species range; and open spaces and scenic views. The relative importance of these criteria increases during focused evaluation, where the conceptual site plan and more detailed field investigations allow the potential for mitigation to be assessed.

Wetlands and Waters

Regulatory Requirements/Policies

According to OAR 340-094-0030(2), "No person shall establish, expand, or modify a landfill in a floodplain in a manner that will allow the facility that may pose a hazard to water resources." Per 40 CFR Part 258.12, landfills are subject to Section 404 of the Clean Water Act compliance through USACE, Oregon Department of State Lands (DSL) removal fill rules (OAR Division 85), and Section 401 of the Clean Water Act for state water quality standards through Oregon DEQ. Under this rule, the project must ensure that endangered or threatened species are not jeopardized, toxic effluent standards are not violated, and landfill operations do not result in a substantial loss of wetland area. Also, the project must attempt to achieve no net loss of wetlands and waters (as defined by acreage and function) by first avoiding impacts to wetlands to the maximum extent practicable, then minimizing unavoidable impacts to the maximum extent practicable, and finally offsetting remaining unavoidable wetland and water impacts through all appropriate and practicable compensatory mitigation actions (e.g., restoration of existing degraded wetlands/waters or creation of man-made wetlands). This rule also presumes that practicable alternatives to the proposed landfill that do not involve wetlands and waters must be evaluated.

Description of Criterion and Criteria Scoring Categories

This criterion provides a broad-based screening of potential sites that may have wetlands and waters.

Scoring	Criteria Categories
5	No wetlands identified
3	Less than 0.5 total acre of wetlands identified
1	More than 0.5 total acre of scattered wetlands identified
0	More than 0.5 acre of wetlands identified and significant impacts cannot be avoided[1]

[1] This is exclusionary if the owner or operator cannot demonstrate compliance with the regulations.

The more focused criterion provides a screening of potential sites that may have wetlands and waters. A focused-level site evaluation criterion would identify and characterize wetlands in the project area. More thorough study will be required during the individual-level site evaluation to delineate any wetlands in the area. This procedure was designed to consider major thresholds for determining USACE and DSL jurisdiction and associated permitting and mitigation requirements identified in Section 404 of the federal Clean Water Act and in DSL's removal fill rules.

Scoring	Criteria Categories
5	No wetlands or waters identified in the active area
3	Artificial wetlands greater than 1 acre (e.g., fed by irrigation or stock watering), isolated wetlands, or ephemeral waters are present
2	Potential for wetland impacts up to 0.5 acre and stream impacts up to 300 linear feet.
0	Potential for wetland impacts exceeding 0.5 acre, stream impacts exceeding 300 linear feet, or impacts to aquatic resources of special concern.[1]

[1] This is exclusionary if the owner or operator cannot demonstrate compliance with the regulations.

Data Sources

A countywide screening of wetlands, conducted during the general site area identification, will use the U.S. Fish and Wildlife Service (USFWS) National Wetland Inventory; DSL wetlands and waters concurrence and permit records database; DSL Local Wetland Inventory mapping; Deschutes County water feature class GIS data; NRCS hydric soil mapping; and historic and current aerial photographs. The information gathered will be used to locate potential wetlands. Field reconnaissance may also be conducted to further characterize wetland and water areas.

Threatened and Endangered Listed Species

Regulatory Requirements/Policies

According to OAR 340-094-0030(3), "No person shall establish, expand or modify a landfill in a manner that will cause or contribute to the actual or attempted (a) harassing, harming, pursuing, hunting, wounding, killing, trapping, capturing, or collecting of any federally listed endangered or threatened species of plants, fish, or wildlife; or (b) direct or indirect alteration of critical habitat which appreciably diminishes the likelihood of the survival and recovery of endangered or threatened species using that habitat."

Per 40 CFR 258.12(a)(2)(iii), a landfill project cannot "jeopardize the continued existence of endangered or threatened species or result in the destruction or adverse modification of a critical habitat, protected under the Endangered Species Act of 1973." Furthermore, if under federal regulations (40 CFR 258) it is determined that operation of a landfill at a site would cause or contribute to the taking of any endangered species of plant, fish, or wildlife listed as such (pursuant to Section 4 of the Endangered Species Act), the site would be removed from consideration. According to this criterion, a site that has the least impact on threatened and endangered species receives the highest score.

