U.S. Department of the Interior

Bureau of Land Management

Cape Modern Geothermal Exploration Project

Beaver County, Utah

Environmental Assessment

February 13, 2023

DOI-BLM-UT-C010-2023-0004-EA

Table of Contents

Appendices

Figures

Tables

CHAPTER 1.0. INTRODUCTION

1.1. SUMMARY OF PROPOSED PROJECT

Escalante Desert Resources LLC (EDR), a wholly owned subsidiary of Fervo Energy Company, has obtained the rights, via competitive geothermal lease sale, to explore for and develop renewable geothermal resources within federal geothermal leases UTU-95314 and UTU-95318, which were included as sale parcels in the December 2020 Utah Geothermal Competitive Lease Sale (BLM Utah State Office 2021).

EDR is proposing to construct, operate, and maintain the Cape Modern Geothermal Exploration Project (project) in Beaver County, Utah (Figure 1-1), with the intent to explore geothermal energy production potential and assess the viability of the geothermal resources in the leased areas. The proposed project would include exploration activities, drilling and testing of up to 29 geothermal wells, reservoir monitoring and characterization activities, and access road construction. The proposed Cape Modern Geothermal Project Plan of Operations for Exploration (POE) including pad construction details are outlined in the attached POE (**Appendix A**) and in Section 2.2.

EDR has also requested a right-of-way (ROW) grant for the construction and maintenance of off-lease well pads and access roads associated with the proposed project. The disturbed margins of the on-lease and off-lease roads and rights of way would likely be used for communications lines, water lines, test pipelines, and power connections to facilitate well operations. Road construction methods are described in Section 2.2.3.

Should this project determine that the geothermal resource is commercially viable, it would likely lead to the conversion of some or all of the exploration wells into production and injection wells connected to a geothermal plant. Development of the geothermal resources for production purposes would require a separate National Environmental Policy Act (NEPA) analysis.

The Area of Interest (AOI) for the proposed project consists of approximately 5,641 acres of federal geothermal leases and two split-estate private geothermal leases located north-northeast of Milford in Beaver County, Utah (Figure 1-1). The federal lands are managed by the BLM Color Country District Office, Cedar City Field Office. The AOI is currently undeveloped desert grassland with some areas of low intensity development. The proposed project is strategically located within the Milford Renewable Energy Corridor, adjacent to other existing geothermal, wind, and solar power facilities that have been successfully developed in the region.

The project area selected for the Cape Modern Geothermal Exploration Project encompasses approximately 293 acres of BLM surface primarily located within the existing geothermal leaseholds. Approximately 21 acres of the project area are located off-lease on split-estate lands with private geothermal leases wherein the BLM manages the surface estate, and the geothermal and mineral estate is privately-owned. Surface disturbance within the project area would most likely be 172 acres, or less with multiple wells per pad. Maximum surface disturbance would be approximately 266 acres with one well per pad, if all well pads and access roads are completed. This EA will assess the maximum surface disturbance potential of 266 acres.

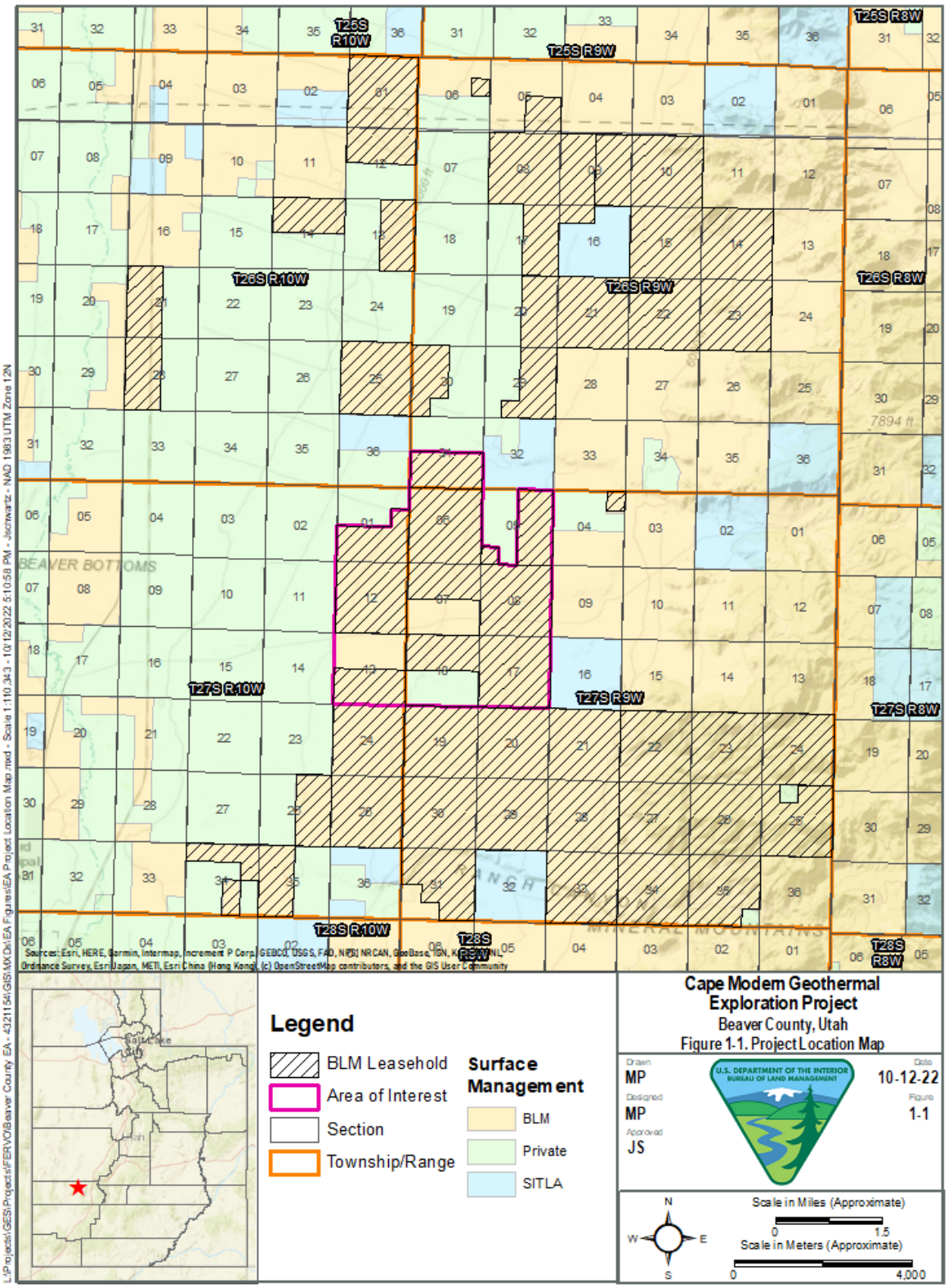

Figure 1-1. Project Location Map.

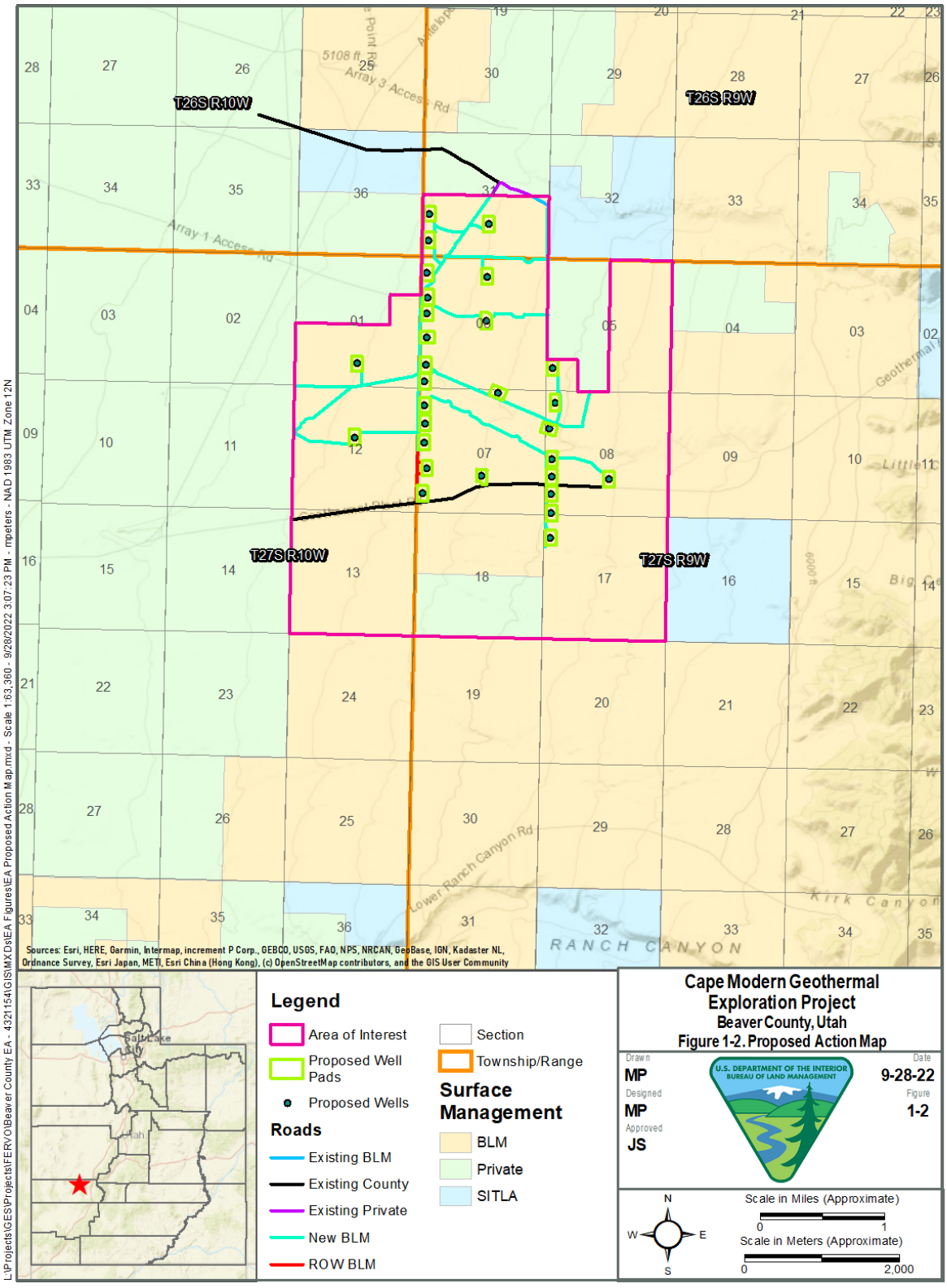

Figure 1-2. Project Area of Interest Map.

1.1.1. Background

The federal leases were approved for geothermal exploration and production activities by previous NEPA analyses including the Programmatic Environmental Impact Statement (EIS) for Geothermal Leasing in the Western United States (BLM and USFS 2008) and the BLM Determination of NEPA Adequacy (DNA) for the December 2020 Utah Geothermal Competitive Lease Sale (DOI-BLM-UT-0000-2019-0006-DNA) for the exploration and development of geothermal resources within 28 parcels in Iron, Millard, and Beaver Counties, Utah, on public lands managed by the BLM's Cedar City and Fillmore field offices (BLM Utah State Office 2021). The adjacent lands were approved in the DNA for the 2021 BLM Utah Geothermal Competitive Lease Sale (BLM Utah State Office 2022).

The AOI for the proposed action consists of approximately 5,641 acres of federal geothermal leases and two split-estate private geothermal leases (Table 1-1 and Table 1-2). The project area selected for the Cape Modern Geothermal Exploration Project encompasses approximately 293 acres of BLM surface primarily located within the existing geothermal leaseholds.

Table 1-1. Federal Geothermal Leases

Lease Number	Township and Range	Section Number(s)	Acreage
UTU-95314	T.27S., R.9W.	All or portions of Sections 05, 06, 07, 08, 17, 18	3014.86
UTU-95314	T.26S., R.9W.	All or portions of Sections 31	326.78
UTU-95318	T.27S., R.10W.	All or portions of Sections 01, 12, 13	1,320

Table 1-2. Private Geothermal Leases

Lease Name	Township and Range	Section Number(s)	Acreage
EDR Cape LSE1	T.27S., R.9W.	All or portions of Section 07	329.11
EDR Cape LSE1	T.27S., R.10W.	All or portions of Section 13	320.00
EDR Cape LSE2	T.27S., R.10W.	All or portions of Section 18	330.50

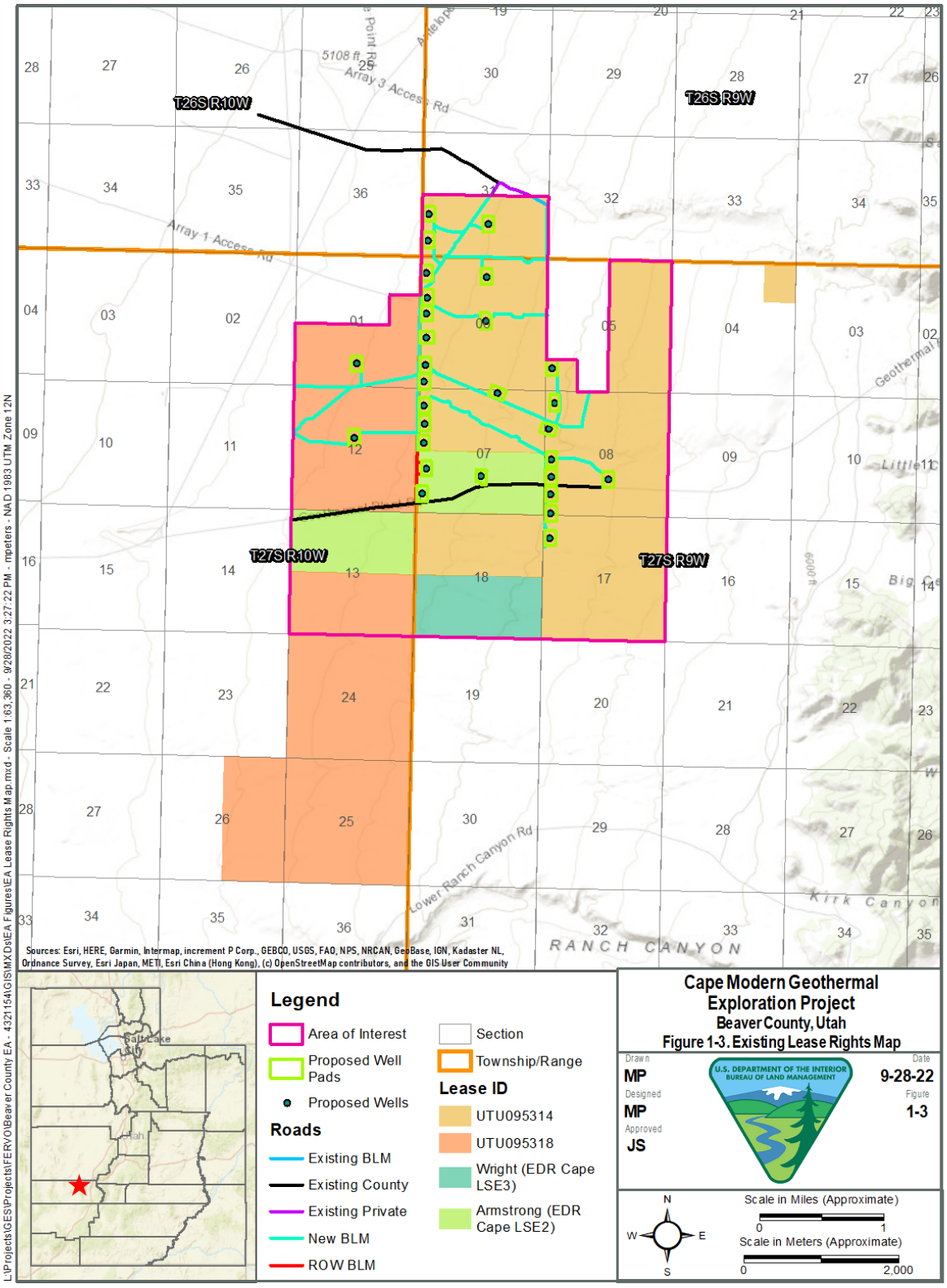

Figure 1-3. Existing Lease Rights Map.

