

ENVIRONMENTAL ASSESSMENT

Gerlach Geothermal Exploration Project

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US Department of the Interior
Bureau of Land Management
Winnemucca District
Black Rock Field Office
5100 East Winnemucca Boulevard
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ACRONYMS AND ABBREVIATIONS

Full Phrase

°F	degrees Fahrenheit
ALAN	artificial light at night
AMSL	above mean sea level
AOI	area of interest
APE	area of potential effect
BLM	United States Department of the Interior, Bureau of Land Management
BMP	best management practice
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CR-34	Washoe County Road 34
CWA	Clean Water Act of 1972, as amended
dBA	A-weighted decibel
DNL	day-night average sound level
DOI	US Department of the Interior
EA	environmental assessment
Eagle Act	Bald and Golden Eagle Protection Act
EGS	enhanced geothermal systems
EIS	environmental impact statement
EMPSi	Environmental Management and Planning Solutions Inc.
EPA	United States Environmental Protection Agency
ESA	Endangered Species Act of 1973, as amended
GGID	Gerlach General Improvement District
GHG	greenhouse gas
GHMA	general habitat management area
Gold Book	Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development
H ₂ S	hydrogen sulfide
HMA	herd management area
HUC	Hydrologic Unit Code
IPaC	USFWS Information for Planning and Consultation
KEC	Kautz Environmental Consultants
KOP	key observation point
LWC	lands with wilderness characteristics
NAAQS	National Ambient Air Quality Standards
NAC	Nevada Administrative Code
NCA	National Conservation Area

NCA Act	Black Rock Desert-High Rock Canyon Emigrant Trails National Conservation Area Act of 2000
NDEP	Nevada Division of Environmental Protection
NDOM	Nevada Division of Minerals
NDOT	Nevada Department of Transportation
NDOW	Nevada Department of Wildlife
NDWR	Nevada Division of Water Resources
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NHT	National Historic Trail
NPS	National Park Service
NRHP	National Register of Historic Places
NSO	no surface occupancy
OHMA	other habitat management area
Ormat	ORNI 26 LLC, a subsidiary of Ormat Nevada, Inc.
pH	potential of hydrogen
PHMA	priority habitat management area
POD	point of diversion
POU	place of use
project	Gerlach Geothermal Exploration Project
RMP	resource management plan
SR-447	Nevada State Route 447
SRMA	special recreation management area
SRP	special recreation permit
study area	hydrologic evaluation study area
SWReGAP	Southwest Regional Gap Analysis Project
TMRPA	Truckee Meadows Regional Planning Agency
UNR	University of Nevada, Reno
US	United States
USACE	US Army Corps of Engineers
USC	United States Code
USFWS	US Fish and Wildlife Service
USGS	US Geological Survey
VRM	visual resource management
WCHD–AQMD	Washoe County Health District–Air Quality Management Division
WSA	wilderness study area

Chapter I

Introduction

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Chapter I. Introduction

The United States (US) Department of the Interior (DOI), Bureau of Land Management (BLM) Black Rock Field Office has prepared this draft environmental assessment (EA) in accordance with the National Environmental Policy Act (NEPA), as implemented by the Council on Environmental Quality (CEQ) revised regulations, effective September 14, 2020, and BLM regulations for implementing NEPA.

I.1 PROJECT SETTING

ORNI 26 LLC, a subsidiary of Ormat Nevada, Inc. (hereinafter collectively referred to as Ormat), is proposing the Gerlach Geothermal Exploration Project (project). The project is within a 2,724-acre area of interest (AOI; see **Section 2.1.1**) in Washoe County, less than 1 mile northwest of Gerlach, Nevada (**Appendix A, Figure A-1**, Project Area). The project proposes drilling and testing of up to 20 geothermal wells and construction of access roads (proposed action). The proposed wells would be located within federal geothermal leases on public lands administered by the BLM in the Gerlach Geothermal Lease Unit (NVN-88151X); these include leases NVN-55718, NVN-75228, NVN-98640, NVN-98641, and NVN-100029 (**Figure A-2**, Geothermal Lease Areas).

Ormat previously proposed a geothermal development project in the same location, and the BLM conducted a 60-day public pre-scoping period from October 1, 2020, to December 1, 2020 (see **Section 1.7**). During the 60-day pre-scoping period, Ormat withdrew its utilization plan and plan of development, and submitted to the BLM an operations plan for geothermal exploration, which is the proposed action analyzed in this EA.

I.2 COOPERATING AGENCIES

The BLM invited the US Fish and Wildlife Service (USFWS), the National Park Service (NPS) National Historic Trails Office, the Nevada Department of Wildlife (NDOW), Washoe County, and the Truckee Meadows Regional Planning Agency (TMRPA) to be cooperating agencies in preparing this EA. They were invited because of their jurisdiction by law or special expertise. To date, the USFWS, NPS National Historic Trails Office, and TMRPA accepted the invitation to be cooperating agencies.

The BLM is the lead federal agency for the NEPA process, the Endangered Species Act (ESA) Section 7 consultation process, and the National Historic Preservation Act (NHPA) Section 106 consultation process. NHPA Section 106 consultation is being carried out in accordance with the process described in 36 Code of Federal Regulations (CFR) 800.8(c). See **Chapter 4**, Consultation and Coordination, for additional information on these consultation processes.

I.3 PURPOSE AND NEED

The BLM's purpose for the federal action is to respond to Ormat's application to explore geothermal energy resources on public lands through the construction of geothermal power exploration wells and associated facilities.

The need for action is established by the BLM's responsibility under the Mineral Leasing Act of 1920, the Geothermal Steam Act of 1970, and the implementing regulations provided under 43 CFR 3200.

I.4 DECISION TO BE MADE

The BLM would decide to grant, grant with modification, or deny Ormat's proposal, in compliance with BLM leasing regulations and other federal laws. Conditions of approval would be applied to the applicable permits and authorizations. Any activities outside the scope of the proposed action would be subject to further NEPA analyses.

I.5 RESOURCE MANAGEMENT PLAN CONFORMANCE

The proposed action would be in conformance with the BLM Winnemucca District Resource Management Plan (RMP; BLM 2015a),¹ as amended. Specifically, the proposed action would be consistent with Objective D-MR 4 (BLM 2015a, p. 2-172), which states, in part, that “Lands within the [Winnemucca District] would be open to geothermal and oil and gas leasing and development except where incompatible with important resource values.”

The proposed action would also be in conformance with the BLM Black Rock Desert-High Rock Canyon Emigrant Trails National Conservation Area (NCA) and Associated Wilderness, and Other Contiguous Lands in Nevada Record of Decision and RMP (BLM 2004). Areas within that RMP’s planning area but outside the NCA and wilderness areas, including the South Playa,² are the focus of leasable mineral decisions in the RMP. Specifically, Ormat’s proposed action would be consistent with Objective MIN-4 (BLM 2004, p. 2-43), which states, “The South Playa is open to new geothermal leasing.”

I.6 RELATIONSHIP TO LAWS, REGULATIONS, POLICIES, AND PLANS

The alternatives analyzed in this EA are consistent with federal laws and regulations; state and local government laws and regulations; and other plans, programs, and policies, to the extent practicable within federal law, regulation, and policy.

The BLM has prepared this EA in accordance with the following statutes and implementing regulations, policies, and procedures that govern the BLM’s actions:

- Mineral Leasing Act of 1920 (30 United States Code [USC] 181), as amended
- Geothermal Steam Act of 1970 (30 USC 23), as amended
- Federal Land Policy and Management Act of 1976 (43 USC 35)
- BLM NEPA Handbook (H-1790-1), as updated (BLM 2008)
- Energy Policy Act of 2005 (42 USC 149), as amended
- Black Rock Desert-High Rock Canyon Emigrant Trails National Conservation Area Act of 2000 (NCA Act) (Public Law 106-554)

I.7 SCOPING AND ISSUE IDENTIFICATION

On October 1, 2020, the BLM issued a press release initiating a 60-day pre-scoping period with the goal of soliciting early public input on Ormat’s proposed plan. At the time, Ormat was proposing a geothermal development project, which included two geothermal power plants and a power line. Ormat had submitted to the BLM a geothermal utilization plan and plan of development for the proposed power line. All comments received were summarized in the pre-scoping summary report (BLM 2021a), which is available on the BLM project website (<https://eplanning.blm.gov/eplanning-ui/project/2016744/510>). During the 60-day pre-scoping period, Ormat withdrew its utilization plan and plan of development, and submitted to the BLM an operations plan for geothermal exploration.

The BLM received 70 comment submissions during the 30-day public scoping period for Ormat’s proposed geothermal exploration plan. The public scoping period opened on December 10, 2021, and closed on January 10, 2022. Comments were submitted by the US Environmental Protection Agency (EPA) Region 9, NDOW, Nevada State Clearinghouse, Basin and Range Watch, BlueRibbon Coalition, Burning Man Project, Friends of Black Rock High Rock, Friends of Nevada Wilderness, Trails West, and private citizens. From these submissions, there were 283 substantive comments. All comments received are summarized in the

¹ References cited in this EA are included in **Appendix B, References**.

² The AOI is in the South Playa, which is located between the NCA’s south boundary and Gerlach (BLM 2004, p. 1-4).

public scoping report (BLM 2022a), which is available on the BLM project website (<https://eplanning.blm.gov/eplanning-ui/project/2016744/510>).

The BLM interdisciplinary team and cooperating agencies held two internal scoping workshops (on January 27, 2021, and January 25, 2022) to identify and discuss issues to be carried forward for analysis in **Chapter 3, Affected Environment and Environmental Consequences**.

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Chapter 2

Proposed Action and Alternatives

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Chapter 2. Proposed Action and Alternatives

2.1 ALTERNATIVE A: PROPOSED ACTION

Alternative A, the proposed action, includes the construction, operation, and maintenance of the project in Washoe County, Nevada (see **Figure A-3** in **Appendix A**). These activities are described in the sections below. Unless otherwise noted, all information describing the elements of Alternative A are from the project operations plan (ORNI 26 LLC 2022).

2.1.1 Area of Interest

The AOI consists of approximately 2,724 acres of public lands administered by the BLM. All proposed surface disturbance would be in the AOI. Proposed surface disturbance in the AOI would be associated with up to 20 exploration wells and well pads, new and upgraded access roads, and expansion of an aggregate pit (see **Table 2-1**, below).

Table 2-1
Proposed Disturbance in the AOI

Project Component	Proposed Surface Disturbance (acres)	Proposed Surface Disturbance after Interim Reclamation (acres)
Well pads	42.0	21.0 ¹
New road construction	2.0	2.0
Existing road improvement	2.5	2.5
Aggregate pit expansion	5.0	5.0
Total	51.5	30.5

Source: ORNI 26 LLC 2022

¹ Assumes half of each well pad would be reclaimed during interim reclamation; see **Section 2.1.8**, Surface Reclamation.

2.1.2 Geothermal Well Field

Ormat is proposing to drill and test up to 20 geothermal exploration wells, all located on public lands administered by the BLM in the AOI. **Figure A-3** in **Appendix A** shows the locations of the proposed exploration wells. Geothermal exploration wells would typically be drilled and tested one at a time. Ormat would adjust the subsequent well locations as additional geologic, geophysical, and geothermal reservoir information are obtained during the drilling of each well. Ormat would use the data collected from each exploration well to inform the geothermal reservoir model and to determine a commercial geothermal resource's viability. The table below summarizes the geothermal well information.

Temporary surface disturbance for up to 20 proposed well pads would be approximately 2.1 acres per pad, or up to approximately 42 acres in total. Each well pad would be approximately 300 feet by 300 feet. Actual dimensions of the well pad would be modified to best match the site's specific physical and environmental characteristics and to minimize grading (cut and fill). Once drilling is complete, the shoulders of the pad would be reclaimed; however, the majority of the pad would be kept clear for ongoing operations and the potential need to work on or redrill the well. See **Section 2.1.8**, Surface Reclamation, for more details on interim reclamation.

**Table 2-2
Geothermal Well Drilling Information**

Drilling Rig Type	Drilling Rig Height (feet)	Average Number of Trucks Needed	Drilling Time (days)¹	Workers On-site	Depth Drilled (feet belowground)
Large rotary drilling rig	160–170	25 or more tractor trailers 8 small trucks	45 ²	9–10 (average) 18 (maximum)	approximately 7,000

Source: ORNI 26 LLC 2022

¹ If difficulties are encountered during the drilling process, including the need to redrill the well, the time required to successfully complete each well could potentially double.

² Drilling would be conducted 24 hours a day, 7 days a week.

Only those drill pads scheduled to be drilled would be cleared. Drill pad preparation would include clearing, earthwork, drainage, and other improvements necessary for efficient and safe operation and for fire prevention. Clearing before drilling would involve brush removal, which would either be taken to an appropriate dump site or piled and left on-site. Topsoil would be stripped, typically to the rooting depth, and salvaged during pad construction, as feasible. Salvaged topsoil and any cleared organic material, if saved, would be stockpiled on the pads for use during the subsequent reclamation of the disturbed areas.

Each drill pad would be prepared to a graded, level surface for the drill rig and support equipment. Stormwater runoff from undisturbed areas around the drill pads would be directed into ditches surrounding the drill pad and back onto undisturbed ground, consistent with best management practices (BMPs) for stormwater. The site would be graded to prevent stormwater runoff from the pad, rather, grading would direct stormwater runoff into a reserve pit on the pad in accordance with the standards of the Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development (The Gold Book; BLM and Forest Service 2007).

Ormat would construct reserve pits on each pad to contain and temporarily store stormwater runoff, geothermal fluid during well testing (see below for more information on well testing), drill cuttings, and circulating drilling mud, in accordance with the BMPs identified in the Gold Book (BLM and Forest Service 2007) and the NDOW's Design Features and Tools to Reduce Wildlife Mortalities Associated with Geothermal Sumps (NDOW, n.d.).

The reserve pits would be fenced on three sides during drilling; once drilling has been completed, the fourth side would be fenced to prevent access by people, wildlife, and livestock. The fence would be built according to rangeland management specifications. It would remain in place until reserve pit reclamation begins. To further prevent people, wildlife, and livestock from becoming entrapped, walls on one side of the reserve pit would be sloped at an approximate 30 percent incline. Each reserve pit would measure approximately 75 feet wide by 200 feet long by 10 feet deep.

Wells would be completed at depths of approximately 1,500 to 7,500 feet, though target depths could change pending the results of well flow testing. Directional drilling could be used to intercept geothermal targets. The casing depth would vary depending on the total depth of the well, but it would comply with the DOI's Geothermal Resources Operational Order No. 2 (DOI 1975) and the Nevada Division of Minerals' (NDOM) requirements, as applicable. In compliance with the DOI order, the well casing depth would be no less than 200 feet belowground to prevent commingling of geothermal fluids and underground aquifers.

Each well could need to be worked over, or redrilled. Well redrilling could consist of 1) reentering and redrilling the existing well bore, 2) reentering the existing well bore and drilling and casing a new well bore, or 3) sliding the rig over a few feet on the same well pad and drilling a new well bore through a new conductor casing.

Short-Term Well Testing

Ormat would conduct one or more short-term flow test(s) of each well drilled. Each test, lasting approximately 3 to 5 days, would consist of flowing the well into the reserve pit or portable steel tanks while monitoring geothermal fluid temperatures, pressures, flow rates, chemistry, and other parameters. Each short-term flow test is expected to discharge approximately 1.5 million gallons per well. Injectivity tests could also be conducted by injecting the produced geothermal fluid from the reserve pit or steel tanks back into the well and the geothermal reservoir.

Long-Term Well Testing

Ormat would likely conduct one or more long-term flow test(s) of each well drilled following the short-term flow test(s) to more accurately determine the long-term well and geothermal reservoir productivity. Each long-term flow test would last approximately 7 to 30 days. Ormat would expect each long-term flow test to discharge approximately 15 million gallons of geothermal fluid.

The process would be conducted by pumping the geothermal fluids from the well through on-site test equipment to the reserve pit on the well pad. The produced geothermal fluid would then be pumped through a temporary 8- to 10-inch-diameter pipeline to either inject the fluid into one of the other geothermal wells drilled within the project area, or to the reserve pit on another well pad. The temporary pipeline would be carried by workers and laid by hand either cross country or on the surface of the disturbed shoulders on the access roads connecting the well pads. If required, roads would be crossed by trenching and burying the temporary pipe. The temporary pipeline typically would consist of aluminum or high-density polyethylene piping appropriately rated for the temperatures and pressures for the long-term flow test(s). Temporary pipeline connections would be bolted or welded together. Ormat personnel or contractor(s), or both, would be on-site monitoring the temporary pipeline and wells during the long-term flow test(s).

Well testing would comply with the State of Nevada Underground Injection Control Program (Nevada Administrative Code [NAC] 445A.908) administered by the Nevada Division of Environmental Protection (NDEP). Injection and flow testing would also comply with other applicable state and federal permitting requirements, including the NDOM Geothermal Permit.

2.1.3 Access Roads

New Access Roads

Ormat would construct new access roads using a dozer or road grader, or both. Approximately 0.9 miles (4,550 feet) of new access roads are proposed (Ormat GIS 2022). The total estimated area of surface disturbance required for new access road construction, assuming a 20-foot-wide area of disturbance, would be approximately 2 acres (**Table 2-1**). Access roads that cross drainages could require culvert installation. Installers would follow BLM design criteria and standards in the Gold Book (BLM and Forest Service 2007). If required, Ormat would obtain all appropriate permits for site access from the Nevada Department of Transportation (NDOT), prior to exploration activities.

Existing Road Improvements

The AOI contains numerous existing access roads and “two tracks.”³ Existing access roads and two tracks would require an additional 10-foot width of surface disturbance for road improvement. Approximately 2.1 miles (11,088 feet) of existing roads could be improved to facilitate access (ORNI 26 LLC 2022). The total estimated area of surface disturbance required to improve existing access roads, assuming approximately 10 feet of disturbance along the road shoulders, is approximately 2.5 acres (**Table 2-1**).

³ A two-track dirt road forms where drivers have operated vehicles enough times in a given area to form a road, though the ground has never been graded.

2.1.4 Water Requirements and Source

Well drilling could require as much as approximately 35,000 gallons of water per day. Water for grading, compaction, and dust control would be as much as approximately 6,000 gallons per day.

This water would be supplied from one or more shallow water wells drilled from one or more of the proposed drill sites, as approved by the BLM and under a waiver for the temporary use of groundwater from the Nevada Division of Water Resources (NDWR). Each water well would be temporary, drilled by a licensed water well driller, and cemented with a 7-inch casing to provide a sanitary seal at the surface. The well would be drilled down to a productive interval of sands, gravels, or fractures (estimated at between 100 and 1,000 feet belowground surface).

The well would be plugged and abandoned in accordance with NAC 534.420, with cement plugs across the bottom of the casing and, if needed, additional plugs to isolate individual producing zones, if present. No additional surface disturbance would be associated with the drilling of each temporary water well. This is because the water well would be located on existing geothermal well pads, if they are drilled.

Alternatively, water could be obtained from an established private ranch source and trucked to each drill site, or as a bulk water purchase from the Gerlach General Improvement District (GGID), pending contract and availability from the GGID.

2.1.5 Aggregate Requirements and Source

Aggregate material would be obtained from one of two sources summarized in **Table 2-3**: 1) an existing NDOT aggregate pit (a mineral materials site) northwest of Gerlach (Ormat would obtain a Free Use Permit from the NDOT if this aggregate pit is selected), or 2) a private aggregate pit located east of Transfer Station Road (**Figure A-3** in **Appendix A**). Whichever aggregate pit is used, the existing pit would be expanded by up to 5 acres.

Table 2-3
Potential Aggregate Sources

Aggregate Source	Township, Range, Section	Approximate Location¹
Aggregate pit 1 (existing public source — NDOT)	T. 32N., R. 23E., Sec. 16	299003, 4503666
Aggregate pit 2 (existing private source)	T. 32N., R. 23E., Sec. 15	299851, 4503528

Source: ORNI 26 LLC 2022

¹ Universal Transverse Mercator coordinates are given in easting (meters), northing (meters), North American Datum of 1983

Ormat selected the proposed well pads and access roads to minimize the need for aggregate application, with the majority of the proposed well pads consisting of an approximate even mix of cut and fill to make a stable surface. At most, each drill pad (exclusive of the reserve pit) would be covered with up to 6 inches of gravel. While much less aggregate is likely required, a high estimate for the total aggregate required for well pad construction is 40,000 cubic yards (approximately 2,000 cubic yards per pad).

Access roads would be covered with up to 4 inches of gravel, as necessary, to create an all-weather surface and to prevent rut formation. The total aggregate required for access road construction is estimated at 2,885 cubic yards (approximately 3 miles of access roads by 15-foot drivable width, covered with 4 inches of aggregate) or less (ORNI 26 LLC 2022).

The total aggregate required for the project is estimated at 42,885 cubic yards.

2.1.6 Personnel

A temporary drilling crew of approximately 10 workers would be at the active drill site for the entire duration of well drilling. The drilling crew is anticipated to consist of current Ormat employees and

contractor(s) that would travel to the project site for exploration activities, as needed. Drilling crews typically include one drilling supervisor, one company person,⁴ one mud logger, one tool pusher, one worker to operate the derrick, one worker to operate the vehicles, and up to four floor hands.

The drilling supervisor and mud logger would typically sleep in a portable trailer on the active drill site while the well is being drilled. The drilling crew could also live on-site during the drilling operations in a self-contained, mobile bunkhouse (a temporary facility that is comparable in size with a double-wide trailer; it would contain sleeping quarters, a galley, a water tank, and a septic tank) or portable trailers. These temporary drilling crew facilities would be placed on one of the drill sites not being actively drilled. In the case of the first well to be drilled, quarters would be placed on the active well pad. Alternatively, the drilling crew could acquire accommodations in Gerlach, depending on lodging availability.

2.1.7 Applicant-Committed Environmental Protection Measures

All proposed activities would be conducted in compliance with applicable geothermal lease stipulations (see Appendix A in ORNI 26 LLC 2020). Ormat has also committed to implementing the following environmental protection measures:

- Portable chemical sanitary facilities would be available and used by all personnel during periods of well drilling, flow testing, and construction. A local contractor would maintain these facilities.
- To prevent the spread of invasive, nonnative species, all vehicles, heavy earth-moving construction equipment, mobile trailers, and campers brought to and used on the project site would go through high-pressure washing of the entire vehicle/unit at a commercial wash station prior to arriving and being used on the project site.
- If needed, certified noxious weed-free hay and straw bales would be purchased and used on the project site.
- Seed mixes for the rehabilitation and revegetation of all disturbed areas related to this project would be certified as weed free, per BLM standards.
- Following project construction, areas of disturbed land no longer required for operations would be reclaimed to promote the reestablishment of native plant and wildlife habitat.
- To minimize visibility, all wellheads would be painted a color that blends with the surrounding landscape.

Measures to Prevent and Control Fire

All construction and operating equipment would be equipped with applicable exhaust spark arresters. Adequate firefighting equipment and water would be available at each active drill site. Fire extinguishers would be available on-site. Water that is used for construction and dust control would be available for firefighting. Personnel would be allowed to smoke only in designated areas. Ormat has prepared a fire contingency plan (ORNI 26 LLC 2022, Section 3.2) with additional fire prevention and control measures, including keeping adequate firefighting equipment on-site, inspecting and cleaning vehicle catalytic converters, conducting spark-producing activities in vegetation-free areas, complying with BLM fire restrictions or closures, and notifying appropriate parties of any fire.

Measures to Protect Surface Water and Groundwater

Geothermal fluids would not be discharged to the ground under normal operating conditions. Stormwater runoff from undisturbed areas around the drill pads would be directed into ditches surrounding the drill pad and back onto undisturbed ground, consistent with stormwater BMPs. The well pad surface would be graded to prevent the movement of stormwater off the constructed site but rather into the reserve pit in accordance with the standards of the Gold Book (Fourth Edition – Revised 2007) (BLM and Forest Service

⁴ Ormat's on-site representative

2007). A stormwater pollution prevention plan would be developed and implemented for the project per the NDEP Bureau of Water Pollution Control requirements. Well casing would prevent commingling of geothermal fluids and underground aquifers.

Measures to Protect Wildlife

Revegetation and periodic maintenance of temporarily disturbed areas would prevent erosion and protect habitat. Ormat would use suitable, BLM-approved revegetation methods. Topsoil would be stockpiled and applied to enhance revegetation success.

To prevent undue degradation and the removal of habitat, cover, and food, existing roads would be used whenever possible; cross-country travel would be restricted to designated construction areas. Speed limits of 35 miles per hour would be observed on all unpaved roads to minimize dust and avoid collisions with wildlife.

To prevent a potential violation of the Migratory Bird Treaty Act and per lease stipulations, Ormat would contract a qualified wildlife biologist to conduct a pre-construction survey for nesting migratory birds during the breeding season (March 1 through August 31) and prior to any ground-clearing or other surface disturbance. The survey would include the proposed footprint of disturbance and an appropriately sized buffer area. If disturbance is not completed within the time frame established as a condition in the geothermal drilling permit for the pre-construction survey, an additional survey may be required after consultation with the BLM. If active nests are found, and in consultation with the BLM, an appropriately sized buffer would be established to exclude any disturbance around the nest until the nesting attempt has been completed. If active nests are not found, surface-disturbing activities would occur within the survey's validity time frame.

Measures to Protect Cultural Resources

Cultural resource surveys have been conducted. Any areas containing cultural resources eligible for inclusion on the National Register of Historic Places (NRHP) or any cultural resources where eligibility for inclusion on the NRHP is unevaluated would be mitigated, as appropriate. Employees, contractors, and suppliers would be instructed that all cultural resources are protected, and that if previously undiscovered resources are encountered, they will be left in place and reported to the responsible Ormat representative or their supervisor, or both.

Measures to Minimize Air Pollution

Ormat would comply with air quality requirements prescribed by the Washoe County Health District–Air Quality Management Division (WCHD–AQMD). Fugitive dust control measures include placing gravel on access roads and watering construction areas. Water would be applied to the ground during the construction and use of the drill pads, access roads, and other disturbed areas, as necessary to control dust. Ormat would obtain a dust control permit with the WCHD–AQMD and implement the required actions to minimize fugitive dust emissions.

Measures to Minimize Noise Pollution

Mufflers would be used on all drilling rig engines. Each well pad could also use one rock muffler, to attenuate steam venting noise during well testing.

Measures to Minimize Public Health and Safety Hazards

Ormat would conduct construction and operation in a manner to avoid creating any hazards to public health and safety. Ormat has prepared an injury contingency plan, a spill or discharge contingency plan, and a H₂S contingency plan. These are available in Section 3.8 of ORNI 26 LLC (2022) and are briefly summarized below.

The injury contingency plan includes measures such as requiring safety and first aid training, keeping first aid equipment on-site, and supervising work to ensure safety measures are followed. All drilling operations are required to be in compliance with all existing laws pertaining to safety and environmental protection.

The spill or discharge contingency plan outlines potential sources of accidental spills or discharges, including geothermal fluid, drilling muds, and lubricating or fuel oils and petroleum products. The plan also outlines actions for spill cleanup, abatement, and notification.

The H₂S contingency plan includes drilling control practices to minimize and avoid potential exposure pathways to non-condensable gases, measures to monitor H₂S during drilling, and blowout prevention measures to stop any unexpected releases.

2.1.8 Surface Reclamation

Once well drilling and testing are complete, liquids in the reserve pits would either evaporate or be removed. The solid contents remaining in each reserve pit, consisting of nonhazardous, nontoxic drilling mud and rock cuttings, would be tested to confirm they are not hazardous. Typical tests could include the Toxicity Characteristic Leaching Procedure (EPA Method 1311), testing for heavy metals, pH (EPA method 9045D), total petroleum hydrocarbons/diesel (EPA Method 8015B), and oil and grease (EPA Method 413.1). Ormat would bury nonhazardous and nontoxic drilling mud and cuttings in the reserve pit, and dispose of any drilling mud and cuttings identified as hazardous or toxic according to NDEP regulations.

The portions of the cleared well sites not needed for operational and safety purposes (that is, the well pad “shoulders”) would be recontoured to a final or intermediate contour that would blend with the surrounding topography as much as possible. Areas to be reclaimed would be ripped, tilled, or disked on contour, as necessary; stockpiled topsoil would be applied. A BLM-approved seed mixture would be applied.

If Ormat judges a well to have no commercial potential, it could continue to monitor the well for the duration of the project; or, the well could be plugged and abandoned in conformance with the well abandonment requirements of the BLM and NDOM. Abandonment typically involves filling the well bore with clean, heavy abandonment mud and cement, until the top of the cement is at ground level. The wellhead and other surface equipment would then be removed, the well casing would be cut off below the ground surface, and the hole would be backfilled to the ground surface. As described above, the surface would be reclaimed. Access roads to plugged and abandoned wells would then be reclaimed. Road reclamation would involve recontouring the roads back to the original contour and seeding with a BLM-approved seed mix.

2.2 ALTERNATIVE B: 3-MILE ACCESS POINT

Under Alternative B: 3-Mile Access Point, access to proposed well pads 71-3, 63-3, 66-3, and 58-3 would utilize the 3-Mile Access Point, an existing dirt road between Washoe County Road 34 (CR-34) and the Black Rock Desert playa. From the 3-Mile Access Point, a new access road on the Black Rock Desert playa would extend to the proposed well pads to the south. This is shown in **Figure A-4**, 3-Mile Access Point (Alternative B), in **Appendix A**. A portion of this access road, approximately 0.4 miles, would be outside the AOI, and as a result, outside the area surveyed for biological resources during baseline data collection (Ormat 2021).

This alternative would minimize the number of project ingress and egress points along CR-34. Minimizing the number of ingress and egress points would decrease the potential for traffic conflicts between project vehicles and recreationists, in turn reducing the potential for public health and safety issues. It would also minimize vegetation disturbance and the potential for soil erosion along the Black Rock Desert playa shoreline.

The length of new access road construction proposed under Alternative B would differ from that under Alternative A. Up to approximately 1.9 miles of new access roads would be constructed, which is an increase

of approximately 1 mile from Alternative A. The acres of proposed disturbance associated with the new access roads would also increase. Up to approximately 4.6 acres of disturbance from new access roads are proposed, which is an increase of 2.6 acres from Alternative A. The total proposed disturbance under Alternative B is summarized in the table below.

Table 2-4
Proposed Disturbance in the AOI, Alternative B

Project Component	Proposed Surface Disturbance (acres)	Proposed Surface Disturbance after Interim Reclamation (acres)
Well pads	42.0	21.0 ¹
New road construction	4.6	4.6
Existing road improvement	2.5	2.5
Aggregate pit expansion	5.0	5.0
Total	54.1	33.1

Sources: ORNI 26 LLC 2022; BLM GIS 2022

¹ Assumes half of each well pad would be reclaimed during interim reclamation; see **Section 2.1.8**, Surface Reclamation

Similarly, the amount of aggregate required to surface the new access roads would increase under Alternative B. Up to approximately 3,908 cubic yards of aggregate are proposed, which is an increase of 1,023 cubic yards from Alternative A.

2.3 ALTERNATIVE C: EXISTING WELL 68-3 ACCESS POINT

Under Alternative C: Existing Well 68-3 Access Point, project ingress and egress from CR-34 to proposed well pads 71-3, 63-3, 66-3, and 58-3 would use an existing dirt road between CR-34 and an existing geothermal exploration well pad (well 68-3). Existing well 68-3 is east of proposed well pad 58-3. From well pad 58-3, a new access road would extend to the three additional proposed well pads to the north. This is shown in **Figure A-5**, Existing Well 68-3 Access Point (Alternative C), in **Appendix A**.

As described for Alternative B: 3-Mile Access Point, this alternative would also minimize the number of project ingress and egress points along CR-34. This would decrease the potential for traffic conflicts and health and safety issues, vegetation removal, and soil erosion.

Under this alternative, up to approximately 1.4 miles of new access roads would be constructed, which is an increase of 0.5 miles from Alternative A. The acres of proposed disturbance associated with the new access roads would also increase. Up to approximately 3.4 acres of disturbance from new access roads are proposed, which is an increase of 1.4 acres from Alternative A. The total proposed disturbance under this alternative is summarized in the table below.

Table 2-5
Proposed Disturbance in the AOI, Alternative C

Project Component	Proposed Surface Disturbance (acres)	Proposed Surface Disturbance after Interim Reclamation (acres)
Well pads	42.0	21.0 ¹
New road construction	3.4	3.4
Existing road improvement	2.5	2.5
Aggregate pit expansion	5.0	5.0
Total	52.9	31.9

Sources: ORNI 26 LLC 2022; BLM GIS 2022

¹ Assumes half of each well pad would be reclaimed during interim reclamation; see **Section 2.1.8**, Surface Reclamation

Similarly, the amount of aggregate required to surface the new access roads would increase under this alternative. Up to approximately 3,428 cubic yards of aggregate are proposed, which is an increase of 546 cubic yards from Alternative A.

2.4 ACTION ALTERNATIVE SUMMARY

The amount of proposed surface disturbance under each action alternative is summarized in the table below. Under all action alternatives, surface reclamation would occur as described in **Section 2.1.8**.

Table 2-6
Proposed Disturbance Summary by Action Alternative

Project Component	Alternative A: Proposed Action Proposed Surface Disturbance	Alternative B: 3-Mile Access Point Proposed Surface Disturbance	Alternative C: Existing Well 68-3 Access Point Proposed Surface Disturbance
Well pads	42.0 acres	42.0 acres	42.0 acres
New road construction	0.9 miles (2.0 acres)	1.9 miles (4.6 acres)	1.4 miles (3.4 acres)
Existing road improvement	2.1 miles (2.5 acres)	2.1 miles (2.5 acres)	2.1 miles (2.5 acres)
Aggregate pit expansion	5.0 acres	5.0 acres	5.0 acres
Total	51.5 acres	54.1 acres	52.9 acres

Sources: ORNI 26 LLC 2022; Ormat GIS 2022

2.5 ALTERNATIVE D: NO-ACTION ALTERNATIVE

Under Alternative D, the no-action alternative, the BLM would not approve Ormat's application to construct, operate, and maintain up to 20 geothermal exploration wells and the associated facilities.

2.6 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED STUDY

No alternatives other than Alternative A, the proposed action; Alternative B, 3-Mile Access Point; Alternative C, Existing Well 68-3 Access Point, and Alternative D, the no-action alternative, were proposed during internal scoping.

During the 60-day pre-scoping period discussed in **Section 1.7**, a commenter suggested that Ormat should consider including a solar component, similar to the solar component at the Tungsten Mountain geothermal facility in Churchill County, Nevada (BLM 2021a). The electricity generated from the Tungsten Mountain solar component will be used to offset the geothermal facility's energy use and increase the renewable energy delivered by the project (Ormat 2019). This potential alternative was eliminated from detailed analysis because Ormat is no longer proposing a geothermal development project.

Further, the project is in an area that is not open for solar leasing and development, per the Winnemucca District RMP (as amended by the BLM's Approved Resource Management Plan Amendments and Record of Decision for Solar Energy Development in Six Southwestern States [BLM 2012]) and the Black Rock Desert-High Rock Canyon Emigrant Trails NCA and Associated Wilderness, and Other Contiguous Lands in Nevada Record of Decision and RMP (BLM 2004). Solar development in this area would require the BLM to grant a variance to the plans.

During the 30-day public scoping period, a commenter asked about alternative project locations, including moving the project east of Gerlach (BLM 2022a). This potential alternative was eliminated from detailed analysis because this location would be inconsistent with the known geothermal resource areas and federal geothermal leases held by Ormat in the AOI.

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Chapter 3

Affected Environment and Environmental Consequences

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Chapter 3. Affected Environment and Environmental Consequences

3.1 INTRODUCTION

This chapter describes the affected environment, which is the existing or baseline conditions relevant to each issue identified during scoping. Following the affected environment is a description of the direct and indirect effects relative to each issue; these effects are analyzed under Alternative A, the proposed action; Alternative B, 3-Mile Access Point; Alternative C, Existing Well 68-3 Access Road; and Alternative D, the no-action alternative. The cumulative effects of the alternatives are described following the analysis of the direct and indirect effects.

3.1.1 Supplemental Authorities and Resource Areas Considered

The CEQ regulations under 40 CFR 1500 and the BLM NEPA handbook require the BLM to identify significant issues for analysis and focus only on those issues. The BLM NEPA handbook defines an issue as “a point of disagreement, debate, or dispute with a proposed action based on some anticipated environmental effect” (BLM 2008, p. 40). In addition, an issue “has a cause and effect relationship with the proposed action and alternatives; is within the scope of analysis; has not [been] decided by law, regulation, or previous decision; and is amenable to scientific analysis rather than conjecture” (BLM 2008, p. 40).

The issues identified during scoping and carried forward for analysis include those elements of Alternatives A, the proposed action; Alternative B, 3-Mile Access Point; or Alternative C, Existing Well 68-3 Access Road that would cause or have the potential to cause significant environmental effects. This chapter provides an analysis of identified issues and the resources affected by those issues. **Table 3-1**, below, provides a summary of issues and affected resources. **Table 3-2** summarizes the resources not significantly affected under Alternatives A, B, or C.

Table 3-1
Supplemental Authorities and Resource Areas Analyzed by Issue

Issue Number	Issue Statement	Supplemental Authorities and Resources Analyzed
1	How would geothermal exploration affect greenhouse gas (GHG) emissions?	Greenhouse gas emissions and climate change
2	How would the presence of equipment, fencing, traffic, and personnel affect resources in the AOI?	Migratory birds;* recreation; special designations and visual resources, including night skies; wildlife (general and sensitive species); cultural resources (national historic trails)*
3	How would ambient noise levels change and what would be the effect on sensitive resources?	Migratory birds;* recreation; special designations and visual resources, including night skies; wildlife (general and sensitive species); cultural resources (national historic trails)*
4	How would geothermal exploration affect the geology, mineral rights, and water resources?	Geology and minerals; water resources (surface and ground);* migratory birds;* wildlife (general and sensitive species)
5	How would ground disturbance and vegetation removal affect resources in the AOI?	Migratory birds;* geology and minerals; soil resources; vegetation and invasive, nonnative species; wildlife (general and sensitive species); cultural resources (national historic trails);* special designations and visual resources, including night skies

*Indicates supplemental authority (BLM 2008)

Table 3-2
Resource Effects Determination and Rationale for Analysis

Supplemental Authority^a or Other Resource Area	Issue 1	Issue 2	Issue 3	Issue 4	Issue 5
Air Quality*	Present/Not Affected^b The action alternatives, which would result in vehicle and equipment use, construction of access roads and well pads, and drilling, would have the potential to generate particle pollution (dust), carbon monoxide, ozone, nitrogen dioxide, and sulfur dioxide. The EPA sets National Ambient Air Quality Standards (NAAQS; 40 CFR 50) for these criteria air pollutants. The NDEP Bureau of Air Pollution Control ensures compliance with the NAAQS. To avoid, minimize, and mitigate air quality impacts and ensure compliance with the NAAQS, Ormat would implement the applicant-committed environmental protection measures described in Section 2.1.7 to minimize fugitive dust emissions. These measures include placing gravel on access roads, watering construction areas, implementing speed limits on access roads, and obtaining and complying with a dust control permit from the WCHD–AQMD. Based on the temporary nature of activities and disturbance, along with Ormat’s compliance with the NAAQS and measures to minimize emissions, no effects on air quality are anticipated as a result of the action alternatives. The action alternatives also are not anticipated to be a substantial source of new odor.				
Cultural Resources*	Present/Not Affected Not applicable to this issue	Present/May be Affected Carried forward in Section 3.3.3	Present/May be Affected Carried forward in Section 3.3.4	Present/Not Affected Carried forward in Section 3.3.5	Present/May be Affected Carried forward in Section 3.3.6
Environmental Justice*	Present/Not Affected Changes in night sky conditions could have disproportionate effects on people and economies that rely on visitation from those seeking night sky viewing opportunities. New sources of artificial light at night (ALAN) ⁵ also have the potential to disproportionately affect populations living near the new ALAN source. The Night Sky Baseline Report (BLM 2022b) analyzed anticipated impacts from ALAN produced during exploration well drilling. As described in the baseline report, for both Washoe and Pershing Counties, the percentages of minority populations and low-income populations are below the statewide averages for Nevada. Evidence from simulated night sky conditions indicates that adverse impacts from proposed nighttime lighting during the drilling period would occur indiscriminately and nearly imperceptibly on area communities. It is unlikely that any measurable adverse effects would be experienced disproportionately by low-income and minority populations in the vicinity.				
Fish Habitat*	Present/Not Affected The nearest fish habitat is in streams in the Granite Basin north of the AOI, between approximately 7 miles and 16 miles north of the AOI. These include Granite Creek, Cottonwood Creek, Wagontire Creek, and Red Mountain Creek. These streams are considered to be potential habitat for the federally threatened Lahontan cutthroat trout (<i>Oncorhynchus clarkii henshawi</i>) (Ormat 2021, p. 17). A number of these streams support brook trout (<i>Salvelinus fontinalis</i>) (FishNV 2022). There is also Lahontan cutthroat trout, federally endangered cui-ui (<i>Chasmistes cujus</i>), and other sport fish habitat in Pyramid Lake, approximately 32 miles from the AOI. There is federally threatened desert dace (<i>Eremichthys acros</i>) habitat in the Soldier Meadows area of the NCA, approximately 47 miles north of the AOI. There is no hydrological connection between the AOI and streams in the Granite Basin, Pyramid Lake, or Soldier Meadows (Ormat 2021, p. 17). Because of this, there is no potential for the action alternatives to affect fish habitat in these areas.				