Description of Criterion and Criteria Scoring Categories

Locations reportedly used by threatened or endangered species or designated as critical habitat are excluded from landfill development. At the broad level, the threatened and endangered listed species criterion measures the proximity of a potential landfill site to known threatened, endangered, and candidate species or critical habitat locations. At the broad level, the criteria categories are as follows:

Scoring	Criteria Categories
5	No occurrence of federal/state threatened, endangered, or candidate species within 3 miles of the site
2	Known occurrence of federal/state threatened, endangered, or candidate species between 1 and 3 miles from the site
1	Known occurrence of federal/state threatened, endangered, or candidate species within 1 mile from the site
0	Known occurrence of federal/state threatened or endangered species on area adjacent to site, in the site buffer, or on site[1]

[1] This is exclusionary if the owner or operator cannot demonstrate compliance with the regulations.

For the focused evaluation, the type of species and the use of the site is evaluated to determine whether mitigation appeared possible. This may require discussions with federal and state agencies.

Scoring	Criteria Categories
5	Federal/state threatened or endangered species or designated critical habitat exist between 1 and 3 miles from the site, with no impacts expected
3	Impacts to federal/state threatened or endangered species or designated critical habitat present in the site vicinity can be avoided
1	Impacts to federal/state threatened or endangered species or designated critical habitat present in the area can be mitigated
0	Impacts to federal/state threatened or endangered species or designated critical habitat cannot be avoided or mitigated[1]

[1] This is exclusionary if the owner or operator cannot demonstrate compliance with the regulations.

Data Sources

Portland State University's Oregon Biodiversity Information Center (ORBIC) and USFWS's Information for Planning and Consultation databases provide data on threatened and endangered species. Information in the databases may only be a relative indicator of the actual presence of threatened or endangered species. For example, a nest site of an endangered species may have a uniform buffer area assigned around the nest as habitat because the actual use of the area by the species is unknown. Therefore, the mapped data may not show the actual location or extent of the habitat. For the focused evaluation, site-specific encroachment on critical habitat will be evaluated, in general, relative to the timing of on-site activity and the patterns and type of use specific to the species using the site. For the purposes of this study, specific information on the location of threatened and endangered species is restricted; therefore, it will be generalized before it is presented to the public.

Wildlife Area Combining Zone

Regulatory Requirements/Policies

The purpose of the Deschutes County Code (DCC) Chapter 18.88 Wildlife Area Combining Zone (WA zone) is to conserve important wildlife areas in Deschutes County; to protect an important environmental, social, and economic element of the area; and to permit development compatible with the protection of the wildlife resource. Landfills in WA zones must be permitted conditionally by the underlying zone (per DCC 18.128.120). Provisions of DCC 18.88 shall apply to all areas identified in the Comprehensive Plan as a winter deer range, significant elk habitat, antelope range, or deer migration corridor. Lands within 100 feet of wetlands, floodplains, or riparian areas or those mapped as "Existing High Use Migration Areas" or "Important Connective Areas Through Existing Developed Areas" on the 1997 Oregon Department of Fish and Wildlife (ODFW) map submitted to the South County Regional Problem Solving Group may also be considered for WA zone conditional use permitting. Unincorporated communities are exempt from the provisions of DCC 18.88.

Description of Criterion and Criteria Scoring Categories

Areas designated by the County as WA zones must meet zoning code criteria for conditional use. This includes consideration of the proximity of a potential landfill site to a WA zone and the designated overlay type. The sites furthest from known WA zones receive the highest scores. At the broad level, this criterion establishes the presence of WA zones in relation to the site as follows:

Scoring	Criteria Categories
5	No WA zone within 3 miles of the site
3	WA zone within 3 miles from the site
1	WA zone on site

At the focused level, this criterion evaluates the habitat characteristics and potential for impacts and mitigation, as follows:

Scoring	Criteria Categories
5	No WA zone within 3 miles of the site
4	No WA zone within 0.25 mile to 3 miles of the site
3	Site is within 0.25 mile of a WA zone, but there are no apparent impacts
2	Impacts to WA zone will occur but can be mitigated on site
1	Impacts to WA zone will occur but can be mitigated off site
0	Impacts to WA zone will occur and cannot be mitigated[1]

[1] This is exclusionary if the owner or operator cannot demonstrate compliance with the regulations.