1.2. PURPOSE AND NEED OF THE BLM

The purpose of the federal action is to respond to EDR's proposal to exercise its valid federal geothermal leases (UTU-95314 and UTU-95318) by drilling up to 29 geothermal exploration wells with associated components, as outlined in the POE (see **Appendix A**), on BLM-administered lands in Beaver County, Utah. The proposal also includes the application for a right-of-way (ROW) grant for off-lease well pads and access roads associated with the proposed project.

The need is established by the BLM's statutory and regulatory responsibilities regarding operations on lands leased for geothermal resources under the Geothermal Steam Act of 1970 and associated regulations (43 Code of Federal Regulations [CFR] 3200), and in furtherance of the Energy Policy Act of 2005 (Title II Section 225). The need to respond to EDR's ROW application is established under the Federal Land Policy and Management Act of 1976 (43 CFR 2800).

1.3. DECISION TO BE MADE

The BLM will make the following decisions based on the analysis in this EA:

1. Whether to approve or deny the proposed Cape Modern Geothermal Exploration Project, as outlined in EDR's POE (**Appendix A**), to drill up to 29 geothermal wells and construct ancillary components and, if so, under what terms and conditions.

2. Whether to approve or deny the proposed ROWs for the construction and maintenance of three well pads and access roads on a split estate private geothermal lease, and if so, under what terms and conditions.

1.4. LAND USE PLAN CONFORMANCE

The Proposed Action is subject to the *Cedar Beaver Garfield Antimony (CBGA) Record of Decision/Resource Management Plan* (ROD/RMP) (BLM 1986) which contains the objectives and land use decisions for BLM-administered public lands within the Cedar Beaver Garfield Antimony Planning Area. The CBGA RMP includes the following applicable objectives:

- Minerals: "Provide maximum leasing opportunity for oil, gas, and geothermal exploration and development by utilizing the least restrictive leasing categories necessary to adequately protect sensitive resources" (page 19).

- Range: "Reduce or eliminate rangeland resource problems on all allotments identified for intensive management while maintaining a production goal of approximately 60,000 AUMs [animal unit months] of livestock forage in the long term" (page 109).

- Range: "Maintain or improve current resource conditions on all identified for maintenance of current management allotments while permitting approximately 23,000 AUMs of livestock grazing use over the long term" (page 109).

- Soil/Water: "Improve watershed conditions on areas identified with significant erosion condition problems and other sensitive watershed areas (riparian areas). Avoid the deterioration of or improve watershed condition on all other Federal lands" (page 95).

- Soil/Water: "Assure an adequate supply of water for existing and proposed Bureau management activities. Ensure production of quality water as required by State and Federal legislative acts and regulations for onsite and downstream users. Coordinate with the proper local, State, and Federal authorities on water-related issues" (page 95).
- Wildlife: "Manage wildlife habitat to favor a diversity of game and nongame species. Provide forage for current big game numbers and prior stable or long-term numbers in the future should populations increase and habitat improvement occur. Improve habitat in poor condition on crucial deer winter range to reduce depredation on private lands. Protect against the loss of crucial big game habitat from encroachment by incompatible uses" (page 69).

The Proposed Action would conform with the CBGA RMP's objectives for minerals, range, soil/water, and wildlife. Under the Proposed Action, geothermal exploration and development opportunities would be increased; AUMs would not be reduced; potential soil erosion would be mitigated through salvage of topsoil at well pads, erosion control measures, and reclamation (Section 2.2 and **Appendix C**); potential surface water impacts would be mitigated through the implementation of a stormwater pollution prevention plan (SWPPP), interim and final reclamation, and appropriate permitting; and game species' population numbers are not likely to experience long-term decline.

1.5. RELATIONSHIP TO STATUTES, REGULATIONS, OTHER NATIONAL ENVIRONMENTAL POLICY ACT DOCUMENTS

The Proposed Action is consistent with federal laws, state laws, local laws, and BLM policy. The Proposed Action is consistent with the following statutes, regulations, and other documents:

Table 1-3. Relationship to Statutes, Regulations, and Other Plans

Relevant Statute, Regulation, Policy, or Plan	Relationship to the Proposed Action	Conformance of the Proposed Action
Safe, Efficient Use and Preservation of Navigable Airspace	Title 14, Part 77.9 of the Code of Federal Regulations (CFR) regulates when construction project proponents must notify the Federal Aviation Administration (FAA) regarding potential hazards posed by construction or alteration of structures.	The FAA Notice Criteria Tool indicates the Proposed Action (140-foot drill rig heights) does not exceed notice criteria.
Migratory Bird Treaty Act (MBTA) of 1918	The MBTA prohibits the take (killing, capturing, selling, trading, and/or transport) of migratory birds and their nests or eggs without a permit. The list of protected migratory birds includes raptors.	The Proposed Action would adhere to migratory bird design features, including nest surveys, to ensure no take of migratory bird species occurs (**Appendix C**).
Bald and Golden Eagle Protection Act of 1940	The Bald and Golden Eagle Protection Act prohibits anyone, without a permit issued by the Secretary of the Interior, from taking bald or golden eagles, including their parts, nests, or eggs.	The Proposed Action would adhere to migratory bird design features, including nest surveys, to ensure no take of Bald and Golden Eagles occurs (**Appendix C**).
National Historic Preservation Act (NHPA) of 1966, Section 106	Geothermal leasing is considered an undertaking pursuant to Section 106 of the NHPA. Agencies must take into account the effects of their undertakings on historic properties.	Consultation pursuant to Section 106 was initiated by the BLM on November 1, 2022, and concurrence from SHPO was received on November 9, 2022. Any areas containing eligible and unevaluated cultural sites would be avoided, or the potential for impacts mitigated in a manner acceptable to the BLM (**Appendix C**).

Relevant Statute, Regulation, Policy, or Plan	Relationship to the Proposed Action	Conformance of the Proposed Action
National Environmental Policy Act (NEPA) of 1969	The National Environmental Policy Act (NEPA) of 1969 was enacted to assure that all branches of government give proper consideration to the environment prior to undertaking any major federal action that significantly affects the environment. Any proposed projects on BLM land would invoke NEPA requirements.	This EA has been prepared for compliance with NEPA.
Clean Air Act (1970)	Clean Air Act (CAA) permitting in the State of Utah is the responsibility of the Division of Air Quality of the Utah Department of Environmental Quality (DAQ). Project activities would be required to adhere to all air quality standards set by the UDAQ.	Beaver County is currently in attainment with the National Ambient Air Quality Standards (NAAQS), and the short-term increase of fugitive dust and small of amounts of equipment emissions are within state air quality standards. The design features in **Appendix C** would limit fugitive dust.
Geothermal Steam Act of 1970	The Geothermal Steam Act governs the leasing of geothermal steam and related resources on public lands.	The Proposed Action would meet the BLM's statutory and regulatory responsibilities regarding operations on lands leased for geothermal resources under the terms of the Geothermal Steam Act of 1970.
Endangered Species Act (ESA) of 1973	The ESA provides a program for the conservation of threatened and endangered plants and animals and the habitats in which they are found. Under Section 7 of the Endangered Species Act, federal agencies must consult with the U.S. Fish and Wildlife Service (USFWS) when any action the agency carries out, funds, or authorizes (such as through a permit) may affect a listed endangered or threatened species.	The Proposed Action would not result in a take of any federally-listed species, and there is no designated critical habitat for threatened and endangered species within or reasonably near the project area.
Clean Water Act of 1974, Section 401, Section 404, and Section 402	Work within Waters of the United States (WOTUS) is regulated by Section 10 of the Rivers and Harbors Act and Section 404 of the Clean Water Act (CWA) and falls under the jurisdiction of the US Army Corps of Engineers (USACE). No navigable waters are located within the AOI; therefore, Section 10 of the Rivers and Harbors Act is not applicable. However, other WOTUS on site; which can include streams, rivers, lakes, wetlands, bays, tidal areas, and near-shore waters; could be subject to federal jurisdiction under Section 404. Under Section 401 of the CWA, a federal agency may not issue a permit or license to conduct any activity that may result in any discharge into Waters of the United States unless a Section 401 water quality certification is issued, or certification is waived. A Section 401 water quality certification has been issued for all Nationwide Permits (NWPs) in the Sacramento District, subject to the conditions and notification requirements of the NWP, the regional conditions set forth by the USACE Utah Regulatory Office, and the conditions set forth in the USACE water quality certification approval.	Impacts to WOTUS, if any, would be in compliance with the General Conditions of applicable NWPs. If the notification threshold(s) is exceeded, a Pre-Construction Notification (PCN) would be submitted to the USACE. A Stormwater Pollution Prevention Plan (SWPPP) and Notice of Intent (NOI) would be submitted to obtain coverage under the Utah Pollutant Discharge Elimination System (UPDES) General Stormwater Permit and receive authorization for stormwater discharges. Stormwater design features in **Appendix C** would help minimize potential impacts to surface waters.
Federal Land Policy and Management Act of 1976 (FLPMA)	FLPMA established guidelines to provide for the management, protection, multiple use, and enhancement of public lands. Section 103(e) of FLPMA defines public lands as any land and interest in land owned by the United States and administered by the Secretary of the Interior through the BLM.	The Proposed Action would meet the BLM's multiple-use and sustained yield mandate to serve present and future generations. The term "sustained yield" means the achievement and maintenance in perpetuity of a high-level annual or regular periodic output of the various renewable resources of the public lands consistent with multiple use (DOI BLM 2022).
American Indian Religious Freedom Act of 1978	The American Indian Religious Freedom Act of 1978 protects the rights of Native Americans to exercise their traditional religions by ensuring access to sites, use and possession of sacred objects, and the freedom to worship through ceremonials and traditional rites.	Notification letters were sent to Native American tribal groups on October 4, 2022. Consultation is on-going.

Relevant Statute, Regulation, Policy, or Plan	Relationship to the Proposed Action	Conformance of the Proposed Action
Public Rangelands Improvement Act of 1978	The Public Rangelands Improvement Act established a national policy to manage, maintain, and improve the condition of public rangelands. The project area intersects two grazing allotments.	The project area is located within the Hanson Allotment and Milford Bench Allotment. Design features including reduced speed limits, exclusionary fencing, and reclamation of disturbed areas utilizing a BLM-approved mix would minimize potential impacts to public rangelands (**Appendix C**).
Utah Geothermal Resource Conservation Act, Section 73-22 (1981)	The Utah Department of Natural Resources, Utah Division of Water Rights (UDWRi) is given jurisdiction and authority over all geothermal resources in the State.	EDR would apply for exploratory wells by submitting the POE (**Appendix A**) and well design to the UDWRi and receive written approval before commencing with drilling operations. Should the project lead to development of the geothermal resource in the future, EDR would comply with all UDWRi regulations and apply for a water right.
Farmland Protection Policy Act (FPPA) (1981)	The Farmland Protection Policy Act (FPPA), part of the 1981 Farm Bill, is intended to limit federal activities that contribute to the unnecessary conversion of farmland to other uses.	No prime farmland or farmland of statewide or local importance is located within the project area.
Utah Pollutant Discharge Elimination System (UPDES) Program (1990), Utah Administrative Code R317-8-3.9	Stormwater general permits are issued through the U.S. Environmental Protection Agency's (EPA) National Pollutant Discharge Elimination System (NPDES) program or the state NPDES permitting authority. Construction activities that disturb one or more acres of land must be authorized under the Utah Pollutant Discharge Elimination System (UPDES). The permit is obtained by creating a Storm Water Pollution Prevention Plan (SWPPP) and submitting a NOI to be covered under the UPDES General Storm Water Permit for Construction Activity (CGP).	A SWPPP and NOI would be submitted to obtain coverage under the (UPDES General Stormwater Permit to receive authorization for stormwater discharges. Stormwater design features in **Appendix C** would help minimize potential impacts to surface water.
Native American Graves Protection and Repatriation Act of 1990	The Native American Graves Protection and Repatriation Act provides for the ownership or control of Native American cultural items (human remains and objects) excavated or discovered on Federal or tribal lands.	Notification letters were sent to Native American tribal groups on October 4, 2022. Consultation is on-going.
Fundamentals of Rangeland Health (43 CFR 4180) (1995, 2006).	Provides standards and guidelines developed by the BLM for rangeland health. Standards for Utah include: • Standard 1 – Upland soils exhibit permeability and infiltration rates that sustain or improve site productivity, considering the soil type, climate, and landform. • Standard 2 – Riparian/wetland areas are in proper functioning condition. Stream channel morphology and functions are appropriate to soil type, climate, and landform. • Standard 3 – Desired species, including native, threatened, endangered, and special status species are maintained at a level appropriate for the site and species involved. • Standard 4 – Water Quality: Surface water and groundwater quality, influenced by agency actions, complies with state water quality standards.	Potential impacts to rangeland health; including the condition of soils, riparian areas, vegetation, and water quality; would be minimized by implementing the design features in **Appendix C**.
Executive Order 13112, *Invasive Species* (1999)	Executive Order 13112, *Invasive Species*, directs federal agencies to use relevant programs and authorities, to the extent practicable and subject to available resources, to prevent the introduction of invasive species and provide for restoration of native species.	The BLM coordinates with County and local governments to conduct an active program for control of invasive species. All vehicles would be power-washed prior to arriving in the project area to limit the potential for the introduction of invasive species, and disturbed areas would be reclaimed utilizing a BLM-approved seed mix (**Appendix C**).

