

Category	Horse Ridge	Roth East
<b>Conceptual Facility Layouts</b>	The Horse Ridge site contains alluvial deposits that allow easier excavation and reuse of sand and gravel for cover materials. The hillside configuration provides airspace for a sloped landfill design. The site includes three surface mines with varying levels of use and infrastructure. Although mined areas provide some “free” airspace and reduce initial excavation needs, underlying basalt bedrock will complicate cell excavation and increase costs. The capacity-to-acreage ratio is greater than Roth East, with approximately 80,000,000 cubic yards of airspace within a 290-acre footprint. The estimated lifespan is 125 years.	The Roth East site has a more efficient square shape, resulting in a favorable capacity-to-acreage ratio and fewer leachate sumps and pumps. As an undeveloped grazing property, no existing infrastructure is available onsite. The mix of sand, gravel, and cobbles within the excavation depth is highly favorable for efficient landfill development. Approximately 80,000,000 cubic yards of airspace are available within a 387-acre footprint. The preliminary design lifespan is approximately 125 years and could potentially be extended through horizontal or vertical expansion.
<b>Site Development and Permitting Assessment</b>	Horse Ridge is an active surface mine zoned Surface Mining (SM) and Exclusive Farm Use–Horse Ridge (EFU-HR), with Wildlife Area (WA) and Surface Mining Impact Area (SMIA) overlays. The site is adjacent to the Horse Ridge Recreation Area and near the Oregon Badlands Wilderness. Although new disposal sites are not permitted in the SM zone, there are pathways to amend the comprehensive plan and/or zoning text prior to preparing a conditional use application. Since a portion of the site is zoned EFU, it will be subject to the Farm Impacts test, but the likelihood of a Land Use Board of Appeals (LUBA) appeal is relatively low since there is no existing onsite agricultural use being displaced. Jurisdictional transfer of the Horse Ridge Frontage Road from Oregon Department of Transportation (ODOT) to the County would require a right-of way grant from the Bureau of Land Management (BLM).	The Roth East Site is currently rural undeveloped land used for grazing purposes and is surrounded by rural residential properties, Off Highway Vehicle (OHV) trails, and the Deschutes National Forest. The Pine Mountain Observatory is located approximately 4.4 miles southwest of the site. The site is zoned Exclusive Farm Use Horse Ridge (EFUHR) with overlays for Forest Use (F1), Landscape Management (LM), Sage Grouse Habitat Area – Low Density (SGIA-LOW), Surface Mining Impact Area (SMIA), and Wildlife Area Combining Zone (WA). A new landfill is a conditional use under EFU zoning and would require a Farm Impact Test. Potential risks may arise from the Farm Impacts Test which could lead to a Land Use Board of Appeals (LUBA) appeal which can be a lengthy process.
<b>Transportation System Assessment</b>	The Horse Ridge site is accessed via Horse Ridge Frontage Road, connecting to US Hwy 20 at both ends. Approximately 6.7 miles of the frontage road would require reconstruction to accommodate long-term landfill operations. Intersection improvements at US Hwy 20 may be required, particularly at the east connection. The frontage road serves residences, two quarries, and recreation trailheads, requiring coordination with adjacent users and BLM. Long-term development would likely require realignment of portions of the frontage road to accommodate phased landfill expansion.	The Roth East site has no existing improved access road between the site and US Hwy 20. As a result, the primary transportation need for this location would be to construct an access road, which would result in more upfront capital expenditures for access compared to the Horse Ridge site. Multiple routes could be considered with trade-offs in regard to overall route length, connection point with US Hwy 20, avoidance of BLM land, and limiting the overall grade along the route. However, several route options would result in direct and unshared access to the site, which would limit any conflict between the landfill and adjacent uses.