Data Sources

Data sources used to assess this resource include Deschutes County WA zone GIS data, provisions of DCC 18.88, and the 1997 ODFW map submitted to the South County Regional Problem Solving Group.

Greater Sage Grouse Area Combining Zone

Regulatory Requirements/Policies

The greater sage-grouse (GSG) has been the focus of sustained conservation efforts for the last two decades, narrowly avoiding a listing designation under the Endangered Species Act in 2015. ODFW is closely involved with ongoing multi-stakeholder conservation efforts for the species throughout Eastern Oregon, including Deschutes County and USFWS. Accordingly, private and other nonfederal landowners are strongly encouraged to participate in a Candidate Conservation Agreement with Assurances program. Voluntary conservation efforts of this nature are recognized by the state of Oregon as a critical part in recovering the breeding populations of GSG. Beyond voluntary efforts, it remains necessary to provide a regulatory framework that offers fairness, predictability, and certainty for all involved parties. Engagement on the part of county governments throughout the GSG's range is critical to Oregon's efforts to address possible impacts from future development.

Deschutes County's GSG Combining Zone code (DCC 18.89; GSG zone) is consistent with ODFW's GSG conservation strategy rules (OAR 635-140) and the Greater Sage-Grouse Conservation Assessment and Strategy for Oregon (2011). These rules and guidelines are intended to advance GSG population and habitat protection through a mitigation hierarchy by establishing mitigation standards for impacts from certain types of development actions in GSG habitat.

The mitigation hierarchy approach is comprised of a three-step process—avoidance, minimization, and compensatory mitigation—and is applied to three distinct GSG habitat conditions:

- Core area (DCC18.89.080)
- Low-density habitat (DCC 18.89.090)
- General habitat (DCC 18.89.100)

The County may approve a large-scale development proposal that does not meet the avoidance test for significant GSG habitat if the County determines that the overall public benefits of the proposal outweigh the damage to significant GSG habitat. However, the project must still comply with the mitigation hierarchy and the applicant must show that the overall public benefits outweigh the damage to the significant GSG habitat (DCC 18.89.110).

Description of Criterion and Criteria Scoring Categories

Areas designated by ODFW and the County as core habitat are presumably excluded from landfill development as alternative sites may be available outside of core areas. Depending on the severity of impact and mitigation obligations, select sites in low density or general habitat may be permittable through agency coordination to develop effective conservation measures and best management practices for the construction and operational phases of the project. Projects outside of these habitats would not need to account for GSG zone requirements for siting. The following table includes key considerations to landfill development siting in different GSG zones.

Habitat Designation	Mitigation Hierarchy			Risk and Fatal Flaw Siting Considerations
	Avoidance	**Minimization**	**Mitigation**	
Core Area	a Alternatives analysis b Satisfy 3 criteria: 1. Not technically feasible to locate elsewhere 2. Dependent on a unique geographic or physical feature(s) 3. Provides important economic opportunity, infrastructure	a Minimize habitat impacts and fragmentation b Micrositing, construction BMPs c Avoid, if possible, impacts in high population richness areas within core area d Costs	a Fully offset impacts to any core area b Comply with ODFW Conservation rules for GSG	**High risk/potential fatal flaw** • Large-scale development must not increase County's metering or disturbance thresholds • Requires alternative analysis for preferred alternative in core area • Subject to ODFW approval and mitigation recommendations • Extensive mitigation may be required
Low Density	a Alternatives analysis b Satisfy 2 criteria: 1. Not technically feasible to locate elsewhere 2. Dependent on a unique geographic or physical feature(s)	a Locate to minimize impacts to habitat b Micrositing, construction BMPs		**Moderate to low risk** • Confirmation from ODFW that there are no threats to significant GSG habitat or use • Subject to ODFW approval and mitigation recommendations
General Habitat	General habitat (within 3.1 miles of an occupied or occupied-pending lek) require consultation with County and ODFW to verify avoidance and minimization measures			
Outside of Habitat	Greater than 3.1 miles from known leks; impacts avoided			**No risk**

The GSG criterion measures the proximity of a potential landfill site to GSG zones. The sites furthest from known GSG zones receive the highest scores. At the broad level, this criterion establishes the presence of GSG zones in relation to the site as follows:

Scoring	Criteria Categories
5	No GSG zones within 3.1 miles of the site
3	Low density or general habitat GSG zone within 3.1 miles from the site
2	Core area GSG zone within 3.1 miles from the site
1	Low density area or general habitat GSG zone on site[1]
0	Core area GSG zone on site[2]

[1] This is exclusionary if the owner or operator cannot demonstrate compliance with the regulations.