Relevant Statute, Regulation, Policy, or Plan	Relationship to the Proposed Action	Conformance of the Proposed Action
Utah Field Office Guidelines for Raptor Protection from Human and Land Use Disturbance (Romin and Muck 2002)	This document provides practices and guidelines for consistent raptor management approaches across Utah.	Raptor nest found in proximity to the project area would be protected and managed according to Utah Field Office Guidelines for Raptor Protection from Human and Land Use Disturbances (Romin and Muck 2002). Raptor nests would be protected through incorporation of spatial and seasonal buffers (**Appendix C**).
Energy Policy Act of 2005 (Title II Section 225)	In August 2005, the U.S. Congress enacted the Energy Policy Act of 2005, Public Law 109-58, which recognizes the increasing demand for renewable energy and the need to facilitate leasing decisions for geothermal resources on public lands (BLM 2008).	The Proposed Action would meet the BLM's regulatory responsibilities regarding facilitating and expediting leasing decisions for geothermal resources on public lands.
Programmatic EIS (PEIS) for Geothermal Leasing in the Western United States (2008)	In furtherance of Section 225 of Energy Policy Act of 2005, the U.S. Department of Interior (DOI) and the U.S. Department of Agriculture finalized a Programmatic EIS (PEIS) for Geothermal Leasing in the Western United States to identify public lands open to geothermal leasing.	The BLM lands within the project area are included in the PEIS and have been identified as open to geothermal leasing. The Proposed Action would meet the need for the Federal action identified in the PEIS to "facilitate geothermal resource leasing in an environmentally responsible manner to help meet the increasing interest in geothermal energy development on public and NFS lands in the western United States" (BLM 2008).
Utah Code, Section 73-3-29 (Relocation of Natural Streams) (2014)	Except as provided in Subsection (2), a state agency, county, city, corporation, or person may not relocate any natural stream channel or alter the beds and banks of any natural stream without first obtaining the written approval of the state engineer.	Based upon the UDWRi review of relevant information, UDWRi has determined that there are no watercourses within the project area that meet the State Engineer's definition of a natural stream. As such, no state stream alteration permits would be required for alteration to these channels.
Secretarial Order 3362, *Big Game* (2018)	Secretarial Order 3362 recognizes state authority to manage big game species including improving habitat quality in western big game winter range and migration corridors.	The Proposed Action would comply with all UDWR recommendations for minimizing potential impacts to big game species (**Appendix C**).
Utah Administrative Code R655-1 - Wells Used for the Discovery and Production of Geothermal Energy in the State of Utah (2018)	The UDWRi has jurisdiction and authority to require that all wells for the discovery and production of water and steam at temperatures greater than 120 degrees centigrade to be used for geothermal energy production in the State of Utah, be drilled, operated, maintained, and abandoned in a manner as to safeguard life, health, property, the public welfare, and to encourage maximum economic recovery.	EDR would apply for exploratory wells by submitting the POE (**Appendix A**) and well design to the UDWRi and receive written approval before commencing with drilling operations. Should the project lead to development of the geothermal resource in the future, EDR would comply with all UDWRi regulations and apply for a water right.
Utah Code, Section 19-2 (Utah Air Conservation Act) (2020)	It is the policy of this state and the purpose of this chapter to achieve and maintain levels of air quality which will protect human health and safety, and to the greatest degree practicable, prevent injury to plant and animal life and property, foster the comfort and convenience of the people, promote the economic and social development of this state, and facilitate the enjoyment of the natural attractions of this state. Persons engaged in operations that result in air pollution may be required to install, maintain, and use emission monitoring devices, as the board finds necessary.	The short-term increase of fugitive dust and small of amounts of equipment emissions from the Proposed Action are within state air quality standards. The design features in **Appendix C** would limit fugitive dust.

The Proposed Action will also be consistent with applicable Beaver County Ordinances including construction codes, public health and sanitation codes, public safety codes, and county use and zoning ordinances. The Proposed Action is also consistent with the *Beaver County Resource Management Plan* (Beaver County 2019). In the plan, objectives for energy resources include

protecting and expanding the tax base and promoting economic activity that provides a high standard of living, while providing a quality environment for the enjoyment and use of citizens. Beaver County "supports the development of energy resources on public lands, subject to valid existing rights". Beaver County also has a policy of no net loss of grazing AUMs; no AUM reduction would result from the proposed project. All disturbed areas would be reclaimed following project completion (**Appendix C**).

The Proposed Action is consistent with the *State of Utah Resource Management Plan* (State RMP) (State of Utah Public Lands Policy Coordinating Office 2022), which recognizes the benefits of geothermal power generation. The plan indicates that the state supports "responsible geothermal resource utilization" and "supports the Bureau of Land Management and the U.S. Forest Service in leasing and selling parcels of land for the development of geothermal industries" (see the 2022 State RMP Energy Resource, Geothermal section).

The Proposed Action would comply with Utah Code regarding geothermal resources. Per Utah Code 73-22-8(2)(a), "Geothermal owners shall, prior to the commencement of, or increase in, production from a well or group of wells to be operated in concert, file an application with the division to appropriate such geothermal fluids as will be extracted from the well or group of wells…The division shall approve an application if it finds that the applicant is a geothermal owner and that the proposed extraction of geothermal fluids will not impair existing rights to the waters of the state." And per Utah Code 73-22-8(2)(b), "the division may grant the quantity of an application on a provisional basis, to be finalized upon stabilization of well production. Flow testing of a discovery well shall not require an application to appropriate geothermal fluids."

Finally, Utah Administrative Code R655-1-1 (1.1) states that "the Division of Water Rights is given jurisdiction and authority to require that all wells for the discovery and production of water and steam at temperatures greater than 120 degrees centigrade to be used for geothermal energy production in the State of Utah, be drilled, operated, maintained, and abandoned in a manner as to safeguard life, health, property, the public welfare, and to encourage maximum economic recovery." Based on these provisions, geothermal water rights in Utah are required for the production and/or utilization of geothermal fluids, but not for exploration geothermal wells or flow testing. EDR would apply for exploratory wells by submitting the POE and well design to the Utah DWRi and receive written approval before commencing with drilling operations. Any temporary water appropriations that are deemed to be required for drilling or testing would be applied for and obtained as part of the Utah Division of Water Rights' (UDWRi) geothermal drilling permit application process.

1.6. ISSUES IDENTIFIED FOR ANALYSIS

The BLM Interdisciplinary (ID) Team screened the Proposed Action and completed an ID Team Checklist (**Appendix B**) to identify resource values and land uses that could be affected by implementation of the Proposed Action and that would therefore require analysis in the EA.

The following potential issues were identified by the BLM ID Team on the ID Team Checklist during the internal scoping process:

- **Soils**: How would surface disturbance from construction of the proposed project affect soils and erosion potential?
- **Vegetation** (excluding USFWS designated species): How would surface disturbance from construction of the proposed project affect native vegetation?
- **Wildlife & Fish** (Big Game Species): How would the Proposed Action affect bighorn sheep, black bears, mule deer, and pronghorn and their habitats?
- **Wildlife & Fish** (excluding U.S. Fish and Wildlife Service [USFWS] designated species): How would the Proposed Action affect fish and wildlife species' populations and habitats, including BLM Sensitive Species?

These issues are discussed in detail in Chapter 3, Affected Environment and Environmental Consequences.

1.7. ISSUES IDENTIFIED BUT ELIMINATED FROM FURTHER ANALYSIS

Issues and resources that are either not present or would not be affected to a degree that require detailed analysis were dismissed from further analysis in this EA (see **Appendix B**). The following issues were identified but eliminated from further analysis based on field surveys or modifications to the Proposed Action:

Cultural Resources and Native American Religious Concerns: How would cultural resources and Native American religious concerns be affected by the Proposed Action?

A Cultural Resources Survey was conducted by Montgomery Archaeological Consultants from March 10th -18th, 2022. The site documentation occurred from July 5th -14th, 2022. All eligible contributing concentrations of cultural resources will be avoided entirely. This will be accomplished by access route and/or pad re-location and the utilization of fencing and/or construction site monitors in situations where construction will be immediately adjacent to eligible sites. For areas where an existing road traverses a contributing concentration, all vehicle traffic will remain within the confines of the existing access road. Concurrence from SHPO regarding avoidance measures and the management of eligible cultural resource sites was received on November 9, 2022 (**Appendix D**).

All tribal consultation for this project is being conducted on a government-to-government basis by the BLM. Notification letters were sent to Native American tribal groups on October 4, 2022.

Invasive Species/Noxious Weeds: How would the Proposed Action affect the spread of noxious weeds and invasive species?

Executive Order 13112, Invasive Species, directs federal agencies to use relevant programs and authorities, to the extent practicable and subject to available resources, to prevent the introduction of invasive species and provide for restoration of native species. The BLM coordinates with County and local governments to conduct an active program for control of invasive species. The Proposed Action has the potential to spread existing noxious weed populations within and adjacent to the project area by seed transport via equipment and vehicle movement. Based on the design features outlined in **Appendix C** under **Air, Soil, and Vegetation Design Features**, impacts from

Invasive Species and Noxious Weeds would be minimized; therefore, this issue was dismissed from further analysis.

Geology / Mineral Resources / Energy Production: How would the Proposed Action affect existing and potential future mining operations in the project area and surrounding areas?

The known mineral resources within the project area are geothermal resources and common varieties of mineral materials including sand and gravel. Sand and gravel resources are widespread throughout Beaver County, primarily in Quaternary alluvial deposits (Beaver County 2019). The Proposed Action would avoid existing energy production operations; however, disturbed acreage could be unavailable for future mineral exploration, mining operations, or energy production projects.

Aggregate material would not be recovered on-lease but would be acquired from an existing local supplier and transported to the project area (**Appendix C**). The attainment of aggregate from an on offsite supplier (Section 2.2.6) would eliminate the need for additional surface disturbance on-lease and would minimize additional impacts to mineral resources and potential future mining operations in the project area; therefore, this issue was dismissed from further analysis.

Rangeland Health Standards: How would Rangeland Health Standards be affected by the Proposed Action?

The project area is located within the Hanson Allotment (northern portion of project area) and Milford Bench Allotment (southern portion of project area). The livestock grazing season of use within the project area is from November 1st – May 15th with a rotating critical growing period of April 1st - May 15th. If the proposed project occurs outside the season of use, there would be no impacts to livestock grazing. If the proposed project is implemented during the season of use, livestock may be temporarily disturbed by construction equipment. Range improvement projects, including pipelines and cattle guards, are not proposed to be impacted by the project. If any improvement projects are impacted, they would be repaired as soon as possible and/or reconstructed immediately following the completion of the project. Any fences or livestock water pipelines that are impacted by the proposed project would be replaced or, if necessary to remaining accessible through the duration of the project, fences would be replaced with cattle guards or gates, as appropriate.

The proposed project would result in a potential forage loss of up to 150 acres (0.4% of 37,207 acres) of the Hanson Allotment and up to 116 acres (1% of 11,976 acres) of the Milford Bench Allotment from surface disturbance activities during exploration; however, disturbed areas determined to not be viable for development would be reclaimed by reestablishing vegetative cover using a BLM-approved seed mix. The design features outlined in **Appendix C** under **Wildlife and Livestock** would minimize impacts to Rangeland Health; therefore, this issue is dismissed from further analysis.

Wildlife – Migratory Birds: How would the Proposed Action affect migratory birds that may pass through or use the project area?

Based on the development of migratory bird and raptor design features in **Appendix C** under **Migratory Birds**, including nest surveys, and project activities being conducted outside of migratory bird nesting season dates, potential impacts to migratory birds would be minimized; therefore, migratory birds were dismissed from further analysis.

CHAPTER 2.0. PROPOSED ACTION AND NO ACTION ALTERNATIVE

This EA analyzes the potential effects of implementing the No Action Alternative and the Proposed Action. The No Action Alternative is considered and analyzed to provide a baseline against which to compare the impacts of the Proposed Action. No other alternatives were brought forward for detailed analysis.

2.1. NO ACTION ALTERNATIVE

Under the No Action Alternative, the BLM would not approve the proposed Cape Modern Geothermal Exploration Project, and the ROWs for off-lease well pads and access roads would not be granted (**Appendix A**). The proposed exploration and confirmation of geothermal resources would not occur. The proposed well pads and access roads would not be constructed, and associated surface disturbance would not occur. However, exploration and subsequent development on the geothermal leases could still occur under geothermal lease rights; potential impacts from these activities would be assessed through a separate NEPA analysis.

2.2. PROPOSED ACTION

The Proposed Action, as described in EDR's POE (**Appendix A**), would include the drilling and testing of up to 29 geothermal wells on 29 well pads (Figure 1-2). The Proposed Action would include associated on-lease access road construction or improvements, and the construction and maintenance of off-lease well pads and access roads. The proposed exploration and confirmation activities would involve:

- measuring the formation temperature,
- verifying the lithologic structure of the formation,
- measuring other key reservoir properties such as porosity and permeability, and potentially hosting data acquisition and communications systems such as fiber optic cables and downhole geophones.

Approximately 21 horizontal wells and 8 vertical wells would be drilled in succession in order to confirm the viability of the geothermal resource. A typical well pad layout is provided as Figure 2-1. Approximate well locations are included in Table 2-1. EDR would carry out these actions in succession and well pads, ancillary facilities, and access roads would be constructed individually or in groups of two or three, rather than all 29 well pads constructed at one time. The Proposed Action would include exploration drilling, well stimulation, and well testing as described in the attached POE (**Appendix A**), and in subsequent sub-sections of this EA.

Prior to the initiation of exploration drilling activities, EDR would submit a BLM Geothermal Drilling Permit (BLM Form 3260-2) and drilling program for the specified geothermal exploration well site location. Additionally, EDR would obtain the appropriate approvals from the UDWRi. After all appropriate federal, state, and local permits necessary for any action are received, well pad preparation and drilling activities would occur.

The proposed well locations deemed non-viable or unnecessary would be reclaimed as described in the POE (**Appendix A**) and in Section 2.2.7.

Table 2-1. Legal Descriptions of Proposed Well Locations

Well No.	Lease	Legal Description	Lat WGS84	Long WGS84	Easting UTM NAD83	Northing UTM NAD83	Estimated Acreage
1	UTU-095314	Section 31, NWSW	38.50450134	-112.9160004	332932.20	4263532.34	6.7
2	UTU-095314	Section 31, SWSW	38.50189972	-112.9160004	332926.19	4263243.70	6.7
3	UTU-095314	Section 31, SWNE	38.50350189	-112.9069977	333714.91	4263405.17	6.7
4	UTU-095314	Section 6, NWNW	38.49840164	-112.9160004	332918.10	4262855.50	6.7
5	UTU-095314	Section 6, NWNE	38.49769974	-112.9069977	333701.56	4262761.29	6.7
6	UTU-095314	Section 6, SWNW	38.49499893	-112.9160004	332910.24	4262477.85	6.7
7	UTU-095314	Section 6, SWNW	38.49290085	-112.9160004	332905.39	4262245.03	6.7
8	UTU-095314	Section 6, NWSE	38.49229813	-112.9069977	333689.14	4262161.80	6.92
9	UTU-095314	Section 6, NWSW	38.49029922	-112.9160004	332899.38	4261956.27	6.63
10	UTU-095314	Section 6, SWSW	38.48720169	-112.9160004	332892.22	4261612.58	6.7
11	UTU-095314	Section 6, SWSW	38.48529816	-112.9160004	332887.82	4261401.28	6.7
12	UTU-095314	Section 7, NWNE	38.48400116	-112.9049988	333844.42	4261237.42	6.7
13	UTU-095314	Section 7, SWNW	38.48260117	-112.9160004	332881.59	4261101.98	6.7
14	UTU-095314	Section 7, NWNW	38.4803009	-112.9160004	332876.28	4260846.74	6.7
15	UTU-095314	Section 7, SWNW	38.47800064	-112.9160004	332870.97	4260591.49	6.7
16	Pvt Lease	Section 7, NWSW	38.47499847	-112.9160004	332864.03	4260258.23	6.07
17	Pvt Lease	Section 7, SWSW	38.47190094	-112.9160004	332856.88	4259914.54	6.92
18	Pvt Lease	Section 7, NESE	38.47439957	-112.9069977	333647.98	4260175.56	6.11
19	UTU-095318	Section 5, SWSW	38.48720169	-112.8970032	334549.22	4261578.25	6.7
20	UTU-095314	Section 8, NWNW	38.48289871	-112.8970032	334539.38	4261100.72	6.55
21	UTU-095314	Section 8, SWNW	38.47990036	-112.8970032	334532.52	4260767.91	6.7
22	UTU-095314	Section 8, NWSW	38.47660065	-112.8970032	334524.98	4260401.80	6.7
23	UTU-095314	Section 8, NWSW	38.47430038	-112.8970032	334519.71	4260146.45	6.7
24	UTU-095314	Section 8, SWSW	38.47240067	-112.8970032	334515.37	4259935.71	6.7
25	UTU-095314	Section 17, NWNW	38.46989822	-112.8970032	334509.65	4259657.94	6.7
26	UTU-095314	Section 17, NWNW	38.46720123	-112.8970032	334503.48	4259358.64	6.7
27	UTU-095314	Section 8, NWSE	38.4742012	-112.8889999	335217.67	4260121.11	6.7
28	UTU-095318	Section 1, SESW	38.48690033	-112.9260025	332019.10	4261597.27	6.7
29	UTU-095318	Section 12, SENW	38.47840118	-112.9260025	331999.37	4260654.09	6.7

2.2.1. SEISMIC MONITORING

Proposed sites for the seismic monitoring stations are to be determined. Locations would depend on the exploration wells actually drilled and would be subject to spatial and timing avoidance requirements to protect sensitive species or eligible cultural sites. Seismic monitoring stations would consist of a 50 to 300-foot drill hole installed by a standard size truck, with no drill pad constructed and minimal site surface disturbance. The station would be powered by a small solar panel and would host either a broadband geophone or accelerometers. An area of approximately 10 feet by 10 feet around the station would be fenced for livestock and wildlife. All sites are within walking distance of existing or planned roads.