<b>Water Infrastructure Assessment</b>	Horse Ridge includes an existing onsite well and prior industrial water use associated with mining operations, providing a practical starting point for early development water needs. Groundwater is deep (approximately 850–950 feet bgs), which increases well drilling costs; however, the site benefits from existing infrastructure and proximity to nearby water rights holders, improving the feasibility of a future water right transfer. The long-term strategy would include upgrading onsite wells and storage systems and securing or transferring a groundwater right for full operational buildout. Due to its closer proximity to the waste centroid and regional infrastructure, supplemental hauled water—if needed during construction or peak demand—would be comparatively less costly than to Roth East.	Roth East does not have an existing permitted water supply suitable for landfill operations. Groundwater is shallower (approximately 450–650 feet bgs), which reduces anticipated well drilling costs relative to Horse Ridge; however, the site is located upgradient of nearby water rights, reducing the likelihood of acquiring a transferable right. Full landfill development would require securing a new groundwater right, constructing new well, storage, and distribution infrastructure, and relying more heavily on supplemental hauled water during construction and peak demand. Its more remote location increases ongoing haul costs for interim water supply compared to Horse Ridge.
<b>Electrical Power Supply Review</b>	The Horse Ridge site would require approximately 6.7 miles of new three-phase overhead electrical distribution line extension from the nearest three-phase connection near Dodds Road and U.S. Highway 20. The extension would generally follow Horse Ridge Frontage Road right-of-way and require installation of new three-phase infrastructure, as upgrading existing single-phase lines is not cost-effective. Due to the length of extension, material escalation, and equipment lead times, Central Electric Cooperative (CEC) has provided a budgetary estimate of approximately \$2,000,000, with long-lead components potentially requiring 12 months or more.	The Roth East site will require approximately 2.3 miles of overhead electrical utility line upgrades from the closest three-phase power connection point, near the intersection of Highway 20 and George Millican Rd. Roughly 1.2 miles will consist of upgrading an existing single-phase overhead line. New three-phase power lines will need to be extended (overhead or underground) an additional 1.1 miles to the landfill location. Easements may be required through private property. Discussions with CEC approximated the cost of this upgrade at roughly \$700,000 with a 50-60 week lead time for material acquisition.
<b>Flood Risk Desktop Review</b>	Horse Ridge is outside mapped Federal Emergency Management Agency (FEMA) flood hazard areas and approximately one mile from the Dry River 100-year floodplain. However, runoff from a larger, steep upstream basin (~2–3 square miles) along the north slope of Horse Ridge presents elevated flash flood risk during intense storms and rain-on-snow events. Multiple gullies convey flows through the site, requiring engineered diversion and conveyance infrastructure. Climate change may increase storm intensity, reinforcing the need for conservatively sized perimeter drainage systems. Secondary risk includes potential temporary access disruption along Highway 20.	Roth East is also outside mapped FEMA flood hazard areas. A smaller upstream basin (~1 square mile) drains north from Pine Mountain through the site toward Dry River, creating a moderate flash flood risk. Compared to Horse Ridge, contributing drainage area and slopes are less severe. The primary concern is secondary access risk, as the Dry River floodplain crosses Highway 20 in several locations, potentially disrupting haul access during extreme events. Coordination with transportation agencies and contingency planning would be prudent.
<b>Geology/Hydrogeology Assessment</b>	Groundwater occurs in a deep, confined volcanic aquifer at approximately 950–975 feet bgs, with stable historical water levels and strong well yields. Interbedded basalt and ash-flow tuffs provide low-permeability conditions and substantial vertical hydraulic separation from the regional aquifer. No perched groundwater has been identified. Baseline groundwater quality is very good, with no regulatory exceedances. The combination of very deep groundwater, confined conditions, and limited recharge under arid climate results in a high degree of natural groundwater protection.	Groundwater is estimated at approximately 450–650 feet bgs within thick, coarse-grained alluvial deposits. The aquifer is regionally deep but less confined than at Horse Ridge, and the unconsolidated sediments provide limited natural attenuation of vertical migration. Available well data indicate good water quality and yield. Although aquifer depth and arid conditions reduce contamination risk, the hydrogeologic setting provides comparatively less natural hydraulic protection than Horse Ridge.