[2] Within core area GSG zones, mitigation is not feasible, and the site is not suitable for landfill siting.

At the focused level, this criterion evaluates the habitat characteristics and potential for impacts and mitigation, as follows:

Scoring	Criteria Categories
5	No GSG zones within 3.1 miles of the site
4	GSG zones within 3.1 miles of the site, but there are no apparent impacts
3	GSG zones within 3.1 miles of the site, and there may be indirect impacts
2	Impacts to low density or general habitat GSG zones will occur, but can be mitigated on site[1]
1	Impacts to low density or general habitat GSG will occur and cannot be mitigated[1]
0	Impacts to core area GSG zone will occur[2]

[1] This is exclusionary if the owner or operator cannot demonstrate compliance with the regulations.

[2] Within core area GSG zones, mitigation is not feasible, and the site is not suitable for landfill siting.

Data Sources

Data sources used to assess this resource include the provisions of DCC 18.89; the Sage-Grouse Conservation Partnership's (Sage-Con) 2015 Sage-Grouse Action Plan; County, state, and Sage-Con GIS mapping layers for landscape planning and development siting; and coordination with ODFW to verify criteria development and assessment.

Sensitive Bird and Mammal Habitat Combining Zone and Migratory Birds

Regulatory Requirements/Policies

The purpose of DCC Chapter 18.90 Sensitive Bird and Mammal Combining Zone (SBMH) is to ensure that sensitive habitat areas identified in the County's Goal 5 sensitive bird and mammal inventory as critical for the survival of the northern bald eagle, great blue heron, golden eagle, prairie falcon, osprey, great grey owl, and the Townsend's big-eared bat are protected from the effects of conflicting uses or activities that are not subject to the Forest Practices Act. This objective shall be achieved by implementation of the decision resulting from the economic, social, environmental and energy analysis (ESEE) for each inventoried sensitive habitat area. Landfill sites permitted in the SBMH zone are subject to conditional use permitting, site plan review for SBMH conditions, and the provisions of the ESEE decision. Approval of the site plan will be conditioned to ensure protection of SBMH resources and will include construction and operational best management practices that avoid or minimize impacts to SBMH resources. When there is a conflict between the site-specific ESEE analysis and the provisions of DCC Title 18, the site-specific ESEE analysis shall control.

The USFWS administers the Bald and Golden Eagle Protection Act (BGEPA) and the Migratory Bird Treaty Act (MBTA) which are strict liability statutes that prohibit the unauthorized taking of migratory birds and bald and

golden eagles within the United States. For these statutes, "take" occurs when any person or entity pursues, hunts, shoots, wounds, kills, traps, captures, or collects a migratory bird or eagle. Additionally, under the BGEPA, anyone who disturbs, agitates, or bothers an eagle to a substantial degree also commits "take." Bald eagles were delisted under the Endangered Species Act in 2007 but are still afforded federal protection under these acts.

The USFWS has provided National Bald Eagle Management Guidelines, which are not federal regulations but provide information for people or entities who engage in recreation or land use activities on how to avoid impacts to eagles prohibited by BGEPA and MBTA. The guidelines are crafted to reflect the current way that federal and state managers interpret these laws. Additionally, if a permit is required under these laws, USFWS recommends that eagle nest surveys out to 2 miles from the boundary of the area be conducted in association with an incidental take permit to provide sufficient information to evaluate project impacts to nearby nesting eagles.