⁵ ALAN is any light source that is produced by electricity or other means for human activity. Wildfires, moonlight, and lightning are not considered to be ALAN.

Supplemental Authority ^a or Other Resource Area	Issue 1	Issue 2	Issue 3	Issue 4	Issue 5
Floodplains*	Not Present The AOI is located in Federal Emergency Management Agency Zone X, Area of Minimal Flood Hazard (FEMA 2009).				
Forests and Rangelands*	Not Present There are no US Forest Service-managed forests or rangelands in or near the AOI. The nearest US Forest Service-managed lands, in the Humboldt-Toiyabe National Forest, are over 30 miles from the AOI.				
Geology and Minerals	Present/Not Affected Not applicable to this issue	Present/Not Affected The presence of equipment, fencing, traffic, and personnel would not affect the geology, seismology, or minerals.	Present/Not Affected Changes in ambient noise levels would not affect the geology, seismology, or minerals.	Present/May be Affected Carried forward in Section 3.3.5	Present/Not Affected Ground disturbance and vegetation removal would not affect the geology, seismology, or minerals.
Geothermal Resources	Present/Not Affected As described in the Conceptual Hydrologic Model in the Hydrologic Evaluation (Stantec 2022a, Section 5.5), the target geothermal resource is likely partially fed by groundwater recharge from the adjacent Granite Range, which circulates to depth in fractured granite and is heated to temperatures as high as 356 to 392 degrees Fahrenheit (°F). Subvertical fractures allow the heated geothermal fluid to rapidly ascend into the shallow groundwater aquifer, which discharges at thermal springs in the AOI. The action alternatives are not anticipated to affect the geothermal resource, because geothermal utilization is not proposed. The volume of geothermal fluid produced during well flow tests is anticipated to be a minor component of the total reservoir. Spring discharges would be monitored to allow early detection of potential changes (Broadbent and Associates Inc. 2022). If water quality or quantity effects were detected, appropriate measures to mitigate effects, as determined by Ormat in coordination with the BLM Authorized Officer, would be implemented.				
Greenhouse Gas Emissions and Climate Change	Present/May be Affected Carried forward in Section 3.3.2 and Appendix E , Greenhouse Gas Emissions	Present/Not Affected Not applicable to this issue	Present/Not Affected Not applicable to this issue	Present/Not Affected Not applicable to this issue	Present/Not Affected Not applicable to this issue
Land Use and Infrastructure	Present/Not Affected There would be no changes in land uses or ownership. Constructing geothermal exploration wells, well pads, and access roads would increase the amount of infrastructure on BLM-administered lands, and could require the BLM to issue rights-of-way for access road construction. Project vehicles would access the AOI using State Route 447 (SR-447) and CR-34, resulting in potential road surface deterioration. Potential impacts on road surface condition would be addressed through normal maintenance performed by the NDOT or Washoe County, or both. The project would not affect the GGID's ability to provide sewer, sanitary, and water service in the community. This is because the project would use portable chemical sanitary facilities, and trash would be contained on-site and hauled to an approved landfill.				

Supplemental Authority ^a or Other Resource Area	Issue 1	Issue 2	Issue 3	Issue 4	Issue 5
Lands with Wilderness Characteristics	Present/Not Affected Not applicable to this issue	Present/May be Affected Carried forward in Section 3.3.3	Present/May be Affected Carried forward in Section 3.3.4	Present/Not Affected Not applicable to this issue	Present/May be Affected Carried forward in Section 3.3.6
Migratory Birds*	Present/Not Affected Not applicable to this issue	Present/May be Affected Carried forward in Section 3.3.3	Present/May be Affected Carried forward in Section 3.3.4	Present/May be Affected Carried forward in Section 3.3.5	Present/May be Affected Carried forward in Section 3.3.6
National Conservation Areas	Present/Not Affected The NCA Act of 2000 established the Black Rock Desert-High Rock Canyon Emigrant Trails NCA to conserve, protect, and enhance the historic, cultural, paleontological, scenic, scientific, biological, educational, wildlife, riparian, wilderness, endangered species, and recreational values and resources associated with the Applegate-Lassen and Nobles Trails corridors and surrounding areas. Per Section 7 of the NCA Act of 2000, the NCA border does not include an associated buffer zone. The southern border of the NCA is approximately 4 miles north of the AOI (see Figure A-9 , Special Designations). Given the distance between the AOI and the NCA boundary, and applicant-committed environmental protection measures (Section 2.1.7) and BLM-required stipulations (Table 3-11) to minimize and avoid effects on cultural resources, visual resources, and recreation values, there would be minimal if any effects on NCA values.				
Native American Religious Concerns*	Not Present Native American religious concerns have not been identified to date. Additional information can be found in Section 4.1.1 , Government-to-Government Consultation.				
Noise	Present/Not Affected Not applicable to this issue	Present/Not Affected Not applicable to this issue	Present/May be Affected Carried forward in Section 3.3.4	Present/Not Affected Not applicable to this issue	Present/Not Affected Not applicable to this issue
Paleontological Resources	Not Present The AOI is composed of areas of potential fossil yield classification 1 and 2 (BLM GIS 2022). Classification and recommended management actions for each class are described in the BLM Instruction Memorandum 2016-124. ⁶ In summary, management concerns are generally nonexistent to low in these classes, and further assessment and mitigation are usually unnecessary.				
Prime or Unique Farmlands	Present/Not Affected Approximately 46 acres (2 percent) of the AOI, the Mazuma-Swangler association soil map unit, is classified as prime farmland, if it is irrigated and reclaimed of excess salts and sodium (Web Soil Survey 2020). Further, approximately 670 acres (25 percent) of the AOI, the Veta-Langston association soil map unit, is classified as farmland of statewide importance, if irrigated (Web Soil Survey 2020). No agricultural activities occur in this area. In areas occupied by well pads and access roads, the action alternatives would cause conversion to non-farmland. In general, the action alternatives would be compatible with agriculture uses and would not reduce opportunities to implement agricultural practices on the remaining prime farmlands, in areas not occupied by well pads and access roads.				

⁶ Internet website: <https://www.blm.gov/policy/im-2016-124>.

Supplemental Authority ^a or Other Resource Area	Issue 1	Issue 2	Issue 3	Issue 4	Issue 5
Public Health and Safety	<p>Present/Not Affected Valley fever (coccidioidomycosis) is an infection caused by breathing in spores of the fungus <i>Coccidioides</i> (CDC 2020). The fungus is known to live in soils in the Black Rock Desert-High Rock Canyon Emigrant Trails NCA, including the Black Rock Desert playa (BLM 2019c). The Black Rock Desert playa also contains alkaline gypsum and silica dust that can become airborne in high concentrations during high wind conditions (Adams and Sada 2010). Exposure to alkaline gypsum dust with a silica component is regulated by the Occupational Safety and Health Administration as a known carcinogen. Project workers may be temporarily exposed to these risk factors during surface-disturbing activities on the playa, especially during high winds. However, the temporary nature of potential exposure, lasting the duration of construction, would limit the overall risk.</p> <p>H₂S is a colorless gas with a strong odor of rotten eggs that can be hazardous to humans at certain exposure levels (NIOSH 2019). H₂S concentrations are likely low enough in the target geothermal system that abatement measures are not needed (ORNI 26 LLC 2022). Nonetheless, Ormat has prepared a H₂S contingency plan (ORNI 26 LLC 2022, p. 15) that outlines standard procedures that would be followed during drilling to minimize risk of exposure, including discharging steam and gases well above head level, continuous H₂S monitoring, and signage. There are no known sources of elevated naturally occurring radioactive materials in the AOI, such as young marine shales or potassium-rich granitic geology (ORNI 26 LLC 2022, p. 15).</p> <p>Finally, Ormat has prepared an injury contingency plan (ORNI 26 LLC 2022, p. 15) that requires drilling operators to safety train workers and to have first aid equipment on-site. Drilling operations would comply with all existing safety and environmental laws.</p>				
Range	<p>Present/Not Affected Portions of the AOI are in the Rodeo Creek and Buffalo Hills grazing allotments (BLM 2015c, p. 3-120), which are authorized for cattle grazing. Therefore, active cattle grazing may occur in the AOI. Cattle trailing may also occur in the AOI with herds moved between the allotments in the spring and fall. Construction of the geothermal exploration wells and access roads would displace livestock from construction areas. The amount of displacement would account for less than 1 percent of the land area in the allotments and would have a negligible effect on grazing opportunities. Sheep trailing also occurs in the AOI. See the discussion in Section 3.2.4, Wildlife, under Big Game, for more information.</p>				
Recreation	Present/Not Affected Not applicable to this issue	Present/May be Affected Carried forward in Section 3.3.3	Present/May be Affected Carried forward in Section 3.3.4	Present/May be Affected Carried forward in Section 3.3.5	Present/Not Affected Not applicable to this issue
Socioeconomics	<p>Present/Not Affected Gerlach is a known astrotourism destination, attracting visitors from outside the region. The Night Sky Baseline Report (BLM 2022b) analyzes anticipated impacts on astrotourism from ALAN produced during exploration well drilling. Anticipated astrotourism impacts from the project would be negligible. Under a worst-case scenario, which assumes 1.5 times the amount of expected lighting would be produced, the radiance of the drill rig would increase to about the same level as the baseline observed radiance of Gerlach (BLM 2022b, Section 3.3.1). The modeled changes in sky glow would be observable to those engaged in astrotourism; however, it would be highly unlikely that the changes would be of a magnitude to discourage astrotourism in the region or displace visitors engaged in the activity. Further, impacts would be temporary in nature, lasting for the duration of drilling. Construction would likely result in short-term, induced economic effects in Gerlach, including from purchasing rental accommodations for workers (should they stay in Gerlach), groceries, and other items. This effect would be temporary, lasting the duration of construction.</p>				

Supplemental Authority^a or Other Resource Area	Issue 1	Issue 2	Issue 3	Issue 4	Issue 5
Soil Resources	Present/Not Affected Not applicable to this issue	Present/Not Affected The presence of equipment, fencing, traffic, and personnel would not affect soil resources.	Present/Not Affected Changes in ambient noise levels would not affect soil resources.	Present/Not Affected Not applicable to this issue	Present/May be Affected Carried forward in Section 3.3.6
Traffic and Transportation	Present/Not Affected SR-447 and CR-34 are the primary access routes used by Burning Man Event participants (BLM 2019b). A traffic analysis conducted in preparation of the Burning Man Event Special Recreation Permit Environmental Impact Statement (EIS) found that traffic volume on these roads was highest on the first and last day of the event, with a corresponding level of service ⁷ rating of C or better in the AOI vicinity (Solaegui Engineers 2018). Should construction overlap with the event, given the volume of event traffic, the addition of relatively few construction-related vehicles is not anticipated to meaningfully contribute to a lowered level of service on SR-447 and CR-34.				
Vegetation and Invasive, Nonnative Species	Present/Not Affected Not applicable to this issue	Present/May be Affected Carried forward in Section 3.3.3	Present/Not Affected Changes in ambient noise levels would not affect vegetation and invasive, nonnative species.	Present/Not Affected Not applicable to this issue	Present/May be Affected Carried forward in Section 3.3.6
Visual Resources, Including Night Sky	Present/Not Affected Not applicable to this issue	Present/May be Affected Carried forward in Section 3.3.3	Present/Not Affected Changes in ambient noise levels would not affect visual or night sky resources.	Present/Not Affected Not applicable to this issue	Present/May be Affected Carried forward in Section 3.3.6
Wastes, Hazardous or Solid*	Not Present The project would not use or generate hazardous wastes, and no hazardous wastes or hazardous materials are known to occur in or near the project area. As outlined in the applicant-committed environmental protection measures (Section 2.1.7), portable chemical sanitary facilities would be available and maintained by a local contractor. As outlined in Ormat's spill or discharge contingency plan (ORNI 26 LLC 2022, p. 13), trash would be contained on-site and hauled to an approved landfill.				

⁷ The level of service describes the operational status of a roadway network. An intersection or roadway segment's level of service can range from an "A," which indicates free-flowing traffic conditions with little or no delay, to "F," which indicates oversaturated conditions where traffic flows exceed design capacity, resulting in delays and a higher probability for vehicle crashes. The NDOT strives to maintain ratings of D or better on all of its roadways (Solaegui Engineers 2018).

Supplemental Authority ^a or Other Resource Area	Issue 1	Issue 2	Issue 3	Issue 4	Issue 5
Water Resources—Surface and Ground*	Present/Not Affected Not applicable to this issue	Present/Not Affected Presence of equipment, fencing, traffic, and personnel would not affect water resources.	Present/Not Affected Changes in ambient noise levels would not affect water resources.	Present/May be Affected Carried forward in Section 3.3.5	Present/May be Affected Carried forward in Section 3.3.6
Wetlands—Riparian Zones*	Present/Not Affected Not applicable to this issue	Present/Not Affected The presence of equipment, fencing, traffic, and personnel would not affect wetlands or riparian zones.	Present/Not Affected Changes in ambient noise levels would not affect wetlands or riparian zones.	Present/May be Affected Carried forward in Section 3.3.5	Present/May be Affected Carried forward in Section 3.3.6
Wild and Scenic Rivers*	Not Present The nearest wild and scenic river, the Feather River in Lassen and Plumas Counties, California, is over 50 miles from the AOI and outside of the Great Basin region.				
Wild Horses and Burros	Present/Not Affected The northern portion of the AOI is within 2 miles of the 103,800-acre Granite Range Herd Management Area (HMA). As of March 2022, there were an estimated 196 wild horses in the HMA, which is within the appropriate management level of 155 to 258 horses, as outlined in Table 3-19 of the Winnemucca District Proposed RMP/Final EIS (BLM 2015c, p. 3-83). Typical wild horse and burro management strategies within HMAs are outlined in the Proposed RMP/Final EIS (BLM 2015c, p. 3-80). Noise and activity during well pad and access road construction in the AOI could temporarily displace animals or restrict animal movement for the duration of construction; however, this would be limited to the portion of the HMA nearest the AOI. This effect would not be expected to occur in the remainder of the HMA. The project would not remove rangeland and forage areas for wild horses and burros in the HMA.				
Wilderness*	Present/Not Affected The southern boundary of the Calico Mountains Wilderness is approximately 15 miles north of the AOI (Figure A-9 , Special Designations). Applicant-committed environmental protection measures for fugitive dust control (Section 2.1.7) would limit dust generated during construction; as such, dust is not anticipated to be visible from the wilderness. Similarly, given the distance from the AOI to the edge of the Calico Mountains Wilderness and the presence of existing ALAN and sky glow from Gerlach and Empire, changes to wilderness character from ALAN generated during drilling would likely be imperceptible (BLM 2022b, p. 3-4). Public access to the wilderness on CR-34 would not be affected. The project would not affect wilderness character or public use of designated wilderness areas.				

Supplemental Authority ^a or Other Resource Area	Issue 1	Issue 2	Issue 3	Issue 4	Issue 5
Wilderness Study Areas	Present/Not Affected There are two wilderness study areas (WSAs) near the AOI (Figure A-9 , Special Designations). The Selenite Mountains WSA (NV020-200) is in the northern portion of the Selenite Range, east of SR-447 and the Black Rock Desert playa. The western border of the WSA is approximately 2 miles east of the AOI. The Fox Range WSA (NV020-014) is southeast of the AOI in the Fox Range. The northern end of this WSA is approximately 2 miles south of the AOI. Construction activity and vehicles could generate dust and ALAN that would be visible from the WSAs. Visible dust and ALAN would temporarily diminish the naturalness character of the WSAs. These impacts would last only for the duration of construction. Also, they are expected to be minor due to applicant-committed environmental protection measures (Section 2.1.7) for fugitive dust control and project design features that minimize construction lighting visibility from surrounding areas, such as using downward-facing lighting and only lighting the immediate work area. During well drilling, ALAN, radiance, and sky glow (see BLM 2022b, Section 3.2) would be noticeable to observers located along the western ridge of the Selenite Mountains in the Selenite Mountains WSA. However, due to the distance between the WSA and proposed drilling locations, and because wilderness characteristics are influenced by the existing ALAN from Gerlach and Empire, it is unlikely that the modeled changes in ALAN, radiance, and sky glow would change the existing wilderness character (BLM 2022b, p. 3-4). Effects would likely be similar for the Fox Range WSA.				
Wildlife (General and Sensitive Species)	Present/Not Affected Not applicable to this issue	Present/May be Affected Carried forward in Section 3.3.3	Present/May be Affected Carried forward in Section 3.3.4	Present/May be Affected Carried forward in Section 3.3.5	Present/May be Affected Carried forward in Section 3.3.6
Wildlife (Threatened or Endangered Species)*	Not Present No threatened, endangered, or proposed species or designated or proposed critical habitat are present in or near the AOI (Ormat 2021, p. 17). Therefore, the project would not affect them. The monarch butterfly (<i>Danaus plexippus plexippus</i>) became a candidate for listing in December 2020; it is not currently listed or proposed for listing under the ESA. The monarch butterfly is analyzed in <i>Wildlife (General and Sensitive Species)</i> .				

^a See BLM Handbook H-1790-1 (BLM 2008), Appendix I, Supplemental Authorities to be Considered.

^b Supplemental authorities that are determined to be not present or present/not affected need not be carried forward or discussed further in the document.

^c Supplemental authorities that are determined to be present/may be affected must be carried forward in the document.

*Indicates supplemental authority

3.2 AFFECTED ENVIRONMENT

3.2.1 Water Resources

For the purpose of inventorying hydrologic features in the vicinity of the AOI, a hydrologic evaluation study area (study area) was designated. The study area encompasses a 5-mile buffer around the AOI, which is reasonably beyond any potential zone of influence. The hydrologic conditions in the study area are described in detail in the Hydrologic Evaluation (Stantec 2022a) and the supplemental memorandum, Gerlach Hydrologic Evaluation – Response to US Geological Survey (USGS) Comments (Stantec 2022b). Brief summaries of existing hydrologic conditions, including hydrologic units and hydrographic basins, climate, surface water features, groundwater conditions, water rights, and jurisdictional waters, are included below. These topics are described in greater detail in the Hydrologic Evaluation (Stantec 2022a).

Additional information on groundwater resources in the study area, including long-term trends in groundwater levels, potentiometric surface, well yield, hydraulic transmissivity, and water quality parameters, are not summarized below; instead, they are described in detail in the Hydrologic Evaluation (Stantec 2022a).

Hydrologic Units and Hydrographic Basins

The AOI is in the Great Basin, which is divided into progressively smaller hydrologic units. These units have unique Hydrologic Unit Codes (HUCs), defined by the US Geological Survey (USGS). The AOI is in the Black Rock Desert (160402) HUC-6 Accounting Unit, and in portions of two HUC-8 Accounting Units: the Lower Quinn (16040202) and Smoke Creek Desert (16040203) (see Table 1 and Figure 2 of Stantec 2022a).

The basins of the Great Basin have also been divided into numbered and named administrative groundwater basins used by the USGS and the NDWR. The AOI is in the San Emidio Desert (hydrographic basin 022) and the Black Rock Desert (hydrographic basin 028). Within 5 miles of the AOI, there are the Smoke Creek Desert (hydrographic basin 021), Granite Basin (hydrographic basin 023), and Hualapai Flat (hydrographic basin 024) (see Figure 3 of Stantec 2022a).

Climate

The Gerlach weather station⁸ (USC00263090) is approximately 0.5 miles southeast of the AOI at an elevation of 3,954 feet above mean sea level (AMSL), which is similar in elevation to the AOI. Average minimum monthly temperatures are between approximately 22 and 60°F; average maximum temperatures range between approximately 41 and 93°F.

Annual total precipitation (rainfall, snowmelt, etc.) averages 7.70 inches and generally occurs throughout the year; however, the monthly totals are lower (less than 0.5 inches) in July through October. The average annual snowfall totals 9.9 inches with snowfall occurring November through April (see Table 2 in Stantec 2022a). Nearby mountain ranges, including the Granite Range, Selenite Range, and Fox Range, receive higher precipitation; the highest parts of the Granite Range (8,974 feet AMSL at Granite Peak) have documented over 20 inches of annual precipitation.

⁸ Weather has been monitored and recorded at the Gerlach weather station since 1948, though the station did not operate from February 1951 to May 1962 and from September 1973 to August 1985. It has not been operational since May 2019.

Surface Water

Wetlands

The AOI includes approximately 436 acres of wetlands (16 percent of the AOI), as mapped by the USFWS National Wetlands Inventory Wetlands Mapper⁹ (USFWS 2021). Of this total, approximately 197 acres are classified as lakes (that is, the Black Rock Desert playa), 127 acres are freshwater emergent wetlands, 40 acres are freshwater ponds, 39 acres are freshwater forested/shrub wetland, and 33 acres are riverine features (see Table 3 and Figure 4 of Stantec 2022a). Generally, these areas correspond to the following ground-truthed Southwest Regional Gap Analysis Project (SWReGAP) land cover types: Intermountain Basins Playa, Western Great Plains Saline Depression Wetland, Great Basin Foothill and Lower Montane Riparian Woodland and Shrubland, and North American Arid West Emergent Marsh. These are discussed in **Section 3.2.3, Vegetation**.

The actual extent of wetlands in the AOI is likely less than indicated by the USFWS National Wetlands Inventory Mapper and ground-truthed SWReGAP land cover types. Ormat completed an aquatic resources delineation report to refine the boundaries of aquatic resources in the AOI (McGinley & Associates 2021). According to the delineation, approximately 15.87 acres of aquatic resources were delineated. Findings in the report suggest that all wetland features identified are isolated, intrastate non-navigable, and nonregulated wetlands under the Clean Water Act (CWA). Ormat has requested concurrence from the US Army Corps of Engineers (USACE) on the report's findings.

Springs

The location and details of springs and seeps (collectively referred to as “springs”) in the study area were derived from the USGS National Water Information System, the USGS National Hydrography Dataset, the Great Basin Groundwater Geochemical Database, and by field sampling conducted by Ormat in August 2019 and by Stantec Consulting Services Inc. (Stantec) starting in March 2020 and continuing quarterly to the present date.

Springs in the AOI include Great Boiling Spring, Ditch Spring, Horse (Corral) Spring, Mud Spring, and three unnamed springs (see Figure 5 in Stantec 2022a). In the larger study area, there are approximately 50 mapped springs. Because springs are present in clusters and have multiple outlets, the reported number of springs is an estimate. The location, flow, and temperature data for springs in the study area are summarized in Table 4 of Stantec (2022a).

Groundwater

Recharge, Discharge, and Basin Interflow

Recharge rates for the hydrologic basins intersecting the study area are summarized in **Table 3-3**. The methods for estimating recharge rates are described in the Hydrologic Evaluation (Section 5.2.2 in Stantec 2022a).

Recharge is likely higher in the mountainous areas and mountain fronts due to higher rainfall and less evapotranspiration. Bedrock in mountains is typically less permeable than alluvium in the valleys and may lead to runoff and mountain front recharge.

⁹ The mapper shows the wetland type and extent using a biological definition of wetlands. There is no attempt to define the limits of proprietary jurisdiction of any federal, state, or local government, or to establish the geographical scope of the regulatory programs of government agencies. Further, the mapper shows reconnaissance-level information on the location, type, and size of these resources. Wetlands are identified based on vegetation, visible hydrology, and geography from an analysis of high-altitude imagery, not detailed on-the-ground inspection. Additional information can be found on the mapper's data limitations, exclusions, and precautions page at <https://www.fws.gov/node/264582>.

Table 3-3
Hydrographic Basin Recharge Estimates

Basin and Size (acres)	Maxey-Eakin Recharge (acre-feet per year and inches per year)	Basin Characterization Model Recharge (acre-feet per year and inches per year)
021 Smoke Creek Desert (707,137)	13,000 and 0.22	16,428 and 0.28
022 San Emidio Desert (194,846)	2,100 and 0.13	4,858 and 0.30
023 Granite Basin (6,982)	2,000 and 3.44	154 and 0.26
028 Black Rock Desert (1,404,835)	13,900 and 0.12	5,847 and 0.05

Source: Table 7 in Stantec 2022a

Groundwater discharge occurs at springs and seeps located in and at the margins on mountain ranges and in the valleys of the San Emidio, Black Rock, and Smoke Creek Deserts hydrographic basins. Groundwater discharge may also occur where the water table is near or above the ground surface. In these locations, discharge occurs through evaporation from the bare ground and evapotranspiration from vegetation in springs and wetlands.

Groundwater discharge through well withdrawals in the Smoke Creek Desert, San Emidio Desert, Granite Basin, and Black Rock Desert hydrographic basins was last compiled for the year 2017 (see Figure 11 in Stantec [2022] for well locations in these basins). **Table 3-4** summarizes this information.

Groundwater flow paths are largely contained within individual hydrographic basins, though topographic gradients and transmissive pathways between basins may result in interbasin flow. Estimated interbasin flows are summarized in **Table 3-5**.

Table 3-4
Hydrographic Basin Well Withdrawals, 2017

Basin and Size (acres)	Total (acre-feet)	Use (percent)
021 Smoke Creek Desert (707,137)	1,049	Irrigation (47), Wildlife (43), Stock (8), Domestic (1), Commercial (1)
022 San Emidio Desert (194,846)	4,841	Irrigation (80), Industry (18), Quasi-municipal (2), Domestic (<1)
023 Granite Basin (6,982)	0	—
028 Black Rock Desert (1,404,835)	7,835	Irrigation (98), Mining and milling (2), Stock, domestic, quasi-municipal (<1)

Source: Section 5.2.2.2 in Stantec 2022a

Table 3-5
Interbasin Flows

Basin and Size (acres)	Total (acre-feet per year)¹	Contributing or Receiving Basin
021 Smoke Creek Desert (707,137)	+5,680	San Emidio Desert, Dry Valley, Honey Lake Valley
022 San Emidio Desert (194,846)	-300	Smoke Creek Desert, Black Rock Desert
023 Granite Basin (6,982)	0	—
028 Black Rock Desert (1,404,835)	+3,860	Pine Forest Valley, San Emidio Desert, Hualapai Flat, Desert Valley

Source: Section 5.2.2.3 in Stantec 2022a

¹ A plus symbol (+) indicates flow to the basin, while a minus symbol (-) indicates flow from the basin.

Perennial Yield

The NDWR has adopted perennial yield estimates to manage groundwater resources and to reasonably limit the lowering of groundwater elevation. **Table 3-6** summarizes the adopted perennial yields, which are estimated from recharge, discharge, and interbasin flows.

Table 3-6
Perennial Yields

Basin and Size (acres)	Perennial Yield (acre-feet per year)
021 Smoke Creek Desert (707,137)	16,000
022 San Emidio Desert (194,846)	4,600
023 Granite Basin (6,982)	200
028 Black Rock Desert (1,404,835)	30,000

Source: Section 5.2.2.4 in Stantec 2022a

Water Quality

Water quality samples have been collected from springs and wells in the AOI and wider region (see Stantec 2022a, Section 5.4, and Table 9; spring and well locations are shown on Figures 5 and 7 in Stantec 2022, respectively). These include sites within and near the AOI, such as Great Boiling Spring, Ditch Spring, Mud Spring, Horse (or Corral) Spring, several cold and geothermal wells, a geothermal exploration borehole, and the GGID hot pool well and community center well. Water from geothermal sources near the AOI has sodium chloride-type water, whereas water samples from cold wells have higher ratios of bicarbonate relative to chloride. Furthermore, water from hot springs and hot wells shows little to no mixing with non-geothermal groundwater, as indicated by magnesium concentrations.¹⁰ Past studies have concluded that mixing between geothermal and cool groundwater in the system probably is not significant (Stantec 2022a, p. 29).

Conceptual Hydrologic Model

As described in the Hydrologic Evaluation (Stantec 2022a, p. 32), the AOI is located at the base of the Granite Range at the boundary between the San Emidio, Smoke Creek, and Black Rock Desert hydrographic basins. Recharge to the groundwater system is likely primarily within the Granite Range and at the mountain block front. Groundwater flows from the fractured rock aquifers of the Granite Range into alluvial aquifers located in the valleys. The coarser alluvium deposits at the Granite Range's base likely also serve as transmissive aquifers, which are locally pumped for irrigation and livestock watering. Unconsumed groundwater flows west and southeast. It discharges at geothermal and cold springs, or continues to the playa zones of the basins where it may be lost to evapotranspiration. Regional groundwater elevations have decreased within the last decades, which may be localized and attributed to withdrawals for irrigation.

The geothermal system at the AOI likely begins with a portion of recharge to the Granite Range that circulates to a depth within the fractured granite bedrock, where heats to temperatures that may be as high as 356°F to 392°F. Subvertical, permeable faults in granite at depth allow the rapid ascent of geothermal fluids into a shallow aquifer.

The bedrock near the AOI generally has low permeability unless it is heavily fractured through seismic activity over geological time. Permeability in the AOI is likely enhanced by three structural features: (1) the intersection of two sets of normal faults that bound the Granite Range on the western and eastern flanks; (2) the southward termination of these fault zones, which likely result in main faults horse-tailing into smaller,

¹⁰ Cool groundwater contains magnesium from water-rock interactions. Due to the lower solubility of carbonate and sulfate minerals at high temperatures, magnesium concentrations are lower in geothermal fluids. The presence of magnesium in geothermal fluids can indicate mixing with non-geothermal groundwater (Stantec 2022a, p. 29).

permeable fractures zones; and (3) local complex structures that result from the former two regional features. Groundwater in the shallow aquifer discharges to Great Boiling Spring, Mud Spring, Ditch Spring, or Horse Spring, or it outflows to the southeast where it progressively cools.

Water Rights

A total of 30 water rights associated with points of diversion (PODs) or places of use (POUs) were identified within the study area; these are summarized in the hydrologic evaluation (see Table 5 and Figure 10 in Stantec 2022a). The PODs are categorized as irrigation (seven), municipal (six), livestock (five), wildlife (three), and commercial (one). Sources for these water rights include well/underground (13), spring (six), and stream (three). The statuses of all municipal water rights are listed as ready for action (protested), while the irrigation, livestock, and wildlife water rights are listed as certificate, vested right, permit, or reserved.

While the community of Gerlach is located immediately southeast of the AOI, water for the community is sourced from beyond the study area; it is supplied by the GGID. Water rights owned by the GGID are associated with PODs Granite Spring and Garden Springs, which are located on the western margin of the Granite Mountains. Granite Spring is located just beyond the study area (5 miles northwest from the AOI). Garden Springs is located 7.8 miles northwest of the AOI. The associated POU for these water rights corresponds with Gerlach in portions of T. 32N., R. 23E., Sections 14, 15, and 22; some of these overlap the AOI (see Figure 10 in Stantec 2022a).

Jurisdictional Water

The surface water features described above may be considered jurisdictional Wetlands and Other Waters of the US by the USACE. This potentially places them under USACE jurisdiction under Section 404 of the CWA. Ormat is coordinating with the USACE to determine the jurisdictional status of these features. Ormat would obtain a Section 404 permit if the project could impact jurisdictional Wetlands and Other Waters of the US.

3.2.2 Geology and Minerals

Geology

Geological conditions are described in detail in the Hydrologic Evaluation (Stantec 2022a). The evaluation uses the same study area described in **Section 3.2.1, Water Resources**. Brief summaries of the regional geological setting and local surface and subsurface geology are included below. Additional information on the resources in the study area, including existing surface geophysical survey results, are described in detail in the Hydrologic Evaluation (Stantec 2022a).

The study area is located in the Basin and Range physiographic province, which is characterized by north- or northwest-trending mountain ranges, which are fault-bounded against adjacent basins. Valley-bounding faults that generally trend north to south have been mapped in the region (see Figure 6 in Stantec 2022a).

Surface geology in the AOI is dominated by granitic, volcanogenic-sedimentary, and sedimentary rocks in the Granite Range and Quaternary alluvial, eolian, and lacustrine deposits in topographically low areas (see Figure 6 in Stantec 2022a). Granitic formations are Cretaceous in age and include biotite-hornblende granite, brecciated granite, and highly weathered granite along the Granite Range front. The volcanogenic-sedimentary unit is Tertiary (late to middle Miocene) in age and includes tuffaceous sediments, volcanoclastic sandstone, tephra, and granitic conglomerates and sandstones. Quaternary sediments include Lake Lahontan lacustrine deposits, Holocene alluvial fans deposits, playa deposits, and playa margin deposits.

North–northeast-trending Basin and Range faults bound the Granite Range on the eastern margin. A series of northwest-trending faults have also been identified or inferred near the southern terminus of the Granite Range (see Figure 6 in Stantec 2022a).

Hydrothermal deposits have been mapped in the AOI; siliceous sinter is present near Great Boiling Springs and Mud Springs. Altered granodiorite, containing silica fill along fault zones, is present between Great Boiling Spring and the Granite Range.

Subsurface geology is available from several exploratory boreholes drilled near and within the AOI, several well logs from across the study area, and data from Ormat's exploration drilling database. In general, encountered lithologies include playa deposits, alluvium, granodiorite, and minor breccia. Exploration boreholes drilled into valley fill encountered up to 3,270 feet of alluvium before encountering the granodiorite basement.

Seismicity

The University of Nevada, Reno (UNR) Seismological Laboratory maintains a record of recent regional seismological events (Nevada Seismological Laboratory 2022). Also, historical data are cataloged in a searchable database by the USGS (USGS 2022).

In 2016, the UNR Seismological Laboratory reported a magnitude 3.9 earthquake located near the communities of Gerlach and Empire. This was the largest of just over 300 earthquakes detected in the area between April and May of that year, including four events between magnitude 3.0 and 3.9, and 28 events between magnitude 2.0 to 2.9 (Nevada Today 2016). Since 2016, there have been 38 earthquakes between magnitude 2.0 to 2.9 detected in the vicinity of the AOI; none have measured larger than magnitude 2.9 (USGS 2022).

Minerals

The BLM manages the surface and subsurface of federal lands under its jurisdiction. In some cases, it has administrative duties for mineral activities on lands managed by other federal agencies or on private split-estate lands. Split-estate lands are those where surface land rights and subsurface mineral rights have been severed from each other and are held by different owners (BLM 2015a). All federal lands in the Winnemucca District, including those in the AOI, are open to geothermal leasing and development, with the exception of administratively closed areas, such as the Black Rock-High Rock Canyon Emigrant Trails NCA, designated wilderness areas, and WSAs (BLM 2015c, p. 3-128). The open-to-leasing designation includes split-estate lands (BLM and Forest Service 2008), which include the lands in the AOI under private surface ownership.

3.2.3 Vegetation

General Vegetation Communities

As described in the Biological Resources Baseline Report (Ormat 2021), there are 11 SWReGAP land cover types in the AOI. **Table 3-7** summarizes the acres and provides a brief description of each type. A map of land cover types and representative photographs of the land cover types are in the Biological Resources Baseline Report (Ormat 2021).

Table 3-7
Vegetation

Cover Type	Description	Acres ¹
Intermountain Basins Mixed Salt Desert Scrub	Open-canopied shrublands of typically saline basins, alluvial slopes, and plains. Vegetation composed of one or more <i>Atriplex</i> species, such as shadscale or fourwing saltbush. Other shrubs present to co-dominate may include Wyoming big sagebrush (<i>Artemisia tridentata</i> ssp. <i>wyomingensis</i>), yellow rabbitbrush (<i>Chrysothamnus viscidiflorus</i>), rubber rabbitbrush (<i>Ericameria nauseosa</i>), and others.	1,005

Cover Type	Description	Acres ¹
Intermountain Basins Greasewood Flat	Occurs near drainages on stream terraces and flats and around sparsely vegetated playas. Soils are saline, with a shallow water table, and flood intermittently. This land cover type is open to moderately dense shrublands dominated or co-dominated by black greasewood (<i>Sarcobatus vermiculatus</i>), fourwing saltbush (<i>Atriplex canescens</i>), or shadscale (<i>Atriplex confertifolia</i>).	679
Intermountain Basins Big Sagebrush Shrubland	Occurs in broad basins between mountain ranges, plains, and foothills. Soils are typically deep, well drained, and non-saline. These shrublands are dominated by big sagebrush.	390
Western Great Plains Saline Depression Wetland	Salt-tolerant species typify this system, including saltgrass (<i>Distichlis spicata</i>) and foxtail barley (<i>Hordeum jubatum</i>). During very wet years, an increase in precipitation can dilute the salt concentration in the soils of some examples of this system; this may allow for less salt-tolerant species to occur.	322
Intermountain Basins Playa	Barren and sparsely vegetated playas with generally less than 10 percent plant cover. Salt crusts are common, with small saltgrass beds in depressions and sparse shrubs around the margins. These systems are intermittently flooded.	208
Intermountain Basins Cliff and Canyon	Includes barren and sparsely vegetated landscapes, with generally less than 10 percent cover. It comprises steep cliff faces, narrow canyons, and smaller rock outcrops of various rock types, as well as sparse vegetation of unstable scree and talus slopes that typically occur below cliff faces.	44
Recently Mined or Quarried	Areas where mining or quarries are visible in the imagery and are 5 acres or greater in size.	41
Intermountain Basins Semi-Desert Shrub Steppe	Occurs at lower elevations on alluvial fans and flats with moderate to deep soils, where ground cover is dominated by grasses and an open shrub canopy exists. Characteristic grasses are Indian ricegrass (<i>Achnatherum hymenoides</i>), blue grama (<i>Bouteloua gracilis</i>), and needle-and-thread grass (<i>Hesperostipa comata</i>), among others. Characteristic species of the woody canopy are saltbushes (<i>Atriplex</i> spp.), rabbitbrushes, and ephedra (<i>Ephedra</i> spp.). Big sagebrush (<i>Artemisia tridentata</i>) may be present but does not dominate.	26
Great Basin Pinyon- Juniper Woodland	Occurs on dry mountain ranges of the Great Basin region. Woodlands are dominated by a mix of single-leaf pinyon pine (<i>Pinus monophylla</i>) and Utah juniper (<i>Juniperus osteosperma</i>), or pure or nearly pure stands of either species. In the AOI, stands are of Utah juniper. Understory layers are variable.	4
Great Basin Foothill and Lower Montane Riparian Woodland and Shrubland	Often occurs as a mosaic of multiple communities that are tree dominated with a diverse shrub component. The variety of plant associations connected to this system reflects the elevation, stream gradient, floodplain width, and flooding events. In the AOI, this community is made mostly of invasive shrubs, including Russian olive (<i>Elaeagnus angustifolia</i>) and saltcedar (<i>Tamarix ramosissima</i>). Fremont cottonwood (<i>Populus fremontii</i>) is also present in limited locations.	3
North American Arid West Emergent Marsh	Occurs throughout much of the arid and semiarid regions of western North America, typically surrounded by savanna, shrub steppe, steppe, or desert vegetation. Natural marshes may occur in depressions in the landscape, as fringes around lakes, and along slow-flowing streams and spring outflows. The vegetation is characterized by herbaceous plants that are adapted to saturated soil conditions, including cattail (<i>Typha</i> spp.), rushes (<i>Juncus</i> spp.), and bulrushes (<i>Schoenoplectus</i> spp.).	1
Total	—	2,724

Sources: Ormat 2021; USGS 2005

¹ Rounded to the nearest whole acre

Noxious Weeds and Nonnative, Invasive Plant Species

The Nevada noxious weed (NDA 2020) saltcedar was mapped in the AOI, in association with low-lying, intermittently wet areas (Ormat 2021). Additionally, Russian knapweed (*Acroptilon repens*) and musk thistle (*Carduus nutans*) have been documented nearby, along CR-34 north of Gerlach (BLM 2009; EDDMapS 2022). Perennial pepperweed (*Lepidium latifolium*) has been documented nearby along Nevada SR-447 (BLM 2009).