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<b>Preliminary Geotechnical Feasibility</b>	Horse Ridge is underlain by 5–50 feet of windblown sand and ancient stream-deposited sand and gravel over basalt bedrock. Landfill cell excavation will extend into hard volcanic rock and will require drill-and-blast methods in many areas. Overlying sandy soils are generally suitable for daily cover and structural fill. Excavated basalt can be crushed and reused for road base, drainage rock, and other site needs, but will require processing. Rock depth and hardness vary across the site, increasing excavation complexity. No geotechnical fatal flaws were identified.	The site is on a fan-shaped sediment deposit, with around 400 feet of mainly gravel layers with cobbles. These gravels can be used as a potential on-site aggregate resource for site development pending further lab testing. Excavation and grading for the landfill are expected to be done using standard equipment. An assumed fault line runs from a nearby mapped fault to the site's northeast corner, but it is considered inactive in recent geological times. The preliminary geotechnical assessment identified no significant issues related to soil stability or geological hazards.
<b>Environmental Assessment Phase I</b>	Horse Ridge is an active quarry site southeast of Bend. The property does not appear on environmental regulatory databases for hazardous substance releases. Site reconnaissance identified two above-ground diesel storage tanks in active use, equipment storage areas, minor petroleum staining, and a former asphalt plant that operated in the 1990s. The former asphalt plant represents a Recognized Environmental Condition (REC). Limited Phase II soil sampling is recommended to evaluate potential petroleum or asphalt-related impacts in localized areas. Overall, environmental risk appears manageable but will require targeted investigation prior to development.	Roth East consists of approximately 1,700 acres of largely undeveloped rangeland east of Millican. Historical aerials and records review did not identify prior industrial or commercial uses of concern. Site reconnaissance noted two likely empty above-ground fuel tanks with no observed staining or evidence of release. Interviews and records review did not identify any Recognized Environmental Conditions. Based on available information, no additional environmental investigation is recommended at this time. The site presents a comparatively lower environmental due diligence burden relative to Horse Ridge.
<b>Weather and Air Quality Desktop Review</b>	Regional weather and air quality data represent both sites. Average annual precipitation is less than 12 inches, so leachate generation is expected to be minimal. PM2.5 and ozone peaks recorded nearby (518 µg/m <sup>3</sup> and 39 ppb) were associated with regional wildfire events. No permitted air facilities or sensitive receptors are located within 3 miles. Prevailing winds are primarily from the southeast and northwest, with typical speeds of 8–13 mph. Wind monitoring near Horse Ridge indicates moderate exposure. Burn probability is moderate to high, though lower vegetation productivity may limit fuel loading relative to Roth East.	Regional weather and air quality conditions are similar to Horse Ridge, with low precipitation (<12 inches annually) and minimal expected leachate generation. Air quality exceedances are primarily wildfire-related. No permitted air facilities or sensitive receptors are located within 3 miles. Prevailing winds are from the southeast and northwest; however, Roth East's more open topography and higher recorded gusts indicate greater wind exposure, increasing potential for operational dust and debris control challenges. Burn probability is high, and more productive sage-steppe vegetation may contribute to greater wildfire intensity and frequency compared to Horse Ridge.
<b>Natural Resources Assessment</b>	No wetlands or waters were identified onsite. The site lies entirely within mule deer and elk winter range and essential/limited pronghorn habitat (Category 2), requiring mitigation to achieve "no net loss" and a net benefit. A golden eagle nest is located approximately 1.2 miles to the southwest, requiring coordination and potential compensatory mitigation. The project would result in an estimated loss of 16.6 functional acres of sage-grouse habitat (19.1 acres required for net benefit). Estimated mitigation costs range from approximately \$1.5M to \$3.3M, substantially driven by big game habitat mitigation, with comparatively lower sage-grouse impacts than Roth East.	No wetlands or waters were identified onsite. The site is entirely within mule deer and elk winter range and essential/limited pronghorn habitat (Category 2), requiring mitigation to achieve "no net loss" and a net benefit. The site is fully within low-density sage-grouse habitat and adjacent to core habitat. Development would result in an estimated loss of 173.3 functional acres (199.3 acres required for net benefit). Estimated mitigation costs range from approximately \$2.0M to over \$8.8M, largely driven by significant sage-grouse habitat impacts, representing a substantially higher mitigation burden than Horse Ridge.