Description of Criterion and Criteria Scoring Categories

The SBMH areas are those identified in the Deschutes County Comprehensive Plan Resource Element inventory and site-specific ESEE for each sensitive bird or mammal site. The SBMH areas to be protected by the provisions of DCC 18.90 is defined as the area:

- Within a radius of 1,320 feet (0.25 mile) of a golden eagle, bald eagle, prairie falcon nest, or a Townsend's big-eared bat hibernating or nursery site.
- Within a radius of 300 feet of a great blue heron rookery or osprey nest.
- Within a radius of 900 feet of a great grey owl nest site.

Established nest buffer distances to known eagle nests are defined in the National Bald Eagle Management Guidelines. In general, Golden eagle nest locations are buffered by a sensitive habitat area that extends out for a radius of 2 miles. Bald eagle nests are buffered by a 0.25-mile radius. Any construction activities during the nesting season within these distances or direct impact to active or alternate nests would require coordination with USFWS and possibly permitting under these rules. The USFWS does not provide set buffer distances to protect nests of migratory birds under the MBTA but would be consulted during permitting to verify nest buffers recommended for the project—typically 100 feet or less for non-raptor species and 300 feet or less for raptors other than bald and golden eagles.

The sites furthest from known SBMH and migratory bird areas receive the highest scores. At the broad level, this criterion establishes the presence of SBMH and migratory bird areas in relation to the site as follows:

Scoring	Criteria Categories
SBMH	
5	No SBMH zone within 0.5 mile of the site
3	SBMH zone less than 0.5 mile from the site
0	SBMH zone on the site[1]
Migratory Birds	
5	No migratory bird nests within 2 miles of the site
3	Bald or golden eagle nests within 2 miles of the site
1	Bald or golden eagle nests or nests of other migratory birds within 0.25 miles of the site
0	Bald or golden eagle nests or nests of other migratory birds on the site[1]

[1] This is exclusionary if the owner or operator cannot demonstrate compliance with the regulations.

At the focused level, the SBMH and migratory birds criterion evaluates the habitat characteristics and potential for impacts and mitigation, as follows:

Scoring	Criteria Categories
SMBH	
5	No SBMH zone within 3 miles of the site
4	No SBMH zone within 0.25 mile to 3 miles of the site
3	Site is within 0.25 mile of a SBMH zone, but there are no apparent impacts
2	Impacts to SBMH zone will occur but can be mitigated on site
1	Impacts to SBMH zone will occur but can be mitigated off site
0	Impacts to SBMH zone will occur and cannot be mitigated[1]
Migratory Birds	
5	No migratory bird nests within 2 miles of the site
4	Nesting migratory birds within 2 miles of the site, but there are no apparent impacts
3	Nesting migratory birds within 2 miles of the site, and there may be indirect impacts that can be mitigated
1	Nesting migratory birds on site and direct impacts may occur, but can be mitigated
0	Impacts to migratory birds will result in take that cannot be mitigated[1]

[1] This is exclusionary if the owner or operator cannot demonstrate compliance with the regulations.

Data Sources

Data sources used to assess this resource include the Deschutes County Comprehensive Plan Resource Element inventory data and site-specific data gathered from various sources, including the County's SBMH zone GIS data, provisions of DCC 18.90, Portland State University's ORBIC dataset, ODFW's inventory records of sensitive species, and USFWS' recent inventory for bald and golden eagles in Deschutes County.

Land Use

Land use criteria evaluate the potential impacts to activities on or near a landfill site and conformity with the zoning designation. Many landfill impacts could be addressed by site design and other mitigation methods.

Proximity to Airports

Regulatory Requirements/Policies

According to OAR 340-094-0040 10(b), "No permittee of a landfill disposing of putrescible wastes that may attract birds and which is located within 10,000 feet (3,048 meters) of any airport runway used by turbojet aircraft or within 5,000 feet (1,524 meters) of any airport used by only piston-type aircraft shall allow the operation of the landfill to increase the likelihood of bird/aircraft collisions." These rules have been further refined by the Federal Aviation Administration Advisory Circular (Section 4.2.1.2) from February 21, 2020, defining the distance from the end of an airport runway, which is how it will be applied.

Description of Criterion and Criteria Scoring Categories

Deschutes County lands located at least 5 miles from any airport runway would be more desirable sites, as they would pose a negligible risk of bird/aircraft collisions. Lands less desirable for this criterion are those located between 10,000 feet and 5 miles from an airport and to a lesser degree 5,000 to 10,000 feet from an airport used by only piston-type aircraft. Any potential site within 5,000 feet of any airport will would increase the likelihood of bird/aircraft collisions to an unacceptable degree and would be a fatal flaw.