2.2.2. WELL PADS

Well pads would be constructed incrementally, 1 to 3 at a time, before drilling activity begins. Each well pad would be approximately 400 feet by 600 feet (approximately 5.51 acres per pad) with 25 feet additional around the entire perimeter for topsoil and other soil storage, resulting in 450 feet by 650 feet (approximately 6.7 acres per pad) disturbance for each pad (Table 2-1). Actual dimensions of the well pads would be modified to best match the specific physical and environmental characteristics of the site and to minimize grading. The maximum surface disturbance associated with new well pad construction would be approximately 193.7 acres (6.7

acres per pad, for 29 pads). Well sites deemed by the operator to be commercially non-viable would be reclaimed as describe in Section 2.2.7.

Depending on the subsurface properties, drilling conditions, and resource characteristics, EDR may consider drilling multiple wells from a single pad in the project area. In some cases, drilling multiple wells from a single pad may require increasing the dimensions of the well pad, however, because this method would require fewer total well pads to complete the project, it would likely result in a reduction of the total surface disturbance. In cases where the resource and logistics allow multiple wells to be drilled on single pad, as few as 15 well pads may be constructed which would reduce the overall well pad surface disturbance to as little as 100 acres, a 48% reduction in disturbance. EDR anticipates that this is the most likely surface disturbance scenario; however, this EA will assess the full potential of 193.7 acres of well pad surface disturbance. A right of way (ROW) would be required for the identified "off-lease" well pads, as three of the well pads are located on split-estate parcels. This right of way would contain 19.375 acres of impact on split-estate lands (privately leased subsurface rights below BLM administered surface lands) and would require an SF-299 form and supplemental Plan of Development, which would be provided separately.

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

Reserve pits would be constructed on each pad for the containment and temporary storage of water, drill cuttings and circulating drilling fluid during drilling operations. Reserve pits would be constructed in accordance with best management practices identified in the Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development (The Gold Book) (BLM 2007). Geothermal fluid produced from the well during flow testing would also drain to the reserve pit.

The reserve pits would be fenced with an eight-foot exclosure fence on three sides and then fenced on the fourth side once drilling has been completed to prevent access by persons, wildlife, or livestock (BLM 2007). Exclosure fencing would consist of chain-link fence with a mesh overlay or other BLM-approved fencing recommendations. The fence would remain in place until pit reclamation begins. To prevent livestock, wildlife, and persons from becoming entrapped, one side of the reserve pit walls would be sloped at an approximate 30 percent incline. The reserve pit would measure approximately 100 feet by 200 feet by 10 feet deep.

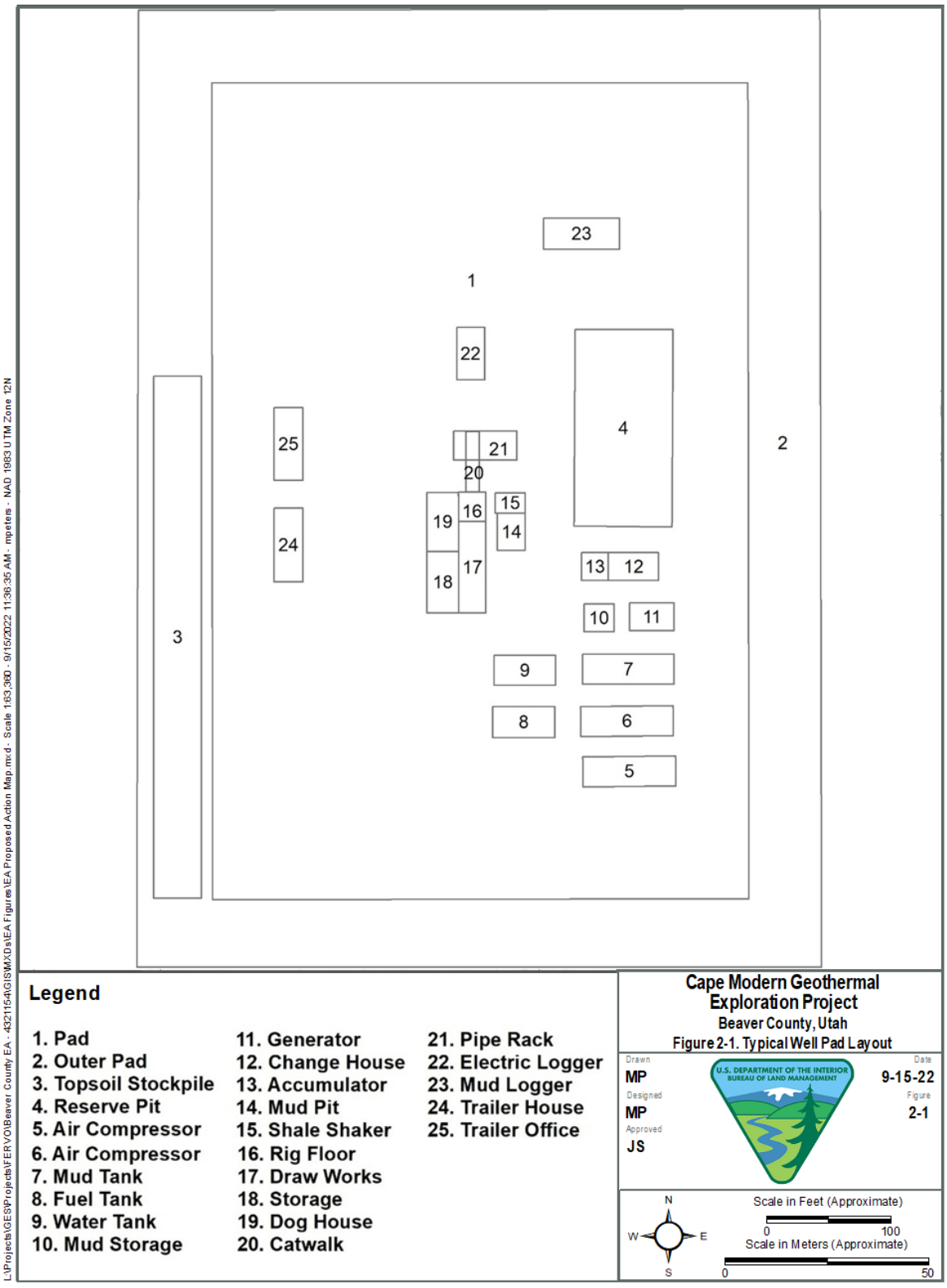

Figure 2-1. Typical Well Pad Layout.

2.2.3. ACCESS ROADS

Principal access to the project area is via Geothermal Plant Road, which heads east from Utah State Route 257, approximately four miles north of Milford, Utah. The project area is traversed by numerous roads and "two-tracks." Geothermal Plant Road and East Salt Cove Road would not require upgrade. All existing "two-track" roads are not existing authorized routes and would require surface disturbance for improvement. New access roads would require a total of 45 feet width of surface disturbance to accommodate a 40-foot-wide drivable roadbed and 2.5 additional feet on each side to facilitate placing or burying water, power, and communications lines as well as stormwater drainage. The width of the roads reflects the anticipated need for safe navigation of the area by large trucks often moving in two-way traffic and carrying oversized loads. New or improved access roads would be constructed using a dozer and/or road grader and would be constructed in succession as needed to allow access to well pads.

The total estimated area of surface disturbance required for new access road construction that would occur on-lease, assuming a 40-foot-wide drivable roadbed (45-foot-wide total width of surface disturbance) would be approximately 70.03 acres (67,791.60 linear feet). Improvements to existing two-track roads have been included as new disturbance in the above acreage of surface disturbance. A ROW would be required for the "split-estate" access roads in the project area. An SF-299 form and supplemental Plan of Development would be provided separately. A summary of access roads construction lengths and disturbances is provided in Table 2-2.

Table 2-2. Access Roads Construction Lengths and Disturbances

Access Road Type	Road Length (feet)	Road Length (miles)	Disturbance (acres)
New Road (on-lease)	67,791.60	12.84	70.03
New Roads (off-lease - ROW required)	2,637.10	0.50	2.72
Total	**70,428.70**	**13.34**	**72.75**

As there are no existing road upgrades required, it is estimated that a total of 72.75 acres of disturbance would be required for new access road construction and existing two-track improvements. Constructed access roads crossing existing drainages may require installation of culverts. Culvert installation would follow BLM design criteria and would be constructed pursuant to standards established in the Gold Book (BLM 2007).

2.2.4. WELL DRILLING AND TESTING

2.2.4.1. *Geothermal Well Drilling*

Geothermal wells would be drilled and tested individually or in groups of two or three and would be drilled in succession, rather than all wells drilled at the same time. A large rotary drilling rig (160 to 180 feet in height) would be used to drill the proposed exploratory geothermal wells.

A drilling supervisor would be on site at all times on the active drill site while the well is being drilled. The drilling crew may live "on-site" during the drilling operations in a self-contained, mobile "bunkhouse" (comparable in size to a double-wide trailer, containing sleeping quarters, galley, water tank, and septic tank) or portable trailers. These quarters for the drilling crew would,

in most cases, be placed on the active well pad. If for any reasons the crew cannot be housed on the active pad, the living facilities would be placed on an inactive pad. Alternatively, the drilling crew may acquire accommodations in Milford, Utah, depending on lodging availability. Personnel on location for a 24-hour operation typically include two 12-hr shifts of approximately 14 workers each, including an EDR supervisor and an EDR safety supervisor.

"Blow-out" prevention equipment would be utilized while drilling below the surface casing. Rig up and testing of the blow-out prevention equipment would be performed as per BLM Onshore Order 2 (BLM 1988). Company Representatives and drilling crew would be trained in well control.

The well bore would be drilled using non-toxic, temperature-stable water-based drilling fluid that may include bentonite clay or polymers for increased viscosity and carrying capacity. If required to improve the success of drilling operations, EDR may utilize underbalanced drilling with air, mist, foam, or aerated fluid.

Variable concentrations of additives would be added to the drilling fluids as needed to prevent corrosion, increase fluid weight, and prevent fluid loss. Some of the fluid additives may be hazardous substances, but would only be used in low concentrations that would not render the drilling fluid hazardous or toxic. Additional drilling fluid would be mixed and added to the fluid system as needed to maintain the required quantities. All exploration wells would drilled, operated, maintained, and abandoned in accordance with UDWRi requirements. The specific drilling methodology, including drilling fluids, would be reviewed and approved by UDWRi as part of the geothermal drilling permit application process (R655-1-2 UAC). Injections wells would also be approved during the geothermal drilling permit process and would be in compliance with R655-1-5 UAC.

Target depths at the proposed Cape Modern geothermal field range between 3,500 and 12,000 feet below ground surface (True Vertical Depth) but may change pending new well data, well testing results, and increased understanding of the subsurface. Directional drilling may be employed to drill horizontal geothermal wells. Well casing would meet all requirements outlined in Geothermal Resources Operational Order No. 2, where the surface casing string would be set at no less than 200 feet to prevent co-mingling of the geothermal fluids with underground aquifers (DOI Geological Survey Conservation Division 1975) or with Onshore Oil and Gas Operational Order No. 2 (BLM 1988), as directed by federal and state regulators.

The horizontal injection and production wells would be designed to target a true vertical depth that meets the resource temperature requirements for commercial production, which is anticipated to be approximately 8,000 feet (true vertical depth), with the potential to be deeper. The wells would be drilled vertically to a pre-determined kick-off point, at which point directional drilling techniques would be employed to build the curved section of the well from an inclination of zero degrees (vertical) to an inclination of approximately 90 degrees (horizontal) at a build rate of approximately 5 - 10 degrees per 100 feet of drilled length. The wells would then continue to be drilled horizontally, maintaining an approximately constant inclination and azimuth.

The target azimuth for the curved section and lateral section would in part be determined based on the state of stress in the local geologic conditions of the formation and the temperature gradients

of the formation. The curved section may be drilled at a combination of target inclinations, azimuths, and build rates to achieve the target landing point. The length of the lateral section would depend on formation characteristics but is expected to be approximately 5,000 feet. If the formation and resource characteristics support it, multiple horizontal wells may be drilled from a single well pad, significantly reducing the surface footprint required to meet the target system capacity.

The vertical observation wells would be drilled to a similar depth as the true vertical depth of the horizontal wells, approximately 8,000 feet, with the potential to be deeper. In some cases, the vertical observation wells may be drilled deeper than the target true vertical depth of the horizontal wells, (as deep as approximately 12,000 feet) in order to further characterize the resource. The vertical observation well locations would generally be targeted near the mid-point of the lateral sections of offset horizontal injection or production wells.

Each well may need to be worked over or be redrilled. Depending on the circumstances encountered, working over a well may consist of lifting the fluid in the well column with air or gas or stimulation of the formation using fresh water and proppant. Well redrilling may 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.

While the drill rig is still over the well, the residual drilling fluid and cuttings would be flowed from the well bore and discharged to the reserve pit. A single well may be drilled by more than one drilling rig. For example, the surface casing may be set by a dedicated smaller rig prior to the main drilling rig arriving on location.

The horizontal injection and production wells would be completed with multiple casing sections. The wells would be completely cased and cemented to the total depth (TD) of the well. Hydraulic communication between the wellbore and the formation would then be established through a series of sequential perforation operations. In addition, reservoir stimulation techniques may be employed. The reservoir stimulation treatment involves performing several stimulation "stages" along the lateral section and curved sections of the wellbore. In each stage, a temporary plug is set at a pre-determined location along the well and a series of perforation holes are placed along a pre-determined length of the wellbore that defines the stage, typically around 100 to 300 feet long. A slurry of water, proppant, and fluid additives is then pumped to stimulate the formation. That process is repeated several times along the length of the wellbore. Once all stages are completed, the temporary plugs are either drilled out or dissolve naturally, at which point the well is prepared for well testing or production. Although the stimulation treatment method described here is the most common stimulation technique, other similar techniques may be used, such as the use of sliding sleeves.

2.2.4.2. *Geothermal Well Testing*

Short-term well tests may be performed on wells. The short-term well tests would last up to seven days on average. Short-term well tests on injection wells would involve injecting fluid into the well, typically using pump trucks to inject fresh water or geothermal brine, while monitoring

temperature, pressure, flow rate, chemistry, and other parameters. Short-term well tests on production wells would involve producing fluid from the well, typically using a workover rig or coiled tubing unit to airlift the well to initiate the flow of fluid into the reserve pit or portable steel tanks while monitoring temperatures, pressure, flow rate, chemistry, and other parameters. In some cases, short-term injection tests may also be performed on a production well in order to measure reservoir properties. Each short-term injection test would involve injecting or producing fluid at rates typically ranging from 500 gallons per minute (gpm) to 2,000 gpm, with total injection or production volumes ranging from approximately 5 to 20 million gallons.