<b>Archaeology and Cultural Heritage Assessment</b>	Horse Ridge includes previously disturbed areas associated with historic aggregate mining, which has reduced surface integrity in portions of the site. A reconnaissance survey of approximately 50 acres within the 400-acre study area identified five archaeological resources (two historic-era debris scatters and two newly recorded precontact isolates, and one previously recorded can dump relocated). Deep alluvial deposits indicate potential for buried archaeological materials. A comprehensive pedestrian survey and subsurface testing would be required under SHPO permit to evaluate National Register of Historic Places (NRHP) eligibility. Compared to Roth East, prior disturbance may reduce resource density in some areas, but subsurface sensitivity remains.	Roth East is largely undeveloped rangeland with minimal historic disturbance. A reconnaissance survey of approximately 128 acres within the 645-acre property identified 12 archaeological resources (six sites and six isolates), primarily precontact lithic scatters and isolates. The setting - level uplands adjacent to drainages - has high sensitivity for additional precontact resources. A formal systematic archaeological survey and SHPO-permitted subsurface testing would be required to delineate and evaluate resources. Compared to Horse Ridge, Roth East presents a higher likelihood of intact and more numerous archaeological deposits, increasing potential time, cost, and mitigation exposure.
<b>Community Assessment</b>	Development of Horse Ridge is viewed by some as more compatible than undeveloped sites because portions are already used for active mining. Public comments emphasize concerns about its proximity to the Horse Ridge recreation area (bike trails and nearby trailheads), as well as the Oregon Badlands Wilderness and Dry River Canyon. Commenters note that while access may remain, the landfill could alter the recreational experience due to visual, noise, traffic, and perceived environmental impacts. Additional concerns include effects on wildlife habitat and cultural resources. The nearest residence is approximately 0.62 miles away.	Development of Roth East is generally viewed as having greater visual and residential impacts due to its largely undeveloped character and intact open landscape. Public comments have raised concerns about impacts to Millican Valley landowners, recreation uses, and the Pine Mountain Observatory. Specific concerns include wind-blown debris and dust, potential groundwater contamination, and changes to the rural character of the area. Similar to Horse Ridge, commenters have noted concerns regarding habitat and wildlife impacts. Compared to Horse Ridge, Roth East has fewer adjacent recreation facilities but greater perceived residential and scenic sensitivity.
<b>Cost Analysis</b>	Initial development costs are estimated at \$63 million, which includes an assumed \$8.5 million for land acquisition. Landfill cell development costs are estimated at \$1.15 million/acre. Annual operating costs are estimated at \$7.6 million/year, which includes \$2.5 million/year for waste hauling. The estimated average disposal cost is \$41/ton, to dispose of roughly 56 million tons over a 125-year lifespan. While Horse Ridge has higher upfront capital and excavation costs, its closer proximity to the waste centroid reduces long-term hauling expenses, resulting in a lower projected average cost per ton over the facility lifespan compared to the Roth East site.	Initial development costs are estimated at \$36 million, which includes \$5.5 million for land acquisition. Landfill cell development costs are estimated at \$393,000/acre. Annual operating costs are estimated at \$8.4 million/year, which includes \$3.3 million/year for waste hauling. The estimated average disposal cost is \$43/ton, to dispose of roughly 56 million tons over a 125-year lifespan. While Roth East has lower acquisition and excavation costs, higher long-term hauling expenses are projected to cause total cumulative costs to exceed those of the Horse Ridge site.