Scoring	Criteria Categories
5	Site where property line is located at least five miles from the property line of any airports
3	Site where property line is located at least 10,000 feet from the property line of any airports
1	Site where property line is located 5,000–10,000 feet from the property line of an airport used by only piston-type aircraft
0	Lands within 5,000 feet of any airport

Data Sources

Deschutes County GIS data will be used to determine proximity of potential sites to airports.

Site Zoning

Regulatory Requirements/Policies

Site zoning considers compatibility of the site with the Deschutes County zoning ordinance (DCZO). Landfills are allowed to be located as a conditional use on non-high value farmland zoned Exclusive Farm Use (EFU; DCZO 18.16.031) or on land zoned Forest Use (F-2; DCZO 18.40.030). Sites located in any other zones will need to be rezoned to EFU and then permitted through the "conditional use" process. The zone change process is anticipated to be difficult and time consuming. Sites zoned Surface Mining (SM; DCZO 18.52) are functionally well suited to landfill disposal sites, so although locating a landfill on a site zoned SM would require a zone change and conditional use review, the criterion recognizes the beneficial co-use and/or reuse of a mining site by scoring SM sites higher than other zones that would require a zone change but lower than non-high value farmland EFU or F-2 sites. Related to zoning are state designated protection areas and specifically the Metolius Area of Critical State Concern (ACSC) (ORS 197.416).

Description of Criterion and Criteria Scoring Categories

Deschutes County lands zoned EFU (non-high value farmland only) or F-2 would be more desirable sites. Lands zoned SM are less desirable based on required entitlements process. Lands zoned in all other zones are not desirable and are given the lowest, non-fatal flaw, rating. Due to the prohibition on large development projects in the Metolius ACSC, this area would be characterized as a fatal flaw.

Scoring	Criteria Categories
5	Lands zoned EFU (non-high value farmland only) or F-2
3	Lands zoned SM
1	Lands in all other zones
0	Lands in Metolius ACSC

Data Sources

Deschutes County GIS-based zoning maps will be used to determine current zoning for potential sites.

Adjacent Land Use Impacts

Regulatory Requirements/Policies

No state or federal siting requirements limit the development of a landfill next to a certain type of land use beyond the local zoning ordinance. Landfill siting must consider the local County limits as well as overall existing land use adjacent to a proposed site or in a position to view the proposed site. Because some types of land uses are more sensitive to landfill development and operation, these types of considerations are critical.

Deschutes County includes proximity standards for conditional use approval of a new landfill disposal site in DCZO 18.128.120. New landfill sites must be located at least 0.25 mile from any existing residential dwelling or public road (except the access road). This screening process considers that a distance of at least 1 mile to the nearest residential dwelling is preferrable. Anticipated impacts to adjacent land uses include nuisances such as additional dust, noise, and odors related to landfill operations. These are expected to impact property values differently depending on the use.

In addition, though not required by regulation, the criteria consider the following adjacent land uses as more compatible with a landfill: rural, agriculture, forest, mining, and institutional. The following adjacent land uses are considered less compatible with a landfill: residential, school, retail, hotel, park, and recreational. Agricultural zoning which allows higher residential density would be considered “residential” and therefore less compatible. The criteria consider existing and planned future adjacent land uses.

Description of Criteria and Criteria Scoring Categories

The Adjacent Land Use Impacts has four criteria, which are each scored separately per the table below:

- Existing Adjacent Use
- Planned Adjacent Use
- Distance to Nearest Residence
- Distance to Nearest Public Road

Scoring	Criteria Categories
Existing Adjacent Use	
5	Rural, agriculture, forest, mining, institutional, or similar
1	Residential, school, retail, hotel, park, recreational, or similar
Planned Adjacent Use	
5	Rural, agriculture, forest, mining, institutional, or similar
1	Residential, school, retail, hotel, park, recreational, or similar
Distance to Nearest Residence	
5	Greater than 1 mile from edge of landfill footprint to nearest residential dwelling
3	Greater than 0.25 mile from edge of landfill footprint to nearest residential dwelling
1/0	Less than 0.25 mile from edge of landfill footprint to nearest residential dwelling (broad/focused screening scores)
Distance to Nearest Public Road	
5	Landfill footprint greater than 0.25 mile
1	Landfill footprint less than 0.25 mile

Data Sources

Deschutes County GIS, supplemented by field visits as needed, will be used to evaluate existing and planned land uses and distances to residences and roads.