Other nonnative, invasive plants observed in the AOI are Russian olive, bur buttercup (*Ceratocephala testiculata*), redstem stork's bill (*Erodium cicutarium*), saltlover (*Halogeton glomeratus*), Russian thistle (*Salsola tragus*), and cheatgrass (*Bromus tectorum*) (Ormat 2021).

Special Status Plants

No special status plant species were observed during surveys in the AOI (Ormat 2021). Based on ground-truthed vegetation (Ormat 2021, Section 3.2.1) and soil map units (Ormat 2021, Section 2.3) in the AOI, there are approximately 2,356 acres of potentially suitable habitat for upland-associated special status plant species. These species are Tonopah milkvetch (*Astragalus pseudoiodanthus*), Schoolcraft buckwheat (*Eriogonum microthecum* var. *schoolcraftii*), oryctes (*Oryctes nevadensis*), Nevada dune beardtongue (*Penstemon arenarius*), and Susanville beardtongue (*Penstemon sudans*). There are 326 acres of potentially suitable habitat for wetland- and riparian-associated species, including Soldier Meadows cinquefoil (*Potentilla basaltica*).

3.2.4 Wildlife

Eagles and Other Raptors

As detailed in the Biological Resources Baseline Report (Ormat 2021, Map A-6, Golden Eagles and Other Raptors), surveys carried out in 2020 documented nests of golden eagle (*Aquila chrysaetos*), large raptors, and small raptors within a 2-mile survey area buffer around the AOI. Six nests (Nests 10, 11A, 11B, 20A, 20B, and 20C) belonged to golden eagles, two nests (Nests 13 and 24) to large raptors, and one nest (Nest 12) to small raptors. None of the nests were occupied at the time of the surveys, and no nesting attempts were observed. Based on the presence of the golden eagle nests, portions of two golden eagle territories were determined to overlap with the AOI.

Burrowing owl call-broadcast surveys did not observe burrow complexes or detect burrowing owls in the AOI (Ormat 2021). Based on the ground-truthed vegetation (Ormat 2021, Section 3.2.1) and slope (Ormat 2021, Section 2.3) in the AOI, there are approximately 2,341 acres of suitable habitat for the burrowing owl.

As detailed in the Biological Resources Baseline Report (Ormat 2021, Table 4), eagles and other raptors with suitable habitat in the AOI, but that were not observed during surveys, are bald eagle (*Haliaeetus leucocephalus*), western burrowing owl (*Athene cunicularia hypugaea*), ferruginous hawk (*Buteo regalis*), northern goshawk (*Accipiter gentilis*), prairie falcon (*Falco mexicanus*), short-eared owl (*Asio flammeus*), Swainson's hawk (*Buteo swainsoni*), and peregrine falcon (*Falco peregrinus*).

Migratory Birds

Since migratory birds may use the entire AOI, regardless of the vegetation community, the entire 2,724-acre AOI contains potential habitat for migratory birds (Ormat 2021, Section 3.3.2).

Migratory bird point-count surveys in the AOI documented the following species: red-winged blackbird (*Agelaius phoeniceus*), black-throated sparrow (*Amphispiza bilineata*), sagebrush sparrow (*Artemisiospiza nevadensis*), killdeer (*Charadrius vociferus*), common raven (*Corvus corax*), Brewer's blackbird (*Euphagus cyanocephalus*), house finch (*Haemorhous mexicanus*), barn swallow (*Hirundo rustica*), northern mockingbird (*Mimus polyglottos*), house sparrow (*Passer domesticus*), blue-gray gnatcatcher (*Polioptila caerulea*), Virginia rail (*Rallus limicola*), rock wren (*Salpinctes obsoletus*), Say's phoebe (*Sayornis saya*), Brewer's sparrow (*Spizella breweri*), western meadowlark (*Sturnella neglecta*), western kingbird (*Tyrannus verticalis*), and mourning dove

(*Zenaida macroura*). Nests of black-throated sparrow, western meadowlark, red-winged blackbird, and sagebrush sparrow were observed in the AOI during surveys (Ormat 2021, Map A-8).

Migratory birds observed incidentally (those that were observed but not during point counts) were common nighthawk (*Chordeiles minor*), horned lark (*Eremophila alpestris*), loggerhead shrike (*Lanius ludovicianus*), long-billed curlew (*Numenius americanus*), and glossy ibis (*Plegadis falcinellus*).

Brewer's sparrow, long-billed curlew, and loggerhead shrike are sensitive species, per BLM Instruction Memorandum No. NV IM-2018-003.

Additional migratory bird species have the potential to occur in the AOI based on habitat conditions, such as wetlands and riparian areas, sagebrush steppe and salt desert scrub, playas, and cliffs and canyons. These species are listed in the Wildlife Clearance Form, which is included as Appendix C of the Biological Resources Baseline Report (Ormat 2021).

Shorebirds

Suitable habitat in the AOI for shorebirds is approximately 531 acres (Ormat 2021, Section 3.3.3). This is where the SWReGAP land cover types Western Great Plains Saline Depression Wetland, North American Arid West Emergent Marsh, and Intermountain Basins Playa are present.

One shorebird species, the long-billed curlew (*Numenius americanus*), was observed during the shorebird surveys described in the Biological Resources Baseline Report (Ormat 2021). Killdeer (*Charadrius vociferus*) and glossy ibis (*Plegadis falcinellus*) were incidentally observed during other surveys in the AOI. It is likely that the killdeer nested in the AOI in 2020, though breeding was not directly observed or detected. The glossy ibis was observed once flying over the AOI. It is unlikely that the ibis would breed there.

During surveys, the Black Rock Desert playa was dry in the vicinity of the AOI, which likely limited shorebird observations; however, water sources were present in some locations in the AOI, including in areas of emergent marsh and spring outflows and ponds.

Mammals

Kangaroo Mouse Habitat Delineation

The kangaroo mouse habitat delineation method was originally developed in coordination with the BLM Winnemucca District Office, NDOW, and Environmental Management and Planning Solutions Inc. (EMPSi), a private consultant for Ormat, during preparation of the Biological Baseline Report for the North Valley Geothermal Project at the San Emidio Geothermal Field Environmental Assessment (BLM 2021b). That project is in the San Emidio Desert in Washoe County, approximately 20 miles south of the AOI. Given the proximity of these areas, the same method was used to delineate potential habitat for the areas considered in this EA.

Acres of non-habitat and low-, moderate-, and high-potential habitat for the dark kangaroo mouse (*Microdipodops megacephalus*) were delineated in the AOI, as described in detail in the Biological Resources Baseline Report (Ormat 2021, Section 3.3.4); they are summarized in **Table 3-8**. The habitat delineation area included the AOI and a 0.25-mile buffer around it. Based on this delineation, there is no habitat for pale kangaroo mouse (*Microdipodops pallidus*) in the AOI or the 0.25-mile buffer around it.

Small Mammal Trapping

As described in the Biological Resources Baseline Report (Ormat 2021), small mammal trapping surveys were done in a potential transmission line route south of the AOI that is no longer included in the proposed project. Trapping was not done in the AOI. However, trapping results are included to describe the survey results and to give an indication of the small mammal species that may also exist in the AOI.

Table 3-8
Kangaroo Mouse Habitat

Common Name Scientific Name	Non-Habitat	Low-Potential Habitat	Medium-Potential Habitat	High-Potential Habitat	Total¹
Dark kangaroo mouse <i>Microdipodops megacephalus</i>	543 acres	0 acres	0 acres	2,181 acres	2,724 acres

Source: Ormat 2021

¹ Rounded to the nearest whole acre

Small mammal trapping did not detect the dark kangaroo mouse or the pale kangaroo mouse. Though these species were not detected during trapping, they may still be present in the surveyed area. Other small mammal species that were observed during trapping were the Merriam's kangaroo rat (*Dipodomys merriami*), northern grasshopper mouse (*Onychomys leucogaster*), Great Basin pocket mouse (*Perognathus parvus*), and deer mouse (*Peromyscus maniculatus*).

Bats

Acoustic bat detection surveys documented bat presence in the AOI. Detectors were placed near areas of potential bat use, including near old buildings that may be used for roosting and near springs and ponds that may be used for foraging. The most common bat species (as indicated by the total number of acoustic recordings made on each detector) were the canyon bat (*Parastrellus hesperus*) and the Mexican free-tailed bat (*Tadarida brasiliensis*). Other species detected were Townsend's big-eared bat (*Corynorhinus townsendii*), big brown bat (*Eptesicus fuscus*), silver-haired bat (*Lasionycteris noctivagans*), hoary bat (*Lasiurus cinereus*), California myotis (*Myotis californicus*), western small-footed bat (*M. ciliolabrum*), long-legged myotis (*M. volans*), and Yuma myotis (*M. yumanensis*). The Biological Resources Baseline Report contains a map showing acoustic detector locations (Ormat 2021, Map A-11) and a table summarizing detections by survey date and detector location (Ormat 2021, Table 16).

Large Mammals

Portions of the AOI are considered to be year-round habitat for bighorn sheep (*Ovis canadensis* ssp.; in the Granite Range), year-round and crucial winter habitat for pronghorn antelope (*Antilocapra americana*), and limited habitat for mule deer (*Odocoileus hemionus*) (Ormat 2021, Appendix B and Appendix C). Targeted surveys for these species were not conducted, nor were these species incidentally observed or detected during other field surveys conducted in preparation of the Biological Resources Baseline Report (Ormat 2021, Section 3.3.4).

Livestock (cattle and domestic sheep) trailing occurs across most of the AOI in the spring (March through May) and fall (October through December).¹¹ Trailing usually includes four to seven bands of domestic sheep that are moved to and from the Blue Wing Seven Troughs Allotment in the Winnemucca District to the adjacent California BLM districts. Trailing through the AOI would normally be expected to take 1 to 2 days per band; temporary (overnight) sheep camps are sometimes set up in the AOI as needed. Trailing is normally centered on roadways, such as SR-447 and CR-34. During trailing, however, livestock may forage some distance from roadways, potentially into year-round habitat for bighorn sheep.

Insects

Of the 2,724-acre AOI, approximately 2,325 acres (85 percent) contain buckwheat (*Eriogonum* spp.) populations (Ormat 2021). Certain species in the *Eriogonum* genera provide larval development habitat for

¹¹ Email from Angela Arbonies, BLM, to Morgan Trieger, EMPSi. Subject: RE: [EXTERNAL] Gerlach Geothermal Exploration Project - domestic sheep trailing. February 8, 2022.

Rice's blue (*Euphilotes pallescens ricei*) and Great Basin small blue (*Philotiella speciosa septentrionalis*) butterflies. There were no observations of known host plants for these sensitive insect species in the AOI; however, observations of other species in the *Eriogonum* genera indicate there is potentially suitable habitat for sensitive insect species. There were no direct observations of special status insect species.

In December 2020, the USFWS determined that listing the monarch butterfly under the ESA was warranted but precluded by higher-priority listing actions (85 *Federal Register* 81813). With this finding, the monarch butterfly became a candidate for listing; it is not yet listed or proposed for listing under the ESA.

Milkweeds (*Asclepias* spp.) are larval host plants for the monarch butterfly. Suitable habitat for the monarch butterfly is likely present where milkweed plants grow. No milkweed plants were observed during special status plant surveys in the AOI (Ormat 2021, p. 33); however, several citizen-science-based observation records for several milkweed species exist in the region (Western Monarch Milkweed Mapper 2022), including narrowleaf milkweed (*A. fascicularis*), showy milkweed (*A. speciosa*), and pallid milkweed (*A. cryptoceras*). Further, several historical monarch butterfly observations have been recorded in the region (Western Monarch Milkweed Mapper 2022). This information suggests that suitable habitat for the monarch butterfly is likely present in the AOI and the vicinity.

Amphibians

Several ponds in the AOI have either a mixture of thermal (hot) and cold water or are far enough from the thermal spring to allow cooling of the water. These aquatic features may support several amphibian species, including northern leopard frog (*Lithobates pipiens*), western toad (*Anaxyrus boreas*), and Great Basin spadefoot toad (*Spea intermontana*). There is approximately 1 acre of the SWReGAP land cover type North American Arid West Emergent Marsh in the AOI (Ormat 2021), indicating suitable aquatic breeding habitat for these species.

Water temperatures in most ponds and springs in the AOI are too high to support western toad breeding and occupancy. However, western toad surveys were carried out in the AOI in ponds with potentially suitable habitat conditions, including those where water temperatures were observed to be below critical thresholds. Surveys were done at Ponds 1, 3, 4, 7, and 8, and at Springs 6, 8, 12, and 17 (Ormat 2021, Map A-12). No adult toads, tadpoles, or egg masses were observed during surveys.

Western toad and Great Basin spadefoot toad breeding habitat is limited to aquatic features; however, these species will also use adjacent upland habitats for dispersal, brumation, and aestivation.¹² Studies examining the nonbreeding movements of western toads have shown that toads can use habitats up to 1.4 miles (Muths 2003) to 1.5 miles (Bartelt et al. 2004) from breeding ponds; however, these studies were conducted in higher-elevation, cooler, moister forested landscapes in the western US. Nonetheless, suitable western toad habitat includes uplands surrounding suitable wetland, pond, and spring habitat. However, upland habitat use in the AOI may be limited to a shorter distance from aquatic areas, compared with western toads in moister forested habitats.

Similarly, the spadefoot toad digs its own burrow in loose soil, or it uses existing small mammal burrows in upland areas adjacent to aquatic breeding habitat (Wildlife Action Plan Team 2012, p. S-66). The distance adult spadefoot toads may travel from burrows to breeding sites is unknown, but the Wyoming Game and Fish Department states they can at least travel several hundred meters (WGFD 2017, p. IV-1-3).

¹² Brumation is the state or condition of inactivity or torpor induced by cold winter temperatures, while aestivation is the state or condition of torpidity or dormancy induced by heat and the dryness of summer.

Reptiles

Reptiles may be found in all areas of the AOI, regardless of the vegetation community; therefore, the entire 2,724-acre AOI contains suitable habitat for reptile species (Ormat 2021, Section 3.3.7). Reptile-specific surveys were not done in the AOI. Incidental reptile observations are discussed below.

The Great Basin collared lizard (*Crotaphytus bicinctores*), desert horned lizard (*Phrynosoma platyrhinos*), and long-nosed leopard lizard (*Gambelia wislizenii*) are sensitive reptile species that were incidentally observed in the AOI during the course of the other surveys (Ormat 2021). Great Basin collared lizards were observed in rocky areas, while long-nosed leopard lizards were observed in areas with sandy soils. Desert horned lizards were observed in the Intermountain Basins Mixed Salt Desert Shrub vegetation type.

The AOI is within the mapped range of an additional sensitive reptile species, the northern rubber boa (*Charina bottae*). While suitable sagebrush shrubland habitat for this species is present, this species was not directly observed; this is likely due to the burrowing habits of this mostly nocturnal species.

Common reptile species incidentally observed during other surveys in the AOI are the zebra-tailed lizard (*Callisaurus draconoides*), western whiptail (*Cnemidophorus tigris*), Great Basin rattlesnake (*Crotalus oreganus lutosus*), bull snake (*Pituophis catenifer sayi*), and western fence lizard (*Sceloporus occidentalis*) (Ormat 2021).

Springsnails

A complex of thermal springs and pools is present in and around the AOI. Most of the springs have water temperatures above the upper temperature threshold for most springsnail species; however, suitable springsnail habitat was observed in several thermal springs, outlet streams, and ponds fed by thermal springs (Ormat 2021). Water temperatures in these areas range from approximately 75°F to 205°F. Springsnail surveys in suitable habitats did not document springsnails or snail shells. The substrate in most springs was either silty mud or solid limestone and not the preferred gravel substrate. Surveyed areas are depicted in the Biological Resources Baseline Report (Ormat 2021, Map A-12).

Greater Sage-Grouse

As described in the Biological Resources Baseline Report (Ormat 2021, Section 3.3.9), habitat for greater sage-grouse (*Centrocercus urophasianus*) was delineated by both the 2015 Nevada and Northeastern California Approved RMP Amendment (BLM 2015b) and the 2019 Nevada and Northeastern California Greater Sage-Grouse RMP Amendment (BLM 2019a). This EA uses habitat data from the 2015 BLM approved RMP amendment (updated 2021) to identify, by way of a desktop analysis, greater sage-grouse habitat in and near the AOI. The 2015 habitat management area data (updated 2021) identify greater sage-grouse habitat types as priority habitat management areas (PHMAs), general habitat management areas (GHMAs), and other habitat management areas (OHMAs).

According to the 2015 greater sage-grouse habitat data (updated 2021), there are approximately 158 acres of OHMAs in the AOI, along the eastern slopes of the Granite Range (**Figure A-6**, Greater Sage-Grouse [2021 Plan Maintenance Action for the Approved Resource Plan Amendment (2015)] in **Appendix A**). There are no GHMAs or PHMAs in the AOI. The nearest GHMA is approximately 0.5 miles north of the AOI, in the Granite Range.

Available data from the NDOW (Ormat 2021, Appendix B) indicate there are no known greater sage-grouse lek sites or radio-marked tracking locations within 4 miles of the AOI.

Threatened and Endangered Species

As described in the Biological Resources Baseline Report (Ormat 2021, Section 2.5.2.10), the BLM queried the USFWS Information for Planning and Consultation (IPaC) system on February 24, 2020. The IPaC identified two federally listed threatened wildlife species, the Lahontan cutthroat trout (*Oncorhynchus clarkii henshawi*) and desert dace (*Eremichthys acros*). Critical habitat for desert dace has been designated.

There are four Lahontan cutthroat trout recovery streams north of the AOI in the Granite Basin; these recovery streams represent potential habitat for the Lahontan cutthroat trout. Granite Creek is about 7 miles, Cottonwood Creek is about 13 miles, Wagontire Creek is about 14 miles, and Red Mountain Creek is about 16 miles from the AOI. There is also Lahontan cutthroat trout occupied habitat in Pyramid Lake, approximately 32 miles south of the AOI; there is no hydrological connection between the AOI and recovery streams in the Granite Basin or Pyramid Lake.

The desert dace is endemic to spring systems in the Soldier Meadows area in the Black Rock Desert-High Rock Canyon Emigrant Trails NCA. In these areas, the desert dace inhabits warm springs and their outflow creeks; designated critical habitat is also at this location. Soldier Meadows is approximately 47 miles north of the AOI, and there is no hydrological connection between these areas.

The monarch butterfly, a candidate for listing under the ESA, is discussed in *Insects*, above.

3.2.5 Soil Resources

The AOI overlaps eight soil map units (Ormat 2021, Section 2.3). **Table 3-9** summarizes selected characteristics of these map units, including the Natural Resources Conservation Service ratings for soil erosion susceptibility by wind and water.

Table 3-9
Soils

Soil Map Unit	Landscape Position	Surface Texture	Drainage	Wind Erosion Rating ¹	Water Erosion Rating ²	Acres ³
210—Veta-Langston Association	Lake plains	Gravelly sandy loam	Well drained	5	0.15	669
1146—Umblerland Association	Lake plains	Silty clay loam	Somewhat poorly drained	8	0.37	674
1191—Ragtown Association	Lake plains	Clay loam	Moderately well drained	4	0.32	420
1520—Kaffur-Slocave-Rock Outcrop Association	Mountains	Very gravelly sandy loam	Well drained	6	0.10	382
1580—Trocken-Ganaflan-Bluewing Association	Lake plains	Very gravelly sandy loam	Well drained	6	0.10	211
1064—Trocken, Stony-Mazuma Association	Fan collars	Stony sandy loam	Well drained	5	0.15	190
900—Playas	Playas	Silty clay	Very poorly drained	4	0.32	130
543—Mazuma-Swangler Association	Lake plains	Fine sandy loam	Well drained	3	0.32	46
Total	—	—	—	—	—	2,724

Sources: Ormat 2021; Web Soil Survey 2020

¹ The wind erosion potential is classified on a scale between 1 and 8. A rating of 1 means soils are highly susceptible to wind erosion, and a rating of 8 means soils are the least susceptible to wind erosion.

² K-Factor (whole soil) is a water erosion rating that indicates susceptibility of a soil to sheet and rill erosion by water. K values range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to erosion by water.

³ Rounded to the nearest whole acre

3.2.6 Cultural Resources

As described in **Appendix C**, Cultural Resources, the BLM has determined a direct area of potential effect¹³ (APE) for physical effects on cultural resources, and an indirect APE for visual and auditory effects. The direct APE includes the 2,724 acres encompassing the AOI, as well as a 2,854-acre linear corridor (approximately 23 miles long and 960 feet wide). A Class III cultural resources inventory of the direct APE was performed. Using the methods in Instruction Memorandum No. NV-2021-006, Bureau of Land Management (BLM) Nevada Template Visual Area of Potential Effect (APE) Policy,¹⁴ the BLM determined that the indirect, visual APE was a 0.44-mile buffer around the proposed well pads. A summary of resources is included below, and more detail is provided in **Appendix C**, Cultural Resources. The BLM is carrying out NHPA Section 106 consultation in accordance with the process described in 36 CFR 800.8(c).

Cultural resources that are eligible for listing on the NRHP include 20 evaluated cultural resources that are eligible for listing on the NRHP under criterion D. These include prehistoric, historic, and multicomponent sites, including lithic, flake, refuse, or ground stone scatters; a probable hearth; a prospecting site; a quarry; a rock shelter; a temporary camp; and a historic habitation.

There are also four resources eligible for listing on the NRHP under criterion A. These are the Guru Road segment/Nobles Trail segment of the California National Historic Trail¹⁵ (NHT; CrNV-22-5656/02-4665; 26WA5549/26PE2301), a prehistorically important spring (Great Boiling Spring; CrNV-22-6149/26WA12721), historic railroad tracks, and a transmission line. There is also a historic cemetery (Gerlach Cemetery; CrNV-22-6150/26WA12722) eligible for listing on the NRHP under criteria A and D.

There are also four unevaluated cultural resources. For the purpose of this inventory, unevaluated cultural resources are treated as though they are eligible for listing on the NRHP. These are three prehistoric lithic scatters and the historic Gerlach Airport.

There are two architectural resources that are eligible for listing on the NRHP under criterion A; these are the Western Pacific Telegraph Line and Railroad.

There is one resource—the Gerlach Water Tower (NRIS #81000385)—that is listed on the NRHP outside the direct APE; however, it is within a mile of it.

3.2.7 Recreation

Recreation in the region mostly occurs in the Black Rock Desert-High Rock Canyon Emigrant Trails NCA. The NCA's southern boundary is about 4 miles north of the AOI. The NCA and surrounding public lands host a multitude of recreation opportunities, which are described in the 2019 Burning Man Event Special Recreation Permit Final Environmental Impact Assessment (BLM 2019b, p. 3-92); these opportunities typically include motorized and nonmotorized activities, such as nature viewing, driving for pleasure, dispersed camping, hiking, and off-highway vehicle use. Many game species provide opportunities for both wildlife observation and hunting; the AOI is in portions of two Nevada game units (Units 014 and 034; NDOW 2018). There are also opportunities to view wild horses and burros.

The Burning Man Event occurs annually in late August to September on the Black Rock Desert playa in the Black Rock Desert-High Rock Canyon Emigrant Trails NCA. The event is permitted under a special recreation permit (SRP) (BLM 2019b, p. 3-94). The event is the largest SRP issued by the BLM nationwide.

¹³ The area of potential effect is defined as the “geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist” (36 CFR 800.16(d)).

¹⁴ <https://www.blm.gov/policy/nv-im-2021-006>

¹⁵ The California NHT was designated by Congress in 1992. The NHT is administered by the National Park Service through its National trails Office in Santa Fe, NM.

During the event, high traffic volumes use SR-447 and CR-34 in the AOI and access the playa using an access road (8-Mile Road) north of the AOI.

Other SRP events not associated with the Burning Man Event occur on the Black Rock Desert playa in the AOI vicinity. These include amateur and experimental rocket launching events, four-wheel drive tours, land speed trials, land sailing, weddings, guided and outfitted camping and horseback trips, and commercial filming and photography (BLM 2019b, p. 3-95).

Recreation also occurs within the Granite Range Special Recreation Management Area (SRMA), which overlaps the AOI (**Figure A-8**, Granite Range Special Recreation Management Area, in **Appendix A**). The SRMA Recreational Management Zone I, Granite Foothills, is managed for visitor, staff, and maintenance facilities and access to surrounding public lands. It also includes the Guru Road site (BLM 2015a, p. 2-69).

Compared with surrounding public lands, there is relatively little recreational activity in the AOI. This is because of the proximity to the community of Gerlach, private property, commercial operations, developed gravel pits, and abundant high-quality recreation in nearby public lands. However, SR-447 and CR-34 in the AOI provide direct access to recreation opportunities on nearby public lands. The Washoe ArTrail includes existing roadways in the AOI. Washoe County developed the trail in partnership with Burning Man and other community partners; the trail highlights cultural, historic, and artistic regional landmarks (Washoe ArTrail 2022). The trail passes through Gerlach and into the AOI; it includes the Gerlach Water Tower, the western mural on Gerlach's Main Street, and the BLM Black Rock Station on Transfer Station Road in the AOI.

Astrotourism, which is traveling to a destination that has very low light pollution for the purpose of seeing the stars and visiting observatories (Altschuler 2019), is a common recreational activity in the AOI vicinity. Gerlach is known as America's darkest town (Roeder 2017). The Massacre Rim WSA, approximately 60 miles north of Gerlach, is one of 15 locations worldwide to be certified as an International Dark Sky Sanctuary (International Dark-Sky Association 2021). While there are no data available to quantify the number of people who visit the area specifically to engage in astrotourism, according to the Nevada Division of Tourism, the percentage of visitors who traveled to northern Nevada for the primary purpose of outdoor recreation grew from 3.8 percent in 2015 to 8.0 percent in 2019 (Travel Trak America 2019). This growth in outdoor recreation demand highlights the importance of astrotourism and other nature-related tourism for local economies in northern Nevada.

3.2.8 Special Designations and Visual Resources, Including Night Skies

Special Designations

Lands with Wilderness Characteristics

The 42,700-acre Granite Peak lands with wilderness characteristics (LWC) area is in the Granite Range; most of the area lies north of the AOI. This LWC area possesses sufficient size, naturalness, and outstanding opportunities for either solitude or primitive and unconfined recreation. Approximately 275 acres of the LWC area's southern portion overlap with the AOI (**Figure A-9**, Special Designations, in **Appendix A**). This represents less than 0.01 percent of the entire LWC area. The Winnemucca District RMP Record of Decision allows for multiple-use and sustained-yield objectives in areas identified as having LWC (see Action LWC I.1 in BLM 2015a, p. 2-45) with appropriate mitigations applied, if needed, to protect LWC criteria.

Visual Resources

Visual Resource Management

BLM-administered lands in the AOI are visual resource management (VRM) Class II¹⁶ and Class III¹⁷ (see **Figure A-10**, Visual Resource Management and Key Observation Points, in **Appendix A**). The AOI is in the northern Basin and Range physiographic province. Basin and Range landscapes in northern Nevada are characterized by elongated, generally north–south-trending mountain ranges separated by broad open basins. This type of landscape allows for long viewing distances. The dominant natural features in and around the AOI are steep, rugged mountains and expansive valleys (the Black Rock Desert playa). Human-made features are structures in Gerlach, paved and dirt roadways and trails, fence lines, utility poles and transmission lines, gravel pits, cleared lots, and communication towers.

The visual contrast rating system provides a systematic way to evaluate proposed projects and to determine whether projects conform to the approved VRM objectives along with identifying mitigation measures to minimize impacts. A visual contrast inventory was done in the AOI using key observation points (KOPs), in accordance with the BLM's VRM system (BLM Manual 8400, Manual H-8410-I, and Manual H-8431).¹⁸ **Appendix D** provides completed visual contrast rating worksheets and photographs from the KOPs.

Night Skies

The night sky refers to the darkness of space and the visibility of stars, planets, and other objects in space. The BLM does not have any policies related to managing the night sky resource (BLM 2022b). Light pollution from ALAN can diminish the night sky resource and disrupt amateur and professional astronomy, lead to human health impacts, disturb wildlife, and affect the characteristics of places being managed for specific natural and cultural resource values.

The broader AOI region that includes Nevada's northwest corner is one of the least populated areas in the US. It has few ALAN sources and is known for its night sky, as described in **Section 3.2.7**, Recreation. The AOI is approximately 75 miles north of the Reno-Sparks metropolitan area, which is the nearest major light source. Winnemucca is approximately 85 miles east of the AOI. Other notable sources of year-round ALAN in the vicinity are the communities of Gerlach and Empire, which are 1 mile and 5 miles from the AOI, respectively; the Hycroft Mine, which is 20 miles northeast of the AOI; and the San Emidio Geothermal Power Plant, which is 20 miles southwest of the AOI. The Burning Man Event, which occurs on the Black Rock Desert playa in late August and early September, is a major contributor of ALAN while the event is active (BLM 2022b).

Sky brightness, typically expressed in the form of luminosity of a celestial object (magnitude [mag]) relative to its distance (arcsec²), is a commonly used method to quantify the relative darkness of the night sky. The higher the mag arcsec² value, the darker the sky and more readily visible the celestial objects are in the sky. As a reference point, during the new moon and with an air quality index near zero, the Massacre Rim WSA

¹⁶ The objective of VRM Class II is to retain the landscape's existing character. The level of change to the characteristic landscape should be low. Management activities may be seen, but they should not attract the attention of the casual observer. Any changes must repeat the basic elements of form, line, color, and texture found in the characteristic landscape's predominant natural features.

¹⁷ The objective of VRM Class III is to partially retain the landscape's existing character. The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the characteristic landscape's predominant natural features.

¹⁸ Internet website: <https://www.blm.gov/programs/recreation/recreation-programs/visual-resource-management>.

has a darkness value of 22.0 mag arcsec², which is near complete darkness¹⁹ (see BLM 2022b, Appendix A, Section 4.5).

Sky brightness values in the AOI are slightly lower than in the Massacre Rim WSA. This means the night sky when viewed from the AOI is less dark than it is when viewed from the WSA. During a new moon and outside of the Burning Man Event, the sky brightness at Gerlach is 21.69 mag arcsec². During the Burning Man Event, it is 21.36 (see BLM 2022b, Appendix A, Section 4.5). These values for Gerlach are representative of the sky brightness in the AOI due to the proximity of Gerlach to the AOI.

Additional information, including day- and nighttime photographs from KOPs in the AOI vicinity, can be found in the Night Sky Baseline Report (BLM 2022b).

3.2.9 Noise

Ambient sound is the result of combined noise sources in a given area. It is usually measured in A-weighted decibels (dBA), which most closely relates to the way humans perceive sound. The decibel scale is logarithmic, not linear. In other words, two sound levels 10 decibels apart differ in acoustic energy by a factor of 10. When the standard logarithmic decibel is A-weighted, an increase of 10 dBA is generally perceived as a doubling in loudness. For example, a 70-dBA sound is half as loud as an 80-dBA sound, and twice as loud as a 60-dBA sound. Noise from stationary sources lessens at a rate of approximately 6 decibels per doubling of distance, depending on such environmental conditions as topography, vegetation, and weather. **Table 3-10** indicates typical noise levels for common indoor and outdoor situations.

Ambient sound levels have been measured at Transfer Station Road in the AOI, as part of the Burning Man Event Special Recreation Permit Final Environmental Impact Statement (BLM 2019b). Ambient sound was measured between August 23 and 26, 2017, outside of the event. The measured day-night average sound level (DNL)²⁰ was 63 dBA; the maximum 15-minute L_{eq} ²¹ was 66 dBA (Salter 2018). The primary sources of noise are local ambient noise from traffic on SR-447, CR-34, and Transfer Station Road; overflying aircraft; wind; and wildlife (such as horses neighing in the distance) (Salter 2018).

Sensitive noise receptors are individuals or groups that could be aware of or be affected by changes in ambient noise levels. For example, sensitive noise receptors in and around the AOI include individuals partaking in outdoor recreation, such as camping, visiting cultural sites and hot springs, retracing historic trails, and stargazing, where serenity and quiet are often desired. Sensitive noise receptors also include the community of Gerlach. Additional sensitive noise receptors are wildlife (see **Section 3.2.4**) and areas with special designations, such as NCAs, designated wilderness areas, and WSAs (see **Section 3.2.8**, Special Designations and Visual Resources, Including Night Skies).

¹⁹ In the Massacre Rim WSA, the lack of ALAN and sky glow makes it possible to view distinct features of the Milky Way and other celestial objects that are otherwise occluded by sky glow and localized ALAN. The sky must be approximately 20.2 mag arcsec² or darker for the Milky Way to be seen (Williams 2015). Typical sky brightness for the central portion of a large city can be 15 mag arcsec², which allows viewers to see only the brightest objects in the night sky.

²⁰ The DNL is a descriptor for a 24-hour A-weighted average noise level. The DNL accounts for the increased acoustical sensitivity of people to noise during the nighttime hours. DNL penalizes sound levels by 10 decibels during the hours from 10:00 p.m. to 7:00 a.m. (Salter 2018).

²¹ L_{eq} is the equivalent continuous sound level that would contain the same acoustic energy as a varying sound level during the same period.

Table 3-10
Typical Noise Levels

Common Outdoor Activity	Noise Level (dBA)	Common Indoor Situation
Typical construction site at 50 feet	70–105	—
Jet flyover at 1,000 feet	100	—
Gas lawn mower at 3 feet	90	—
Diesel truck at 50 feet traveling 50 miles per hour	80–85	Food blender at 3 feet; garbage disposal at 3 feet
Congested urban area, daytime	70	Vacuum cleaner at 10 feet
Commercial area with heavy traffic	60	Normal speech at 3 feet
Quiet urban daytime	50	Large business office; dishwasher in next room
Quiet urban nighttime	40	Theater or large conference room (background)
Quiet suburban nighttime	30	Library
Quiet rural nighttime	20	Bedroom at night
—	10	Broadcast/recording studio
Lowest threshold of human hearing	0	Lowest threshold of human hearing

Sources: Caltrans 2013; US EPA 1971

3.2.10 Greenhouse Gas Emissions and Climate Change

Climate change is defined by the Intergovernmental Panel on Climate Change as a change in the state of the climate. This can be identified (for example using statistical tests) by changes in the mean temperature or the variability of its properties that persist for an extended period, typically decades or longer. It refers to any change in climate over time, due to natural variability or as a result of human activity (IPCC 2013).

Nevada's climate is changing. Observed conditions and projected trends include increased average temperatures, punctuated by more severe heat waves, increased drought, reduced winter snowpack and earlier snow melt, more frequent flooding, and increased wildfire driven by more invasive annual grasses and dryer fuels. More detail is provided in Table I of Nevada Climate Initiative (2022).

GHGs are compounds in the atmosphere that absorb infrared radiation given off by the earth after it is warmed by the sun. This process traps heat and warms the earth's atmosphere. GHGs are released naturally and by human processes. GHGs influence climate over long time frames and at a global scale.

The NDEP estimated Nevada's statewide GHG emissions in 2019 (the most recent year for which state data have been tabulated) at 40.6 million metric tons of carbon dioxide equivalents (NDEP 2021). The major sectors contributing to Nevada's GHG emissions in 2019 were as follows: transportation (34 percent), electricity generation (29 percent), industry (17 percent), residential and commercial (12 percent), waste management (4 percent), and agriculture (4 percent). The EPA estimated that national GHG emissions were 6,558 million metric tons of carbon dioxide equivalents in 2019 (US EPA 2021).

GHG emissions near the project area would come from nearby mining and geothermal operations, including the Hycroft Mine and San Emidio Geothermal Plant. Emissions would also come from nearby traffic on roads. Emissions resulting from range and recreational uses are generally minimal. Additional information can be found in **Appendix E**, Greenhouse Gas Emissions.

3.3 ENVIRONMENTAL CONSEQUENCES

3.3.1 Analysis Methods and Assumptions

This section describes the potential effects on resources and resource uses by issue (see **Table 3-1**). It describes effects in terms of their duration (temporary or permanent) and context (local or regional). A

temporary effect is one that occurs only during implementation of the alternative, while a permanent effect could occur for an extended period after the alternative's implementation. Where appropriate, the analysis provides recommended avoidance, minimization, or mitigation measures to avoid, reduce, or otherwise offset effects on the specified resource or resource use. Any specific assumptions are identified for each issue.

Ormat would conduct all proposed activities in compliance with all relevant federal, state, and local regulations and permits; applicable geothermal lease stipulations (ORNI 26 LLC 2020, Appendix A); the Winnemucca District's BMPs and standard operating procedures (BLM 2015a, Appendix B); the BMPs in Appendix D of the Final Programmatic Environmental Impact Statement for Geothermal Leasing in the Western US (BLM and Forest Service 2008); and the requirements and conditions specified in the NEPA decision record. Implementing applicant-committed environmental protection measures (**Section 2.1.7**), and additional BLM-required stipulations (see **Table 3-11**), would further avoid, minimize, or mitigate potential adverse environmental impacts.

The analysis of the environmental consequences of implementing applicable geothermal lease stipulations, applicant-committed environmental protection measures, BMPs, and BLM-required stipulations follows the analysis of direct and indirect effects under each issue. The direct and indirect effects are those that may occur after implementing the measures, as applicable.

3.3.2 Issue 1: How would geothermal exploration affect GHG emissions?

Analysis Area and Assumptions

It is not currently possible to correlate local GHG emissions with specific, local climate effects. The magnitude of the potential effects of GHGs emitted by a specific source can be roughly assessed by comparing the amount of GHGs emitted to state and national emission inventories. Climate effects related to the proposed action would consist of an increase in currently observed climate effects proportional to the increase in total state and national emissions related to the proposed action. See **Section 3.2.10** for a description of currently observed climate change impacts in Nevada.