One or more long-term flow test(s) of each well drilled would likely be conducted following the short-term flow test(s) to accurately determine long-term well and geothermal reservoir productivity. For production wells, the long-term flow test(s), each lasting between seven and 30 days, would be conducted by pumping the geothermal fluids from the well through on-site test equipment, typically by using a workover rig to airlift the well or using a line shaft pump, to the reserve pit. A surface booster pump would pump the residual produced geothermal water/fluid through a temporary eight 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 hand laid across undisturbed surface or on the surface of the disturbed shoulders on the access roads connecting the full-size geothermal wells (as required, roads would be crossed by trenching and burying the temporary pipe in the trench). The on-site test equipment would include standard flow metering, recording, and sampling apparatus. For injection wells, long-term flow test(s) would be performed by injecting fluid into the wellbore, typically using pump trucks to pump fresh water or geothermal brine, while monitoring temperature, pressure, flow rate, chemistry, and other parameters. Each long-term well test is expected to flow approximately 20 to 50 million gallons of geothermal brine. In some cases, long-term well tests on production wells and injection wells would be performed concurrently, in which case a significant portion of the produced fluid, typically up to 70%, may be recycled for reinjection.

2.2.5. WATER REQUIREMENTS

The water requirements vary considerably between the drilling, completion, and well testing phases for a given well. During the drilling phase, the total water requirement is anticipated to be approximately 50,000 barrels (2.1 million gallons). The drilling phase is anticipated to last approximately 60 days for each well, which equates to an average water requirement of approximately 833 barrels (34,990 gallons) per day. During the completion phase, the total water requirement is anticipated to be approximately 350,000 barrels (14.7 million gallons). However, the completions phase occurs over a significantly shorter duration compared to the drilling phase, typically taking about 7 days total. Therefore, the average water requirement during the completions phase is approximately 50,000 barrels (2.1 million gallons) per day over the 7-day period. Water requirements for grading, construction, and dust control would average substantially less at around 143 barrels (6,000 gallons) per day. One or more portable water tank(s), holding a combined total of at least 238 barrels (10,000 gallons), would be maintained on the well sites during drilling operations.

Water would be obtained from shallow water wells drilled from one or more of the proposed drill sites, with a waiver for the temporary use of groundwater from the Utah Division of Water Rights, or piped to each well pad from a private source using above-ground piping.

If obtained via shallow water well(s), each well location would be determined upon individual need, likely at a pad located centrally within the project area. Each water well would be temporary, drilled by a licensed water well driller and cemented with seven-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 below the surface). An electric submersible pump on four-inch column pipe would then be run to below the producing interval. The well would be plugged and abandoned in accordance with Utah Administrative Code R655-4-14, with cement plugs across the bottom of the casing and, if needed, with additional plugs to isolate individual producing zones if identified as present. No additional surface disturbance would be associated with the drilling of each temporary water well because, if drilled, water well(s) would be located on existing geothermal well pads.

Alternatively, if a waiver for temporary use of groundwater is not granted, water could be obtained from a private source and trucked or piped to each drill site using temporary hand placed pipes. If water is trucked to the project area, the frequency of trips would depend on the rate of fluid loss down the well while drilling and the capacity of the available water trucks. EDR would determine the water source while a BLM Geothermal Drilling Permit (BLM Form 3260-2) and drilling program is being prepared for the specified well site location to be drilled.

2.2.6. AGGREGATE REQUIREMENTS AND SOURCE

Aggregate material would be acquired from existing suppliers and transported to the project area. Aggregate material would likely be obtained from a local source, such as the Martin Marietta Milford Quarry, located approximately six miles southwest of the AOI. Well pads and access roads were selected 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. It is expected that at most, each well pad (exclusive of the reserve pit) would be covered with up to six inches of gravel. While the proposed project would likely utilize much less, a conservative estimate for the total aggregate required for well pad construction is estimated at 98,542.58 cubic yards (approximately 3,398.02 cubic yards/pad * 29 pads).

Access roads would be covered with up to four inches of gravel, as necessary, to create an all-weather surface and to prevent the formation of ruts. Total aggregate required for access road construction within the project area is estimated at 34,779.60 cubic yards (approximately 13.34 miles of access roads * 40-foot width * 4-inch depth).

Total aggregate required for the well pad and access road construction is estimated at 133,322.18 cubic yards.

2.2.7. SURFACE RECLAMATION

After the well drilling and testing operations are completed, the liquids from the reserve pits would either naturally evaporate or be removed as necessary to reclaim the reserve pits. The solid contents

remaining in each of the reserve pits, typically consisting of non-hazardous, non-toxic drilling fluid and rock cuttings, would be tested in accordance with the Gold Book (BLM 2007), existing state standards, or with project-specific requirements of the drilling and water permitting agencies to confirm that they are not hazardous. As stated in Section 2.2.4, fluid additives in high concentrations may be hazardous or toxic, but in the concentrations utilized for exploration, the solid contents remaining in reserve pits are not expected to be hazardous or toxic. Non-hazardous and non-toxic drilling fluid and cuttings would be buried in the reserve pit, and any drilling fluid and/or cuttings identified as hazardous or toxic would be disposed of according to Utah Department of Environmental Quality (UDEQ) – Division of Waste Management and Radiation Control (DWMRC) regulations.

If a well is judged by EDR to have no commercial potential, it may continue to be monitored, but would be plugged and abandoned in conformance with the well abandonment requirements of the BLM and UDWRi. Abandonment typically involves placement of two or more tested cement plugs in the wellbore to isolate formations and prevent interzonal fluid migration. The well head (and any other equipment) would then be removed, the casing cut off well below ground surface, and the hole backfilled to the surface. Any associated access roads would also be reclaimed in accordance with best management practices identified in the Gold Book (BLM 2007).

The portions of the cleared well sites not needed for operational and safety purposes (i.e., the "shoulders" of the pad) 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 and reseeded with native grasses and forbs. The stockpiled topsoil would also be spread on the area to aid in revegetation.

2.2.8. SUMMARY OF SURFACE DISTURBANCES

EDR anticipates drilling and testing up to 29 wells. In cases where the resource and logistics allow, multiple wells could potentially be drilled on each pad, resulting in as few as 15 well pads. Total surface disturbance for the proposed project could range from 172.75 acres up to 266.395 acres maximum, resulting in a surface disturbance of roughly 3.5-4.75% of the AOI (Table 2-3). All surface disturbing activities would progress incrementally, with well pads, ancillary facilities, and access roads constructed individually or in groups of two or three, rather than all well pads and access roads constructed at one time.

Table 2-3. Summary of Proposed Action Surface Disturbance

Project Component	Disturbed Area (acres)
Well Pads (on-lease)	174.27
Well Pads (off-lease)	19.375
Access Roads (on-lease)	70.03
Access Roads (off-lease)	2.72
Total	**266.395**

2.2.9. Design Features

Design features are measures or procedures incorporated into the Proposed Action that could reduce or avoid adverse impacts. Design features incorporated into this Proposed Action are included in **Appendix C**. The BLM has also provided specific stipulations applicable to project activities. The stipulations are detailed in leases UTU-95314 and UTU-95318 and separate BLM-provided documents (**Appendix C**).

2.3. ALTERNATIVES CONSIDERED BUT NOT ANALYZED IN DETAIL

For an EA where there are no unresolved conflicts concerning alternative uses of available resources, only the Proposed Action requires consideration (BLM 2008). In this EA, no unresolved conflicts with respect to alternative uses have been identified, and only the Proposed Action and No Action Alternative are considered.

CHAPTER 3.0. AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

3.1. INTRODUCTION

This chapter describes the existing baseline conditions relevant to the issues presented in Section 1.6 and discloses the potential environmental impacts of the Proposed Action and No Action Alternative on those issues. The NEPA Handbook states that issues need to be analyzed in detail if 1) "analysis of the issue is necessary to make a reasoned choice between alternatives," and 2) "the issue is significant (…or where analysis is necessary to determine the significance of impacts)" (BLM 2008). Issues potentially impacted to a level requiring further analysis are described in this chapter.

A field assessment was conducted by Groundwater and Environmental Services, Inc. (GES) from February 7th – 11th, 2022. The field assessment included an evaluation of biological resources within the project area including the following:

- Assessment of Land Use.
- Determination of Waters of the U.S. and Waters of State.
- Evaluation of Vegetation.
- Evaluation of Soils.
- Wildlife Habitat Analysis.
    - Sensitive, Threatened, and/or Endangered Species Analysis
    - Migratory Birds Analysis
    - Big Game Species Analysis
- Evaluation of Hazardous Waste or Contamination Potential.

A Class III Cultural Resources Survey was conducted by Montgomery Archaeological Consultants from March 10th -18th, 2022. The site documentation occurred between July 5th -14th, 2022.

3.2. GENERAL SETTING

3.2.1. Past and Present Actions

Generally, past, and present actions in the analysis areas include renewable energy production facilities (geothermal, solar, and wind), roads and highways, railways, utility lines, and agricultural production. Past and present land-disturbing activities in the analysis areas were estimated through acres of land with disturbed or developed SWReGAP land cover classes (Lowry et al. 2005). Disturbed or developed land cover classes within the analysis areas are shown on Figure 3-1. Past and present actions are discussed in detail in the Affected Environment section for each issue.

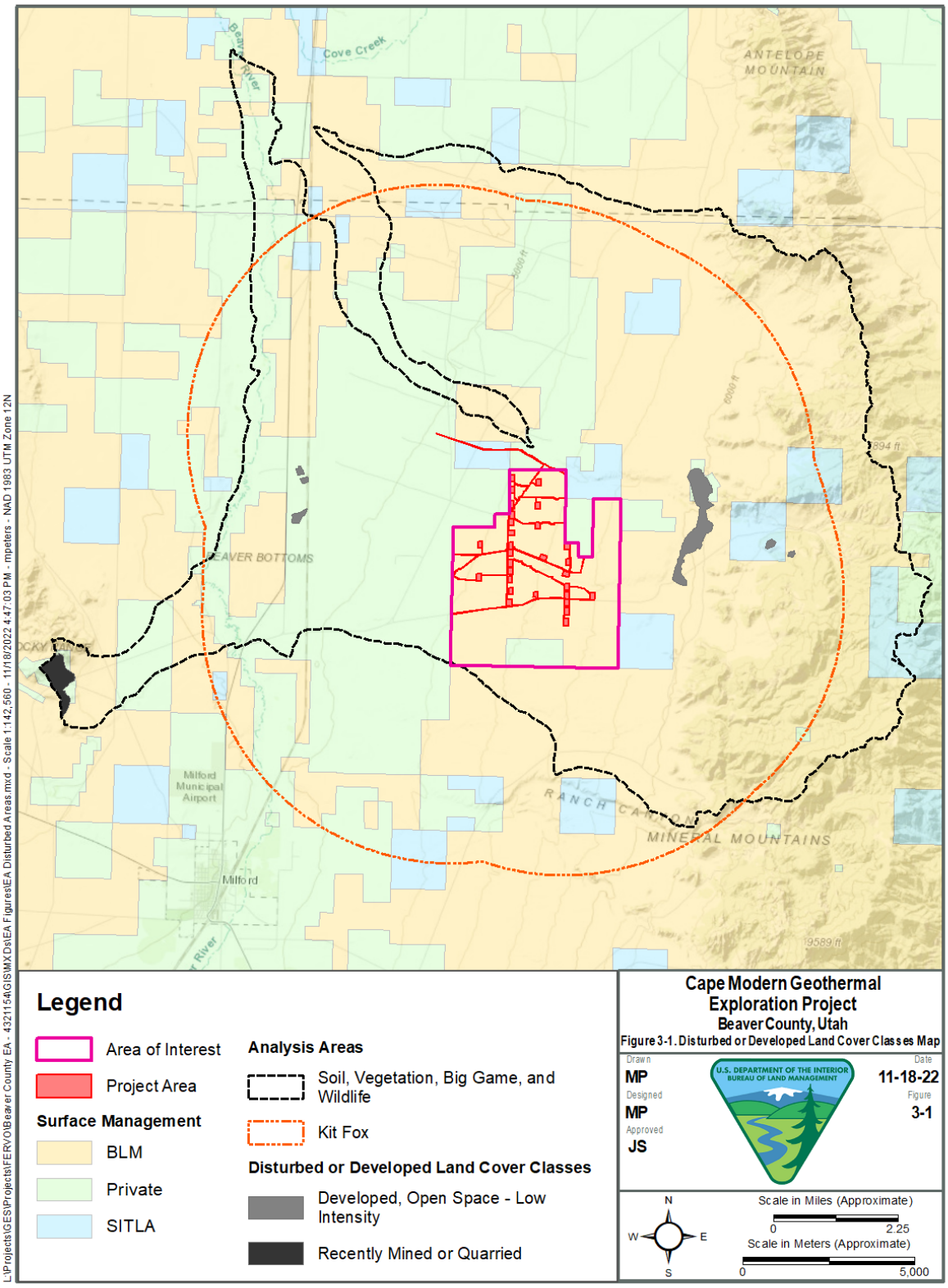

Figure 3-1. Disturbed or Developed Land Cover Classes Map.

3.2.2. Reasonably Foreseeable Future Actions

Reasonably foreseeable future actions (RFFAs) are decisions, funding, or formal proposals that are either existing or highly probable based on known opportunities or trends. The BLM is not aware of any other additional proposals or authorizations presently encumbering the project area at this time.

The only minerals-related authorizations within the project area are the existing geothermal leases (UTU-95314 and UTU-95318). However, there are other geothermal leases within the analysis area including eleven parcels of federal mineral estate (32,527 acres) recently offered by the BLM in the *April 2022 Utah Geothermal Competitive Lease Sale* (BLM Utah State Office 2022); recently-approved geothermal projects including the Bailey Mountain Geothermal Exploration Project (BLM) located to the east of the project area, Utah Frontier Observation for Research into Geothermal Energy (FORGE) Strainmeter Monitoring Sites located adjacent to the project area; and existing geothermal projects including the Utah FORGE Milford, Utah Site, Utah FORGE Seismic Project, and the Blundell Geothermal Power Plant. Exploration and development of geothermal resources are highly probable based on the existing geothermal leases and authorizations. Those RFFAs with quantifiable surface disturbance impacts based on approved proposals are summarized in Table 3-1.

Table 3-1. Quantifiable RFFAs within Analysis Areas

Project	Project ID	Project Status	Surface Disturbance (acres)[1]
Bailey Mountain Geothermal Exploration Project	DOI-BLM-UT-CO10-2021-0015	Approved	62.20
Utah FORGE Seismic Project	DOI-BLM-UT-C010-2016-0042	Approved	62.50
Utah FORGE Milford, Utah Site	DOE/EA-2070	Approved	130.52
Utah FORGE Strainmeter Monitoring Sites	DOI-BLM-UT-C010-2022-0002	Approved	0.77
Total			**255.99**

[1]Surface disturbance acreage was taken from NEPA documentation for each respective project.

The actions below have no formal proposals but are likely to become reasonably foreseeable future actions in the analysis areas based on current land use patterns and trends:

- Geothermal exploration on existing geothermal leases.
- Additional renewable energy generation projects.
- Continued cattle grazing and range improvement projects.

If the Proposed Action's exploration wells indicate a commercially viable geothermal resource, a development well field and generation facility could be proposed in the future which could impact existing geothermal resources in the project area. The potential effects from a development well field and generation facility are speculative at this time and would be analyzed in a new NEPA document.