Site Visibility/Aesthetic Impacts

This criterion evaluates visual and aesthetic impacts of potential landfill sites by rating each site's remoteness and visibility from adjacent property and roads.

Regulatory Requirements/Policies

Deschutes County protects scenic views inventoried in Comprehensive Plan Goal 5 Inventory Section 5.5, Open Spaces, Scenic Views and Sites, through the Landscape Management Combining Zone DCZC 18.84 (primarily located along roadways and wild and scenic rivers), and through the Open Space and Conservation zone (DCZC 18.48). No siting criteria are based on these regulations because the County has indicated that these regulations would not provide distinction useful in evaluating potential landfill sites. Visual impacts are instead evaluated through an evaluation of visibility and remoteness.

Description of Criteria and Criteria Scoring Categories

Site Visibility/Aesthetic Impacts has three criteria, which are each scored separately per the table below:

- Visibility Based on Topography and/or Vegetation
- Remoteness

Scoring	Criteria Categories
Visibility Based on Topography and/or Vegetation	
5	Site is not visible to any occupied residence or location accessible to the public within 5 miles of the site
3	Site is not visible to any occupied residence or location accessible to the public within 1 mile of the site
1	Site is visible to an occupied residence or location accessible to the public within 1 mile of the site
Remoteness	
5	Site is over 1 mile from any occupied or active development of any kind
3	Site is between 0.5 and 1 mile of an occupied or active development of any kind
1	Site is less than 0.5 mile from any occupied or active development of any kind

Data Sources

GIS contour maps from USGS, DOGAMI lidar mapping, aerial photographs, and site visits will be used to evaluate visibility due to terrain and vegetation.

Transportation System Needs/Opportunity

Regulatory Requirements/Policies

There are no specific regulatory requirements related to this criterion.

Description of Criterion and Criteria Scoring Categories

The transportation system needs/opportunity criterion provides a qualitative measure of transportation system constraints and opportunities that could exist along possible Haul Routes to or from transfer stations and possible landfill sites. Specifically, this criterion will identify locations of known congestion (e.g., an identified need within an adopted transportation system plan that would impact a haul route) or opportunity (e.g., funded projects within adopted Capital Improvement Programs [CIPs] that would benefit a haul route). Landfill locations that provide the most synergy opportunities with funded transportation infrastructure project are the most desirable. Rating a site will be based on the net number of needs (-) and opportunities (+) identified for routes between the transfer stations and landfill site.

Scoring	Criteria Categories
5	A rating equal to or greater than +1 (opportunities outnumber needs by 1 or more)
3	A rating of 0 (opportunities equal needs)
1	A rating equal to or less than -1 (needs outnumber opportunities by 1 or more)

Data Sources

Adopted local agency Transportation System Plan and CIPs.

Haul Route Impacts

Regulatory Requirements/Policies

There are no specific regulatory requirements related to this criterion.

Description of Criterion and Criteria Scoring Categories

The haul route impacts criterion provides a measure for comparing sites in terms of the greatest number of residents who would be affected along the access route by haul traffic. The purpose of this criterion is to provide, at a general site-specific level, a measure of nuisance impacts to residents from haul traffic (e.g., noise, odor, traffic, and degradation of aesthetics). This criterion examines the number of total housing units directly adjacent to and accessing the haul route between the site and an existing designated state route or county arterial. Landfill locations and the associated haul routes that affect the fewest homes are the most desirable.

Scoring	Criteria Categories
5	Less than 5 housing units impacted
4	Between 6 and 10 housing units impacted
3	Between 11 and 15 housing units impacted
2	Between 16 and 20 housing units impacted
1	Greater than 21 housing units impacted

Data Sources

Deschutes County GIS data and aerial imagery will be analyzed in GIS to quantify housing units along haul routes.

On-Site Land Use Impacts

On-site land use impacts consider displacement of existing uses and/or impacts to cultural or historic resources on the site.