Alternative A: Proposed Action

The use of drilling rigs and vehicles powered by internal combustion engines would generate approximately 5,519 tons (5,007 metric tons) per year of GHG emissions during the proposed action (see **Appendix E**). This would represent approximately 0.012 percent of the 2021 statewide GHG emissions (40.6 million metric tons) reported by the NDEP. It would represent approximately 7.63×10^{-5} percent of the 2021 national GHG emissions (6,558 million metric tons) reported by the US EPA. This would be a relatively small contribution to state and national GHG emissions, and would have a correspondingly small contribution to climate change.

Alternative B: 3-Mile Access Point

GHG emissions and associated effects would be the same as those described for Alternative A.

Alternative C: Existing Well 68-3 Access Point

GHG emissions and associated effects would be the same as those described for Alternative A.

Alternative D: No-Action Alternative

There would be no GHG emissions because Ormat would not construct the project. GHG emissions from regional sources would continue to occur.

Table 3-11
BLM-Required Stipulations

Resource or Resource Use	Required Stipulation	Applicable Issue(s)
Air Quality	To control fugitive dust, vehicle speeds would be limited to 25 miles per hour on gravel roads and 15 miles per hour on dirt roads.	5
Special Designations and Visual Resources	Lights used during night drilling would be limited to those required to safely conduct operations, and would be shielded or directed to focus light on the immediate work area. Lights on drill rig derricks would pulse at the minimum intensity and minimum number of flashes per minute allowable by the Federal Aviation Administration or other applicable regulations.	2
Vegetation	<p><u>Portion of access road not previously surveyed (would apply only to Alternative B: 3-Mile Access Point)</u></p> <ul style="list-style-type: none"> The BLM analyzes specific environmental protection measures as part of the proposed project NEPA documentation process. To ensure that potential impacts on vegetation and special status plants from the proposed project are avoided, minimized, or mitigated, as applicable, pre-construction surveys be conducted in the area before the surface is disturbed. If pre-construction surveys indicate suitable habitat or presence of special status plant species as documented elsewhere in the Biological Resources Baseline Report (Ormat 2021) and EA, then the same recommended measures to avoid, minimize, or mitigate impacts would be applied. If pre-construction surveys indicate suitable habitat or presence of a special status plant species not already documented elsewhere in the Biological Resources Baseline Report (Ormat 2021) and EA, then additional NEPA documentation would occur. Measures to avoid, minimize, or mitigate impacts would be developed during that additional NEPA process. Following construction activities, disturbed areas would be seeded by the applicant as directed by the BLM using a BLM-approved native seed mixture and application rate. Any variance in the mix would be coordinated first with the BLM. Following construction activities, disturbed areas no longer required for operations would be reclaimed to promote the reestablishment of native plant and wildlife habitat. Prior to any surface-disturbing activities, a special status plant survey is required for the area. Timing of the survey would be dependent on the habitat type and the detectability of the target species. If a special status plant is located, a protective buffer would be delineated in consultation with the BLM Authorized Officer. 	5
Water Resources	Spring discharges would be monitored to allow early detection of potential changes. The monitoring plan (Broadbent and Associates Inc. 2022) outlining monitoring locations, parameters, frequency, and duration would be approved by the BLM Authorized Officer prior to drilling activities. If water quality or quantity effects are detected, appropriate measures to mitigate the effects, as determined by Ormat in coordination with the BLM Authorized Officer, would be implemented.	4
Water Resources	If deemed necessary by the USACE, Ormat would obtain a CWA Section 404 permit and comply with all permit requirements.	5

Resource or Resource Use	Required Stipulation	Applicable Issue(s)
Wildlife (General, including Special Status Species)	If a special status wildlife species is identified in or near the work area during construction, work near the species would be halted. A qualified biologist would be consulted to determine an appropriate buffer and other protective measures, as applicable. The appropriate resource agencies, including the BLM, USFWS, and/or NDOW, would be notified of the discovery within 24 hours. If avoidance is infeasible, consultation with the appropriate resource agency would be conducted prior to continuing work in the immediate area.	5
Wildlife (General, including Special Status Species)	Ormat would implement the applicable measures described in the NDOW's Design Features and Tools to Reduce Wildlife Mortalities Associated with Geothermal Sumps (NDOW, n.d.). Applicable measures would be determined in coordination with the BLM Authorized Officer.	2, 4
Wildlife (General, including Special Status Species)	Ormat would prevent wildlife access to pits and tanks containing liquids contaminated by substances that may be harmful due to toxicity or with the potential to foul fur or feathers, and liquids at excessive temperatures. Wildlife exclusion could be done by fencing, netting, or otherwise covering liquids when not in active use. If exclusion is not feasible, a hazing program, in conjunction with monitoring, would be implemented (BLM and Forest Service 2008, p. B-17).	4
Wildlife (General, including Special Status Species)	To minimize wildlife trapping hazards in steep-sided or smooth-lined clean-water impoundments, all such impounds would have functional escape ramps (BLM and Forest Service 2008, p. B-17).	2
Wildlife (General, including Special Status Species)	<u>Portion of access road not previously surveyed (would apply only to Alternative B: 3-Mile Access Point)</u> <ul style="list-style-type: none"> The BLM analyzes specific environmental protection measures as part of the proposed project NEPA documentation process. To ensure that potential impacts on wildlife species and habitat from the proposed project are avoided, minimized, or mitigated, as applicable, pre-construction surveys be conducted in the area before the surface is disturbed. If pre-construction surveys indicate suitable habitat or presence of special status wildlife species as documented elsewhere in the Biological Resources Baseline Report (Ormat 2021) and EA, then the same recommended measures to avoid, minimize, or mitigate impacts would be applied. If pre-construction surveys indicate suitable habitat or presence of a special status wildlife species not already documented elsewhere in the Biological Resources Baseline Report (Ormat 2021) and EA, then additional NEPA documentation would occur. Measures to avoid, minimize, or mitigate impacts would be developed during that additional NEPA process. 	2, 3, 5
Wildlife (Eagles and Other Raptors)	Bald or golden eagles, or both, may now or hereafter use the project area. The BLM would not issue a notice to proceed for any project that is likely to result in take of bald eagles or golden eagles until the applicant completes its obligation and demonstrates compliance with the Bald and Golden Eagle Protection Act (Eagle Act). This includes coordination with the USFWS on agreed-upon measures to avoid take, or obtaining an eagle take permit, should take be unavoidable. The BLM hereby notifies the applicant that compliance with the Eagle Act is a dynamic and adaptable process that may require the applicant to conduct further analyses and mitigation following assessment of operational impacts. Any additional analysis or mitigation required to comply with the Eagle Act would be developed with the USFWS and coordinated with the BLM (WO-IM-2010-156; https://www.blm.gov/policy/im-2010-156).	2, 3, 5

Resource or Resource Use	Required Stipulation	Applicable Issue(s)
Wildlife (Eagles and Other Raptors)	Each year, western burrowing owl clearance surveys would be conducted prior to surface disturbance in suitable habitat during the nesting season (March 1 through August 31). A qualified biologist would conduct the surveys and follow the BLM Winnemucca District Office protocol. If active burrow(s) are detected, an avoidance buffer of no less than 250 feet would be established and avoided to prevent destruction or disturbance to burrows. The buffer would remain in place until young have fledged or the burrow is no longer active, as confirmed by burrow monitoring. If no active burrows are present, surface disturbance could commence within 10 days of the survey.	2, 3, 5
Wildlife (Greater Sage-Grouse)	The project would comply with Nevada State Executive Order 2018-32, which could include coordination with the Sagebrush Ecosystem Technical Team on the application of a compensatory mitigation program, such as the Nevada Conservation Credit System for mitigating activities that result in greater sage-grouse habitat loss and degradation in Nevada. Under this system, the application of compensatory mitigation would occur on, or the credit would be applied to, disturbance on BLM-administered lands.	2, 3, 5
Cultural Resources	All cultural resources that are eligible or unevaluated for listing on the NRHP would be avoided. When ground-disturbing project activities would occur within 30 meters (98 feet) of a NRHP-eligible or unevaluated cultural resource, an archaeological monitor would be present to ensure resources are not disturbed. Temporary or permanent fencing around NRHP-eligible or unevaluated cultural resources could be installed to prevent disturbance, if the BLM Authorized Officer determines it is necessary. Employees, contractors, and suppliers would be instructed that all cultural resources are protected, and that if previously undiscovered resources are encountered, the resources will be left in place and reported to the BLM by the responsible Ormat representative.	5

Sources: cited in the table

3.3.3 Issue 2: How would the presence of equipment, fencing, traffic, and personnel affect resources in the AOI?

Analysis Area and Assumptions

The analysis area for both direct and indirect effects is the project area. The analysis area for indirect effects on cultural resources is defined as the indirect APE for cultural resources; the indirect effects analysis area for special designations and visual resources is the viewsheds from which proposed project elements would be visible.

Alternative A: Proposed Action

Recreation

Alternative A would temporarily increase the amount of equipment, project traffic, and ground disturbance visible from the Granite Range SRMA. Alternative A also would permanently increase the amount of development visible from this area in the form of well pads and access roads. However, numerous developed areas in the AOI are already visible from the SRMA, such as traffic on CR-34 and SR-447, gravel pits, and other municipal and commercial developments around Gerlach. As such, effects on the recreation setting would be minor.

Access to recreation opportunities may be temporarily restricted in the immediate work area during construction, displacing visitors from localized areas. However, numerous other access points to the same opportunities would remain open during construction. Visitors would be permanently displaced from fenced

well pads, but this would not restrict access to recreation opportunities in the vicinity. As such, effects from restricting or displacing recreation opportunities would be minor.

Proposed Mitigations

There would be no specific mitigation measures for recreation. However, implementing measures to avoid, reduce, or mitigate visual-related impacts on other resources would directly and indirectly reduce the potential for Alternative A to change the recreation setting.

Wildlife (General and Sensitive Species) and Migratory Birds

Proponents of projects that would involve human disturbances in or within 3.7 miles (6 kilometers) of PHMAs, GHMAs, or OHMAs are required to consult with the Nevada Sagebrush Ecosystem Technical Team to determine whether mitigation is necessary. Ormat has initiated coordination with the team. To date, the team has not recommended any additional habitat quantification or mitigation measures beyond the applicant-committed environmental protection measures (**Section 2.1.7**) already included in this EA.

A comprehensive review of the effects of ALAN on wildlife species is included in the Night Sky Baseline Report (BLM 2022b, Section 3.3). In summary, ALAN has been shown or is inferred to have a number of effects on wildlife, as described below. Minimizing lighting during drilling operations would minimize, but not eliminate, the potential for these effects. The following effects would be temporary, lasting the duration of drilling:

- There could be disruption of small mammal movement and foraging patterns and increased predation risk from increased visibility.
- Amphibians, including frogs and toads, could experience increased risk of predation and vehicle strike on roads, changes in reproductive activity, and movement disruptions. Frogs and toads have been observed to congregate at lights to forage on insects attracted to such lighting, but this could make them more susceptible to vehicle collisions on nearby roads.
- ALAN could attract nocturnal insects, including insect pollinators, in the immediate vicinity. Insects attracted to the lighting could then attract insect-eating birds or bats, leading to increased mortality of insects and successful predation for birds and bats.
- ALAN could disorient migrating birds or attract birds away from suitable stopover habitat, causing unanticipated energy expenditure. The potential for bird/structure collisions could increase for night-migrating species, which could become disoriented by nighttime lights on tall structures, particularly during inclement weather.

Using wildlife-friendly fencing, netting, or other coverings to exclude wildlife from sumps, tanks, and impoundments, including drill reserve pits, containing hot or contaminated liquids and other constituent chemicals would minimize the potential for hazards to migratory birds, bats, and other wildlife from exposure to detrimental substances or entrapment.

Vehicles can collide with wildlife, causing injury or mortality. There could be an additional risk for scavenger species, such as turkey vultures (*Cathartes aura*), ravens, and raptors, foraging along roads. Also, risks could increase for perching bird species, such as horned larks, whose concentrations have been observed to increase along newly constructed roads in sagebrush habitats (Inglefinger and Anderson 2004).

Domestic sheep trailing would likely overlap temporally with the project. The BLM would not anticipate that the presence of project equipment and personnel would cause a higher probability of interaction between domestic sheep and bighorn sheep, which in turn would increase the potential for pathogen transmission between domestic and non-domestic animals. This is because trailing is typically centered on SR-447 and CR-34, which would not be obstructed by project equipment, and because only one well would be drilled at a time. This would limit the area over which equipment and personnel are distributed at a given time.

Further, bighorn sheep could be more likely to temporarily avoid the project area due to increased noise and activity, lowering the potential for interaction with domestic animals.

Proposed Mitigations

Implementing applicant-committed environmental protection measures (see **Section 2.1.7**), including restricting cross-country travel to designated construction areas and imposing speed limits of 35 miles per hour on unpaved roads, would minimize the potential for vehicle collisions with wildlife.

BLM-required stipulations (**Table 3-11**) would minimize the potential for effects on wildlife from project elements, equipment, and personnel. These stipulations include:

- Lights on drill rig derricks would pulse at the minimum intensity and minimum number of flashes per minute allowable by the Federal Aviation Administration or other applicable regulations. Also, lights used during night drilling would be limited to those required to safely conduct operations; these lights would be shielded or directed to focus light on the immediate work area.
- Adhering to applicable measures, as determined by the BLM and the NDOW (described in the NDOW's Design Features and Tools to Reduce Wildlife Mortalities Associated with Geothermal Sumps), would minimize the potential for wildlife impacts from exposure to detrimental substances associated with geothermal reserve pits.
- To minimize wildlife hazards from pits and tanks containing harmful liquids, Ormat would prevent wildlife access to liquids contaminated by substances that could be harmful due to toxicity or with the potential to foul fur or feathers, and liquids at excessive temperatures. Wildlife exclusion could be done by fencing, netting, or otherwise covering liquids when not in active use. If exclusion is not feasible, a hazing program, in conjunction with monitoring, would be implemented (BLM and Forest Service 2008, p. B-17).
- To minimize wildlife trapping hazards in steep-sided or smooth-lined clean-water impoundments, all such impounds would have functional escape ramps (BLM and Forest Service 2008, p. B-17).

Special Designations and Visual Resources, Including Night Skies

Special Designations

Alternative A would not have direct effects on the Granite Peak LWC area because proposed project elements would be outside the area. Minor, indirect effects would occur because proposed project elements would be visible from portions of the LWC area. This would be on the steeply sloping southeast-facing flank of the Granite Range above the AOI, where proposed project elements would be located within approximately 0.1 mile of the LWC area. The proximity and visibility of proposed project elements would reduce opportunities and feelings of solitude or primitive and unconfined recreation for visitors in the LWC area.

This effect would be minor because numerous nearby developed areas are already visible from this portion of the LWC area, including traffic on CR-34 and SR-447, gravel pits, and other municipal and commercial developments around Gerlach. As a result, opportunities and feelings of solitude or primitive and unconfined recreation are already low.

According to BLM Manual 6320, Considering Lands with Wilderness Characteristics in the BLM Land Use Planning Process, the BLM is not required to protect wilderness characteristics as a priority over other resource values and multiple uses.

Visual Resource Management

Proposed project elements and equipment would be noticeable from project KOPs; however, they would not dominate the view of the casual observer (see a map of KOPs in **Figure A-10** and visual contrast rating worksheets and photographs from KOPs in **Appendix D**). The proposed project elements would repeat

the basic elements present in the landscape character; this is because there are already nonnatural lines and forms, namely CR-34 and SR-447, dirt roads, fences, power lines, and other municipal and commercial developments in and around Gerlach. Access roads, wellheads, and well pad fences would be visible to the casual observer, but they would be below the horizon line and would not attract attention. Further, wellheads would be painted a color consistent with BLM visual color guidelines; the color would blend with the surrounding landscape to minimize visibility. To provide an example of the visual appearance of proposed well pads and sumps, **Figure A-12** in **Appendix A** provides representative photographs of existing geothermal development in the AOI.

Following construction, areas of disturbed land no longer required for operations would be reclaimed, and fences would be removed. Taking these measures into account, the degree of contrast and modification imposed on the landscape by the project would be minor. This is within the parameters of the VRM Class II objective to retain the landscape's existing character, and Class III objective to partially retain the landscape's existing character. Accordingly, the project would be in conformance with VRM guidelines and policy (BLM Manual 8400, Manual H-8410-I, and Manual H-8431).

Night Sky Conditions

Anticipated changes in ALAN, radiance, and sky glow would have temporary effects on the Granite Peak LWC area. This is because light generated by drilling would be discernible from portions of the LWC area. This would be particularly true on the steeply sloping southeast-facing flank of the Granite Range above the AOI, where proposed project elements would be located within approximately 0.1 mile of the LWC area. Viewers in this area would experience reduced opportunities and feelings of solitude or primitive and unconfined recreation.

This effect would be minor for several reasons. First, under a worst-case scenario, which assumes 1.5 times the amount of expected lighting would be produced, the radiance of the drill rig would increase to a level equivalent to the observed radiance of Gerlach (BLM 2022b, p. 3-4); actual lighting produced would be lower, and measures to reduce the amount of light produced would be in effect. Numerous sources of nearby ALAN are present in this area, primarily from Gerlach and Empire. As a result, night sky conditions and associated opportunities and feelings of solitude or primitive and unconfined recreation are already low in this area. Finally, effects would be temporary, lasting the duration of construction.

In other portions of the LWC area farther from drilling, effects would be negligible. This is because from the perspective of viewers in other portions of the LWC area, the topography would directly obscure drilling in the AOI. Further, since existing ALAN in the region already affects night sky conditions, anticipated changes in conditions would be indistinguishable (BLM 2022b, p. 3-4).

Proposed Mitigations

Implementing applicant-committed environmental protection measures (see **Section 2.1.7**), including reclaiming temporarily disturbed areas and painting wellheads a color that blends with the surrounding landscape, would reduce the intensity of effects on visual resources from project elements and equipment. Paint used on wellheads would be consistent with BLM visual guidelines to blend with the area and minimize visibility.

Per BLM-required stipulations (**Table 3-11**), lights used during night drilling would be limited to those required to safely conduct operations, and they would be shielded or directed to focus light on the immediate work area.

There would be no specific mitigation measures for special designations. However, implementing the measures above to avoid, reduce, or mitigate visual-related impacts would reduce the potential for Alternative A to affect wilderness characteristics in the Granite Peak LWC area.

Cultural Resources (National Historic Trails)

Two of the geothermal leases in the AOI (NVN-98641 and NVN-100029) were leased in 2019 and 2020, respectively. Both leases contain no surface occupancy (NSO) stipulations for trails, including NHTs, as required under the BLM Winnemucca District RMP (BLM 2015a), as amended. Six proposed wells (86-16, 67-16, 45-16, 37-16, 62-20, and 11-21) are within trail NSO areas and would require a stipulation waiver to be drilled. A waiver would require the BLM to consult with the NPS, Nevada State Historic Preservation Office, and other interested public entities under the NHPA. Similarly, proposed wells 37-16 and 62-20 are also within NRHP-eligible sites with a NSO stipulation; they also would require waivers to be drilled. The required analysis and consultations to procure waivers are not included in Alternative A. As a result, these wells would not be permitted, and direct effects on NHTs would not occur.

Geothermal leases NVN-75228 and NVN-55718 were leased in 2001 and 1992, respectively. At the time these leases were sold, the Sonoma-Gerlach Management Framework Plan was the planning document in effect. Unlike the BLM Winnemucca District RMP mentioned above, this plan did not include similar trails stipulations. The remaining proposed wells are within these lease areas; as a result, they would not be subject to the trail NSO stipulation. However, the plan does provide the BLM discretion to stipulate restrictions for surface use in direct conflict with cultural resources eligible for listing on the NRHP. Proposed well 83-16 would be located directly on such a resource. For this reason, the well would not be permitted without a similar additional analysis and consultations, as described above. As a result, this well would not be permitted, and the direct effects on the eligible resource would not occur.

The anticipated effects on cultural resources from the 13 remaining wells and other project components are discussed below.

A visual effects analysis was done at KOPs in and around the indirect APE, including at the Nobles Trail section of the California NHT, the Gerlach Cemetery, and the Gerlach Water Tower. There is the potential for temporary, indirect, adverse effects on the setting, feeling, and association of eligible or unevaluated sites, including the NHT and Gerlach Cemetery. Temporary adverse effects would occur from the visual and noise intrusion of construction activity during well drilling, which typically would last up to 45 days per well. While temporary changes in the visual and noise baseline conditions of the area would occur, these would be resolved upon completion of the exploration project. The KOP assessment also found that effects on the Gerlach Water Tower would be similarly limited since the view of the project from the water tower is already obstructed by Gerlach's existing built environment.

There is also the potential for similar temporary, indirect, adverse effects on Great Boiling Spring. The KOP analysis was not completed for this site because it is on private surface. The 2006 Final Ethnographic Assessment (Bengston 2006) identified Great Boiling Spring as a potential ritual site for Northern Paiutes, but no tribes have offered any further information on Great Boiling Spring as part of the consultation process.

There is also the potential for temporary, indirect, adverse effects on the setting, feeling, and association from anticipated changes in the ALAN, radiance, and sky glow due to nighttime drilling. This is because light generated by drilling would be discernible from eligible and unevaluated sites. This effect would be minor for several reasons. First, under a worst-case scenario, which assumes 1.5 times the amount of expected lighting would be produced, the radiance of the drill rig would increase to a level equivalent to the observed radiance of Gerlach (BLM 2022b, p. 3-4). Actual lighting produced would be lower, and measures to reduce the amount of light produced would be in effect. Numerous sources of nearby ALAN are present in this area, primarily from Gerlach and Empire. As a result, night sky conditions and the associated setting, feeling, and association are already compromised in this area. Finally, effects would be temporary, lasting the duration of construction.

Permanent impacts on the integrity of the setting, feeling, and association of eligible or unevaluated sites are not expected. This is because—with the exception of proposed well 83-16 discussed above—proposed project components would not be sited on these resources themselves. No significant indirect effects on other cultural resources would be expected to occur.

Proposed Mitigations

There would be no specific mitigation measures for cultural resources because there would be no significant visual or noise impacts. However, implementing measures to avoid, reduce, or mitigate visual and noise impacts on other resources would directly and indirectly reduce the potential for Alternative A to affect the integrity of the setting, feeling, and association of cultural resources.

Implementing applicant-committed environmental protection measures (see **Section 2.1.7**), including reclaiming temporarily disturbed areas and painting wellheads a color that blends with the surrounding landscape, would reduce the intensity of effects on visual resources from project elements and equipment. Paint used on wellheads would be consistent with BLM visual guidelines to blend with the area and minimize visibility. These measures also include using mufflers on all drilling rig engines and using a rock muffler to attenuate steam venting noise during well testing.

Per BLM-required stipulations (**Table 3-11**), lights used during night drilling would be limited to those required to safely conduct operations. They would be shielded or directed to focus light on the immediate work area.

Alternative B: 3-Mile Access Point

Recreation

Potential effects on recreation would be similar to those described for Alternative A. Because access to proposed well pads 71-3, 63-3, 66-3, and 58-3 would be from the 3-Mile Access Point under Alternative B, visitors wishing to access the Black Rock Desert playa at this location could be temporarily delayed by construction traffic accessing these well pads. This effect would be negligible. This is because the delays would be temporary, lasting only minutes, and because other playa access points would remain open and unobstructed by project equipment and traffic.

Proposed Mitigations

There would be no specific mitigation measures for recreation. However, implementing measures to avoid, reduce, or mitigate visual-related impacts on other resources would directly and indirectly reduce the potential for Alternative B to change the recreation setting.

Wildlife (General and Sensitive Species) and Migratory Birds

The effects on wildlife and migratory birds would be the same as those described for Alternative A. The proposed mitigations also would be the same as those described under Alternative A.

Special Designations and Visual Resources, Including Night Skies

The effects on the Granite Peak LWC area, VRM, and night sky conditions would be the same as those described for Alternative A. The proposed mitigations also would be the same as those described under Alternative A.

Cultural Resources (National Historic Trails)

The effects on cultural resources would be the same as those described for Alternative A. The proposed mitigations also would be the same as those described under Alternative A.

Alternative C: Existing Well 68-3 Access Point*Recreation*

The effects on recreation and the proposed mitigations under Alternative C would be the same as those described under Alternative A.

Wildlife (General and Sensitive Species) and Migratory Birds

The effects on wildlife and migratory birds would be the same as those described under Alternative A. The proposed mitigations also would be the same as those described under Alternative A.

Special Designations and Visual Resources, Including Night Skies

The effects on the Granite Peak LWC area, VRM, and night sky conditions would be the same as those described under Alternative A. The proposed mitigations also would be the same as those described under Alternative A.

Cultural Resources (National Historic Trails)

The effects on cultural resources would be the same as those described for Alternative A. The proposed mitigations also would be the same as those described under Alternative A.

Alternative D: No-Action Alternative

There would be no effects from the presence of project elements, equipment, or personnel. This is because Ormat would not construct the project. Existing recreation experiences, opportunities, and access would be unchanged. Existing development and night sky conditions associated with and influenced by development in and around Gerlach would remain unchanged, as would opportunities and feelings of solitude or primitive and unconfined recreation for visitors in the Granite Peak LWC area. Wildlife would also continue to be affected by existing ALAN from these sources. The potential for pathogen transmission between domestic sheep and bighorn sheep in the Granite Range would continue during periodic trailing activities. There would be no changes to the existing form, color, line, or texture, in accordance with BLM VRM guidelines; this is because project elements would not be built.

3.3.4 Issue 3: How would ambient noise levels change and what would be the effect on sensitive resources?**Analysis Area and Assumptions**

Noise-generating sources from the proposed action would come from stationary and mobile equipment. Stationary equipment is a point source, meaning noise from the source propagates outward in all directions (Caltrans 2013). Stationary equipment would be the primary noise source for the proposed action. This includes the drill rig, rig engines (generators), pumps, and light plants. Mobile equipment is a line source, meaning the noise is spread out in a linear direction as the source moves (Caltrans 2013). Mobile equipment includes trucks, dozers, and excavators. **Table 3-12** summarizes the typical noise levels associated with the stationary and mobile equipment proposed for the project. Typical noise levels reported in the table are from a distance of 50 feet from the source; the exception is the large rotary drill rig, which generates a range of noise levels observed at the noise source by Ormat drilling contractors; these noise levels can be considered maximum expected values.²²

Since noise from stationary sources lessens at a rate of approximately 6 dBA per doubling of distance, noise receptors occurring 1 to 2 miles outside the project area (approximately 5,300–10,500 feet away) would likely experience noise levels that are comparable with current conditions (see **Section 3.2.10**, Noise). As

²² Email from Kim Carter, Ormat, to Morgan Trieger, EMPSi, on February 28, 2022, regarding Gerlach Geothermal Exploration Project EA - drilling noise question.

Table 3-12
Project Noise Sources

Source Type	Source	Quantity	Daily Use Hours	Typical Noise Level (dBA) at 50 Feet from Source
Stationary	Large rotary drill rig	1	24	91–106 ¹
	Rig generators	3	24	82
	Light plant	12	12	85
	Pumps	14	24	77
Mobile	Grader, excavator, water truck	1 each	10	85
	Front-end loader	1	10	80
	Tractor trailer	25 or more	4	84
	Small trucks	8	4	55

Sources: BLM 2022b; Caltrans 2013; ORNI 26 LLC 2022; Ormat 2022b

¹ Approximate noise levels at the noise source, as reported from Ormat drilling contractors and not based on noise models or studies. Values can be interpreted as maximum expected values.

such, the analysis area for noise effects is the project area plus a 2-mile buffer around this area. Effect intensity would depend on the distance from the project area and on the receptor's sensitivity.

All action alternatives would comply with the BLM regulation that mandates that noise at 0.5 miles—or at the lease boundary, if closer—from a major geothermal operation should not exceed 65 dBA (43 CFR 3200.4(b)).

Alternative A: Proposed Action

Recreation

Construction noise could temporarily impact the recreation setting. Primarily, noise could affect experiences of isolation and remoteness, reducing the potential for positive recreation outcomes. The greatest potential for this effect would be in the Granite Peak LWC area and the Granite Range SRMA. However, effects in these areas would be minor for several reasons. First, noise effects would be mostly limited to the portions of these areas on the steeply sloping southeast-facing flank of the Granite Range above the AOI. Recreation opportunities in this area are limited due to the rugged, steep terrain and lack of access roads, trails, or other facilities. Further, this area is already subject to noise effects from traffic on CR-34, vehicles driving on the Black Rock Desert playa, operations in the existing gravel pits in the AOI, and other noise emanating from day-to-day activities in Gerlach. As a result, the potential for experiences of isolation and remoteness are lower in this area than elsewhere in the LWC area and SRMA. Any noise effects in these areas would also be temporary, lasting the duration of construction.

Construction noise is not anticipated to affect the recreation setting in the Black Rock Desert-High Rock Canyon Emigrant Trails NCA; this is because the NCA's southern border is about 4 miles away from the AOI, and the NCA Act of 2000 does not designate a buffer around the NCA border. At this distance, noise receptors would experience noise levels that are comparable with current conditions.

Proposed Mitigations

There would be no specific mitigation measures for recreation. However, implementing measures to avoid, reduce, or mitigate noise-related effects on other resources would directly and indirectly reduce the potential for noise from Alternative A to affect the recreation setting or experiences.

Wildlife (General and Sensitive Species) and Migratory Birds

While Ormat would use both stationary and mobile noise sources up to 24 hours a day, stationary sources would have the most potential to displace wildlife. This is because noise levels surrounding the stationary source would remain more or less constant, as would the attendant displacement effects.

Stationary and mobile noise sources could temporarily displace wildlife from suitable habitat in the project area. This could reduce breeding or nesting success, especially if species are displaced during sensitive life cycle periods. Noise could also affect foraging opportunities or effectiveness. Generally, these effects would last only as long as the duration of the project activity, including during well pad and road construction, well drilling, and well testing.

Implementing eagle conservation measures (Ormat 2022a, Table 5) would reduce the potential for noise effects on golden eagles in the Granite Range. Construction would not occur within 1 mile of occupied golden eagle nests between January 15 and April 6, or until an occupied nest is no longer in use (typically by August 30; see CM-1 in Ormat 2022a). Ormat would use rock mufflers during well testing (CM-8 in Ormat 2022a); these devices attenuate steam venting noise. As a result of these measures, construction noise would be unlikely to disrupt golden eagle nesting, reduce nest productivity, or cause nest abandonment.

Construction would not occur near active burrowing owl burrows or migratory bird nests during the burrowing owl and migratory bird breeding season (March 1 through August 31). Thus, construction would be unlikely to cause nest failure or abandonment.

Since it would occur 24 hours a day, noise from well drilling could disrupt bat foraging behavior by acoustic masking, attentional distraction, and avoidance response (Barber et al. 2009). These effects would last through the duration of drilling activities.

Temporary project construction noise could displace big game species from habitat in or near the project area. This includes bighorn sheep and mule deer in the Granite Range and pronghorn antelope, whose distribution is more widespread in and around the AOI (Ormat 2021, Appendix B).

Greater sage-grouse using habitat management areas in and around the AOI could experience temporary noise effects during project activities. The effects would be limited to habitat management areas within 2 miles of the AOI, which includes approximately 1,767 acres of OHMAs and 85 acres of GHMAs (BLM GIS 2022). This is because, due to typical noise attenuation rates as described in the *Analysis Area and Assumptions*, noise receptors occurring 1 to 2 miles outside the project area would likely experience noise levels that are comparable with current conditions. Because there are no known greater sage-grouse lek sites within 4 miles of the AOI, noise effects on leks are not anticipated to occur.

Proposed Mitigations

Implementing applicant-committed environmental protection measures (see **Section 2.1.7**) would reduce the potential for noise effects on wildlife. These measures include using mufflers on all drilling rig engines and using a rock muffler to attenuate steam venting noise during well testing.

Ormat would avoid the effects from construction noise on breeding golden eagles by implementing measures described in the project's USFWS-approved eagle conservation plan (Ormat 2022a).

Implementing BLM-required stipulations (see **Table 3-11**) would avoid construction noise impacts on breeding burrowing owls and migratory birds because construction would occur outside the breeding season. If construction must occur during this period, pre-construction surveys would be conducted. Ormat would avoid active nests near the construction area by using an appropriate buffer, as determined in coordination with the BLM. Buffers would remain in effect until young have fledged or the nest has failed, subject to BLM approval.

Special Designations and Visual Resources, Including Night Skies

Construction noise could temporarily impact the naturalness character in portions of the Granite Peak LWC area. As described above in *Recreation*, this effect would be most pronounced on the steeply sloping southeast-facing flank of the Granite Range above the AOI. The naturalness character in this area is already

degraded by noise effects from traffic on CR-34, vehicles driving on the Black Rock Desert playa, operations in the existing gravel pits in the AOI, and other noise emanating from day-to-day activities in Gerlach. As a result of these existing conditions, the addition of temporary construction noise would be a minor effect.

Proposed Mitigations

The Winnemucca District RMP Record of Decision allows for multiple-use and sustained-yield objectives in LWC areas (see Action LWC 1.1 in BLM 2015a, p. 2-45) with appropriate mitigations applied, if needed, to protect wilderness characteristics. Implementing applicant-committed environmental protection measures (see **Section 2.1.7**) would reduce the potential for noise effects on the LWC area. These measures include using mufflers on all drilling rig engines and using a rock muffler to attenuate steam venting noise during well testing.

Cultural Resources (National Historic Trails)

Noise effects on cultural resources are analyzed in **Section 3.3.3**.

Alternative B: 3-Mile Access Point

Recreation

The potential for noise from Alternative B to affect the recreation setting or experiences would be the same as those described for Alternative A. The proposed mitigations also would be the same as those described for Alternative A.

Wildlife (General and Sensitive Species) and Migratory Birds

The potential for noise from Alternative B to affect wildlife and migratory birds would be the same as those described for Alternative A. The proposed mitigations also would be the same as those described for Alternative A.

Special Designations and Visual Resources, Including Night Skies

The potential for noise from Alternative B to affect wilderness characteristics in the Granite Peak LWC area would be the same as described for Alternative A. The proposed mitigations also would be the same as those described under Alternative A.

Cultural Resources (National Historic Trails)

Noise effects on cultural resources are analyzed in **Section 3.3.3**.

Alternative C: Existing Well 68-3 Access Point

Recreation

The potential for noise from Alternative C to affect the recreation setting or experiences would be the same as those described for Alternative A. The proposed mitigations also would be the same as those described for Alternative A.

Wildlife (General and Sensitive Species) and Migratory Birds

The potential for noise from Alternative C to affect wildlife and migratory birds would be the same as those described for Alternative A. The proposed mitigations also would be the same as those described for Alternative A.

Special Designations and Visual Resources, Including Night Skies

The potential for noise from Alternative C to affect wilderness characteristics in the Granite Peak LWC area would be the same as described for Alternative A. The proposed mitigations also would be the same as those described under Alternative A.

Cultural Resources (National Historic Trails)

Noise effects on cultural resources are analyzed in **Section 3.3.3**.

Alternative D: No-Action Alternative

There would be no construction-related noise because there would be no construction authorized under Alternative D; thus, the effects on recreation, wildlife, special designations, and cultural resources described for the action alternatives would not occur. Noise from existing activities in the AOI, including traffic on CR-34 and SR-447, gravel pit operations, vehicle use on the Black Rock Desert playa, and day-to-day activities in Gerlach, would continue to affect the recreation setting, wildlife, and the naturalness character in portions of the Granite Peak LWC area in the vicinity of the AOI.

3.3.5 Issue 4: How would geothermal exploration affect the geology, mineral rights, and water resources?**Analysis Area and Assumptions**

The analysis area for water resources is the hydrologic evaluation study area described in **Section 3.2.1**, Water Resources, and the project Hydrologic Evaluation (Stantec 2022a). The analysis area for other resources analyzed under this issue is the project area.

Alternative A: Proposed Action*Geology and Minerals*

Direct impacts on surface geology would be limited to the areas proposed for well pad and access road construction and gravel pit expansion. Impacts on surface geology would be temporary where reclamation is proposed, such as well pad shoulders. Where reclamation is not proposed, such as the portion of well pads that would remain cleared for maintenance and monitoring, the effects would be permanent.²³ The effects also would be permanent in the proposed gravel pit expansion.

Under certain circumstances, increased pore pressures resulting from fluid injection can trigger earthquakes (Nicholson and Wesson 1990), including from development of enhanced geothermal systems (EGS; Zang et al. 2014; McGarr et al. 2015). EGS activities are not proposed; however, proposed injectivity tests, in which geothermal fluid produced during well testing would be injected back into the well and the geothermal reservoir (see **Section 2.1.2**), could have the potential to induce earthquakes. This is because fluid injection is a component of both EGS and the proposed injectivity test.

The potential for this effect and its magnitude would vary depending on several factors, such as the injection site's proximity to a fault or fracture and the hydrologic properties of the receiving reservoir. As a general example, as discussed in the Department of Energy's Protocol for Addressing Induced Seismicity Associated with Enhanced Geothermal Systems (Majer et al. 2012) and the Best Practices for Addressing Induced Seismicity Associated with Enhanced Geothermal Systems (Majer et al. 2016), earthquakes induced in EGS fields generally range from magnitude 2 (insignificant) to about 3.5 (locally perceptible to humans).

Valid existing leases would continue to be managed under stipulations in effect when the leases were issued. Any operations on existing leases would continue to be subject to conditions of approval by the BLM Authorized Officer.

Proposed Mitigations

There would be no specific mitigation measures for geology and minerals.

Water Resources (Surface and Ground)

The project could potentially affect water resources in the following ways: (1) direct disturbance in, or increased erosion and sediment transport into, wetlands and riparian areas; (2) alterations to the spring

²³ If Ormat does not move forward with the project, or abandons the lease(s), wells could be abandoned and plugged, and the surface could be reclaimed, as described in **Section 2.1.8**.

discharge quantity or quality; (3) alterations to the shallow groundwater aquifer or geothermal reservoir quantity or quality; or (4) permittees being unable to fulfill their water rights' intended beneficial use.

Ormat would not anticipate direct disturbance in, or increased erosion and sediment transport into, wetlands and riparian areas. This is because exploration activities would incorporate a riparian habitat buffer of 500 feet, subject to modification or exception, in accordance with geothermal lease stipulations (NV-B,C,W-10-B-CSU; see ORNI 26 LLC 2022, Appendix A for full lease stipulations). The project would also minimize cut and fill activities and follow stormwater BMPs in the stormwater pollution prevention plan, which would prevent stormwater sediment transport from disturbance in uplands into wetlands and riparian areas.

Implementing a water monitoring plan (see BLM-required stipulations in **Table 3-11**) would reduce, but not eliminate, the potential for the water quantity and quality effects described in this section. When monitoring the water quantity and quality and implementing adaptive management and mitigation measures, there is the potential for a time lag between detectable and maximum effects in surface expression. This results in maximum impacts that are larger than those observed even after measures are implemented. Further, the recovery to baseline states could occur slowly (see, for example, Bredehoeft and Durbin 2009). Therefore, monitoring and mitigation measures would minimize, but could not completely avoid, long-term effects on the water quantity and quality.

During drilling, the potential exists for geothermal fluids to mix with the shallow groundwater aquifer, potentially affecting the water quality, including temperature, of spring discharges and the associated surface water features. The potential for this effect is low, because Ormat would case exploration wells to comply with the DOI's Geothermal Resources Operational Order No. 2 (DOI 1975) and the NDOM requirements to prevent commingling of geothermal fluids and underground aquifers.