3.3. ISSUE #1. SOILS: HOW WOULD SURFACE DISTURBANCE FROM THE PROPOSED PROJECT AFFECT SOILS, INCLUDING POTENTIAL LOSS OF SOIL THROUGH REMOVAL AND EROSION, AS WELL AS COMPACTION?

3.3.1. Affected Environment

The project area is located within the Beaver River: Beaver Bottoms - Beaver River, Negro Mag Wash, and Wild Horse Canyon subwatersheds within the larger Beaver Bottoms-Upper Beaver Watershed (HUC 16030007). The Beaver Bottoms - Beaver River, Negro Mag Wash, and Wild Horse Canyon subwatersheds (72,430 acres) were selected as the analysis area for soils as it provides a clear topographic boundary against which to measure impacts to soils. The subwatersheds are shown on Figure 3-2a.

Soils within the project area described in the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Web Soil Survey (WSS) were reviewed to characterize the project area soils. Five soil units are mapped within the project area and are summarized below (Table 3-2). The USDA Soils Map is provided as Figure 3-2a and 3-2b. The erosion hazard ratings described below indicate the hazard of soil loss from unpaved roads or trails. The off-road and off-trail hazards of erosion for these five soil types have not been rated. A rating of "slight" indicates that little or no erosion is likely; "moderate" indicates that some erosion is likely, that unpaved roads or trails may require occasional maintenance; and that simple erosion-control measures are needed; and "severe" indicates that significant erosion is expected, that the roads or trails require frequent maintenance, and that costly erosion-control measures are needed (NRCS Soil Survey Staff 2022).

Table 3-2. Project Area Soil Types

Map Unit Symbol	Map Unit Name	Landform	Parent Material	Natural Drainage Class	Runoff Potential	Hazard of Erosion
116	Hiko Peak-Crestline complex, 3 to 8 percent slopes	Fan remnants and semi-bolsons	Alluvium derived from igneous and sedimentary rock	Well drained	Low	Moderate
137	Escalante sandy loam, 3 to 15 percent slopes	Escarpments on inset fans, escarpments on stream terraces, and semi-bolsons	Alluvium derived from igneous and sedimentary rock	Well drained	Low	Moderate
206	Sheeprock-Cokel complex, 3 to 30 percent slopes	Hills, ridges, and semi-bolsons	Alluvium and colluvium derived from acid igneous rock and intermediate igneous rock	Somewhat excessively drained to well drained	Low to medium	Moderate to severe
ESD2	Escalante-Hiko Peak complex, 2 to 10 percent slopes, eroded	Alluvial fans	Alluvium derived from granite	Well drained	Low to medium	Moderate
HDD	Haybourne coarse sandy loam, 1 to 10 percent slopes	Alluvial fans	Alluvium derived from granite	Well drained	Medium	Moderate

In general, soils within the project area range from very fine sands and silty sands to sandy loams. Soil erosion potential in the project area is generally moderate and varies based on soil type and slope.

Past and Present Surface-Disturbing Activities

Past and present land-disturbing activities in the soil condition analysis area were estimated through acres of land with disturbed or developed SWReGAP land cover classes (Lowry et al. 2005). Disturbed or developed land cover classes within the soil analysis area are shown on Figure 3-1. Disturbed or developed land cover classes indicate impacts to soils from sources related to human activity. Impacts to soils from these land-disturbing activities include increased erosion, loss of soil structure, compaction, and loss of topsoil / topsoil degradation.

Approximately 383 acres (0.5%) of the analysis area are classified as Developed, Open Space – Low Intensity land cover type. This land cover class includes areas with a mixture of constructed materials and vegetation with impervious surfaces accounting for 0 - 49 percent of total cover. Approximately 189 acres (less than 0.5%) of the analysis area is classified as Recently Mined or Quarried. This land cover class includes open pit mining or quarries that are two hectares (4.9 acres) or greater in size.

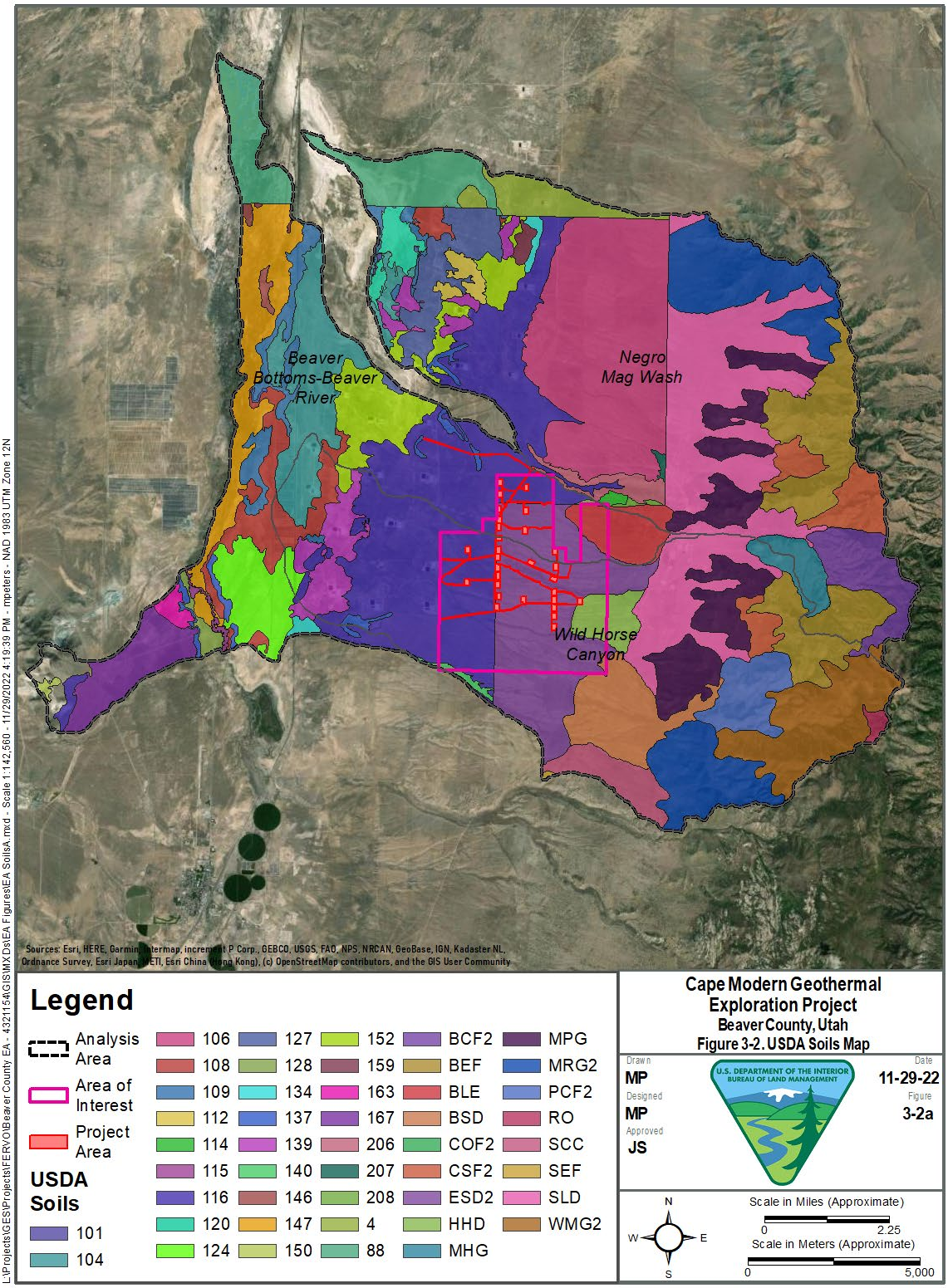

Figure 3-2a. USDA Soils Map (Analysis Area).

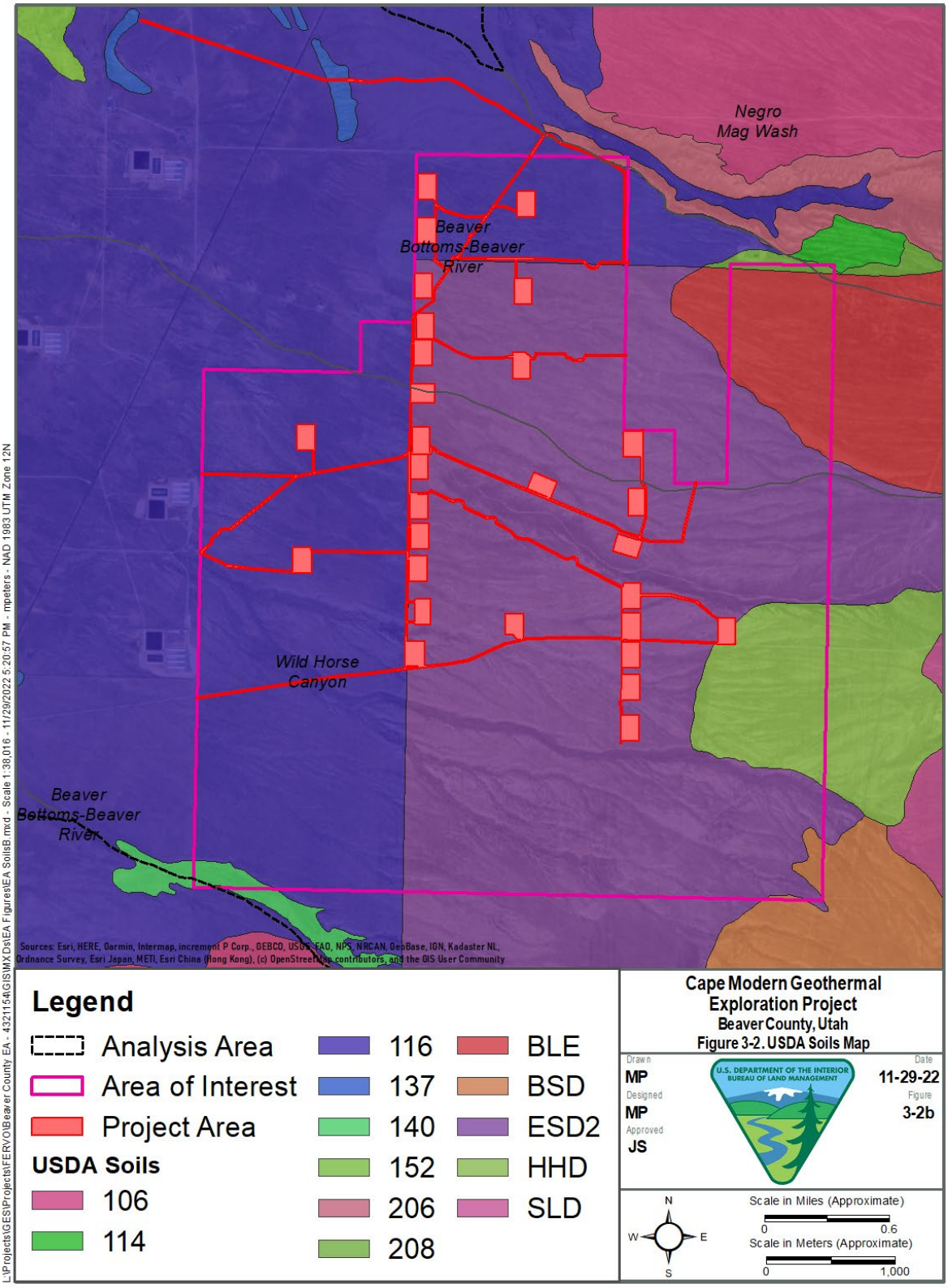

Figure 3-2b. USDA Soils Map (Project Area).

3.3.2. Environmental Impacts—No Action Alternative

Under the No Action Alternative, there would be no changes to the soil in the project area as a result of the Proposed Action; however, because of existing geothermal leases within the AOI, exploration and development within the AOI are RFFAs under lease rights. Therefore, impacts to soil similar to those discussed in Section 3.3.3 would likely result from RFFAs within the analysis area.

3.3.3. Environmental Impacts—Proposed Action

The Proposed Action would result in up to 266 acres of surface disturbance (less than 0.5% the soil analysis area). Soil erosion potential in the project area is generally moderate and varies based on soil type and slope. The majority of the proposed surface disturbance would occur in areas with shallow slopes of 0% to 15% with moderate erosion potential. Expected impacts to specific soil types are described in Table 3-3.

Table 3-3. Project Surface Disturbance by Soil Type

Map Unit Symbol	Map Unit Name	Soil Type in Project Area Disturbed (acres)	Soil Type in Analysis Area (acres [%])	Soil Type in Analysis Area Disturbed (%)
116	Hiko Peak-Crestline complex, 3 to 8 percent slopes	71	7,731 (18.4%)	0.9%
137	Escalante sandy loam, 3 to 15 percent slopes	0	408 (<1%)	0%
206	Sheeprock-Cokel complex, 3 to 30 percent slopes	0	449 (<1%)	0%
ESD2	Escalante-Hiko Peak complex, 2 to 10 percent slopes, eroded	191	4,685 (11.1%)	4%
HDD	Haybourne coarse sandy loam, 1 to 10 percent slopes	3	634 (<0.5%)	0.5%

Land disturbing activities within the project area would likely result in increased erosion, loss of soil structure, compaction, and loss of topsoil / topsoil degradation. Use of equipment may compact soils, which could reduce soil infiltration rates, leading to increases in overland flow of water, erosion, and displacement of soil (BLM 2016). These impacts are expected to be primarily localized to construction areas and access roads. The referenced impacts to soils may extend slightly beyond the project footprint due to increased soil instability and increased potential for wind and water erosion in the vicinity of surface disturbing activities (compacted and graded areas, areas of vegetation removal).

The potential for increased erosion and sedimentation would be greatest in the short term immediately after construction when disturbed soils are loose, but would decline over time in areas where reclamation is implemented and in other areas as natural stabilization occurs (BLM 2016). During project activities, the disturbance corridor would be maintained to preserve the natural runoff regime and prevent excessive erosion. Increased stormwater runoff, sedimentation, and soil compaction during well pad and road construction would be mitigated through the implementation of best management practices (BMPs) and design features included in **Appendix C**. Erosion

mitigation measures may include drainage bars, check dams, and berms. Disturbed areas that are no longer being used would be reclaimed immediately, and the reclamation of the project area following project completion would help avoid a long-term loss of soil and soil degradation.

A SWPPP would be implemented for the construction activities associated with the proposed project. The SWPPP would include measures designed to prevent excess sediment from discharging to surface waters in the analysis area.

Cumulative Impacts

The Proposed Action would add incrementally to the acreage of soil impacts from past and present surface-disturbing activities (572 acres) and quantifiable RFFAs (256 acres, Table 3-1) in the analysis area. The cumulative impacts from geothermal energy exploration and development on soil compaction and erosion would be considered minor when combined with other projects and land uses in the analysis area (U.S. Forest Service and BLM 2008). The approximately 266 acres of disturbance from the Proposed Action would represent a 46% increase to the approximately 572 acres of past and present surface disturbance to soils in the analysis area (Figure 3-1). Including the quantifiable RFFAs within the analysis area, this proposed increase of surface disturbance would result in a cumulative 1.5% of disturbance within the soil analysis area.

All surface disturbing activities would progress incrementally. Well sites and associated access roads determined by the operator to be commercially non-viable would be reclaimed as the project progresses. Therefore, the actual acreage of disturbed soil at any given point in time would likely be lower than the proposed maximum of 266 acres of disturbance. Salvaged topsoil (and cleared organic material, if saved) from the initial disturbance would be used during the subsequent reclamation. Cumulative impacts to soils from these land-disturbing activities include increased erosion, loss of soil structure, compaction, and loss of topsoil / topsoil degradation.