Displacement

The ideal landfill site would be undeveloped and vacant or previously developed but ready for a new use and would not require displacement of a current economic activity.

Regulatory Requirements/Policies

There are no regulatory requirements related to landfill siting and specific use displacement.

Description of Criteria and Criteria Scoring Categories

Undeveloped sites or sites previously developed but ready for a new use are preferred, followed by sites with minimal, resource-related uses. Displacement of residential uses is least preferred.

Scoring	Criteria Categories
Current Land Use	
5	Undeveloped and vacant or surface mining in partial use or former use
4	Surface mining in active use
3	Natural resource or non-high value farming use
2	Commercial, industrial, or institutional use
1	Current residential use on site

Data Sources

Deschutes County GIS for land use. Site visits and interviews for use details.

Cultural and Historic Resources

Preferred landfill sites would not require displacement or disturbance of any cultural resources. Cultural resources can be divided into three categories: archaeological sites, above ground, historic structures, and Other Properties of Tribal Importance. These cultural resource categories are not mutually exclusive and are managed somewhat differently. Archaeological sites are the physical remains of past human activity and have three subcategories consisting of precontact sites, historic-era sites, or multicomponent sites (which have both precontact and historic materials). Above ground, historic structures are mostly buildings but can include facilities (e.g., bridges, irrigation systems, roads). Other Properties of Tribal Importance are locations of tribal concern or interest. These locations, often referred to as Traditional Cultural Places (TCPs), may not have artifacts and can include mountains, valleys, rock formations, or plant patches, for example. The Confederated Tribes of the Warm Springs will be consulted with regarding TCPs and data resources to use in applying these criteria.

Regulatory Requirements/Policies

Deschutes County Comprehensive Plan includes an inventory of significant cultural and historic resources in Comprehensive Plan Goal 5 Inventory Section 5.5, Cultural and Historic Resources. Comprehensive Plan Policy 2.11.2 encourages coordination with the Oregon State Historic Preservation Office, and Policy 2.11.3 encourages the preservation of lands with significant historic or cultural resources, including those on the National Register of Historic Places (NRHP). If federal funding or permits are involved for the development of the new landfill, the project would also need to comply with the National Historic Preservation Act of 1968. Deschutes County Code Chapter 2.28 guides the management and preservation of listed historic and archaeological resources.

Description of Criteria and Criteria Scoring Categories

Scoring criteria focus on known cultural resources and the potential for buried archaeological sites. For known cultural resources, the order of preference is based principally on the category of cultural resources present because each category presents a different mitigation risk. For example, it is usually much more complex to mitigate a Property of Tribal Importance than a standing structure. Sites with no potential to impact cultural resources are preferred. This is followed in descending order of preference: sites that have standing structures, sites that have archaeological sites, and sites with the potential to impact Other Properties of Tribal Importance.

The potential for buried archaeological sites is scored separately and is based on an assessment of the likelihood that a site may be found in a particular place on the landscape While the other categories of cultural resources can usually be identified by research, a field visit, or tribal consultation, identifying buried archaeological sites requires more intensive field investigation and can be time consuming. The level of effort necessary for identifying buried archaeological sites is tied to the assessed potential for buried materials to be present at different places on the landscape.

Scoring	Criteria Categories
Known Cultural Resources Categories within Site or within 500 feet of Site	
5	No known cultural resources
4	Above ground/ standing structures within site
2	Archaeological sites
1	Other Properties of Tribal Importance

Scoring	Criteria Categories
Potential for Buried Archaeological Sites within Site or within 500 feet of Site	
5	The site and the surrounding 500 feet contain only areas with low probability to encounter buried archaeological sites
3	The site contains low probability, but the surrounding 500 feet contain areas with moderate probability to encounter buried archaeological sites
1	The site and the surrounding 500 feet contain areas with moderate or high probability to encounter buried archaeological sites

Data Sources

At the broad level, the principal data source to identify known cultural resources will be information from the State Historic Preservation Office. The County list in Section 5.5 may also be useful. During focused evaluations, the conceptual site plan, local environmental conditions, and previous cultural resources work will be used to refine the potential for cultural resources and an area's low, moderate, and high potential for buried archaeological sites.