If sourcing construction water from shallow water wells in the AOI, there is the potential to temporarily reduce spring discharge rates or lower groundwater well levels and productivity for other groundwater users in the local hydrologic basins. Drilling each proposed exploration well would require approximately 1.845 million gallons, or 6.8 acre-feet.²⁴ As shown in **Table 3-6**, adopted perennial yields for the local hydrographic basins are between 200 and 30,000 acre-feet per year. If the quantity of surface water discharge or groundwater levels were reduced, vested and other water rights could be indirectly impacted as permittees could be temporarily unable to fulfill their water rights' intended beneficial use. Additionally, wetlands that are hydrologically fed by spring discharge could be adversely affected. Conversely, purchasing water from outside the local hydrographic basins and transporting it to the project site would have no effects on spring discharge rates, wetland conditions, or water rights in the local hydrologic basins.

During short- and long-term well testing at each well, geothermal fluids would be discharged to reserve pits or containers. This could affect the volume of the geothermal reservoir. The precise volume of the geothermal reservoir is not reported in the project hydrologic evaluation; however, the volume of fluid withdrawn during the relatively short-duration well tests would be up to approximately 1.5 million gallons per short-term test and up to 15 million gallons per long-term test. This is expected to be minor, compared with the volume of fluid available in the geothermal resource. Removing geothermal fluid during testing would not be expected to affect the geothermal reservoir's quantity or quality.

Geothermal fluid injection could occur during well testing at each well. If this occurs, it is not anticipated to have impacts on surface or shallow groundwater quality because the NDEP's Bureau of Water Pollution Control underground injection control permit would be required to conduct injection. The permit would

²⁴ As described in **Section 2.1.4**, the project would require up to 35,000 gallons of water per day for well drilling, and up to 6,000 gallons per day for dust control, or approximately 41,000 gallons per day. Over the anticipated 45-day drilling period per well, this is 1,845,000 gallons, or 6.8 acre-feet.

require that injection be designed and monitored to prevent degradation of underground drinking water sources from geothermal fluid injection.

Temporary geothermal fluid extraction and injection during well testing is not anticipated to affect the shallow groundwater aquifer's quantity or quality characteristics. This is because water quality sampling in the vicinity indicates little to no mixing of the geothermal reservoir and the shallow groundwater aquifer (Stantec 2022, Section 5.4), and because wells would be cased to prevent mixing of geothermal fluids and the shallow groundwater aquifer, as described above.

Ormat would implement the applicant-committed environmental protection measures (**Section 2.1.7**) to protect surface and groundwater. As such, surface or groundwater contamination from accidental spills or discharges, such as diesel fuel or lubricants, would be unlikely to occur.

Proposed Mitigations

Implementing applicant-committed environmental protection measures (**Section 2.1.7**) would reduce the potential for effects on water resources. Specifically, geothermal fluids would not be discharged to the ground under normal operating conditions. Should accidental discharges occur, measures in a spill prevention, control, and countermeasure plan (ORNI 26 LLC 2022, p. 13) would be implemented. Ormat would also develop and implement a stormwater pollution prevention plan, per the NDEP Bureau of Water Pollution Control requirements; follow stormwater BMPs; and minimize cut and fill activities; these would minimize the potential for erosion from stormwater runoff. Well casings would prevent commingling of geothermal fluids and underground aquifers.

Implementing BLM-required stipulations (**Table 3-11**) would further minimize the potential for effects on water resources. Spring discharges would be monitored to allow early detection of potential changes. If water quality or quantity effects were detected, appropriate measures to mitigate effects, as determined by Ormat in coordination with the BLM Authorized Officer, would be implemented.

Wildlife (General and Sensitive Species) and Migratory Birds

As described in the analysis for *Water Resources (Surface and Ground)*, above, spring discharge monitoring would allow early detection of potential changes; if effects were detected, appropriate measures, as determined by Ormat in coordination with the BLM Authorized Officer, would be implemented. Thus, Alternative A is not anticipated to affect water availability or quality for wildlife at area springs, wetlands, or wells in the long term.

Constructing reserve pits in accordance with the NDOW's Design Features and Tools to Reduce Wildlife Mortalities Associated with Geothermal Sumps (NDOW, n. d.) and fencing reserve pits according to rangeland management specifications would minimize the potential for wildlife harm due to ingesting geothermal fluids or becoming entrapped in pits.

Proposed Mitigations

Implementing applicant-committed environmental protection measures (see **Section 2.1.7**) would reduce the potential for effects on wildlife from exposure to geothermal fluids. Specifically, geothermal fluids would not be discharged to the ground under normal operating conditions. Should accidental discharges occur, measures in a spill prevention, control, and countermeasure plan (ORNI 26 LLC 2022) would be implemented. Ormat would also follow stormwater BMPs and minimize cut and fill activities, to minimize the potential for habitat loss and degradation from erosion.

Implementing BLM-required stipulations (**Table 3-11**) would further minimize the potential for effects on wildlife. Spring discharges would be monitored to allow early detection of potential changes; this would minimize the potential that there would be changes in water quality or quantity at wells or springs used by

wildlife. If water quality or quantity effects were detected, appropriate measures to mitigate effects, as determined by Ormat in coordination with the BLM Authorized Officer, would be implemented.

To minimize the potential that wildlife would come into contact with geothermal fluids or become entrapped in reserve pits, Ormat would construct reserve pits in accordance with the NDOW's Design Features and Tools to Reduce Wildlife Mortalities Associated with Geothermal Sumps (NDOW, n. d.) and fence reserve pits according to rangeland management specifications.

Cultural Resources

There is the potential for Alternative A to alter or diminish the quality and quantity of groundwater resources. This would indirectly affect cultural resources associated with springs and wells in the direct APE, including Great Boiling Spring. Monitoring spring discharges (see BLM-required stipulations in **Table 3-11**) would allow early detection of potential changes; if effects were detected, appropriate measures, as determined by Ormat in coordination with the BLM Authorized Officer, would be implemented. Thus, Alternative A is not anticipated to affect cultural resources associated with area springs or wells in the long term.

Proposed Mitigations

Implementing BLM-required stipulations (**Table 3-11**) would minimize the potential for effects on water resources. Spring discharges would be monitored to allow early detection of potential changes. If water quality or quantity effects were detected, appropriate measures to mitigate the effects, as determined by Ormat in coordination with the BLM Authorized Officer, would be implemented.

Alternative B: 3-Mile Access Point

Geology and Minerals

The effects on surface geology would be substantially similar to those described under Alternative A. The precise amount and location of surficial effects would vary due to the different configuration and length of access roads proposed under Alternative B. The effects on seismicity and minerals would be the same as those described under Alternative A.

Water Resources (Surface and Ground)

The potential for geothermal exploration from Alternative B to affect water resources would be the same as described for Alternative A. The proposed mitigations also would be the same as those described for Alternative A.

Wildlife (General and Sensitive Species) and Migratory Birds

The potential for geothermal exploration from Alternative B to affect wildlife resources would be the same as described for Alternative A. The proposed mitigations also would be the same as those described for Alternative A.

Cultural Resources

The potential for geothermal exploration from Alternative B to affect cultural resources would be the same as described for Alternative A. The proposed mitigations also would be the same as those described for Alternative A.

Alternative C: Existing Well 68-3 Access Point

Geology and Minerals

The effects on surface geology would be substantially similar to those described under Alternative A. The precise amount and location of surficial effects would vary due to the different configuration and length of access roads proposed under Alternative C. The effects on seismicity and minerals would be the same as those described under Alternative A.

Water Resources (Surface and Ground)

The potential for geothermal exploration from Alternative C to affect water resources would be the same as described for Alternative A. The proposed mitigations also would be the same as those described for Alternative A.

Wildlife (General and Sensitive Species) and Migratory Birds

The potential for geothermal exploration from Alternative C to affect wildlife resources would be the same as described for Alternative A. The proposed mitigations also would be the same as those described for Alternative A.

Cultural Resources

The potential for geothermal exploration from Alternative C to affect cultural resources would be the same as described for Alternative A. The proposed mitigations also would be the same as those described for Alternative A.

Alternative D: No-Action Alternative

There would be no increase in the potential for effects on surface water, groundwater, geothermal fluids, or use of water rights, compared with current conditions. There would be no changes in water availability or quality for wildlife at springs or wells. Because proposed injection tests would not occur, there would be no increase in the potential for induced seismicity.

3.3.6 Issue 5: How would ground disturbance and vegetation removal affect resources in the AOI?**Analysis Area and Assumptions**

The analysis area for direct effects is the AOI; the analysis area for indirect effects is the AOI, plus a 650-foot buffer around this area. The buffer is the distance that fugitive dust or surface water runoff would generally travel from areas of ground disturbance. This distance is based on typical Nevada BLM geothermal lease stipulations for ground disturbance buffers.

Alternative A: Proposed Action*Soil Resources*

Alternative A would disturb approximately 51.5 acres of the ground surface, as summarized in **Table 2-1**. After reclamation following the methodology in **Section 2.1.8**, there would be approximately 30.5 acres of surface disturbance that would not be reclaimed. **Table 3-13** summarizes the acres of proposed surface disturbance in each soil map unit in the AOI.

Table 3-13
Proposed Disturbance by Soil Map Unit

Soil Map Unit	Disturbance Acres¹
210—Veta-Langston Association	17.9
1146—Umbertland Association	14.9
1191—Ragtown Association	8.5
1520—Kaffur-Slocave-Rock Outcrop Association	0.1
1580—Trodden-Ganaflan-Bluewing Association	0
1064—Trodden, Stony-Mazuma Association	2.2
900—Playas	2.3
543—Mazuma-Swangler Association	0

Sources: Ormat GIS 2022; BLM GIS 2022; Web Soil Survey 2020

¹ Disturbance acres from the proposed aggregate pit expansion are not included, as the pit location is yet to be determined. The pit expansion would add approximately 5 acres of disturbance in either 1520—Kaffur-Slocave-Rock Outcrop Association or 1064—Trodden, Stony-Mazuma Association.

Where surface disturbance is proposed, implementing applicant-committed environmental protection measures (**Section 2.1.7**) would minimize, but not prevent, the potential for soil erosion by wind or water. These measures include following stormwater BMPs, grading practices described in the Gold Book (BLM and Forest Service 2007), and developing and implementing a stormwater pollution prevention plan. Residual effects could include increasing erosion rates from site grading or by reducing soil productivity and the potential for successful restoration. This would come about by exposing soil surfaces, which would increase the potential for wind- and water-driven erosion. There could also be effects from compacting the soil to a level that prevents or slows successful restoration and eventual reestablishment of vegetation.

The region has the potential for high winds and infrequent strong rains, which could increase erosion rates and soil loss in disturbed areas. The use of vehicles and equipment on disturbed areas could further increase the potential for wind- and water-driven erosion and contribute to soil compaction, thus reducing the restoration potential.

Soil erosion ratings (see **Table 3-9**) of the soil map units with the greatest amount of proposed disturbance in the AOI indicate that the susceptibility of these soils to wind and water erosion is generally low to moderate. Unit 210—Veta-Langston Association is moderately susceptible to wind erosion and not very susceptible to water erosion. Unit 1146—Umbertland Association is not susceptible to wind erosion and moderately susceptible to water erosion.

Although measures would reduce the potential for wind- and water-driven erosion and soil compaction and would help maintain the soil restoration potential, some level of localized topsoil loss due to wind- and water-driven erosion and soil compaction is still expected to occur.

Proposed Mitigations

Following applicant-committed environmental protection measures (see **Section 2.1.7**), including following stormwater BMPs, grading practices described in the Gold Book (BLM and Forest Service 2007), and developing and implementing a stormwater pollution prevention plan, would minimize the potential for Alternative A to erode soils. Reclaiming temporarily disturbed areas, using BLM-approved revegetation methods, and stockpiling topsoil to enhance revegetation success would increase the potential for successful reclamation.

Vegetation and Invasive, Nonnative Species

As summarized in **Table 2-1**, Alternative A would disturb approximately 51.5 acres of the ground surface, thereby removing vegetation from these areas. After reclamation following the methodology in **Section 2.1.8**, there would be approximately 30.5 acres of surface disturbance and associated vegetation removal that would not be reclaimed. Acres of proposed surface disturbance and the associated vegetation removal in each vegetation type in the AOI are summarized in **Table 3-14**.

Direct effects on special status plants are unlikely to occur. This is because surveys did not document special status plants in the AOI (Ormat 2021, p. 22). Indirect effects on special status plants would include potential habitat loss for upland- and wetland-associated special status plant species. As summarized in **Table 3-14**, above, construction disturbance would occur on up to approximately 38.2 acres²⁵ of potentially suitable habitat for upland-associated species and 6.1 acres²⁶ of potentially suitable habitat for wetland-associated species.

²⁵ Potentially suitable habitat corresponds to the land cover types Intermountain Basins Mixed Salt Desert Scrub, Intermountain Basins Greasewood Flat, and Intermountain Basins Big Sagebrush Shrubland (Ormat 2021, p. 22).

²⁶ Potentially suitable habitat corresponds to the land cover types North American Arid West Emergent Marsh, Western Great Plains Saline Depression Wetland, and Great Basin Foothill and Lower Montane Riparian Woodland and Shrubland. (Ormat 2021, p. 22).

Table 3-14
Proposed Disturbance by Vegetation Type

Cover Type	Acres¹
Intermountain Basins Mixed Salt Desert Scrub	21.3
Intermountain Basins Greasewood Flat	14.2
Intermountain Basins Big Sagebrush Shrubland	2.7
Western Great Plains Saline Depression Wetland	6.1
Intermountain Basins Playa	1.5
Intermountain Basins Cliff and Canyon	0
Recently Mined or Quarried	0
Intermountain Basins Semi-Desert Shrub Steppe	0
Great Basin Pinyon-Juniper Woodland	0
Great Basin Foothill and Lower Montane Riparian Woodland and Shrubland	0
North American Arid West Emergent Marsh	0

Sources: Ormat GIS 2022; BLM GIS 2022; Robison GIS 2020; USGS 2005

¹ Disturbance acres from the proposed aggregate pit expansion are not included, as the pit location is yet to be determined. The pit expansion would add approximately 5 acres of disturbance in either the land cover type Intermountain Basins Mixed Salt Desert Scrub, or Recently Mined or Quarried.

It is unlikely that the project would actually disturb up to 6.1 acres of suitable habitat for wetland-associated special status plant species; actual disturbance would likely be much smaller, if any. This is because such habitat is in wetlands, which were delineated in the AOI (see *Surface Water—Wetlands* under **Section 3.2.1**, Water Resources). While wetlands in the AOI are found in association with several of the SWReGAP land cover types discussed above, the spatial extent of delineated wetlands is typically more restricted than the ground-truthed land cover types.²⁷ Further, project proponents would typically be required to avoid these areas, or if avoidance is not feasible, obtain permits to fill or otherwise disturb wetlands (see BLM-required stipulations in **Table 3-11**).

Though some areas of temporary disturbance in special status plant habitat in the AOI would be reclaimed following construction, as described in **Section 2.1.8**, habitat suitability for special status plants would likely take decades or more to return, if at all. This would effectively make this effect permanent.

Following applicant-committed environmental protection measures (see **Section 2.1.7**) for fugitive dust control, including watering work areas and placing gravel on access roads, would minimize, but not prevent, the potential that vegetation would be indirectly affected by fugitive dust generated during ground disturbance and vehicle and equipment use. Fugitive dust can settle on nearby vegetation, reducing pollinator success and diminishing plant productivity.

Following applicant-committed environmental protection measures (see **Section 2.1.7**) for noxious weeds and invasive, nonnative plant species would minimize, but not prevent, the potential that ground disturbance would increase these plant species' establishment and spread. Measures include washing equipment and vehicles to be used on the project site, and using certified noxious weed-free hay and straw bales for erosion control.

Proposed Mitigations

Implementing applicant-committed environmental protection measures (see **Section 2.1.7**), including using existing roads whenever possible and preventing cross-country travel outside the work area, would minimize vegetation removal under Alternative A. Reclaiming temporarily disturbed areas, using BLM-approved revegetation methods, and stockpiling topsoil to enhance revegetation success would increase the potential

²⁷ Wetland delineation requires detailed investigation of soil pits and belowground hydrological conditions, which is not conducted during vegetation ground truthing.

for successful reclamation. Washing equipment and vehicles to be used on the project site, and using certified noxious weed-free hay and straw bales for erosion control, would help minimize the spread of invasive, nonnative species.

Wildlife (General and Sensitive Species) and Migratory Birds

As summarized in **Table 2-1**, Alternative A would disturb approximately 51.5 acres of the ground surface, thereby removing wildlife habitat from these areas. The acres and percentages of proposed habitat removal for key wildlife species are summarized in **Table 3-15**.

Table 3-15
Proposed Disturbance by Wildlife Habitat Type

Wildlife Habitat Type	Total Habitat in AOI (acres) ¹	Habitat Removal (acres ^{1,2} and percent)
Burrowing owl	2,341	45.9 (2)
Migratory birds	2,724	51.5 (2)
Shorebirds	531	7.6 (1)
Dark kangaroo mouse (high-potential habitat)	2,181 ³	42.4 (2)
Insects (larval host plant habitat)	2,325 ⁴	3.6 (<1)
Amphibians (aquatic breeding habitat)	1	0 (0)
Reptiles	2,724	51.5 (2)
Greater Sage-Grouse OHMA (2021 Plan Maintenance Action for the Approved Resource Plan Amendment [2015])	158	0 (0)

Sources: Ormat GIS 2022; BLM GIS 2022

¹ Rounded to the nearest whole acre

² Disturbance acres from the proposed aggregate pit expansion are not included, as the pit's location is yet to be determined. The pit expansion would add approximately 5 acres of disturbance in most general and some sensitive wildlife habitat types.

³ The habitat delineation area for dark kangaroo mouse included the AOI and a 0.25-mile buffer around it; see **Section 3.2.4**.

⁴ Acres of buckwheat populations in the AOI; see **Section 3.2.4**.

Temporarily disturbed areas would be reclaimed following the methods in **Section 2.1.8**. Where wildlife habitat was reclaimed, habitat removal would be a temporary effect. The duration of the temporary effect would vary, depending on the habitat type affected. For example, burrowing owls and some generalist migratory birds, such as common ravens, horned larks, and meadowlarks, can inhabit relatively disturbed habitats lacking intact, native vegetation; thus, these species could reoccupy temporarily disturbed and restored areas relatively quickly.

In contrast, some migratory bird species that could be less tolerant of fragmented or disturbed habitats, such as Brewer's sparrow, black-throated sparrow, and sage sparrow, could not reoccupy temporarily disturbed habitats for longer periods. Similarly, kangaroo mice typically require relatively undisturbed habitats with intact native vegetation. Temporarily disturbed suitable habitat, even if restored, can take a relatively long time to regain suitability. Even if habitat suitability is restored, this does not always allow for species recolonization.

Removing milkweed plants would remove larval host plant habitat for the monarch butterfly, a candidate for listing under the ESA.

As discussed above in *Vegetation and Invasive, Nonnative Species*, adhering to noxious weed and fugitive dust measures would minimize, but not prevent, indirect effects on wildlife habitat from weed establishment and spread and fugitive dust deposition on vegetation.

Proposed Mitigations

Implementing applicant-committed environmental protection measures (see **Section 2.1.7**), including using existing roads whenever possible and preventing cross-country travel outside the work area, would minimize wildlife habitat removal under Alternative A. Reclaiming temporarily disturbed areas, using BLM-approved revegetation methods, and stockpiling topsoil to enhance revegetation success would increase the potential for successful reclamation.

Implementing applicant-committed environmental protection measures (see **Section 2.1.7**), including washing equipment and vehicles used on the project site and using certified noxious weed-free hay and straw bales for erosion control, would help minimize the potential for wildlife habitat degradation from the spread of invasive, nonnative species.

In accordance with applicant-committed environmental protection measures (see **Section 2.1.7**), a qualified biologist would conduct a migratory bird nesting survey prior to any surface disturbance proposed during the avian breeding season. Active nests would be avoided, and activities would be restricted to avoid effects.

Implementing BLM-required stipulations (**Table 3-11**) would minimize the potential for effects on special status wildlife species. If a special status species is identified in or near the work area during construction, work near the species would be halted, and a qualified biologist would be consulted to determine an appropriate buffer and other protective measures, as applicable. Ormat would notify the BLM of the discovery within 24 hours. If avoidance is not feasible, consultation with the NDOW and/or the USFWS would be conducted prior to continuing work in the immediate area.

In accordance with BLM-required stipulations (**Table 3-11**), Ormat would conduct western burrowing owl clearance surveys prior to surface disturbance in suitable habitat during the nesting season. Also, avoidance buffers would be established around any active burrows until young have fledged or the burrow is no longer active.

Special Designations and Visual Resources, Including Night Skies

Construction activity could generate dust, which would be temporarily visible from the steeply sloping southeast-facing flank of the Granite Peak LWC area. This would diminish the naturalness character in this area. The naturalness character in this area is already degraded by several factors, including visibility of CR-34, dust from vehicles driving on the Black Rock Desert playa, operations in the existing gravel pits in the AOI, and other visible day-to-day activities in Gerlach. As a result of these existing conditions, the addition of temporary construction dust would be a minor effect.

Proposed Mitigations

The Winnemucca District RMP Record of Decision allows for multiple-use and sustained-yield objectives in LWC areas (see Action LWC 1.1 in BLM 2015a, p. 2-45) with appropriate mitigations applied, if needed, to protect wilderness characteristics. Implementing applicant-committed environmental protection measures (see **Section 2.1.7**) would reduce the potential for temporary construction dust to diminish the naturalness character of the LWC area. These measures include watering work areas and applying gravel to access roads.

Cultural Resources (National Historic Trails)

Because all NRHP-eligible and unevaluated sites in the APE would be avoided during construction and maintenance, and an archaeological monitor would be present during ground-disturbing activity within 30 meters (98 feet) of NRHP-eligible and unevaluated sites to ensure sites are not disturbed, direct effects from ground disturbance on eligible or unevaluated sites are not expected to occur.

Proposed Mitigations

Following applicant-committed environmental protection measures (see **Section 2.1.7**) would minimize the potential for direct, adverse effects on NRHP-eligible and unevaluated resources; this is because these

resources would be avoided. As outlined in the BLM-required stipulations (**Table 3-11**), when ground-disturbing project activities are proposed within 30 meters (98 feet) of a NRHP-eligible or unevaluated cultural resource, an archaeological monitor would be present to ensure sites are avoided and not disturbed during construction and maintenance. Temporary or permanent fencing around NRHP-eligible or unevaluated cultural resources could be installed to prevent disturbance, and personnel would be instructed that all cultural resources are to be protected.

Alternative B: 3-Mile Access Point

Soil Resources

The type of effects on soil resources would be largely the same as those described under Alternative A. However, because Alternative B would require Ormat to build more new access road on the western edge of the Black Rock Desert playa, as compared with Alternative A, there would be additional effects on soil resources. This would mainly be in the soil map units 900—Playas, which is moderately susceptible to water and wind erosion, and 1146—Umblerland Association, which is moderately susceptible to water erosion and the least susceptible to wind erosion (see **Table 3-9**). The potential for wind and water erosion effects would therefore be somewhat greater than under Alternative A. Alternative B would include the same proposed mitigation measures as described for Alternative A; this would reduce the effects.

Vegetation and Invasive, Nonnative Species

The type of effects on vegetation would be largely the same as those described under Alternative A. However, because Alternative B would require Ormat to build more new access road, as compared with Alternative A, there would be additional acres of surface disturbance and associated vegetation removal. The additional surface disturbance would be mainly in the Black Rock Desert playa, which is mostly devoid of vegetation. Further, because three segments of new access road between CR-34 and proposed well pads 71-3, 63-3, and 66-3 would not be constructed, the associated impacts in the vegetation types Intermountain Basins Big Sagebrush Shrubland and Western Great Plains Saline Depression Wetland would not occur. As a result, though Alternative B proposes more new access road construction than Alternative A, direct impacts on vegetation could be somewhat reduced.

As under Alternative A, direct effects on special status plants would not occur; this is because surveys did not document special status plants in the AOI (Ormat 2021, p. 22). The type of indirect effects on special status plants would be the same as those described for Alternative A. However, because more acres of Intermountain Basins Playa, and fewer acres of the vegetation communities Intermountain Basins Big Sagebrush Shrubland and Western Great Plains Saline Depression Wetland would be disturbed during construction, less potentially suitable habitat for these species would be affected.

The potential for noxious weed and invasive, nonnative plant species establishment and spread, and the effects on vegetation from fugitive dust would be essentially the same as under Alternative A.

Alternative B also would include the same proposed mitigation measures as described for Alternative A.

Wildlife (General and Sensitive Species) and Migratory Birds

The type of effects on wildlife and migratory birds would be largely the same as those described under Alternative A. However, because Alternative B would require Ormat to build more new access road, as compared with Alternative A, there would be additional acres of surface disturbance and the associated habitat removal. The additional surface disturbance would be mainly in the Black Rock Desert playa, which is considered suitable habitat for shorebirds and some migratory birds. As a result, habitat removal would be slightly higher for these types of species.

Alternative B would include the same proposed mitigation measures as described for Alternative A.

Special Designations and Visual Resources, Including Night Skies

The potential for effects on the Granite Peak LWC area and the proposed mitigations under Alternative B would be the same as those described for Alternative A.

Cultural Resources (National Historic Trails)

The potential for effects on cultural resources and the proposed mitigations under Alternative B would be the same as those described for Alternative A.

Alternative C: Existing Well 68-3 Access Point*Soil Resources*

The type of effects on soil resources would be largely the same as those described under Alternative A. However, because Alternative C would require Ormat to build more new access road on the western edge of the Black Rock Desert playa, as compared with Alternative A, there would be additional effects on soil resources. This would mainly be in the soil map units 900—Playas, which is moderately susceptible to water and wind erosion, and 1146—Umbertland Association, which is moderately susceptible to water erosion and the least susceptible to wind erosion (see **Table 3-9**). The potential for wind and water erosion effects would therefore be somewhat greater than under Alternative A. Alternative C would include the same proposed mitigation measures as described for Alternative A; this would reduce the effects.

Vegetation and Invasive, Nonnative Species

The effects on vegetation and invasive, nonnative species, including rare plant species, would be the same as those described under Alternative B. The proposed mitigations also would be the same as those described under Alternative B.

Wildlife (General and Sensitive Species) and Migratory Birds

The effects on wildlife and migratory birds would be the same as those described under Alternative B. The proposed mitigations also would be the same as those described under Alternative B.

Special Designations and Visual Resources, Including Night Skies

The potential for effects on the Granite Peak LWC area and the proposed mitigations under Alternative C would be the same as those described for Alternative A.

Proposed Mitigations

Alternative C would include the same proposed mitigation measures as described for Alternative A.

Cultural Resources (National Historic Trails)

The potential for effects on cultural resources and the proposed mitigations under Alternative B would be the same as those described for Alternative A.

Alternative D: No-Action Alternative

Under Alternative D, surface disturbance from construction would not occur. As a result, vegetation would not be removed, and the potential for water- and wind-driven soil erosion would not increase. Similarly, there would be no removal of habitat for special status plant and wildlife species from construction. The potential for noxious weeds and invasive, nonnative species to establish and spread, and the associated degradation of wildlife habitat, would remain due to passenger vehicle traffic and recreational uses in the AOI.

There would be no dust generated by construction. Dust generated by passenger vehicle traffic on existing dirt roads in the AOI would continue to be visible from the Granite Peak LWC area.

3.3.7 Cumulative Effects

Past, Present, and Reasonably Foreseeable Future Activities

The CEQ defines cumulative effects as “the impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal and non-federal) or person undertakes such other actions” (40 CFR 1508.7; CEQ 1997).

To determine which other actions should be included in a cumulative effects analysis, the region of influence for each resource must first be defined. These regions should not be limited to only the geographic areas of resources addressed by the project; they should also account for the distances that cumulative effects could travel and the regional characteristics of the affected resources.

The cumulative effects analysis area for water resources is the same as the hydrologic evaluation study area described in the Hydrologic Evaluation (Stantec 2022, Section 2.2 and Figure 2). This area includes portions of the Black Rock Desert playa and alluvial deposits of the Black Rock Desert, San Emidio Desert, Smoke Creek Desert, and Granite Basin hydrographic basins. As described in the Hydrologic Evaluation (Stantec 2022, Section 2.2), this area was chosen due to the potential for connected aquifer system(s) in the hydrologic basins.

The cumulative effects analysis area for special designations and visual resources, including night skies, is the same as the night sky study area described in the Night Sky Baseline Report (BLM 2022b, Section 1.2 and Figure 1). This area includes the project AOI, the communities of Empire and Gerlach, and the BLM-administered lands that extend northward along the Granite Range from Gerlach to the Massacre Rim WSA and east to the Jackson Mountains. The area is largely encompassed by the Black Rock Desert-High Rock Canyon Emigrant Trails NCA; it includes the largest regional sources of ALAN, such as Empire, Gerlach, the Hycroft Mine, and the Burning Man Event.

The cumulative effects analysis area for other resources is the area within 3 miles of the project area that would be visible from the project area. The cumulative effects analysis areas are shown on **Figure A-11** and **Figure A-12** in **Appendix A**.

The time scale for analysis is the lifetime of the geothermal leases (10 years). The geothermal leases could be extended or renewed beyond these time lines.

The BLM has identified past, present, and reasonably foreseeable future actions (**Table 3-16**) that overlap both spatially and temporally with Alternative A on BLM-administered lands in the cumulative effects analysis areas; thus, these actions are relevant for the analysis.

Table 3-16
Past, Present, and Reasonably Foreseeable Future Actions

Past, Present, or Reasonably Foreseeable	Action	Brief Description
Past	Fluid mineral exploration and development	Geothermal gradient test holes and deeper exploration holes were drilled in and around the AOI in the 1970s and 1980s. Borehole depths ranged from approximately 43 to 5,800 feet (Stantec 2022).
Present	Special designations	The NCA Act of 2000 established the Black Rock Desert-High Rock Canyon Emigrant Trails NCA to conserve, protect, and enhance values and resources associated with the Applegate-Lassen and Nobles Trails corridors and surrounding areas. Also in the area are the Calico Mountains Wilderness, Massacre Rim and Selenite Mountains WSAs, and Granite Peak LWC area.

Past, Present, or Reasonably Foreseeable	Action	Brief Description
Present	Locatable minerals exploration and development	Locatable minerals exploration and development are ongoing at the Hycroft Mine and Empire Mine.
Present	Mineral materials development	There are two aggregate pits in the project area, including a NDOT pit northwest of Gerlach and a private aggregate pit located east of Transfer Station Road.
Present	Lands and realty	A Los Angeles Department of Water and Power 500-kilovolt transmission line runs north to south, along the eastern base of the Fox Range and western base of the Granite Range, just west of the AOI.
Present	Fluid minerals exploration and development	Ormat operates the 10-megawatt San Emidio geothermal plant in the San Emidio Desert. Surface disturbance associated with the plant is approximately 64 acres (BLM 2010). There are also seven production or injection wells, well pads, and access roads associated with the San Emidio plant and the decommissioned AMOR II plant.
Present	Fluid minerals exploration and development	Ormat is drilling and testing six geothermal resource exploration wells on BLM-administered land in the San Emidio Geothermal Unit in the San Emidio Desert (BLM 2010).
Present	Agricultural development	Farming and ranching interests are anticipated to continue at current levels into the foreseeable future. Approximately 1,660 acres are under cultivation on private land in the San Emidio Desert (BLM 2010).
Present	Rangeland	Portions of the AOI are in the Rodeo Creek and Buffalo Hills grazing allotments (BLM 2015c, p. 3-120), which are authorized for cattle grazing.
Present	Rangeland	Domestic sheep trailing occurs across most of the AOI in the spring and fall. ²⁸ Trailing consists of four to seven bands of domestic sheep that are moved to and from the Blue Wing Seven Troughs Allotment in the Winnemucca District to the adjacent California BLM districts.
Present	Transportation	SR-447 and CR-34 are main, paved highways that traverse the analysis areas. There are many paved and unpaved access roads in the analysis areas, including Transfer Station Road, SR-49 (Jungo Road), Soldier Meadows Road, transmission line maintenance roads, and others. A Union Pacific Railroad line connecting Susanville, California, and Winnemucca, Nevada, passes through the analysis areas at Gerlach.
Present	Recreation	The BLM signed a decision record and renewed a 10-year SRP for the Burning Man Event. The event is held annually in late August and early September on the Black Rock Desert playa. Under terms of the issued permit, the event is capped at 80,000 total attendees (BLM 2019d).
Reasonably foreseeable	Fluid minerals exploration and development	The BLM signed the decision record for Ormat's 40-megawatt North Valley Geothermal Development Project San Emidio Geothermal Field (BLM 2021c) in the San Emidio Desert. Surface disturbance associated with the plant and the associated 120-kilovolt overhead generation-tie line will be approximately 190 acres.
Reasonably foreseeable	Water rights transfer	There is a water rights acquisition and proposed transfer for planned municipal uses in Storey County. Any transfer of water out of the hydrologic basin(s) in the analysis area would be subject to the approval of the Nevada State Engineer.

Sources: As noted in the table

²⁸ Email from Angela Arbonies, BLM, to Morgan Trieger, EMPSi, on February 8, 2022, regarding Gerlach Geothermal Exploration Project - domestic sheep trailing.

Cumulative Effects Analysis

Past, present, and reasonably foreseeable future actions that have affected, and will continue to affect, GHG emissions are fluid minerals and locatable minerals exploration and development, including the Hycroft Mine and San Emidio geothermal plant. Infrastructure and transportation, including vehicle traffic on regional highways and railroads, have contributed and will continue to contribute GHG emissions to the atmosphere.

Actions that have contributed to the presence of infrastructure in the analysis area are primarily existing geothermal utilization in the San Emidio Desert, locatable minerals development at the Hycroft Mine, the Los Angeles Department of Water and Power 500-kilovolt transmission line, the Union Pacific Railroad line, and SR-447 and CR-34. The communities of Gerlach and Empire, the San Emidio geothermal plant, Hycroft Mine, and the Burning Man Event will continue to contribute to regional sources of ALAN.

Those actions that have affected and will continue to affect ambient noise levels in the analysis area primarily include the mineral developments, regional highways, and railroad mentioned above. The Burning Man Event has, and will continue to, periodically affect ambient noise levels.

Those actions that have affected and will continue to affect water resources are existing and planned geothermal resource utilization in the San Emidio Desert and agricultural irrigation water use. The recent acquisition of water rights in the San Emidio Desert for planned municipal uses in Storey County could result in water being transferred out of the basin. Any transfer of water out of the basin would be subject to the approval of the Nevada State Engineer.

Construction, operation, and maintenance of most of the past, present, and reasonably foreseeable future actions have removed, and will continue to remove, vegetation and disturb soils in the analysis area. This has reduced, and will continue to reduce, habitat quality for general and sensitive plant and wildlife species.

When combined with these past, present, and reasonably foreseeable future actions, Alternatives A, B, and C would contribute incrementally to GHG emissions, the presence of temporary equipment, noise levels, the potential for effects on water resources, and surface disturbance and associated vegetation removal in the analysis area, as described below. Implementing applicant-committed environmental protection measures (**Section 2.1.7**) and additional BLM-required stipulations (**Table 3-11**) would minimize the action alternatives' contribution to the cumulative effects.

Geothermal exploration would have the potential to contribute incrementally to effects on resources in the analysis area. The action alternatives would temporarily increase the presence of equipment and traffic, and increase the presence of access roads, well pads, and wellheads in the long term in the analysis area. The primary potential impacts associated with this are temporarily restricted access to recreation opportunities and changes to the recreation setting, and reduced opportunities and feelings of solitude or primitive and unconfined recreation in special designation areas from changes in ALAN. The potential would be reduced by incorporating visual design standards and lighting measures to minimize ALAN.

Temporary noise would come from constructing proposed access roads and well pads and drilling geothermal exploration wells. Noise generated during construction would affect the recreation setting in the Granite Range SRMA, the naturalness character in portions of the Granite Peak LWC area, and wildlife, such as from disturbance and displacement from habitat during construction. Since existing commercial and recreational activities in the analysis area already generate noise, anticipated effects would be minor.

Temporary effects on water resources would occur if exploration activities changed the shallow groundwater aquifer's quality or quantity. This could affect the water quality or availability in the hydrologic basins for wildlife and water rights holders. While sampling in the vicinity indicates little to no mixing of the geothermal reservoir and the shallow groundwater aquifer (Stantec 2022a, Section 5.4), developing and

implementing the groundwater monitoring plan (Broadbent and Associates Inc. 2022) would identify changes in nearby resources and inform appropriate corrective measures.

The action alternatives would cause surface disturbance, remove vegetation, and increase the potential for water- and wind-driven soil erosion. Surface disturbance in suitable habitat for special status species would result in contributions to cumulative effects on these species and their habitat. The impacts would be incremental, when combined with vegetation removal and soil disturbance from past, present, and future actions in the analysis area. Temporary contributions would occur from constructing the proposed access roads and well pads. Long-term contributions would occur in the footprints of areas that would not be reclaimed after construction. The primary potential impacts associated with these contributions are temporary and permanent vegetation and wildlife habitat removal, soil disturbance that increases the potential for invasive plant establishment and spread, water- and wind-driven soil erosion, and visual impacts, including on the context and setting for special designations areas and the integrity of setting, feeling, and association of cultural resources. However, incorporating visual design standards would reduce these potential visual impacts.

Contributions to cumulative effects on special status species would be greater for those species that are less tolerant of fragmented or disturbed habitats. While some wildlife can inhabit relatively disturbed habitats and reoccupy temporarily disturbed and restored areas relatively quickly, some special status species do not have this ability. Temporarily disturbed suitable habitat, even if restored, can take a relatively long time to regain suitability. Also, this does not guarantee species reoccupation.

Based on the anticipated potential impacts from Alternative A: Proposed Action, Alternative B: 3-Mile Access Point, or Alternative C: Existing Well 68-3 Access Point, when combined with impacts from past, present, and reasonably foreseeable future actions in the cumulative effects analysis area, no cumulatively significant impacts are anticipated.

There would be no cumulative effects from Alternative D: No-Action Alternative, because Ormat would not construct the project.

Chapter 4

Consultation and Coordination

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Chapter 4. Consultation and Coordination

4.1 TRIBES, INDIVIDUALS, ORGANIZATIONS, AND AGENCIES CONSULTED

During the NEPA process for this EA, the BLM formally and informally consulted and coordinated with other federal agencies, state and local governments, Native American tribes, and the interested public. The BLM did this to ensure its compliance, in both the spirit and intent, with 40 CFR 1501.7 and 1503. In addition to formal scoping, the BLM implemented collaborative outreach and a public involvement process that included inviting agencies to be cooperative partners for the EA planning process. A cooperating agency is any federal, state, or local government agency or Native American tribe that enters into a formal agreement with the lead federal agency to help develop an environmental analysis.

4.1.1 Government-to-Government Consultation

The federal government works on a government-to-government basis with Native American tribes because they are recognized as separate governments. This relationship was formally recognized on November 6, 2000, with Executive Order 13175 (65 *Federal Register* 67249). As a matter of practice, the BLM coordinates with all tribal governments, associated native communities, native organizations, and tribal individuals whose interests might be directly and substantially affected by activities on public lands. In addition, Section 106 of the NHPA requires federal agencies to consult with Native American tribes for undertakings on tribal lands and for historic properties of significance to the tribes that may be affected by an undertaking (36 CFR 800.2(c)(2)). BLM Manual 1780, Tribal Relations, and BLM Handbook H-1780-1, Improving and Sustaining BLM-Tribal Relations, provide guidance for Native American consultations.