In addition to the quantifiable RFFAs, the BLM recently offered a competitive geothermal lease sale for 11 parcels in Beaver and Millard Counties (BLM 2021a). Approximately 11,687 acres of the soil analysis area was included in the geothermal lease sale. Exploration and development on future leases could cause additional impacts to soils; however, these impacts are not quantifiable at the leasing sale stage of the process because no specific projects have been proposed. The BMPs and design features included in **Appendix C** would limit long-term, incremental cumulative impacts to soils.

If a commercially viable geothermal resource is confirmed, a development well field and generation facility would likely be proposed in the future, which could result in additional impacts to soils in the AOI. The completion of the wells for production and injection, as well as the construction of the power plant, would require a separate NEPA analysis.

3.4. ISSUE #2. VEGETATION: HOW WOULD SURFACE DISTURBANCE FROM CONSTRUCTION OF THE PROPOSED PROJECT AFFECT NATIVE VEGETATION?

3.4.1. Affected Environment

The Beaver Bottoms - Beaver River, Negro Mag Wash, and Wild Horse Canyon subwatersheds (72,430 acres) were selected as the analysis area for vegetation as it provides a clear topographic boundary against which to measure impacts to vegetation. The subwatersheds are shown on Figure 3-3. Vegetation in the analysis area was determined by reviewing existing ecoregion and land cover designations (EPA Level IV Ecoregions and SWReGAP land cover classes) and the vegetation communities observed during the field assessment. The project area is located within the Sagebrush Basins and Slopes Level IV Ecoregion as mapped by the EPA (USEPA 2011). The typical natural vegetation in this region is sagebrush with perennial bunchgrasses occurring as available moisture increases. The major land use of the region is cattle grazing. According to the SWReGAP land cover data (Lowry et al. 2005), there is approximately 71,867 acres of vegetation within the 72,430-acre analysis area (Figure 3-3a). Inter-Mountain Basins Big Sagebrush Shrubland is the most abundant land cover type in the project area and Colorado Plateau Pinyon-Juniper Woodland is the most abundant in the analysis area. Table 3-4 lists the acreages of vegetation by SWReGAP land cover type that the Proposed Action would impact through surface-disturbing activities (Figure 3-3b).

Table 3-4. Acres of Land Cover Type Affected by Project Surface Disturbance

Land Cover Type	Cover Type in Project Area Disturbed (acres)	Cover Type in Analysis Area (acres)	Cover Type in Analysis Area Disturbed (%)
Colorado Plateau Pinyon-Juniper Woodland	13	20,467	0.06%
Great Basin Xeric Mixed Sagebrush Shrubland	11	1,473	0.75%
Inter-Mountain Basins Big Sagebrush Shrubland	220	19,121	1.15%
Inter-Mountain Basins Mixed Salt Desert Scrub	3	7,957	0.04%
Inter-Mountain Basins Semi-Desert Shrub Steppe	13	8,866	0.15%
Invasive Annual and Biennial Forbland	1	352	0.28%
Invasive Annual Grassland	2	1,442	0.14%
Invasive Perennial Grassland	1	738	0.14%

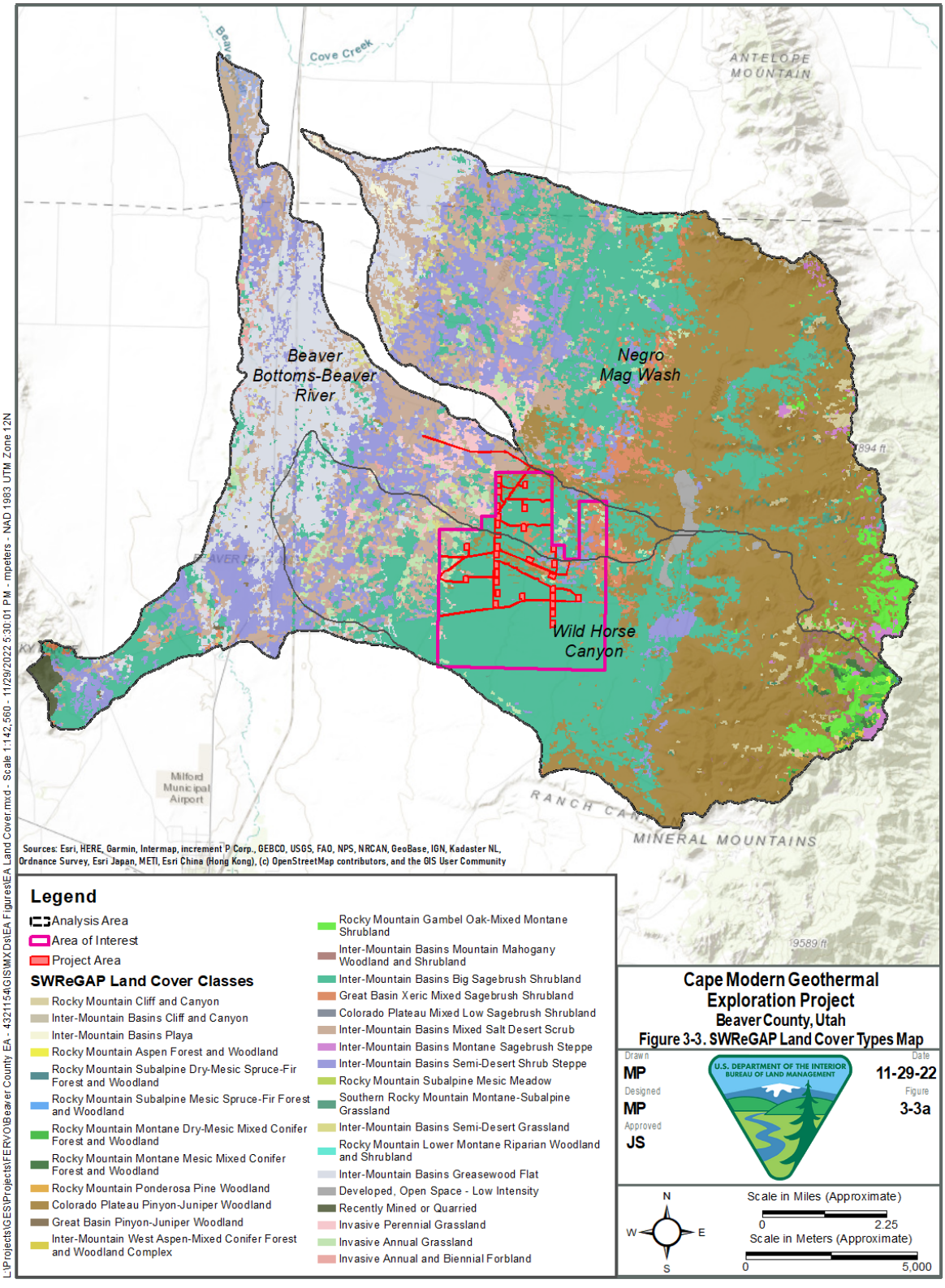

Figure 3-3a. SWReGAP Land Cover Types Map (Analysis Area).

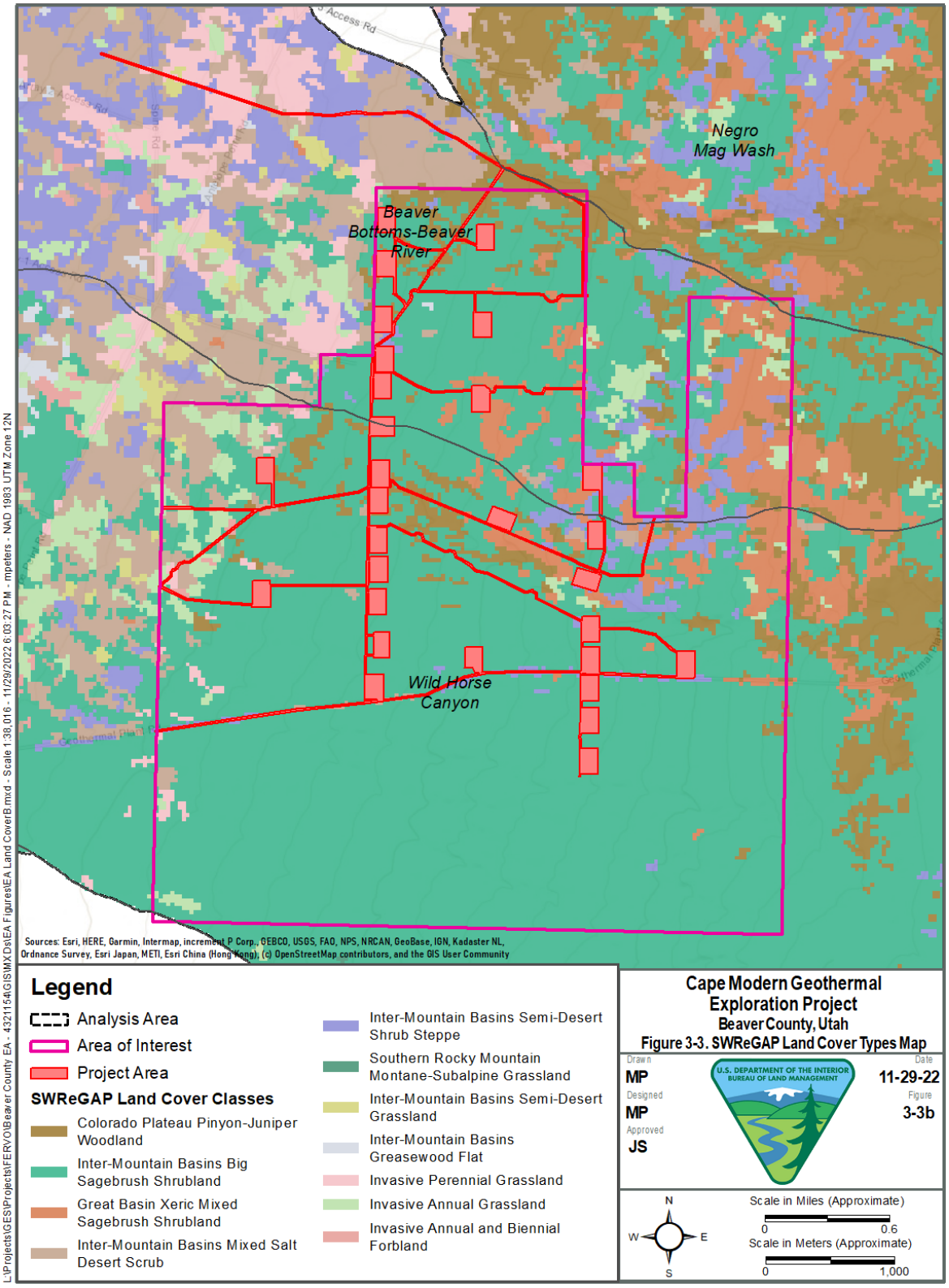

Figure 3-3b. SWReGAP Land Cover Types Map (Project Area).

Crested wheatgrass (*Agropyron cristatum*) and forage kochia (*Bassia prostrata*) are the dominant vegetation species throughout the majority of the project area. Other species including rubber rabbitbush (*Ericameria nauseosa*), Indian ricegrass (*Eriocoma hymenoides*), and winterfat (*Krascheninnikovia lanata*) are present within the project area; however, they are widely scattered. Cheatgrass (*Bromus tectorum*) and prickly Russian thistle (*Salsola tragus*) are also present throughout the area.

The project area and analysis area are also located within UDWR Wildlife Management Unit #22 – Beaver. Within this Wildlife Management Unit, the closest study to the project area is Big Cedar Cove (Study No. 22-12). The Big Cedar Cove Study (UDWR 2018b) was reviewed to characterize vegetation trends in the analysis area over the past decades. The study was initiated in 1985 with vegetation sampled in 1985, 1991, 1998, 2003, 2008, 2013, and 2018. The last major disturbance in the area was the Milford Flat wildfire in 2007. Rehabilitation efforts following the wildfire included aerial seeding with a mixture of grasses and forbs, including sagebrush (*Artemisia tridentata*). Following the Milford Flat Fire, vegetation within the area transitioned from Wyoming Big Sagebrush to Annual-Perennial Grass, with cheatgrass persisting as a co-dominant species (UDWR 2018b). During the field assessment, sagebrush observations within the project area were scarce with individuals observed less that 1-foot in height and generally isolated with not more than one individual observed within a 1,000 square foot (sqf) area. The lack of sagebrush could also be attributed to the presence of invasive annuals including cheatgrass and Russian thistle, which could impede native grasses, forbs, and shrubs from establishing. These invasives have also been attributed to more frequent and intense wildfires (Brooks et al, 2004).

Past and Present Surface-Disturbing Activities

Past and present land-disturbing activities in the vegetation analysis area were estimated through acres of land with disturbed or developed SWReGAP land cover classes (Lowry et al. 2005). Disturbed or developed land cover classes within the vegetation analysis area are shown on Figure 3-1. Disturbed or developed land cover classes indicate impacts to vegetation from sources related to human activity. Impacts to vegetation from these land-disturbing activities include vegetation loss, plant community fragmentation, and introduction of invasive species. Indirect impacts to vegetation can also result from the changes to soil from land-disturbing activities, primarily the loss of topsoil and soil degradation. These impacts can include increased dust deposition on vegetation, decreased plant production, and decreased species diversity.

3.4.2. Environmental Impacts—No Action Alternative

Under the No Action Alternative, there would be no changes to vegetation in the project area as a result of the Proposed Action; however, because of existing geothermal leases within the AOI, exploration and development within the AOI are RFFAs under lease rights. Therefore, impacts to vegetation similar to those discussed in Section 3.4.3 would likely result from RFFAs within the analysis area.

3.4.3. Environmental Impacts—Proposed Action

The Proposed Action would result in up to 266 acres of surface disturbance and potential impacts to vegetation. Impacted vegetation types according to the SWReGAP land cover classes include:

- Colorado Plateau Pinyon-Juniper Woodland
- Great Basin Xeric Mixed Sagebrush Shrubland
- Inter-Mountain Basins Big Sagebrush Shrubland
- Inter-Mountain Basins Mixed Salt Desert Scrub
- Inter-Mountain Basins Semi-Desert Shrub
- Invasive Annual and Biennial Forbland
- Invasive Annual Grassland
- Invasive Perennial Grassland

As depicted in Table 3-1, impacts to these vegetation types represent a loss of 0.06 – 1.15% of the available land cover type in the analysis area. It should be noted that while the highest two percentages of impacts according to SWReGAP were Inter-Mountain Basins Big Sagebrush Shrubland (at 1.15%) and Great Basin Xeric Mixed Sagebrush Shrubland (at 0.75%); as discussed in Section 3.4.1, following the Milford Flat wildfire in 2007, the project area transitioned from a Wyoming Big Sagebrush to an Annual-Perennial Grass cover type. The SWReGAP database also noted 13 acres of Colorado Plateau Pinyon-Juniper Woodland would be disturbed; however, no pinyon pine or juniper species were observed within the project area during the field assessment. Dominant vegetation observed during the field assessment included mostly invasive annuals including cheatgrass and Russian thistle. The differences between SWReGAP data and the vegetation observed during the field assessment indicates impacts to native vegetation types would be much lower with greater impacts predominately being to Invasive Annual Grassland. All disturbed areas would be reclaimed utilizing a BLM-approved seed mix. The BLM seed mix would be a weed-free mixture of grasses and forbs. Additionally, if noxious weeds are discovered within the project area, these areas would be avoided to limit the spread of noxious weeds. Scotch thistle (*Onopordum acanthium* L.) is the primary noxious weed concern in the project area. The design features in **Appendix C** would help minimize potential impacts to vegetation. Due to the time it may take for vegetation to fully reestablish, complete reclamation of disturbed areas may take several years.