Executive Order 13175 stipulates that, during the NEPA process, federal agencies must consult tribes identified as being directly and substantially affected. The BLM notified several tribes of the proposed action in writing on November 9, 2021, and again on February 7, 2022. The BLM sent letters to the Fallon Paiute-Shoshone Tribe, the Pyramid Lake Paiute Tribe, the Reno-Sparks Indian Colony, the Summit Lake Paiute Tribe, and the Susanville Rancheria. The BLM also notified the Fort McDermitt Paiute and Shoshone Tribe about the project, though the BLM did not send an outreach letter to this tribe. On February 18, 2022, the BLM shared the project's existing cultural documentation with the Reno-Sparks Indian Colony, at the request of the tribe.

On April 26, 2022, the BLM held an information-sharing meeting with the Reno-Sparks Indian Colony. At the meeting, the BLM and tribe discussed project NHPA Section 106 consultation that is being carried out under 36 CFR 800.8(c), and the reasoning for conducting the consultation under this process instead of the 2014 State Protocol Agreement between the BLM and Nevada State Historic Preservation Office for implementing the NHPA.²⁹ The BLM and tribe also discussed the project time line and other geothermal projects currently underway in Nevada.

To date, the BLM has not received a request for formal government-to-government consultation from contacted tribes. Outreach, communication, and coordination will continue throughout the NEPA process. Continued communication and coordination will help to ensure that management actions are consistent with rights retained by tribes and that the concerns of tribal groups are considered.

4.1.2 Nevada State Historic Preservation Office

In accordance with the requirements of Section 106 of the NHPA, the BLM is consulting with the Nevada State Historic Preservation Office. NHPA Section 106 consultation is being carried out in accordance with

²⁹ The State Protocol Agreement is available online at https://shpo.nv.gov/uploads/documents/BLM_Nevada_State_Protocol_Agreement_2014.pdf.

the process described in 36 CFR 800.8(c). Additional information on this process and consultation can be found in **Appendix C**, Cultural Resources.

4.1.3 US Department of the Interior, Fish and Wildlife Service

Consultation with the USFWS is required under Section 7(c) of the ESA before the BLM begins any project that may affect federally listed or endangered species or their habitat. Current surveys have indicated that the proposed action would not affect ESA-listed species. This indicates that a biological assessment would not be needed to evaluate the project's potential impacts on federally listed threatened and endangered species.

The BLM also coordinated with the USFWS Migratory Bird Program during each agency's review of Ormat's Eagle Conservation Plan (Ormat 2022a).

4.1.4 US Department of the Interior, National Park Service

The National Park Service is the administering agency for national historic trails. The BLM is coordinating with the National Park Service because the California National Historic Trail crosses the AOL's southern portion. Additional information on this coordination can be found in **Appendix C**, Cultural Resources.

4.1.5 Cooperating Agencies

Cooperating agencies are any federal, state, or local government agency or Native American tribe that enters into a formal agreement with the lead federal agency to help develop an environmental analysis. Cooperating agencies and tribes work with the BLM, sharing knowledge and resources, to achieve desired outcomes for public lands and communities within statutory and regulatory frameworks. **Table 4-1**, below, presents the agencies that the BLM invited and those that accepted and signed a memorandum of understanding agreeing to participate as cooperating agencies for this NEPA process. See **Section 4.1.1**, Government-to-Government Consultation, for information on outreach to Native American tribes.

Table 4-1
Cooperating Agencies

Agencies Invited to Be Cooperators	Invited	Accepted
NDOW	Yes	No
NPS	Yes	Yes
TMRPA	Yes	Yes
USFWS	Yes	Yes
Washoe County	Yes	No

4.2 LIST OF PREPARERS

This EA was prepared by an interdisciplinary team of staff from the BLM and EMPSi, with their supporting subcontractors. The following tables list those who prepared or contributed to the development of this EA.

Table 4-2
List of Preparers, BLM and Cooperating Agencies

Team	Name and Agency	Role/Responsibility
Management	James (Andy) Boerigter (BLM)	Assistant Field Office Manager
	Susan Grande (BLM)	Assistant Field Office Manager
	Mark Hall (BLM)	Authorized Officer; Field Office Manager; Planning and Environmental Coordinator (acting)
	Tai Subia (BLM)	Project Manager; Geology and Minerals

Team	Name and Agency	Role/Responsibility
Interdisciplinary	Jeremy Anderson (BLM)	Wildlife; Threatened and Endangered Species; Special Status Species; Migratory birds
	Angela Arbonies (BLM)	Range
	Jennifer Barnett (BLM)	Geology and Minerals
	Heather Beeler (USFWS)	Golden Eagles and Other Raptors
	Jeanette Black (BLM)	Hydrology
	Brian Deaton (NPS)	National Historic Trails
	Shannon Deep (BLM)	Native American Tribal Consultation
	Frank Giles (BLM)	Air Quality and Climate Change
	Michael Kizorek (BLM)	Recreation
	Holley Kline (BLM)	Wildlife; Threatened and Endangered Species; Special Status Species; Migratory Birds
	Lee Kreutzer (NPS)	National Historic Trails
	Michael Kraus (BLM)	Cultural Resources; Archaeology
	Michael McCampbell (BLM)	Invasive, Nonnative Species
	Brian McMillan (BLM)	Wildlife; Threatened and Endangered Species; Special Status Species; Migratory Birds
	Garrett Swisher (BLM)	Wild Horses and Burros
	Kathy Torrence (BLM)	Special Designations
	Mitchell Vorwerk (BLM)	Hydrology

Table 4-3
List of Preparers, Consultant Team

Team	Name and Company	Role/Responsibility
Management	Jennifer Thies (EMPSi)	Project Manager; Quality Assurance/Quality Control
Interdisciplinary Team and Support Staff	Sean Cottle (EMPSi)	Public Outreach; Special Designations
	Chelsea Ontiveros (EMPSi)	Geographic Information System Technician
	Rob Lavie (EMPSi)	Geographic Information System Lead
	Kim Murdock (EMPSi)	Technical Editor
	Cindy Schad (EMPSi)	Word Processing
	Kirsti Davis (EMPSi)	Public Outreach; Geology and Hydrology; Soil Resources; Visual Resources
	Andy Spellmeyer (EMPSi)	Section 508 Compliance
	Morgan Triege (EMPSi)	Vegetation; Wildlife; Noise; Geology and Hydrology; Visual Resources

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Appendix A

Figures

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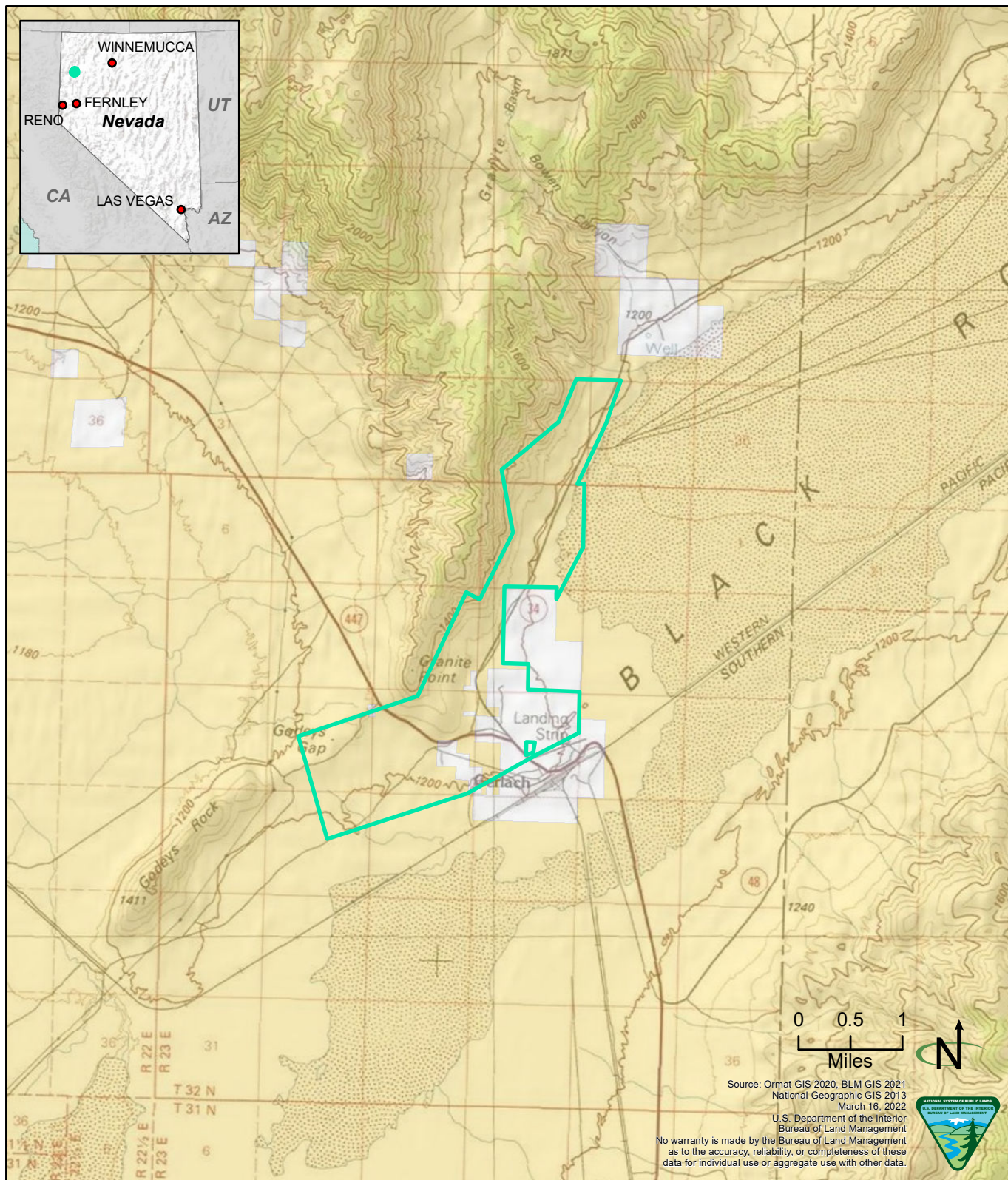


Figure A-1. Project Area

- Area of Interest
- Bureau of Land Management
- Private

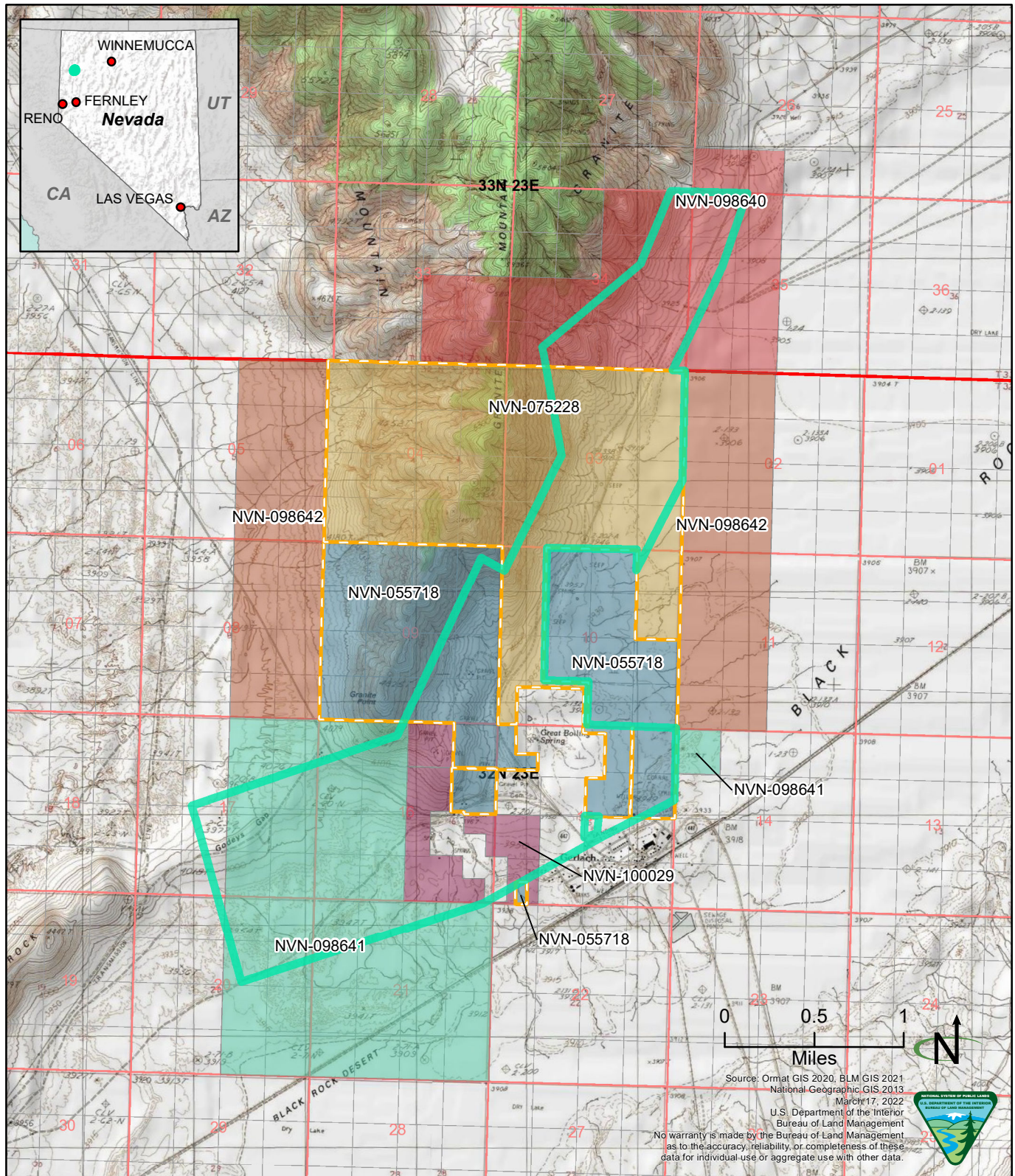
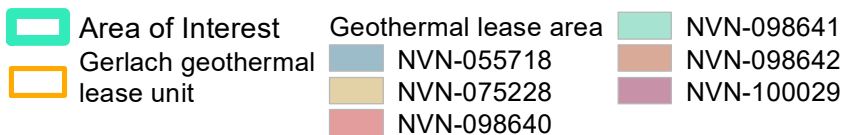


Figure A-2. Geothermal Lease Areas



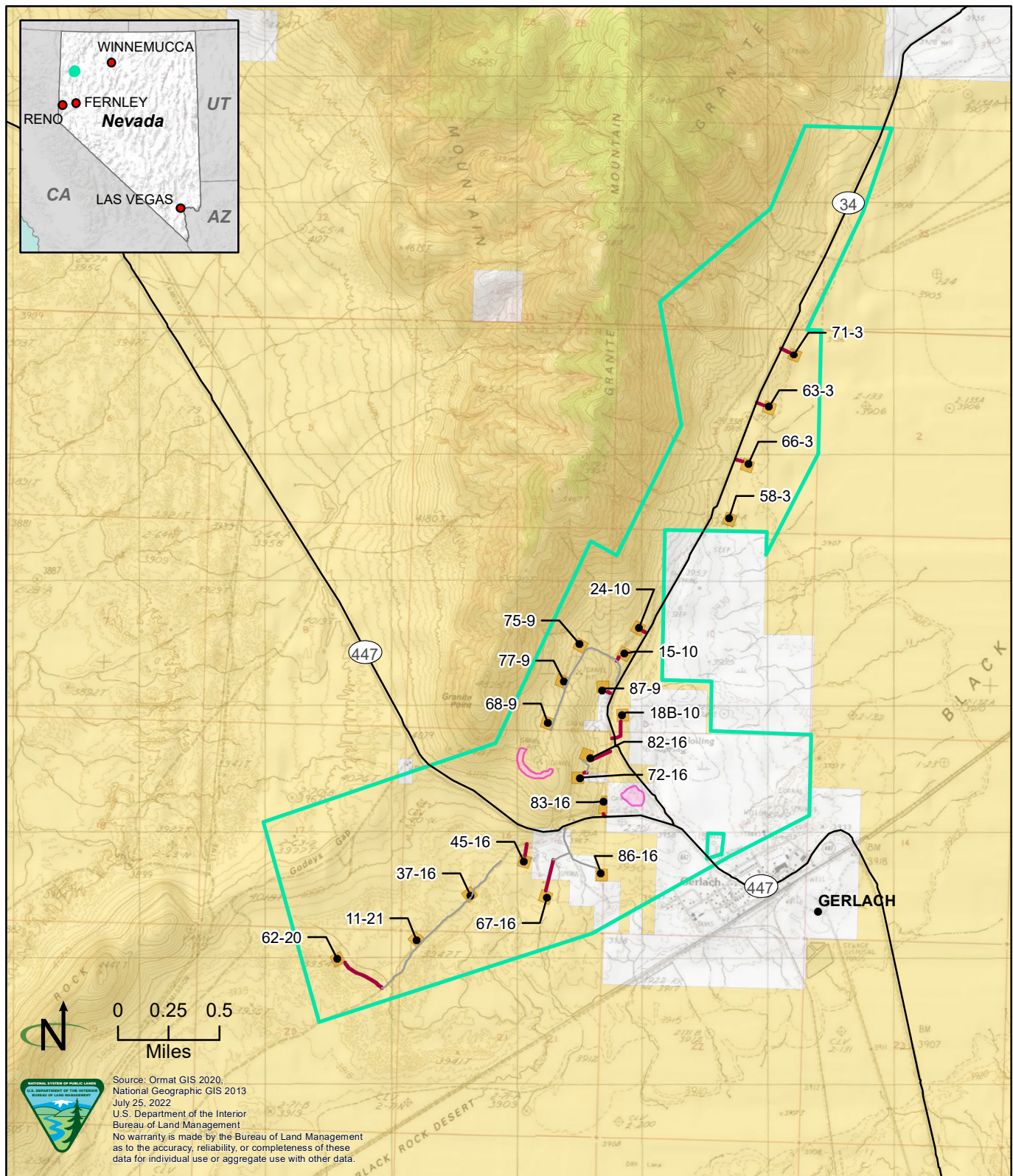
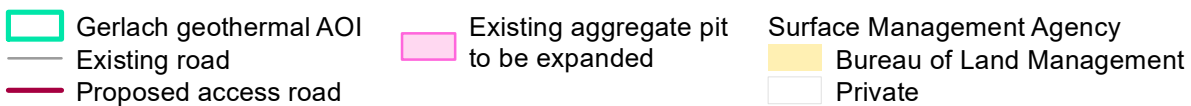


Figure A-3. Proposed Action (Alternative A)



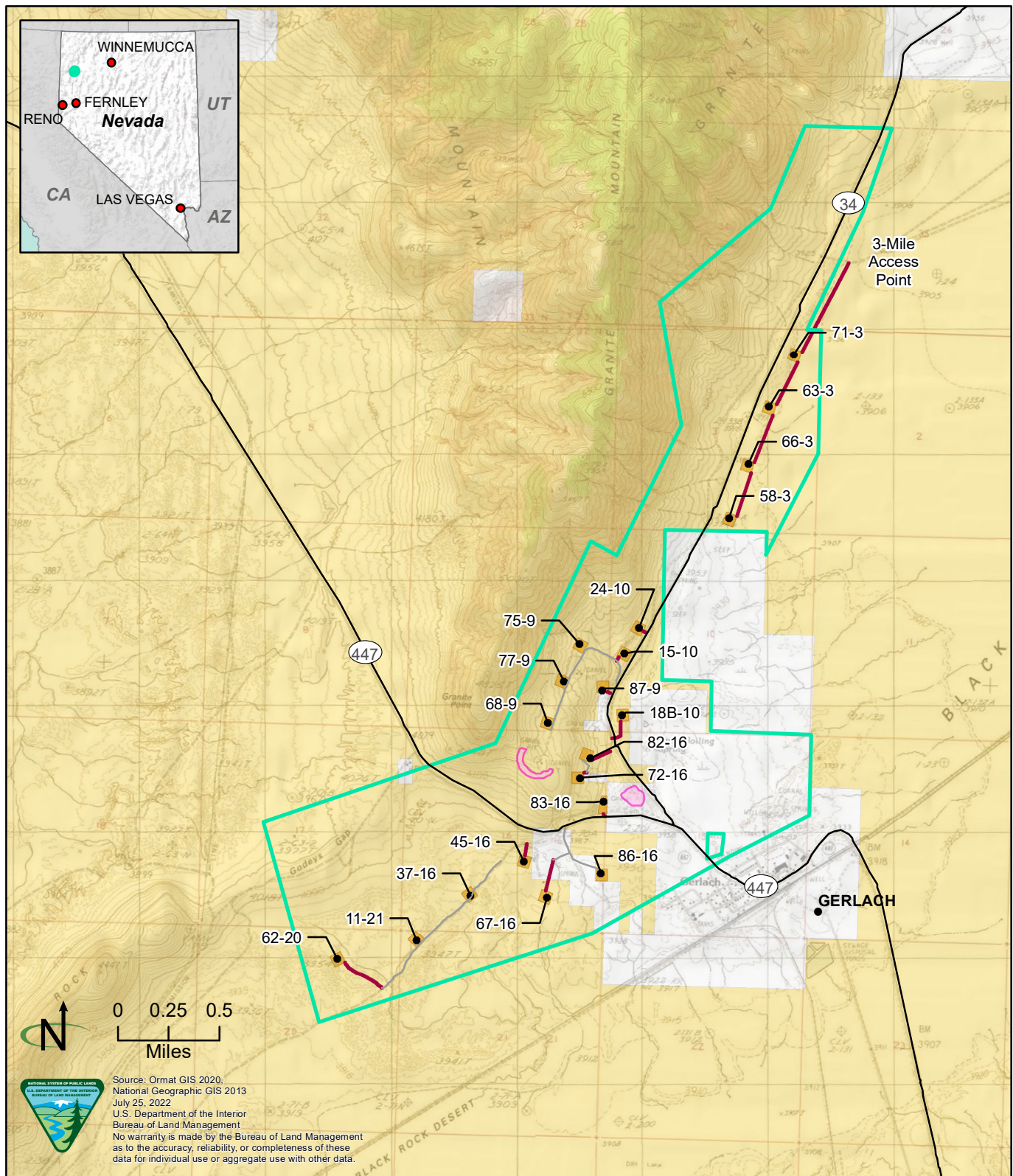
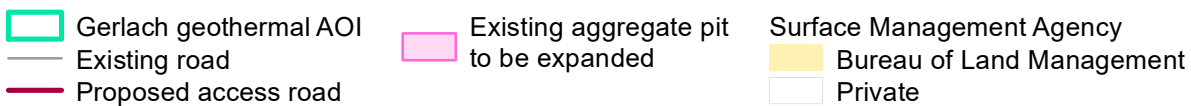


Figure A-4. 3-Mile Access Point (Alternative B)



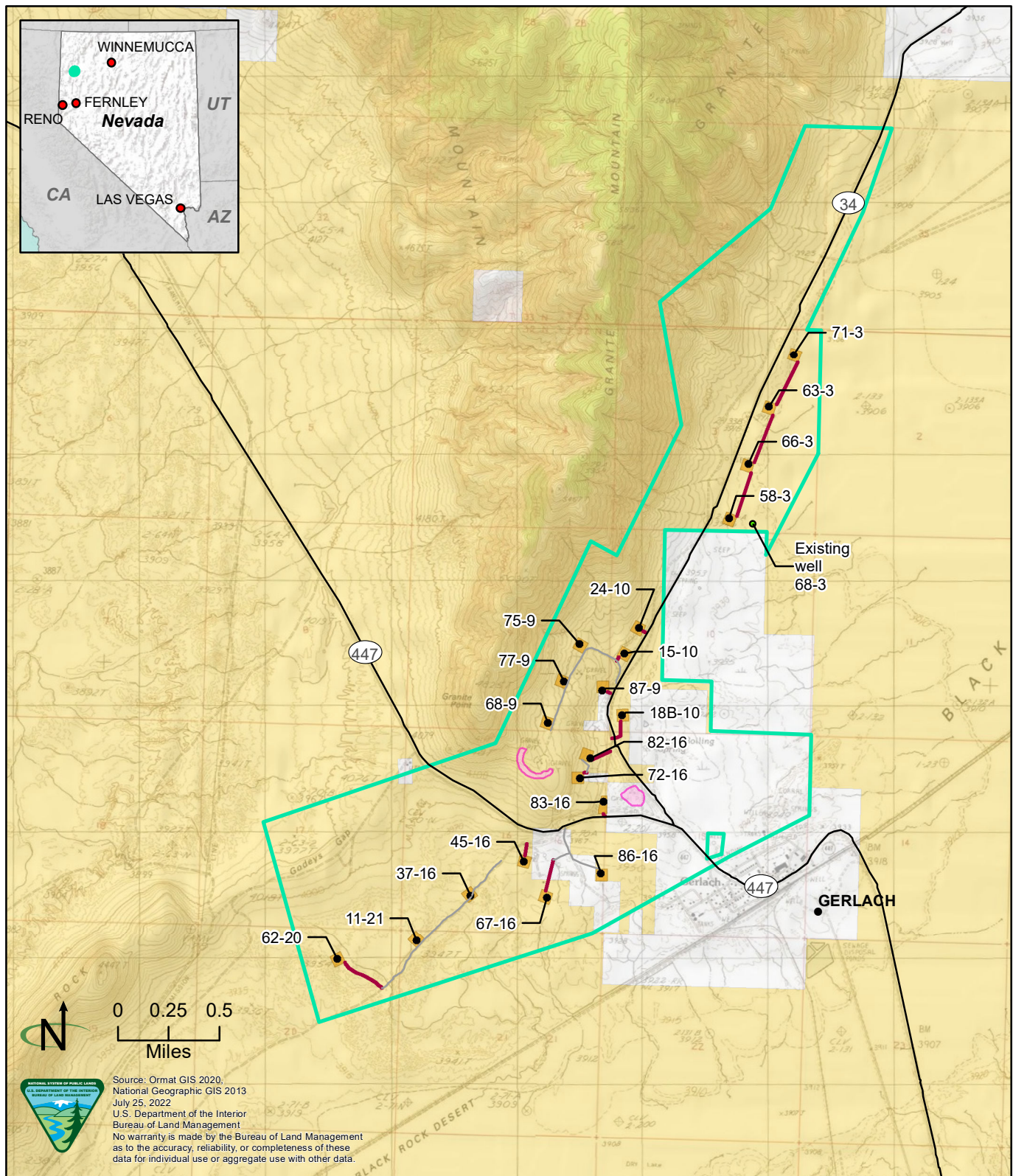
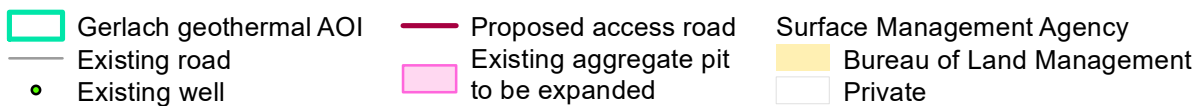
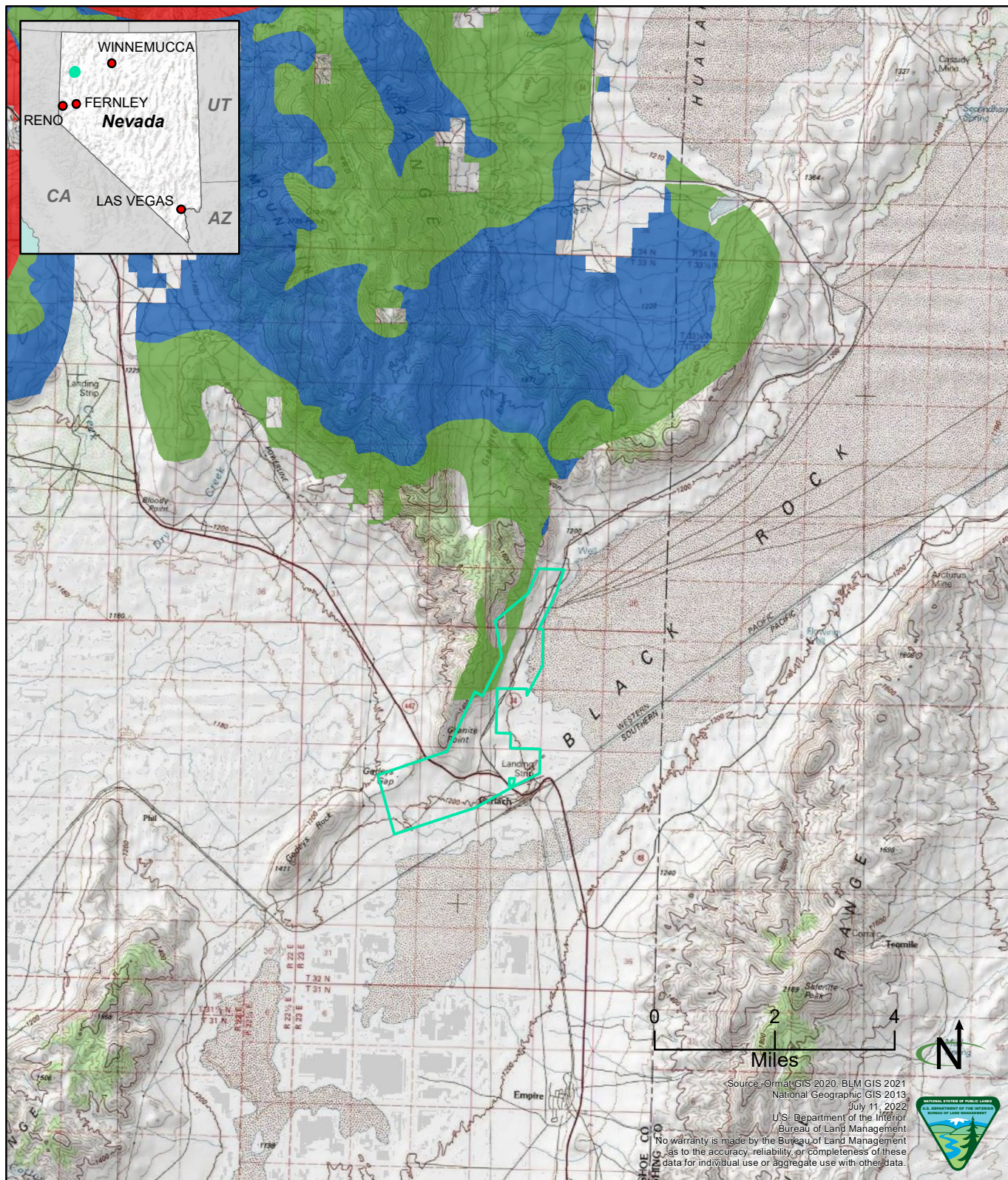


Figure A-5. Existing Well 68-3 Access Point (Alternative C)





**Figure A-6. Greater Sage-Grouse
 (2021 Plan Maintenance Action for the Approved Resource Plan Amendment (2015))**

- General habitat management area
- Priority habitat management area
- Other habitat management area
- Area of Interest

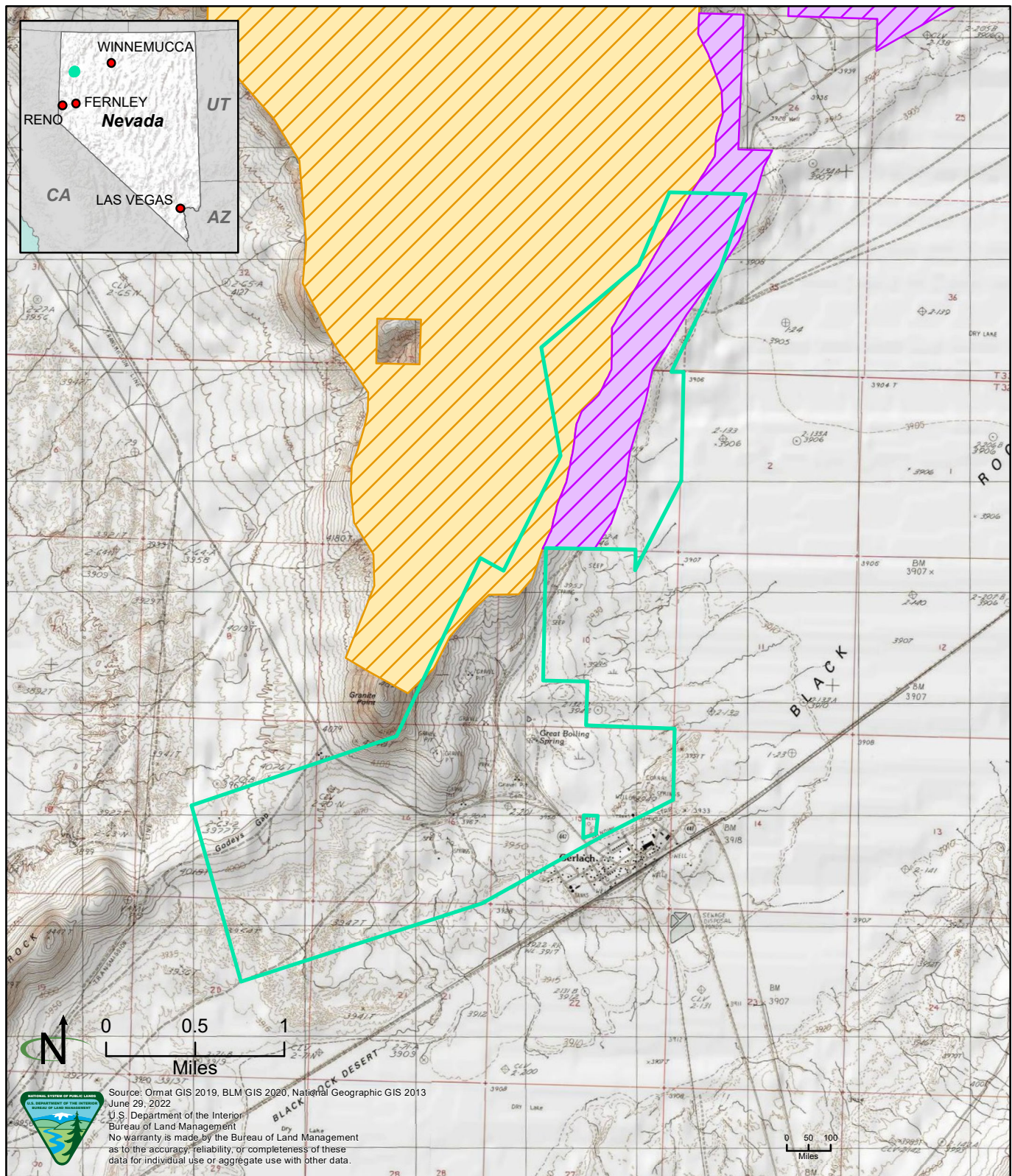


Figure A-7. Granite Range Special Recreation Management Area

- Area of Interest
- Granite
- Granite Foothills
- Recreation management zone

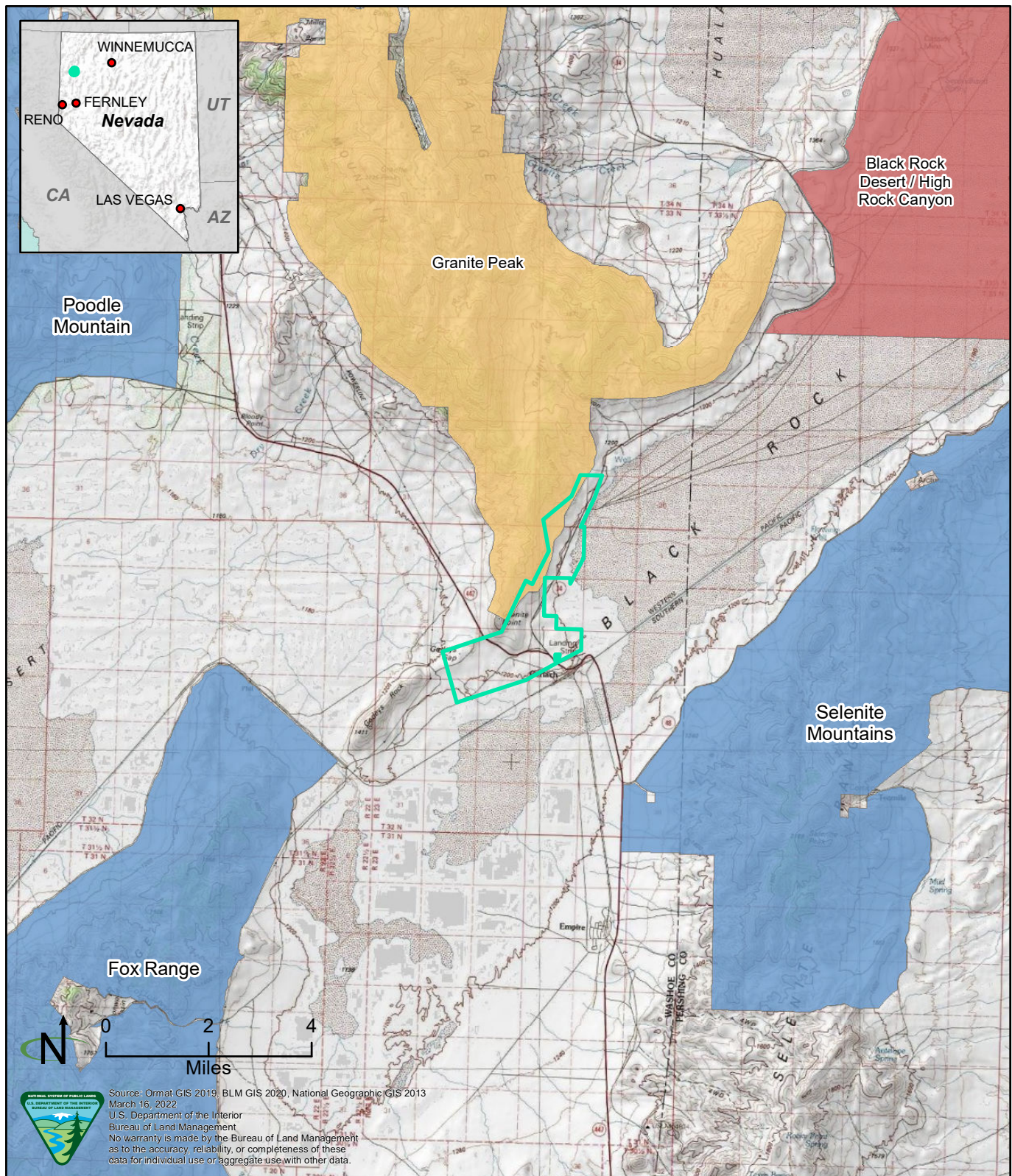


Figure A-8. Special Designations

- Area of Interest
- Land with wilderness characteristics
- National conservation area
- Wilderness study area

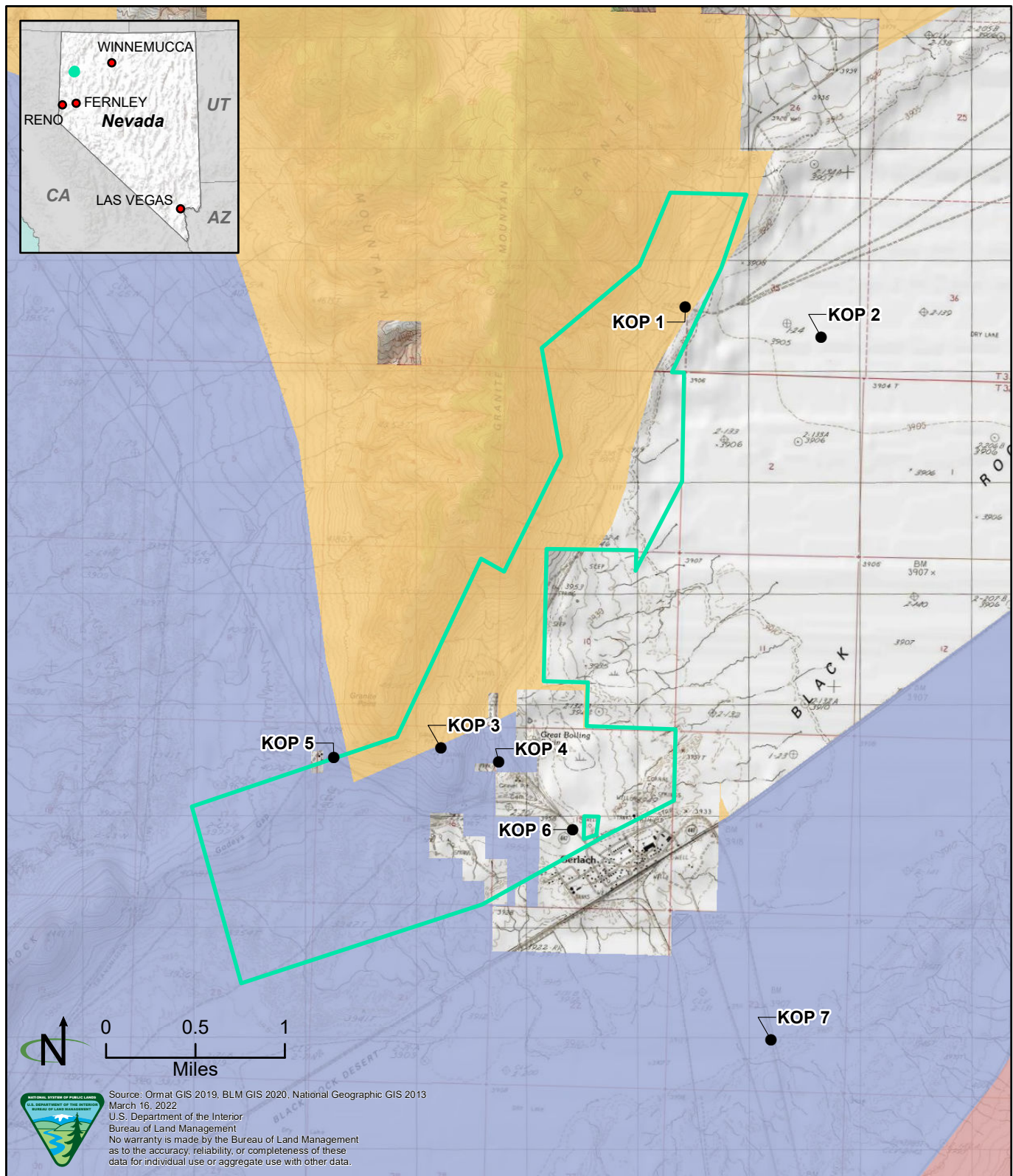


Figure A-9. Visual Resource Management Class and Key Observation Points

- Key observation point
- Area of Interest
- VRM Class I
- VRM Class II
- VRM Class III

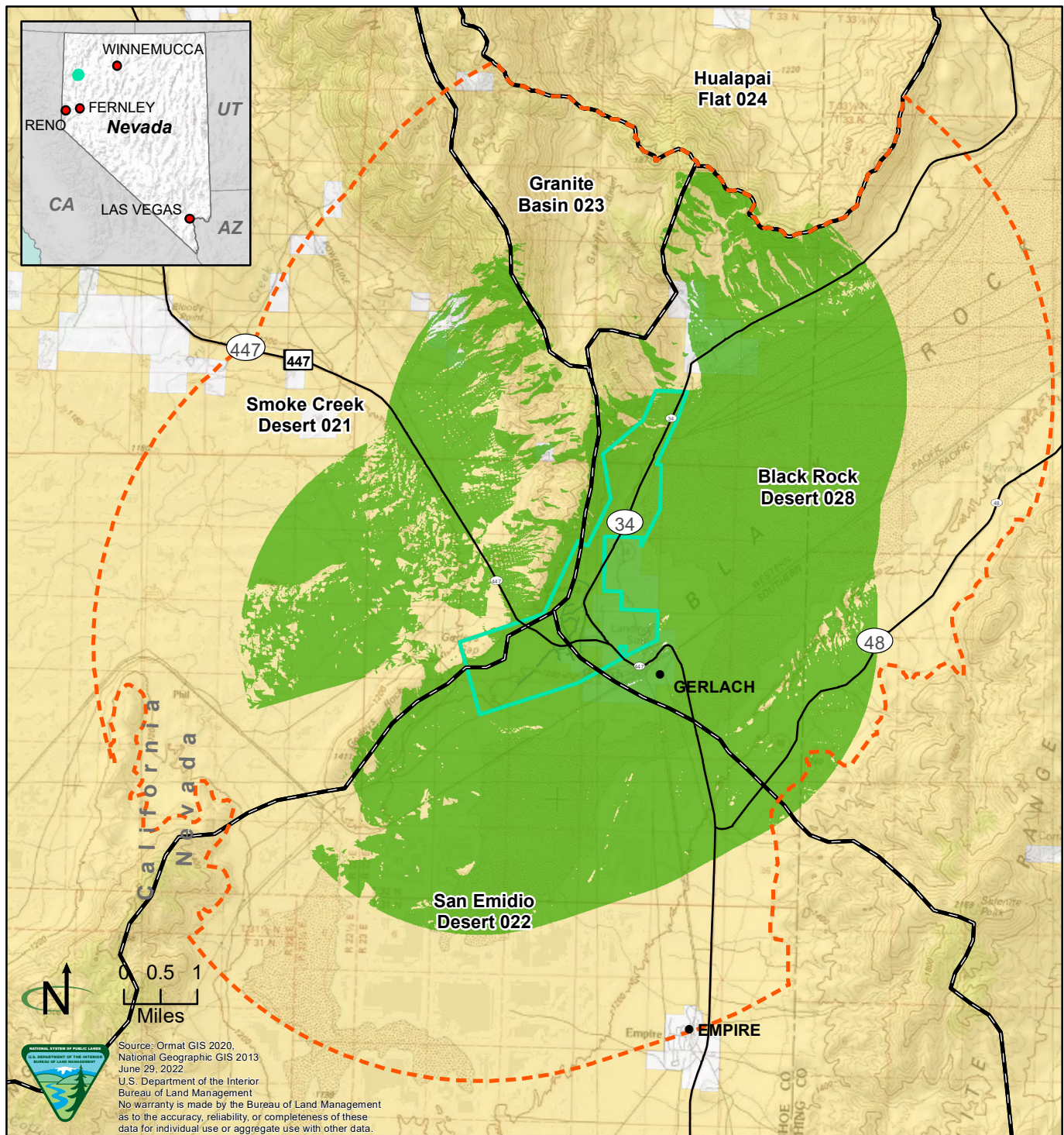


Figure A-10
Cumulative Effects Analysis Areas (Water and Other Resources)

- | | | |
|--|------------------------|---------------------------|
| Cumulative effects analysis area - water resources | Gerlach geothermal AOI | Surface Management Agency |
| Cumulative effects analysis area - other resources | | Bureau of Land Management |
| Hydrologic Evaluation Study Area | | Private |

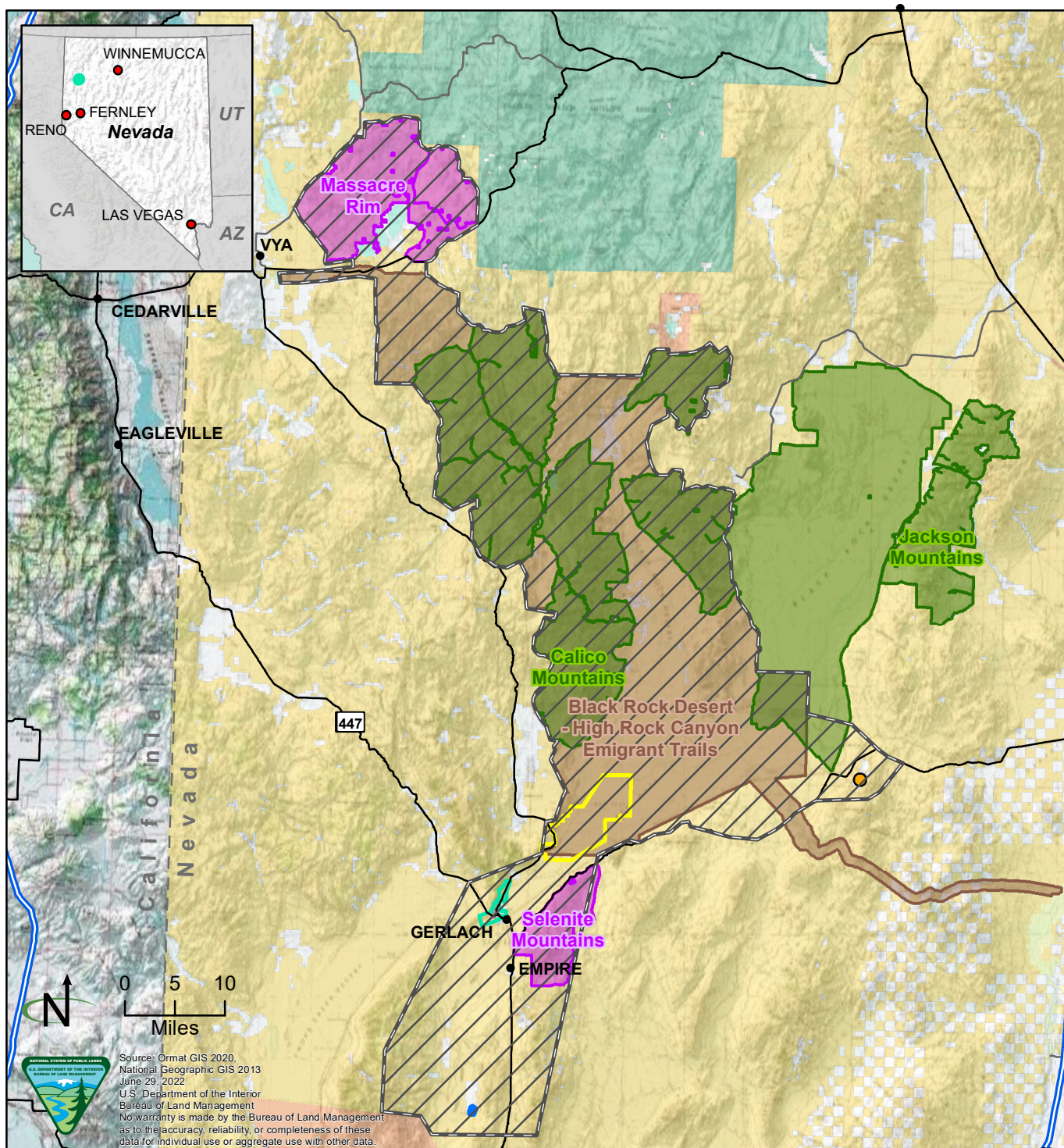


Figure A-11
Cumulative Effects Analysis Areas (Special Designations and Visual Resources, including Night Skies)

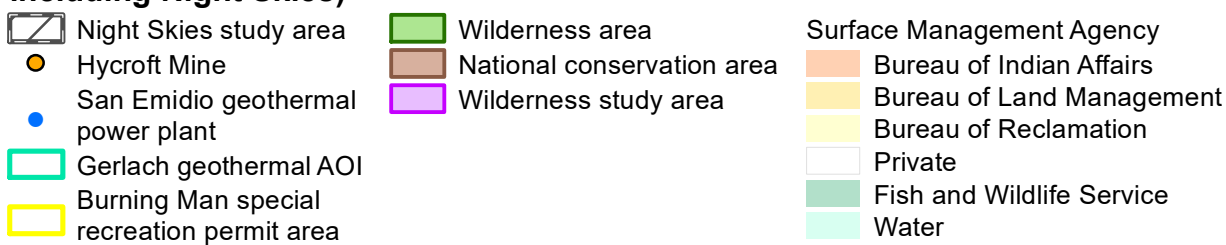


Figure A-12, Photographs of Existing Well and Pad Features**Top: Existing well 68-3 pad. Photograph taken September 22, 2021.****Middle: Existing well 68-3 sump. Photograph taken September 22, 2021.****Bottom: Existing well 18A-10 gravel pad and wellhead. Photograph taken September 22, 2021.**

Appendix B

References

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Appendix C

Cultural Resources

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Appendix C. Cultural Resources

A records check of state and federal databases indicated 119 cultural resource inventories have been conducted within 1 mile of the project area since 1976. A total of 336 previously recorded archaeological sites—298 prehistoric, 26 historic, 11 multicomponent, and 1 of unknown age—were located within a 1-mile radius of the project area. Twenty-seven sites were recommended eligible for the National Register of Historic Places (NRHP), 58 were recommended not eligible, 250 were unevaluated, and no data were available for the remaining site. Of the previously recorded archaeological sites, 101 were located within the project area.

After the initial records search was completed, Kautz Environmental Consultants (KEC) completed a 5,578-acre survey and wrote a report titled Cultural Resources Inventory for the Ormat Nevada, Inc. Gerlach Geothermal Development Project, Washoe County, Nevada (CR2-3489). This survey included the 2,724-acre direct area of potential effect (APE) and a 2,854-acre linear corridor that was 23 miles long and 960 feet wide. This survey for the project was done to record any newly identified resources within the direct APE, update any resources recorded over 10 years ago, update the Nobles Route of the California National Historic Trail (NHT) and Western Pacific Railroad, establish key observation points (KOPs), and conduct visual assessments at certain known and new sites to evaluate indirect effects on NRHP values.

A total of 198 archaeological sites are addressed in the inventory report. These include 96 newly identified resources and 42 updates to previously recorded sites. These totals include four sites that were combined with resources. Sixty previously recorded sites that have not been relocated are addressed in the inventory report; many of these sites represent isolates and small lithic scatters that were previously collected. KEC identified 134 sites as being within the APE after surface survey and the consideration of collected sites and isolated artifacts.

RESOURCES OF CULTURAL SIGNIFICANCE

Cultural resources include prehistoric and historic archaeological sites, buildings, structures, districts, or other places or objects considered important to a culture, subculture, or community for traditional, religious, scientific, or other purposes. If these resources meet defined significance criteria, they are protected under several federal laws and executive orders. The federal laws include the National Historic Preservation Act of 1966, as amended; the Archaeological and Historic Preservation Act of 1974; the Archaeological Resources Protection Act of 1979; and the Native American Graves Protection and Repatriation Act of 1990. These laws also require the Bureau of Land Management (BLM) to invite federally recognized tribes for government-to-government consultation, as do Executive Order 13007 (Indian Sacred Sites) and Executive Order 13175 (Consultation and Coordination with Indian Tribal Governments).

Cultural resources are eligible for the NRHP if they meet one or more of four significance criteria (36 Code of Federal Regulations 60.4) and retain historic integrity. For an understanding of integrity, see the *National Register Bulletin* provided by the National Park Service at https://www.nps.gov/subjects/nationalregister/upload/NRB-15_web508.pdf.

Historic and archaeological districts are evaluated for NRHP eligibility as a whole. Individual sites within a district are evaluated as contributing or not contributing to the district's significance. Sites within a district may also be evaluated individually for NRHP eligibility. Cultural resources eligible for the NRHP or contributing to an eligible district are referred to as historic properties. Unevaluated cultural resources are treated as though they are eligible or contributing; they are considered historic properties in this analysis.

RESOURCES IDENTIFIED

Cultural resources addressed in the inventory report are summarized in **Table C-I**. Resources presented in **Table C-I** include the 134 cultural resources that KEC confirmed in the APE.

Table C-I
Identified Cultural Resources

Agency Number CRNV-	Trinomial Number (26WA-)	Historic, Prehistoric, or Multicomponent	Description	National Register Recommendation	Criteria	District (Number: Contributing/ Non- Contributing)
02-31	2250	Multicomponent	Lithic and ground stone/refuse scatter	Eligible	D	—
02-32	2249	Prehistoric	Lithic scatter	Unevaluated	—	—
02-40	2257	Multicomponent	Lithic scatter Refuse scatter	Not eligible	—	—
02-42	2259	Prehistoric	Lithic scatter	Not eligible	—	—
02-106	2306	Prehistoric	Lithic and ground stone scatter	Eligible	D	—
02-122	2322	Prehistoric	Lithic scatter	Not eligible	—	—
02-125	2325	Prehistoric	Lithic scatter	Eligible	D	—
22-00902	6631	Multicomponent	Rock shelter, lithic scatter Prospecting, refuse scatter	Eligible	D	—
22-1211	3133	Prehistoric	Quarry	Eligible	D	D368: Contributing
22-1244	2592	Prehistoric	Lithic scatter	Not eligible	—	—
22-1245	2863	Prehistoric	Lithic scatter	Eligible	D	—
22-1274	2892	Prehistoric	Lithic scatter	Eligible	D	—
22-2858	3011	Prehistoric	Lithic scatter	Eligible	D	—
22-4178	3740	Prehistoric	Lithic scatter	Not eligible	—	D368: Non-contributing
22-4181	3743	Prehistoric	Lithic scatter	Eligible	D	D368: Contributing
22-5619	5540	Prehistoric	Lithic scatter	Not eligible	—	—
22-5620	5541	Historic	Refuse scatter	Not eligible	—	—
22-5656/ 02-4665	26WA5549/ 26PE2301	Historic	Guru Road segment/Nobles Route	Eligible	A	—
22-5702	6624	Prehistoric	Lithic and ground stone scatter	Eligible	D	—
22-5705	6627	Historic	Refuse scatter	Not eligible	—	—
22-5707	6629	Historic	Refuse scatter	Not eligible	—	—
22-5708	6630	Multicomponent	Lithic scatter Refuse scatter	Not eligible	—	—
22-5710	6632	Multicomponent	Rock shelter Historic refuse	Eligible	D	—
22-5711	6633	Prehistoric	Lithic scatter	Eligible	D	—
22-5738	5628	Prehistoric	Lithic scatter	Not eligible	—	—

Agency Number CRNV-	Trinomial Number (26WA-)	Historic, Prehistoric, or Multicomponent	Description	National Register Recommendation	Criteria	District (Number: Contributing/ Non-Contributing)
22-6149	12721	Multicomponent	Prehistorically important spring Historic spring/park	Eligible	A	—
22-6150	12722	Historic	Cemetery	Eligible	A, D	—
22-6151	12723	Prehistoric	Lithic scatter	Not eligible	—	—
22-6152	12724	Historic	Historic habitation	Eligible	D	—
22-6155	12725	Prehistoric	Lithic scatter	Not eligible	—	—
02-6736/ 12903	6358	Historic	Railroad tracks	Eligible	A	—
22-6814	6409	Historic	Gerlach Airport	Unevaluated	—	—
02-9102	9377	Historic	Refuse scatter	Not eligible	—	—
02-9105	9029	Prehistoric	Lithic scatter	Not eligible	—	D368: Non-contributing
02-9106	9030	Prehistoric	Lithic scatter	Not eligible	—	D368: Non-contributing
02-9107	9031	Multicomponent	Lithic scatter Mining claim	Not eligible	—	D368: Non-contributing
02-9108	9032	Prehistoric	Lithic scatter	Not eligible	—	D368: Non-contributing
02-9020	9378	Multicomponent	Lithic/refuse scatter	Eligible	D	—
02-12497	9733	Historic	Road	Not eligible	—	—
02-12498	9735	Historic	Refuse scatter	Not eligible	—	—
02-14303	12636	Historic	Refuse scatter	Not eligible	—	—
02-14304	12637	Historic	Refuse scatter	Not eligible	—	—
02-14305	12638	Historic	Refuse dump	Not eligible	—	—
02-14306	12639	Historic	Refuse scatter	Not eligible	—	—
02-14307	12640	Historic	Refuse scatter	Not eligible	—	—
02-14308	12641	Historic	Refuse scatter	Not eligible	—	—
02-14309	12642	Historic	Refuse scatter	Not eligible	—	—
02-14310	12643	Prehistoric	Lithic scatter	Not eligible	—	—
02-14311	12644	Historic	Refuse scatter	Not eligible	—	—
02-14312	12645	Prehistoric	Lithic scatter	Not eligible	—	—
02-14313	S2702	Historic	Corral	Not eligible	—	—
02-14314	12646	Historic	Refuse scatter	Not eligible	—	—
02-14315	12647	Prehistoric	Lithic scatter	Unevaluated	—	—
02-14316	12648	Prehistoric	Lithic scatter	Not eligible	—	—
02-14317	12649	Historic	Road	Not eligible	—	—
02-14318	12650	Historic	Refuse scatter	Not eligible	—	—
02-14319	12651	Prehistoric	Lithic scatter	Not eligible	—	—
02-14320	12652	Historic	Road	Not eligible	—	—

Agency Number CRNV-	Trinomial Number (26WA-)	Historic, Prehistoric, or Multicomponent	Description	National Register Recommendation	Criteria	District (Number: Contributing/ Non- Contributing)
02-14321	12653	Prehistoric	Lithic scatter	Unevaluated	—	—
02-14322	12654	Prehistoric	Lithic scatter	Not eligible	—	—
02-14323	12655	Prehistoric	Lithic scatter	Not eligible	—	—
02-14324	12656	Historic	Refuse scatter	Not eligible	—	—
02-14325	12657	Historic	Refuse dump	Not eligible	—	—
02-14326	S2703	Historic	Road: County Road 34	Not eligible	—	—
02-14327	S2704	Historic	Fence	Not eligible	—	—
02-14328	12658	Historic	Refuse scatter	Not eligible	—	—
02-14329	12659	Prehistoric	Lithic scatter	Not eligible	—	—
02-14330	12660	Historic	Refuse scatter	Not eligible	—	—
02-14331	12661	Prehistoric	Lithic and ground stone scatter	Eligible	D	—
02-14332	12662	Prehistoric	Lithic scatter	Not eligible	—	—
02-14333	12663	Prehistoric	Lithic scatter	Not eligible	—	—
02-14334	12664	Prehistoric	Lithic scatter	Not eligible	—	—
02-14335	12665	Prehistoric	Lithic scatter	Not eligible	—	—
02-14336	12666	Prehistoric	Lithic scatter	Not eligible	—	—
02-14337	12667	Prehistoric	Temporary camp	Eligible	D	—
02-14338	12668	Prehistoric	Flake and ground stone scatter with probable hearth	Eligible	D	—
02-14339	12669	Prehistoric	Lithic scatter	Not eligible	—	—
02-14340	12670	Prehistoric	Lithic scatter	Not eligible	—	—
02-14341	12671	Prehistoric	Lithic scatter	Not eligible	—	—
02-14342	12731	Multicomponent	Lithic and ground stone scatter Livestock operation	Eligible	D	D375: Contributing
02-14343	12672	Historic	Road	Not eligible	—	—
02-14344	12673	Prehistoric	Lithic scatter	Not eligible	—	—
02-14345	12674	Historic	Road	Not eligible	—	—
02-14346	12675	Historic	Road	Not eligible	—	—
02-14347	12676	Prehistoric	Lithic scatter	Not eligible	—	—
02-14349	12677	Historic	Refuse scatter	Not eligible	—	—
02-14350	12678	Prehistoric	Lithic scatter	Not eligible	—	—
02-14351	12679	Prehistoric	Lithic scatter	Not eligible	—	—
02-14352	12680	Prehistoric	Lithic scatter	Eligible	D	—
02-14353	12681	Historic	Refuse scatter	Not eligible	—	—
02-14354	12682	Multicomponent	Lithic/refuse scatter	Not eligible	—	—

Agency Number CRNV-	Trinomial Number (26WA-)	Historic, Prehistoric, or Multicomponent	Description	National Register Recommendation	Criteria	District (Number: Contributing/ Non- Contributing)
02-14355	12683	Historic	Road	Not eligible	—	—
02-14356	12684	Prehistoric	Lithic scatter	Eligible	D	—
02-14357	S2714	Historic	Corral	Not eligible	—	—
02-14358	12685	Prehistoric	Lithic scatter	Not eligible	—	—
02-14359	12686	Prehistoric	Lithic scatter	Not eligible	—	—
02-14360	12687	Historic	Road	Not eligible	—	—
02-14361	12688	Prehistoric	Lithic scatter	Not eligible	—	—
02-14362	12689	Historic	Cairns	Not eligible	—	—
02-14363	12690	Historic	Cairns	Not eligible	—	—
02-14364	12691	Historic	Refuse scatter	Not eligible	—	—
02-14365	12692	Historic	Refuse scatter	Not eligible	—	—
02-14366	12693	Prehistoric	Lithic scatter	Not eligible	—	—
02-14367	12694	Prehistoric	Lithic scatter	Not eligible	—	—
02-14368	12695	Historic	Road	Not eligible	—	—
02-14369	S2705	Historic	State Highway 447	Not eligible	—	—
02-14370	12696	Prehistoric	Lithic and ground stone scatter	Eligible	D	—
02-14371	12697	Prehistoric	Lithic scatter	Not eligible	—	—
02-14372	12698	Historic	Refuse scatter	Not eligible	—	—
02-14373	12699	Prehistoric	Lithic scatter	Not eligible	—	—
02-14374	12700	Prehistoric	Lithic scatter	Not eligible	—	—
02-14375	12701	Historic	Refuse scatter	Not eligible	—	—
02-14376	12702	Historic	Refuse scatter	Not eligible	—	—
02-14377	12703	Historic	Refuse scatter	Not eligible	—	—
02-14378	12704	Prehistoric	Lithic scatter	Not eligible	—	—
02-14379	12705	Prehistoric	Lithic scatter	Not eligible	—	—
02-14380	12706	Historic	Road	Not eligible	—	—
02-14381	12707	Prehistoric	Lithic scatter	Not eligible	—	—
02-14382	12708	Prehistoric	Lithic scatter	Not eligible	—	—
02-14383	12709	Prehistoric	Lithic scatter	Not eligible	—	—
02-14384	12710	Prehistoric	Lithic scatter	Not eligible	—	—
02-14385	12711	Prehistoric	Lithic scatter	Not eligible	—	—
02-14386	12712	Prehistoric	Lithic scatter	Not eligible	—	—
02-14387	12713	Prehistoric	Lithic scatter	Not eligible	—	—
02-14388	12714	Prehistoric	Lithic scatter	Not eligible	—	—
02-14389	12715	Prehistoric	Lithic scatter	Not eligible	—	—

Agency Number CRNV-	Trinomial Number (26WA-)	Historic, Prehistoric, or Multicomponent	Description	National Register Recommendation	Criteria	District (Number: Contributing/ Non- Contributing)
02-14390	12716	Prehistoric	Lithic scatter	Not eligible	—	—
02-14391	12717	Historic	Gravel pit	Not eligible	—	—
02-14392	12718	Historic	Road	Not eligible	—	—
02-14393	12719	Historic	Road	Not eligible	—	—
02-14394	12729	Historic	Ditch	Not eligible	—	—
02-14395	12730	Historic	Road 5-Mile Playa access	Not eligible	—	—
02-14396	12720	Historic	Road	Not eligible	—	—
02-14397	S2706	Historic	Transmission line	Eligible	A	—

There is one resource previously listed in the NRHP that is located within a 1-mile radius of the direct APE. It is the Gerlach Water Tower (National Register Information System number 81000385). The survey identified a total of 14 architectural resources within the project area; two are eligible for the NRHP under criterion A. These are summarized in **Table C-2**.

Table C-2
Architectural Resources

Agency Number CRNV-	State Historic Preservation Office Resource	Date Built	Name	NRHP Recommendation	Criteria	District
02-14313	S2702	Unknown	Corral	Not eligible	N/A	N/A
02-14326	S2703	1950	County Road 34	Not eligible	N/A	N/A
02-14327	S2704	1940	Fence	Not eligible	N/A	N/A
02-14342	D375	N/A (District)	Ranching Complex	Not eligible	N/A	N/A
02-14342	S2708	circa 1930	Ranch Building	Not eligible	N/A	Not contributing
02-14342	S2709	circa 1930	Livestock Chute	Not eligible	N/A	Not contributing
02-14342	S2710	circa 1960	Storage Structure	Not eligible	N/A	Not contributing
02-14342	S2711	circa 1930	Fence	Not eligible	N/A	Not contributing
02-14342	S2712	circa 1930	Corral 1	Not eligible	N/A	Not contributing
02-14342	S2713	circa 1930	Corral 2	Not eligible	N/A	Not contributing
02-14357	S2714	circa 1930– 1964	Corral	Not eligible	N/A	N/A
02-14369	S2705	1911	State Highway 447	Not eligible	N/A	N/A
02-14397	S2706	1909	Western Pacific Telegraph Line	Eligible	A	N/A
02-6736	S2707/WA6358	1906– 1909	Western Pacific Railroad	Eligible	A	N/A

VISUAL EFFECTS

KEC conducted an analysis of the project's visual effects on resources. The analysis for the report (CR2-3489) studied KOPs for the Gerlach Water Tower, the Gerlach Cemetery, and a portion of the Nobles Route of the California NHT. Environmental Management and Planning Solutions Inc. (EMPSi) conducted an analysis for a BLM Night Sky Baseline Report for the Gerlach Geothermal Exploration Project.

The BLM Instruction Memorandum NV IM-2021-006 (Bureau of Land Management Nevada Template Visual Area of Potential Effect [APE] Policy) provides a means to uniformly provide a visual APE. Using the intercept theorem/basic proportionality theorem, buffers of the proposed facilities were determined by calculating at what distance the 100- x 60-foot facility would appear 1 inch or less (that is, standing at the edge of the buffer, the facility would look the same size as an object 1 inch in size held at arm's length).

$$\frac{\text{Distance to X}}{\text{Size of X}} = \frac{\text{Distance to Y}}{\text{Size of Y}}$$

Given the intercept theorem, a 60-foot-tall drill rig that has a 100-foot base length could cover an area visually similar to an item 1 x 1 inch, given that the item was held at arm's length (30 inches) and that the

person was 0.44 miles away from the drill rig. This 0.44-mile buffer area did not intersect with any additional sites that would be affected by visual impacts in areas outside the APE on BLM-administered lands. Given that some surface disturbances, such as roads, have no or minimal height disturbances, these are not viewed as major visual impacts.

Concerning the Nobles Route of the California NHT and the Gerlach Cemetery, KEC concludes that “Effects of the planned exploration project will be temporary and limited to the duration of the temporary operations. While temporary changes in the visual baseline conditions of the area will occur, these will be resolved upon completion of the exploration project. This assessment indicates no historic properties would be affected.” KEC also concluded that the view of the project from the water tower is already obstructed by the existing built environment of Gerlach.

Similarly, EMPSi indicated that for astrotourism, the “radiance level (of the drill rig) would be equivalent of the observed radiance of Gerlach” in a worst-case scenario. The visual effects on any unknown segments of the California NHT would likely be similar to these nighttime light radiance-level effects on astrotourism, given their geographic location on the Black Rock Playa. These effects are also likely to be limited and temporary. These effects may still constitute a temporary adverse effect on the California NHT. These temporary adverse effects would also occur on other sites, such as the Great Boiling Spring or other natural areas that may be associated with the use of the California NHT but that are on private land. These areas were not analyzed in detail as KOPs because they are outside the area of interest. Also, they are on private land and are similar to the known significant resources that were analyzed on BLM-administered lands. Additional visual effects are not anticipated because the KOP analysis indicated the effects would be limited and temporary at worst.

The year a geothermal parcel was leased may have an effect on the stipulations and analysis that can be used in determining mitigation requirements for pads within that parcel. Two of the lease parcels included within the area of interest, NVN-098641 and NVN-100029, have been leased recently under the 2019 and 2020 Geothermal Lease Sales (DOI-BLM-NV-W000-2020-0002-DNA and DOI-BLM-NV-W000-2019-0001-DNA). They contain no surface occupancy (NSO) stipulations, as required under the resource management plan (RMP) for the Winnemucca District concerning trails. Six well pads (86-16, 67-16, 45-16, 37-16, 62-20, and 11-21) are proposed to occur in these NSO areas and would require a waiver to proceed, as discussed in the Winnemucca District RMP. Additionally, well heads 37-16 and 62-20, which have a trails NSO stipulation, are in areas marked NSO due to NRHP-eligible sites. These well heads would also require another waiver for surface use due to the NSO stipulations. These wells would not be permitted without a waiver and a further impact analysis. For these reasons, these pads would not be permitted under this environmental assessment.

Lease areas NVN-075228 (2001) and NVN-055718 (1992) were leased much earlier and do not maintain the same stipulations and requirements as parcels leased later. Due to valid and existing rights, the pads in these areas would not have the same visual stipulations and requirements of visual effects that are addressed in the current RMPs (the 2004 Black Rock Desert-High Rock Canyon Emigrant Trails National Conservation Area and Associated Wilderness and Other Contiguous Lands in Nevada RMP, and the 2015 Winnemucca District RMP) or BLM Trail Manual 6280 (2012); this is because their leasing predates the documents. At the time of their lease, the planning document for this area was the 1998 Sonoma-Gerlach Management Framework Plan, which did not have stipulations regarding trails. If a well pad is not placed directly on the cultural resource in these lease areas, there is little the BLM can mandate for visual effects on cultural properties in these lease areas. However, pad 83-16 has been found to be located on an eligible resource; for this reason, under the Sonoma-Gerlach Management Framework Plan, the BLM would not permit surface use on pad 83-16 without further consultation and review. Therefore, pad 83-16 would not be permitted under this environmental assessment.

Appendix D

Visual Contrast Rating Worksheets and
Photographs

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1. KOP 1. Photograph taken March 2, 2021.



2. KOP 2. Photograph taken March 2, 2021.



3. KOP 3. Photograph taken March 2, 2021.



4. KOP 4. Photograph taken March 2, 2021.



5. KOP 5. Photograph taken March 2, 2021.



6. KOP 6. Photograph taken March 2, 2021.



7. KOP 7. Photograph taken March 2, 2021.

Visual Resource Photo Log

Date (MM/DD/YYYY)	Time (hh:mm)	Photo #	KOP # (4 digit sequential #, starting from 0001)	KOP Name	Elevation (feet)	Type of Feature Point Represents (stationary, along a route, boundary)	Observer Height	Comments and Methodology (description of the reasoning behind determining the KOP and description of the KOP)
03/02/2021	10:49 AM	—	0007	KOP 7	3,900	NV State Route 447, viewing N-NW, 180°	5'6"	Viewpoint at a distance looking towards AOI and including Gerlach; adjacent to NV State Route 447
03/02/2021	11:38 AM	—	0006	KOP 6	3,960	Community of Gerlach, NV; viewing N-NW, 180°	5'6"	Viewpoint from Gerlach adjacent to NV State Route 447 within the AOI
03/02/2021	11:55 AM	—	0005	KOP 5	4,087	Water tanks, viewing E-S-W, 180°	5'6"	Viewpoint toward AOI from an elevated location adjacent to the project and NV State Route 447
03/02/2021	12:45 PM	—	0001	KOP 1	3,948	3-Mile playa access point, viewing SW, 180°	5'6"	Viewpoint from the north-east portion of AOI looking into (SW) the AOI, adjacent to County Road 34
03/02/2021	1:21 PM	—	0002	KOP 2	3,940	Black Rock Desert Playa viewing SW, 180°	5'6"	Viewpoint from Black Rock Desert playa toward AOI
03/02/2021	1:45 PM	—	0004	KOP 4	4,000	Black Rock Station and Visitor Center, viewing N-NW, 180°	5'6"	Viewpoint within central portion of AOI from Black Rock Station and Visitor Center
03/02/2021	2:23 PM	—	0003	KOP 3	4,140	Overlook viewing NE, 180°	5'6"	Viewpoint toward the AOI from an elevated location (KOP is within the AOI)

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UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
VISUAL CONTRAST RATING WORKSHEET

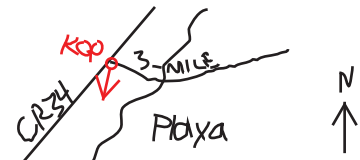
Date: 03/02/2021

District Office: Winnemucca

Field Office: Black Rock

Land Use Planning Area: Winnemucca

SECTION A. PROJECT INFORMATION

1. Project Name Gerlach Geothermal Exploration Project	4. KOP Location (T.R.S) T33N, R23E, S34	5. Location Sketch 
2. Key Observation Point (KOP) Name KOP 1	(Lat. Long) 40° 41' 49" N, 119° 21' 4" W	
3. VRM Class at Project Location VRM Class II		

SECTION B. CHARACTERISTIC LANDSCAPE DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	Flat to steep	Numerous complex forms	None evident
LINE	Horizontal to diagonal, weak transition	Continuous and rugged	None evident
COLOR	Dull light brown	Dull light green	None evident
TEX-TURE	Fine and rough	Coarse and dense, uneven distribution	None evident

SECTION C. PROPOSED ACTIVITY DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	Horizontal and vertical	Linear form from access roads	Linear form from access roads, vertical form from well heads
LINE	Horizontal and vertical	Lines created by access roads	Horizontal access roads
COLOR	Light browns	Tans and greens	Light brown access roads and well heads
TEX-TURE	Fine and smooth	Fine to moderate	Fine to moderate

SECTION D. CONTRAST RATING ☐ SHORT TERM ☒ LONG TERM

1. DEGREE OF CONTRAST		FEATURES												2. Does project design meet visual resource management objectives? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No (Explain on reverses side)		
		LAND/WATER BODY (1)				VEGETATION (2)				STRUCTURES (3)						
		STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE			
ELEMENTS	FORM			✓				✓					✓		3. Additional mitigating measures recommended <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No (Explain on reverses side)	
	LINE			✓				✓					✓			
	COLOR			✓				✓					✓			
	TEXTURE			✓				✓					✓			
															Evaluator's Names Morgan Triegeer	Date 02/15/2021

SECTION D. (Continued)

Comments from item 2.

Wellheads would be painted a color consistent with BLM visual color guidelines that blends with the surrounding landscape to minimize visibility.

Following construction, areas of disturbed land no longer required for operations would be reclaimed. Reclaimed areas would be recontoured to blend with surrounding topography to the extent possible. Suitable, BLM-approved revegetation methods would be used, including use of stockpiled topsoil to aid revegetation.

The objective of VRM Class II is to retain the existing character of the landscape. The level of change to the characteristic landscape should be low. Management activities may be seen, but should not attract the attention of the casual observer. Any changes must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape.

The proposed facilities repeat basic elements present in the landscape character, as there are already non-natural lines and forms, namely, Washoe County Road 34. Access roads and wellheads could be seen by the casual observer, but would not protrude above the skyline and therefore would not attract attention.

Additional Mitigating Measures (See item 3)

No additional mitigating measures are recommended outside of the applicant-committed environmental protection measures described in the Operations Plan.

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
VISUAL CONTRAST RATING WORKSHEET


Date: 03/02/2021

District Office: Winnemucca

Field Office: Black Rock

Land Use Planning Area: Winnemucca

SECTION A. PROJECT INFORMATION

1. Project Name Gerlach Geothermal Exploration Project	4. KOP Location (T.R.S) T33N, R23E, S35	5. Location Sketch 
2. Key Observation Point (KOP) Name KOP 2	(Lat. Long) 40° 41' 41" N, 119° 20' 12" W	
3. VRM Class at Project Location Unassigned		

SECTION B. CHARACTERISTIC LANDSCAPE DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	Simple	Simple	Simple
LINE	Horizontal, bold edge	Simple, irregular, not present in foreground	Horizontal
COLOR	Light tan and brown	Dark green	White
TEX-TURE	Smooth	Fine	Blends with horizon, slightly rough

SECTION C. PROPOSED ACTIVITY DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	Horizontal and vertical	Linear form from access roads	Linear form from access roads, vertical form from well heads
LINE	Horizontal and vertical	Lines created by access roads	Horizontal access roads
COLOR	Light browns	Tans and greens	Light brown access roads and well heads
TEX-TURE	Fine and smooth	Fine to moderate	Fine to moderate

SECTION D. CONTRAST RATING SHORT TERM ☒ LONG TERM

1. DEGREE OF CONTRAST		FEATURES												2. Does project design meet visual resource management objectives? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No (Explain on reverses side) 3. Additional mitigating measures recommended <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No (Explain on reverses side)
		LAND/WATER BODY (1)				VEGETATION (2)				STRUCTURES (3)				
		STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE	
ELEMENTS	FORM			✓				✓				✓		Evaluator's Names Morgan Triegeer Date 02/15/2021
	LINE			✓				✓				✓		
	COLOR				✓			✓				✓		
	TEXTURE				✓			✓				✓		

SECTION D. (Continued)

Comments from item 2.

Wellheads would be painted a color consistent with BLM visual color guidelines that blends with the surrounding landscape to minimize visibility.

Following construction, areas of disturbed land no longer required for operations would be reclaimed. Reclaimed areas would be recontoured to blend with surrounding topography to the extent possible. Suitable, BLM-approved revegetation methods would be used, including use of stockpiled topsoil to aid revegetation.

The objective of VRM Class III is to partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.

The proposed facilities repeat basic elements present in the landscape character, as there are already non-natural lines and forms, namely, the community of Gerlach and associated structures including Washoe County Road 34. Access roads and wellheads could be seen by the casual observer, but would not protrude above the skyline and therefore would not attract attention.

Additional Mitigating Measures (See item 3)

No additional mitigating measures are recommended outside of the applicant-committed environmental protection measures described in the Operations Plan.

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
VISUAL CONTRAST RATING WORKSHEET


Date: 03/02/2021

District Office: Winnemucca

Field Office: Black Rock

Land Use Planning Area: Winnemucca

SECTION A. PROJECT INFORMATION

1. Project Name Gerlach Geothermal Exploration Project	4. KOP Location (T.R.S) T33N, R23E, S16	5. Location Sketch 
2. Key Observation Point (KOP) Name KOP 3	(Lat. Long) 40° 39' 38" N, 119° 22' 27" W	
3. VRM Class at Project Location VRM Class III		

SECTION B. CHARACTERISTIC LANDSCAPE DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	Flat, rugged	Simple, numerous	Rectangular
LINE	Horizontal, broken by highway, angular edges	Transitional edge, uneven	Vertical, horizontal
COLOR	Dull tans and greys	Dull green, light brown	White and black
TEXTURE	Rough, patchy	Medium grained, scattered	Coarse

SECTION C. PROPOSED ACTIVITY DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	Horizontal and vertical	Linear form from access roads	Linear form from access roads, vertical form from well heads
LINE	Horizontal and vertical	Lines created by access roads	Horizontal access roads
COLOR	Light browns	Tans and greens	Light brown access roads and well heads
TEXTURE	Fine and smooth	Fine to moderate	Fine to moderate

SECTION D. CONTRAST RATING SHORT TERM ✓ LONG TERM

1. DEGREE OF CONTRAST		FEATURES												2. Does project design meet visual resource management objectives? <u>✓</u> Yes <u> </u> No (Explain on reverses side) 3. Additional mitigating measures recommended <u> </u> Yes <u>✓</u> No (Explain on reverses side)
		LAND/WATER BODY (1)				VEGETATION (2)				STRUCTURES (3)				
		STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE	
ELEMENTS	FORM			✓				✓				✓		Evaluator's Names Morgan Triegeer Date 02/15/2021
	LINE			✓				✓				✓		
	COLOR			✓				✓				✓		
	TEXTURE			✓				✓				✓		

SECTION D. (Continued)

Comments from item 2.

Wellheads would be painted a color consistent with BLM visual color guidelines that blends with the surrounding landscape to minimize visibility.

Following construction, areas of disturbed land no longer required for operations would be reclaimed. Reclaimed areas would be recontoured to blend with surrounding topography to the extent possible. Suitable, BLM-approved revegetation methods would be used, including use of stockpiled topsoil to aid revegetation.

The objective of VRM Class III is to partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.

The proposed facilities repeat basic elements present in the landscape character, as there are already non-natural lines and forms, namely, the community of Gerlach and associated structures including Washoe County Road 34 and areas with disturbed vegetation and aggregate piles. Access roads and wellheads could be seen by the casual observer, but would not protrude above the skyline and therefore would not attract attention.

Additional Mitigating Measures (See item 3)

No additional mitigating measures are recommended outside of the applicant-committed environmental protection measures described in the Operations Plan.

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
VISUAL CONTRAST RATING WORKSHEET

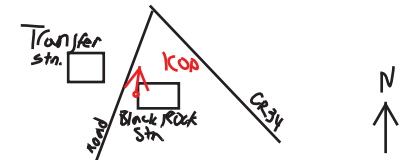
Date: 03/02/2021

District Office: Winnemucca

Field Office: Black Rock

Land Use Planning Area: Winnemucca

SECTION A. PROJECT INFORMATION

1. Project Name Gerlach Geothermal Exploration Project	4. KOP Location (T.R.S) T33N, R23E, S15	5. Location Sketch 
2. Key Observation Point (KOP) Name KOP 4	(Lat. Long) 40° 39' 34" N, 119° 22' 11" W	
3. VRM Class at Project Location VRM Class III		

SECTION B. CHARACTERISTIC LANDSCAPE DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	Flat to steep	Numerous, complex forms	Rectangular, angular
LINE	Horizontal, undulating	Regular, interrupted by structures, rugged	Vertical, angular
COLOR	Light tans and browns	Dull, light green	Tan and white, brown and black
TEX-TURE	Smooth	Coarse	Coarse, clumped

SECTION C. PROPOSED ACTIVITY DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	Horizontal and vertical	Linear form from access roads	Linear form from access roads, vertical form from well heads
LINE	Horizontal and vertical	Lines created by access roads	Horizontal access roads
COLOR	Light browns	Tans and greens	Light brown access roads and well heads
TEX-TURE	Fine and smooth	Fine to moderate	Fine to moderate

SECTION D. CONTRAST RATING SHORT TERM ✓ LONG TERM

1. DEGREE OF CONTRAST		FEATURES												2. Does project design meet visual resource management objectives? <u>✓</u> Yes <u> </u> No (Explain on reverses side) 3. Additional mitigating measures recommended <u> </u> Yes <u>✓</u> No (Explain on reverses side)
		LAND/WATER BODY (1)				VEGETATION (2)				STRUCTURES (3)				
		STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE	
ELEMENTS	FORM			✓				✓					✓	Evaluator's Names Morgan Triegeer Date 02/15/2021
	LINE			✓				✓					✓	
	COLOR				✓			✓					✓	
	TEXTURE			✓				✓					✓	

SECTION D. (Continued)

Comments from item 2.

Wellheads would be painted a color consistent with BLM visual color guidelines that blends with the surrounding landscape to minimize visibility.

Following construction, areas of disturbed land no longer required for operations would be reclaimed. Reclaimed areas would be recontoured to blend with surrounding topography to the extent possible. Suitable, BLM-approved revegetation methods would be used, including use of stockpiled topsoil to aid revegetation.

The objective of VRM Class III is to partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.

The proposed facilities repeat basic elements present in the landscape character, as there are already non-natural lines and forms, namely, the parking lot, restroom, and shade canopy at the Black Rock Station, Transfer Station Road, Washoe County Road 34, and areas with disturbed vegetation and aggregate piles. Access roads and wellheads could be seen by the casual observer, but would not protrude above the skyline and therefore would not attract attention.

Additional Mitigating Measures (See item 3)

No additional mitigating measures are recommended outside of the applicant-committed environmental protection measures described in the Operations Plan.

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
VISUAL CONTRAST RATING WORKSHEET


Date: 03/02/2021

District Office: Winnemucca

Field Office: Black Rock

Land Use Planning Area: Winnemucca

SECTION A. PROJECT INFORMATION

1. Project Name Gerlach Geothermal Exploration Project	4. KOP Location (T.R.S) T33N, R23E, S16	5. Location Sketch 
2. Key Observation Point (KOP) Name KOP 5	(Lat. Long) 40° 39' 34" N, 119° 23' 14" W	
3. VRM Class at Project Location VRM Class III		

SECTION B. CHARACTERISTIC LANDSCAPE DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	Rolling	Complex, numerous shrubs, few trees	Cylindrical, vertical
LINE	Rugged, undulating	Uneven	Vertical
COLOR	Light tans and browns	Tan and dull green	Tan and brown (utility poles)
TEXTURE	Medium	Medium to coarse, scattered	Coarse

SECTION C. PROPOSED ACTIVITY DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	Horizontal and vertical	Linear form from access roads	Linear form from access roads, vertical form from well heads
LINE	Horizontal and vertical	Lines created by access roads	Horizontal access roads
COLOR	Light browns	Tans and greens	Light brown access roads and well heads
TEXTURE	Fine and smooth	Fine to moderate	Fine to moderate

SECTION D. CONTRAST RATING SHORT TERM ✓ LONG TERM

1. DEGREE OF CONTRAST		FEATURES												2. Does project design meet visual resource management objectives? <u>✓</u> Yes <u> </u> No (Explain on reverses side)	
		LAND/WATER BODY (1)				VEGETATION (2)				STRUCTURES (3)					
		STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE		
ELEMENTS	FORM			✓				✓					✓		3. Additional mitigating measures recommended <u> </u> Yes <u>✓</u> No (Explain on reverses side)
	LINE			✓				✓					✓		
	COLOR				✓			✓					✓		
	TEXTURE			✓				✓					✓		
														Evaluator's Names Morgan Triege	Date 02/15/2021

SECTION D. (Continued)

Comments from item 2.

Wellheads would be painted a color consistent with BLM visual color guidelines that blends with the surrounding landscape to minimize visibility.

Following construction, areas of disturbed land no longer required for operations would be reclaimed. Reclaimed areas would be recontoured to blend with surrounding topography to the extent possible. Suitable, BLM-approved revegetation methods would be used, including use of stockpiled topsoil to aid revegetation.

The objective of VRM Class III is to partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.

The proposed facilities repeat basic elements present in the landscape character, as there are already non-natural lines and forms, namely, the water tanks, utility poles and line, dirt roads, and graded areas with disturbed vegetation. Access roads and wellheads could be seen by the casual observer, but would not protrude above the skyline and therefore would not attract attention.

Additional Mitigating Measures (See item 3)

No additional mitigating measures are recommended outside of the applicant-committed environmental protection measures described in the Operations Plan.

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
VISUAL CONTRAST RATING WORKSHEET


Date: 03/02/2021

District Office: Winnemucca

Field Office: Black Rock

Land Use Planning Area: Winnemucca

SECTION A. PROJECT INFORMATION

1. Project Name Gerlach Geothermal Exploration Project	4. KOP Location (T.R.S) T33N, R23E, S15	5. Location Sketch 
2. Key Observation Point (KOP) Name KOP 6		
3. VRM Class at Project Location Unassigned	(Lat. Long) 40° 39' 15" N, 119° 21' 42" W	

SECTION B. CHARACTERISTIC LANDSCAPE DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	Flat and rolling	Simple	Vertical, angular
LINE	Horizontal, regular	Smooth, broken by patchy shrubs	Vertical
COLOR	Tans, black (road)	Tan and dull green	Green and white
TEXTURE	Fine, even	Fine to medium, patchy	Coarse and random

SECTION C. PROPOSED ACTIVITY DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	Horizontal and vertical	Linear form from access roads	Linear form from access roads, vertical form from well heads
LINE	Horizontal and vertical	Lines created by access roads	Horizontal access roads
COLOR	Light browns	Tans and greens	Light brown access roads and well heads
TEXTURE	Fine and smooth	Fine to moderate	Fine to moderate

SECTION D. CONTRAST RATING ☐ SHORT TERM ☒ LONG TERM

1. DEGREE OF CONTRAST		FEATURES												2. Does project design meet visual resource management objectives? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No (Explain on reverses side)	
		LAND/WATER BODY (1)				VEGETATION (2)				STRUCTURES (3)					
		STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE		
ELEMENTS	FORM			✓				✓						✓	3. Additional mitigating measures recommended <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No (Explain on reverses side)
	LINE			✓				✓						✓	
	COLOR				✓			✓						✓	
	TEXTURE			✓				✓						✓	
Evaluator's Names: Morgan Triegeer Date: 02/15/2021															

SECTION D. (Continued)

Comments from item 2.

Wellheads would be painted a color consistent with BLM visual color guidelines that blends with the surrounding landscape to minimize visibility.

Following construction, areas of disturbed land no longer required for operations would be reclaimed. Reclaimed areas would be recontoured to blend with surrounding topography to the extent possible. Suitable, BLM-approved revegetation methods would be used, including use of stockpiled topsoil to aid revegetation.

The objective of VRM Class III is to partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.

The proposed facilities repeat basic elements present in the landscape character, as there are already non-natural lines and forms, namely, Nevada State Route 447, utility poles and line, and other structures around Gerlach. Access roads and wellheads could be seen by the casual observer, but would not protrude above the skyline and therefore would not attract attention.

Additional Mitigating Measures (See item 3)

No additional mitigating measures are recommended outside of the applicant-committed environmental protection measures described in the Operations Plan.

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
VISUAL CONTRAST RATING WORKSHEET


Date: 03/02/2021

District Office: Winnemucca

Field Office: Black Rock

Land Use Planning Area: Winnemucca

SECTION A. PROJECT INFORMATION

1. Project Name Gerlach Geothermal Exploration Project	4. KOP Location (T.R.S) T33N, R23E, S34	5. Location Sketch 
2. Key Observation Point (KOP) Name KOP 7	(Lat. Long) 40° 38' 15" N, 119° 20' 24" W	
3. VRM Class at Project Location VRM Class III		

SECTION B. CHARACTERISTIC LANDSCAPE DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	Flat	Simple, few	Horizontal, angular
LINE	Horizontal, bold	Angular, broken	Bold, jagged
COLOR	Light tan	Grey, dark green	White
TEX- TURE	Smooth	Sparse and patchy	Coarse, uniform

SECTION C. PROPOSED ACTIVITY DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	Horizontal and vertical	Linear form from access roads	Linear form from access roads, vertical form from well heads
LINE	Horizontal and vertical	Lines created by access roads	Horizontal access roads
COLOR	Light browns	Tans and greens	Light brown access roads and well heads
TEX- TURE	Fine and smooth	Fine to moderate	Fine to moderate

SECTION D. CONTRAST RATING SHORT TERM ☒ LONG TERM

1. DEGREE OF CONTRAST		FEATURES												2. Does project design meet visual resource management objectives? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No (Explain on reverses side)
		LAND/WATER BODY (1)				VEGETATION (2)				STRUCTURES (3)				
		STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE	
ELEMENTS	FORM			<input checked="" type="checkbox"/>				<input checked="" type="checkbox"/>				<input checked="" type="checkbox"/>		3. Additional mitigating measures recommended <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No (Explain on reverses side)
	LINE			<input checked="" type="checkbox"/>				<input checked="" type="checkbox"/>				<input checked="" type="checkbox"/>		
	COLOR				<input checked="" type="checkbox"/>				<input checked="" type="checkbox"/>				<input checked="" type="checkbox"/>	
	TEXTURE				<input checked="" type="checkbox"/>				<input checked="" type="checkbox"/>				<input checked="" type="checkbox"/>	
														Evaluator's Names: Morgan Triegeer Date: 02/15/2021

SECTION D. (Continued)

Comments from item 2.

Wellheads would be painted a color consistent with BLM visual color guidelines that blends with the surrounding landscape to minimize visibility.

Following construction, areas of disturbed land no longer required for operations would be reclaimed. Reclaimed areas would be recontoured to blend with surrounding topography to the extent possible. Suitable, BLM-approved revegetation methods would be used, including use of stockpiled topsoil to aid revegetation.

The objective of VRM Class III is to partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.

The proposed facilities repeat basic elements present in the landscape character, as there are already non-natural lines and forms, namely, the community of Gerlach and associated structures in the background. Access roads and wellheads likely could not be seen by the casual observer at this distance, and would not protrude above the skyline, therefore they would not attract attention.

Additional Mitigating Measures (See item 3)

No additional mitigating measures are recommended outside of the applicant-committed environmental protection measures described in the Operations Plan.

Appendix E

Greenhouse Gas Emissions

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February 23, 2022

ATTN: Ms. Tai Subia
Bureau of Land Management
Winnemucca District
5100 East Winnemucca Blvd.
Winnemucca, NV 89445

**Re: Air Emission Baseline Estimates for the
Gerlach Geothermal Exploration Project**

Dear Ms. Subia:

Ormat Nevada, Inc. (Ormat) is hereby providing the Bureau of Land Management, Winnemucca District Office baseline air emission estimates for the Gerlach Geothermal Exploration Project (Project). The Project is located in Washoe County, Nevada in portions of Township (T) 32 North (N), Range (R) 23 East (E), Sections 3, 9, 10, 15-17, 20-21 and T33N, R23E, Sections 34-35.

The Project is located in an area designated as attainment for all criteria pollutants as ambient concentrations in the area are below Nevada and National Ambient Air Quality Standards (NvAAQS, NAAQS). The Project is located less than one mile northwest of Gerlach, Nevada in a minimally developed area. Although the Project is not expected to cause an exceedance of any one criteria pollutant as the emission sources are intermittent and short-term in duration, an emission estimation has been prepared. The climate in the area is classified as arid with low rainfall and annual and diurnal temperature ranges.

The air emissions for the Project were evaluated using the U.S. Environmental Protection Agency approved AP-42 emission factors. A conservative hourly and annual emission inventory for criteria pollutants was prepared and is attached summarizing data inputs with maximum expected timeframes. The pollutants include particulate matter in aerodynamic size of 10 and 2.5 microns or less (PM, PM₁₀, PM_{2.5}), carbon monoxide (CO), Oxides of Nitrogen (NO_x), Sulfur Dioxide (SO₂), Volatile Organic Compounds (VOCs), greenhouse gases (GHG), and Hazardous Air Pollutants (HAPs). Best Management Practices were factored into the emission estimations for particulate as watering of roadways would be required to control fugitive dust.

A summary of air emission estimate totals is shown in Table 1 for the three main phases of the Project including construction, well drilling, and well testing. It is proposed that up to 20 geothermal exploration wells would be drilled and tested for the Project. Construction procedures would include drill pad preparation activities including clearing, earthwork, drainage, and other improvements necessary for efficient and safe operation and fire prevention. Ormat would only clear well pads for those wells scheduled to be drilled. The

ORMAT NEVADA, INC.

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ormat.com

typical drilling time per well is approximately 45 days with drilling occurring 24 hours a day, seven days a week. Once wells are drilled, well testing would commence with short term well testing lasts three to five days on average and long-term well testing lasts on average seven to 30 days. To take into consideration worst case scenario, the long-term drilling emissions were analyzed for the Project at 24 hours per day and 45 days per well. In addition, vehicle traffic emissions from workers and material transportation were estimated. All inputs can be found in the reference information (attached).

Table 1: Gerlach Project Air Emission Estimate Totals

Pollutant	Hourly Pounds (lbs/hr)			Annual Tons (tons/yr)		
	Construction	Well Drilling	Testing	Construction	Well Drilling	Testing
PM	13.50	1.52	1.84	0.34	0.65	0.69
PM10	3.44	1.13	0.66	0.10	0.56	0.44
PM2.5	0.36	1.00	0.29	0.01	0.54	0.36
CO	0.17	17.51	8.00	0.59	9.36	10.81
NOx	0.06	29.67	7.44	0.25	16.03	10.37
SO2	0.00	0.03	0.01	0.00	0.02	0.02
VOCs	0.00	1.98	0.69	0.00	1.07	0.93
GHG	346	3446	1448	1552	1898	2069
Single Highest HAP- Formaldehyde	0	0	0	0.0E+00	2.6E-02	5.7E-02
Total HAPs	0	0	0	0.0E+00	8.5E-02	1.9E-01

The emission estimates show that the Project would not result in major emissions of pollutants. In addition, based on the intermittent and short duration of exploration activities and small amount of emission sources, it is hard to predict GHG cumulative impacts and climate change on a local scale to compare to global climate changes. Overall, the remoteness of the Project in combination with the low emission estimates suggests the Project would not contribute significantly to air pollution levels locally or regionally.

Should you have any questions, please feel free to contact me at (775) 446-9648.

Sincerely,



Kim Carter
Environmental Permitting Specialist
Ormat Nevada, Inc.
kcarter@ormat.com

Attachment: Air Emissions Inventory Spreadsheet

Crescent Valley Geothermal Exploration Project
Ormat Nevada, Inc.

Project Emission Totals (Worst-Case)

Pollutant	Hourly Pounds (lbs/hr)				Annual Tons (tons/yr)		
	Construction	Well Drilling	Testing		Construction	Well Drilling	Testing
PM	13.50	1.52	1.84		0.34	0.65	0.69
PM10	3.44	1.13	0.66		0.10	0.56	0.44
PM2.5	0.36	1.00	0.29		0.01	0.54	0.36
CO	0.17	17.51	8.00		0.59	9.36	10.81
NOx	0.06	29.67	7.44		0.25	16.03	10.37
SO2	0.00	0.03	0.01		0.00	0.02	0.02
VOCs	0.00	1.98	0.69		0.00	1.07	0.93
GHG	346	3446	1448		1552	1898	2069
Single Highest HAP- Formaldehyde	0	0	0		0.0E+00	2.6E-02	5.7E-02
Total HAPs	0	0	0		0.0E+00	8.5E-02	1.9E-01

							Emission Factor										
Construction	Emission Source	Daily Hrs	Ann Hrs	% Control	Type	Rating	PM	PM10	PM2.5	CO	NOx	SO2	VOC	CO2	CH4	N2O	
	EF Unit					VMT/hr	VMT/yr	lb/VMT	lb/VMT	lb/VMT	g/mile	g/mile	g/mile	g/mile			
	Graders	10	280	90%	Water	20	560	12.6	3.1	0.4	1.6	0.7	0.002		4.1E+03		
	Water Trucks	10	280	90%	Water	50	1,400	6.0	1.5	0.2	1.6	0.7	0.002		4.1E+03		
	1-ton Crew Trucks	1	7	90%	Water	15	210	2.7	0.7	0.1	1.6	0.7	0.002		4.1E+03		
	EF Unit					tons	tons/yr	lb/ton	lb/ton	lb/ton	g/mile	g/mile	g/mile	g/mile			
	Loader	10	140	0%	None	5	560	5.9E-04	2.8E-04	4.2E-05	1.6	0.7	0.002		4.1E+03		
	Excavator	10	350	0%	None	3.75	560	5.9E-04	2.8E-04	4.2E-05	1.6	0.7	0.002		4.1E+03		
	EF Unit					acre		lb/acre	lb/acre	lb/acre							
	Wind Erosion- Stockpiles			0%	None	1.00		1.3E-02	6.5E-03	9.7E-04							
Well Drilling	hp-hr							lb/ hp-hr	lb/ hp-hr	lb/ hp-hr	lb/ hp-hr	lb/ hp-hr	lb/ hp-hr	lb/ hp-hr	lb/ hp-hr	lb/ hp-hr	
	Large Rotary Drill Rig (Tier 2)	24	1,080	0%	None	1,600		3.3E-04	3.3E-04	3.3E-04	5.8E-03	9.9E-03	1.1E-05	6.6E-04	1.1E+00	4.6E-05	9.3E-06
	3 Diesel Pump Engines (Generator)	24	1,080	0%	None	1,408		3.3E-04	3.3E-04	3.3E-04	5.8E-03	9.9E-03	1.1E-05	6.6E-04	1.1E+00	4.6E-05	9.3E-06
Testing	EF Unit					hp-hr		lb/ hp-hr	lb/ hp-hr	lb/ hp-hr	lb/ hp-hr	lb/ hp-hr	lb/ hp-hr	lb/ hp-hr	lb/ hp-hr	lb/ hp-hr	
	Aggreko 500kw Diesel Generator	24	2,880	0%	None	671		3.3E-04	3.3E-04	3.3E-04	5.8E-03	9.9E-03	1.1E-05	6.6E-04	1.1E+00	4.6E-05	9.3E-06
	Light Tower 20kw-Isuzu 4LE2T Tier 4 Engine	12	1,440	0%	None	27		4.9E-05	4.9E-05	4.9E-05	9.0E-03	6.9E-03	1.1E-05	1.3E-03	1.1E+00	4.6E-05	9.3E-06
	Light Tower 20kw-Isuzu 4LE2T Tier 4 Engine-12	12	1,440	0%	None	27		4.9E-05	4.9E-05	4.9E-05	9.0E-03	6.9E-03	1.1E-05	1.3E-03	1.1E+00	4.6E-05	9.3E-06
	6GHT Pump (Tier 4)	24	2,880	0%	None	115		3.3E-05	3.3E-05	3.3E-05	8.2E-03	6.6E-04	1.1E-05	3.1E-04	1.1E+00	4.6E-05	9.3E-06
	7kW Light Towers (Injection Pad - Kubota D1005 Engine, Tier 4)	12	1,440	0%	None	9.4		6.6E-04	6.6E-04	6.6E-04	1.3E-02	1.1E-02	1.1E-05	1.3E-03	1.1E+00	4.6E-05	9.3E-06
	8 GHH Pump (Tier 4)	24	2,880	0%	None	415		3.3E-05	3.3E-05	3.3E-05	5.8E-03	6.6E-04	1.1E-05	3.1E-04	1.1E+00	4.6E-05	9.3E-06
Well Drilling	ROADS - FUGITIVE																
	EF Unit	VMT					lb/VMT	lb/VMT	lb/VMT								
	Vehicle Type A on Unpaved Roads	4	480	90%	Water	4.5		2.4E+00	6.1E-01	6.1E-02							
Testing	Vehicle Type A on Unpaved Roads	4	480	90%	Water	4.5		2.4E+00	6.1E-01	6.1E-02							
Construction	ROADS- COMBUSTION					VMT/hr	VMT/yr	g/mile	g/mile	g/mile	g/mile	g/mile	g/mile	g/mile			
	Heavy Tractor/trailers (Delivery/Pickup)	4	200	0%	None	53.5	53.5	0.042	0.042	0.039	1.31	0.68	0.00		4.1E+03		
Well Drilling	Workers Traveling from Gerlach	1	2,880	0%	None	4.5	2.25	0.005	0.005	0.004	1.60	0.68	0.00		4.1E+03		
	Workers 2 trips Reno to Gerlach	2	32	0%	None	107	53.5	0.005	0.005	0.004	1.60	0.68	0.00		4.1E+03		
Testing	Workers Travel from Gerlach	1	2,880	0%	None	4.5	2.25	0.005	0.005	0.004	1.60	0.68	0.00		4.1E+03		
	Workers 2 trips Reno to Gerlach	2	32	0%	None	107	53.5	0.005	0.005	0.004	1.60	0.68	0.00		4.1E+03		

Emissions Estimate (lbs/hr)											Emissions Estimate (tons/yr)											
PM	PM10	PM2.5	CO	NOx	SO2	VOC	CO2	CH4	N2O	GHG	PM	PM10	PM2.5	CO	NOx	SO2	VOC	CO2	CH4	N2O	GHG	
2.53	0.61	0.08	0.01	0.00	0.00		1.8E+01				1.77E-01	4.28E-02	5.49E-03	2.8E-02	1.2E-02	3.4E-05		7.2E+01				
2.99	0.77	0.08	0.02	0.01	0.00		4.6E+01				8.37E-02	2.15E-02	2.15E-03	6.9E-02	2.9E-02	8.5E-05		1.8E+02				
7.96	2.05	0.20	0.11	0.04	0.00		2.7E+02				9.29E-04	2.39E-04	2.39E-05	2.6E-04	1.1E-04	3.2E-07		6.7E-01				
3.0E-03	1.4E-03	2.1E-04	1.8E-03	7.5E-04	2.2E-06		4.6E+00				2.3E-02	1.1E-02	1.7E-03	1.4E-01	5.9E-02	1.7E-04		3.6E+02				
2.2E-03	1.1E-03	1.6E-04	1.3E-03	5.6E-04	1.6E-06		3.4E+00				5.8E-02	2.7E-02	4.2E-03	3.5E-01	1.5E-01	4.2E-04		8.9E+02				
0.01	0.01	0.00									6.5E-06	3.2E-06	4.9E-07									
0.53	0.53	0.53	9.21	15.78	0.02	1.05	1.8E+03	0.07	0.01		2.8E-01	2.8E-01	2.8E-01	5.0E+00	8.5E+00	9.4E-03	5.7E-01	9.9E+02	4.0E-02	8.0E-03		
0.46	0.46	0.46	8.10	13.89	0.02	0.93	1.6E+03	0.07	0.01		2.5E-01	2.5E-01	2.5E-01	4.4E+00	7.5E+00	8.3E-03	5.0E-01	8.7E+02	3.5E-02	7.0E-03		
0.22	0.22	0.22	3.86	6.61	0.01	0.44	7.7E+02	0.03	0.01		3.2E-01	3.2E-01	3.2E-01	5.6E+00	9.5E+00	1.0E-02	6.3E-01	1.1E+03	4.5E-02	8.9E-03		
0.00	0.00	0.00	0.24	0.19	0.00	0.04	3.1E+01	0.00	0.00		9.5E-04	9.5E-04	9.5E-04	1.7E-01	1.3E-01	2.1E-04	2.6E-02	2.2E+01	8.9E-04	1.8E-04		
0.00	0.00	0.00	0.24	0.19	0.00	0.04	3.1E+01	0.00	0.00		9.5E-04	9.5E-04	9.5E-04	1.7E-01	1.3E-01	2.1E-04	2.6E-02	2.2E+01	8.9E-04	1.8E-04		
0.00	0.00	0.00	0.95	0.08	0.00	0.04	1.3E+02	0.01	0.00		5.4E-03	5.4E-03	5.4E-03	1.4E+00	1.1E-01	1.8E-03	5.2E-02	1.9E+02	7.7E-03	1.5E-03		
0.01	0.01	0.01	0.12	0.10	0.00	0.01	1.1E+01	0.00	0.00		4.4E-03	4.4E-03	4.4E-03	8.9E-02	7.4E-02	7.3E-05	8.9E-03	7.7E+00	3.1E-04	6.3E-05		
0.01	0.01	0.01	2.39	0.27	0.00	0.13	4.7E+02	0.02	0.00		2.0E-02	2.0E-02	2.0E-02	3.4E+00	3.9E-01	6.5E-03	1.9E-01	6.8E+02	2.8E-02	5.5E-03		
0.27	0.07	0.01									5.67E-02	1.46E-02	1.46E-03									
0.27	0.07	0.01									5.67E-02	1.46E-02	1.46E-03									
1.2E-03	1.2E-03	1.1E-03	3.9E-02	4.4E-05	1.3E-07		2.7E-01				5.0E-04	5.0E-04	4.6E-04	8.0E-03	8.0E-03	2.3E-05		4.9E+01				
4.8E-05	4.8E-05	4.3E-05	1.6E-02	1.5E-05	4.3E-08		9.1E-02				3.4E-05	3.4E-05	3.1E-05	1.1E-02	4.9E-03	1.4E-05		3.0E+01				
5.7E-04	5.7E-04	5.1E-04	1.9E-01	1.8E-04	5.1E-07		1.1E+00				9.1E-06	9.1E-06	8.1E-06	3.0E-03	1.3E-03	3.7E-06		7.8E+00				
4.8E-05	4.8E-05	4.3E-05	1.6E-02	1.5E-05	4.3E-08		9.1E-02				3.4E-05	3.4E-05	3.1E-05	1.1E-02	4.9E-03	1.4E-05		3.0E+01				
5.7E-04	5.7E-04	5.1E-04	1.9E-01	1.8E-04	5.1E-07		1.1E+00				9.1E-06	9.1E-06	8.1E-06	3.0E-03	1.3E-03	3.7E-06		7.8E+00				
Emissions Estimate (lbs/hr)											Emissions Estimate (tons/yr)											TOTALS
PM	PM10	PM2.5	CO	NOx	SO2	VOC	CO2	CH4	N2O	GHG	PM	PM10	PM2.5	CO	NOx	SO2	VOC	CO2	CH4	N2O	GHG	
13.50	3.44	0.36	0.17	0.06	0.00	0.00	345.92	0.00	0.00	345.92	0.34	0.10	0.01	0.59	0.25	0.00	0.00	1552.03	0.00	0.00	1552.03	Construction
1.52	1.13	1.00	17.51	29.67	0.03	1.98	3434.51	0.14	0.03	3446.29	0.65	0.56	0.54	9.36	16.03	0.02	1.07	1891.39	0.08	0.02	1897.75	Well Drilling
1.84	0.66	0.29	8.00	7.44	0.01	0.69	1443.34	0.06	0.01	1448.29	0.69	0.44	0.36	10.81	10.37	0.02	0.93	2062.31	0.08	0.02	2069.26	Testing

<i>Emission Factor Notes</i>	Fugitive PM EMISSION FACTOR INPUTS											
	k(PM)	k (PM10)	k (PM2.5)	U(mph)	M(%)	s(%)	S(mph)	f(%)	p (days)	W (tons)		
Grader	1	0.6	0.031				10				AP-42, Section 11.9, Table 11.9-1 (10/98)	
Crew, Water, Other Truck	4.9	1.5	0.15			5			40	3	AP-42, Section 13.2.2, Expressions 1a and 2 (11/06)	
Loader, Excavator	0.74	0.35	0.053	6.64	7						AP-42, Section 13.2.4, Expression 1 (11/06)	
Wind Erosion- Annual	1	0.5	0.075			7.4		4.9	40		AP-42, Section 11.2.3, particle size fractions from AP-42, Section 13.2.5 (11/06)	
Wind Erosion- Hourly	1	0.5	0.075			4.9		1	10			
Vehicle Combustion:	Emission Factors from EPA MOVES model (g/mile)											
Drill Rig, Diesel Genset (CH4, N2O):	Tier 2 Emission Standards 40 CFR 89.112 for Engines Rated > 560 kW, Diesel Sulfur Content 15 ppm, 40 CFR 98 Tables C-1 and C-2, 7,000 Btu/hp-hr, and 19,300 Btu/lb diesel											
90% Water Control:	Control of Open Fugitive Dust Sources (09/88), pages 5-9 through 5-14											
CO2e emissions	Summation of individual greenhouse gas emissions multiplied by their global warming potential (GWP). GWP of CO2 = 1, GWP of CH4 = 25, GWP of N2O = 298.											

MOVES 3.0 Run

Medium Vehicle Combustion:	PM	PM10	PM2.5	CO	NOx	SO2	
2022	1486487	1486487	1326567	239110	105120	292	
2023	1442364	1442364	1286272	237439	97810	294	
	2928851	2928851	2612839	476549	202930	586	g/ 2 yr/mile
	1464426	1464426	1306419.5	238274.5	101465	293	g/yr/mile
				CO	NOx	SO2	
	0.004828	0.004828	0.00430667	1.5968856	0.6800056	0.0019636	g/mile
			303348288	149212	miles	2 years	

Heavy		PM	PM10	PM2.5	CO	NOx	SO2	
	2022	2050891	2050891	1886788	47754	25848	71	
	2023	1803676	1803676	1659348	48943	24111	72	
		3854567	3854567	3546136	96697	49959	143	g/ 2 yr/mile
		1927283.5	1927283.5	1773068	48348.5	24979.5	71.5	g/yr/mile
					CO	NOx	SO2	
		0.0421569	0.0421569	0.0387837	1.3083782	0.6759803	0.0019349	g/mile
				45716864	36953	miles	2 years	

[illegible]

	QTY	PROCESS DESCRIPTION	MAX Daily PROCESS RATE	MAX Annual PROCESS RATE	UNITS	INFORMATION DESCRIPTION
Construction						
	1	Graders	10	280	hrs	Hours of operation per grader
			2	2	mph	Mean vehicle speed
			20	560	VMT	Vehicle miles traveled per grader
	1	Water Trucks	10	280	hrs	Hours of operation per water truck
			13	13	tons	Mean vehicle weight
			2,500	2,500	gal	Water tank capacity
			5	5	mph	Mean vehicle speed
			50	1,400	VMT	Vehicle miles traveled per water truck
	2	1-ton Crew Trucks	1	7	hrs	Hours of operation per crew truck
			3	3	tons	Mean vehicle weight
			30	30	mph	Mean vehicle speed
			15	210	VMT	Vehicle miles traveled per crew truck
	1	Loader	5	140	tons	Total amount of material moved per loader
	1	Excavator	3.75	105	tons	Total amount of material moved per excavator
			10	350	hrs	
	1	Wind Erosion- Stockpiles	1.00	1.00	acres	Acreage of stockpiles
			7.4	7.4	%	Silt content of stockpile material
			4.9	4.9	%	Percentage of time with mean wind speed greater than 12 mph at the mean pile height
			1	30	days	Days the stockpiles are used
	25	Heavy Tractor/trailers (Delivery/Pickup)	214	10700	VMT	Reno to Gerlach 107 miles
			4	200	hrs	
Well Drilling						
	1	Large Rotary Drill Rig (Tier 2)	24	1,080	hours	Hours of operation
			1,600	1,600	hp	Engine horsepower (not generator output).
		1	4	wells	Wells/Year	
	3	3 Diesel Pump Engines (Generator)	24	1,080	hours	Hours of operation
			1,408	1,408	hp	Gen output
	8	Vehicle Type A on Unpaved Roads	3	3	tons	Mean vehicle weight
			4	180	hours	Annual hours of operation per vehicle
			15	15	miles/hour	Mean vehicle speed
			5	5	%	Silt content of unpaved road surface
		Workers Traveling from Gerlach	4.5	6480	VMT	For Gerlach
			1	2880	hrs	
		Workers 2 trips Reno to Gerlach	214	1712	VMT	
			2	32	hrs	
Long-term Test						
1	Aggreko 500kw Diesel Generator	24	2,880	hours	Hours of operation	
		500	500	kw	Engine kw	
1	Light Tower 20kw-Isuzu 4LE2T Tier 4 Engine	12	1,440	hours	Hours of operation	
		20	20	kw	Engine kw	
1	Light Tower 20kw-Isuzu 4LE2T Tier 4 Engine-12	12	1,440	hours	Hours of operation	
		20	20	kw	Engine kw	
1	6GHT Pump (Tier 4)	24	2,880	hours	Hours of operation	
		115	115	hp	Engine horsepower	
2	7kW Light Towers (Injection Pad - Kubota D1005	12	1,440	hours	Hours of operation	
		7	7	kw	Engine kw	
1	8 GHH Pump (Tier 4)	24	2,880	hours	Hours of operation	
		415	415	hp	Engine horsepower	
8	Vehicle Type A on Unpaved Roads	3	3	tons	Mean vehicle weight	
		4	480	hours	Annual hours of operation per vehicle	
		15	15	miles/hour	Mean vehicle speed	
		5	5	%	Silt content of unpaved road surface	
		4.5	2160	VMT	For Gerlach	