Cumulative Impacts

The Proposed Action would add incrementally to the acreage of vegetation impacts from past and present surface-disturbing activities (572 acres) and quantifiable RFFAs (256 acres, Table 3-1) in the analysis area. The approximately 266 acres of surface disturbance from the Proposed Action would represent a 46% increase to the approximately 572 acres of past and present surface disturbance to vegetation in the analysis area (Figure 3-1). Including the quantifiable RFFAs within the analysis area, this proposed increase of surface disturbance would result in a cumulative 1.5% of disturbance within the vegetation analysis area. In general, there would be only a minor cumulative impact on vegetation from geothermal development (U.S. Forest Service and BLM 2008). The main concern is the potential for non-native and invasive species to colonize and dominate sites, and the long-term conversion of habitat types, such as from sagebrush to grassland (U.S. Forest Service and BLM 2008). However, as the project area has already been converted from sagebrush to grassland as a result of wildfire, overall cumulative impacts to vegetation are expected to be minor.

All surface disturbing activities would progress incrementally, and well sites and associated access roads determined by the operator to be commercially non-viable would be reclaimed as the project

progresses. Up to 266 acres of vegetation would be disturbed if all 29 proposed well pads are constructed. If wells were determined to be non-viable, then the reclamation process would be initiated to restore vegetation to the pre-construction baseline. Complete reclamation of disturbed areas may take several years to occur; therefore, the vegetation would remain in a disturbed state until reclamation is complete.

In addition to the quantifiable RFFAs, the BLM recently offered a competitive geothermal lease sale for 11 parcels in Beaver and Millard Counties (BLM 2021a). Approximately 11,687 acres of the vegetation analysis area was included in the geothermal lease sale. Exploration and development on future leases could cause additional impacts to vegetation; however, these impacts are not quantifiable at the leasing sale stage of the process because no specific projects have been proposed. The design features included in **Appendix C** as well as the incremental construction and concurrent reclamation of the proposed project would help minimize long-term negative impacts to vegetation.

3.5. ISSUE #3. WILDLIFE & FISH: HOW WOULD THE PROPOSED PROJECT AFFECT BIGHORN SHEEP, BLACK BEARS, MULE DEER, AND PRONGHORN AND THEIR HABITATS?

3.5.1. Affected Environment

The Beaver Bottoms - Beaver River, Negro Mag Wash, and Wild Horse Canyon subwatersheds (72,430 acres) were selected as the analysis area for big game species as subwatersheds represent a defined continuous area linked by common watercourses on which wildlife depend. The subwatersheds are shown on Figure 3-4.

The project area and analysis area are located within UDWR Wildlife Management Unit #22 – Beaver. The closest study to the project area is Big Cedar Cove (Study No. 22-12), which was reviewed to characterize vegetation trends and wildlife responses in the analysis area over the past decades (1985 – 2018) (UDWR 2018b). Following the Milford Flat wildfire, vegetation within the area transitioned from Wyoming Big Sagebrush to Annual-Perennial Grass, with cheatgrass persisting as a co-dominant species (UDWR 2018b). The transition from shrubland habitat into a perennial grassland habitat could be a contributing factor to the decline in big game species, most notably mule deer (*Odocoileus hemionus*), within the analysis area. According to the Big Cedar Cove (Study No. 22-12), preferred browse cover within the area dropped from 22.6% in 2003 (pre-wildfire) to 0.2% in 2008 (post-wildfire). Although preferred browse cover increased to 3.4% as of 2018 (UDWR 2018b), with the RFFAs in the analysis area, this area is likely to remain dominated by perennial grasses.

Based on UDWR geospatial data, the project area contains crucial year-long habitat for pronghorn, and the analysis area contains crucial year-long habitat for black bear (*Ursus americanus*), crucial winter habitat for mule deer, substantial summer habitat for mule deer, and substantial year-long habitat for Rocky Mountain elk (*Cervus elaphus nelsoni*) (Figure 3-4). Additionally, desert bighorn sheep (*Ovis canadensis nelsoni*) were recently reintroduced into Beaver County (UDWR 2018a). A portion of the Mineral Mountains Bighorn Sheep Management Unit is located within the analysis area (Figure 3-5). The UDWR habitat definitions are provided below:

- Crucial value - habitat on which the local population of a wildlife species depends for survival because there are no alternative ranges or habitats available. Crucial value habitat

is essential to the life history requirements of a wildlife species. Degradation or unavailability of crucial habitat will lead to significant declines in carrying capacity and/or numbers of wildlife species in question.

- Substantial value - habitat used by a wildlife species but is not crucial for population survival. Degradation or unavailability of substantial value habitat will not lead to significant declines in carrying capacity and/or numbers of the wildlife species in question.

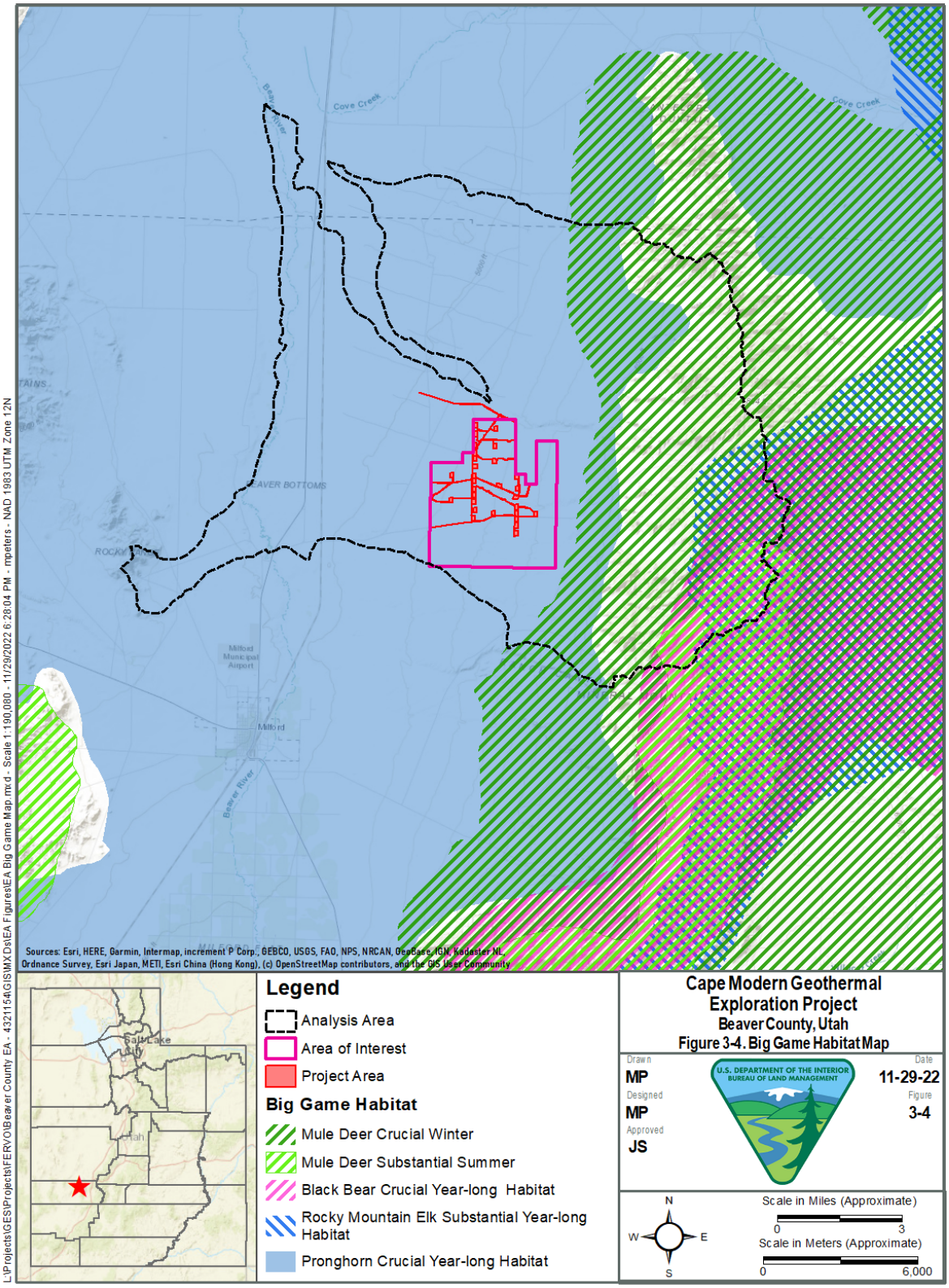

Figure 3-4. Big Game Habitat Map.

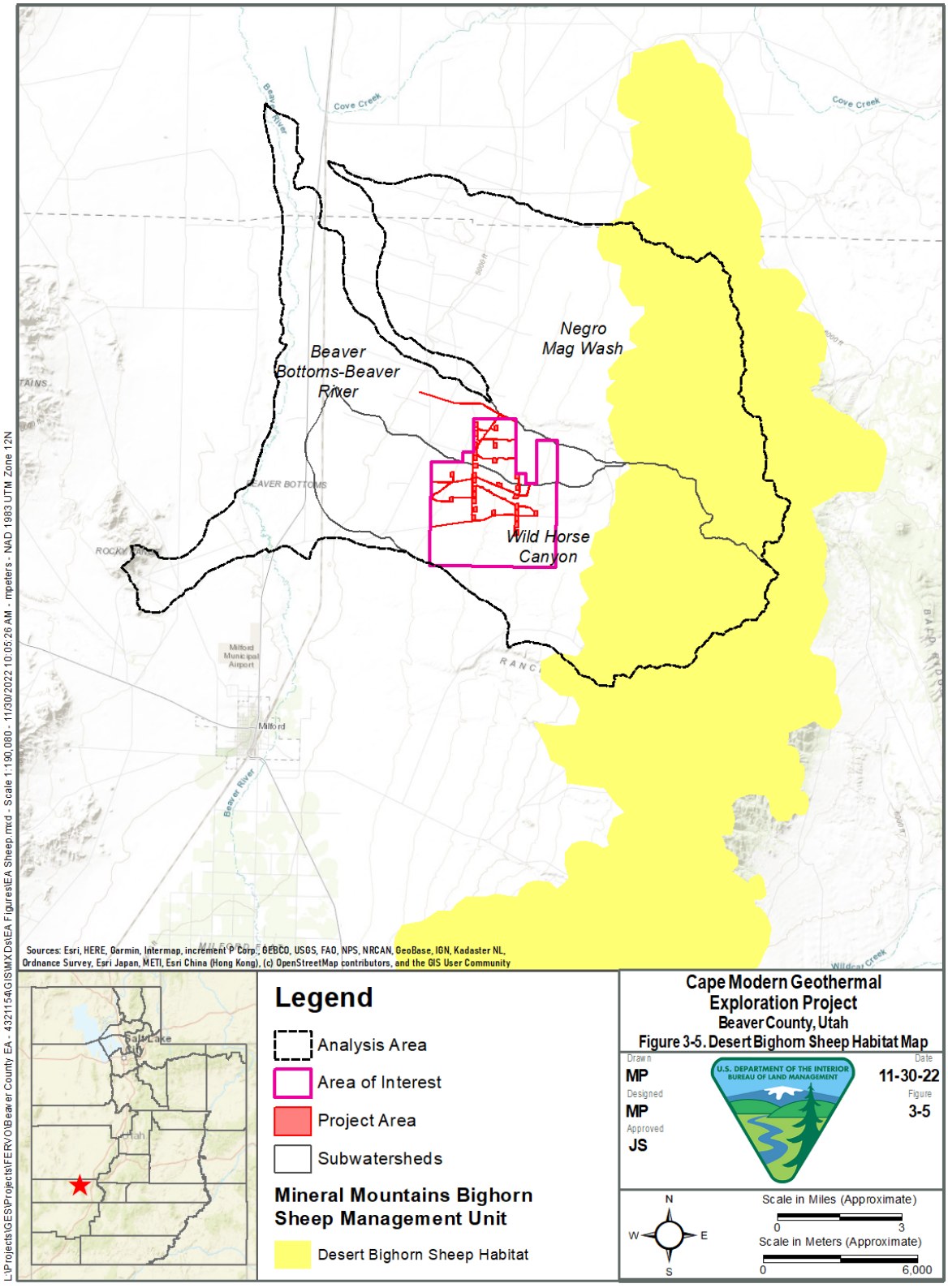

Figure 3-5. Desert Bighorn Sheep Habitat Map.

Pronghorn

In Utah, most pronghorn populations occur in shrub-steppe habitat (UDWR 2018c). Pronghorn are browsers that consume shrubs, as well as grasses and forbs (BLM 2016). Currently, habitat loss and habitat degradation are major concerns for pronghorn in Utah. Past and present surface-disturbing activities in the analysis area that have affected pronghorn habitat include renewable energy production facilities (geothermal, solar, and wind), roads and highways, railways, utility lines, and agricultural production.

In addition to the direct loss of habitat from past and present surface disturbing activities, pronghorn are also impacted by indirect effects from activities including habitat fragmentation, interruption of migration corridors, restriction of access to water, and the introduction of invasive vegetation species. Habitat impacts would likely continue due to RFFAs in the analysis area.

A leading component of development impacting pronghorn is fencing. Unlike deer or elk, pronghorn are generally unable to jump over fences. Fencing creates barriers to the movement of pronghorn which can impact pronghorn seasonal movements and / or daily activities when attempting to access water or feeding areas. Fencing may also cause injury and unnecessary fatalities of pronghorn which can get snared on barbs or fatally entangled (Paige 2008). *Wildlife & Energy Development Pronghorn of the Upper Green River Basin - Year 4 Summary* (Beckmann and Seidler 2009) noted the distance to the nearest fence; independent of the distance to the nearest paved road, nearest graded road, nearest energy structure, and nearest human observer; had a statistically significant impact on the foraging rates of pronghorn. This study suggests that, in addition to increasing injury and mortality of pronghorn and impacting migration and access to water or feeding areas, fencing within pronghorn habitat also impacts foraging rates. Fencing specifications most compatible with pronghorn movement consist of a smooth bottom wire 40 – 46 cm (16–18 inches) above the surface of the ground (Autenrieth et al. 2006). With the exception of the exclusionary fencing around reserve pits which would consist of chain-link fencing with a mesh overlay or other BLM-approved fencing recommendations, EDR would use fencing consistent with the UDWR-recommended specifications for pronghorn (smooth bottom wire) (**Appendix C**).

Black Bear

According to the BLM CCFO RMP, black bears are native to and common in Utah, and year-round substantial and crucial habitat is located on the eastern side of the CCFO (BLM 2019). Black bears in Beaver County occur primarily in large, forested areas east of Interstate 15 and have only occasionally been reported on the Mineral Mountains. Summer black bear diets consist of insects, grasses, and forbs, while fall diets are comprised largely of berries and hard mast (Utah Black Bear Advisory Committee 2011). During winter months, black bears typically hibernate in dens dug into trees or tree root systems, excavated into a brushy hillside, or create dens in rocky areas where rock provides a part of the den structure (Utah Black Bear Advisory Committee 2011).

No crucial or substantial habitat for black bears has been mapped within the project area, and the project area notably lacks the food sources and habitat suitable for den locations that is needed to support the black bear life cycle. Suitable (designated crucial) habitat is located

east of the project area along the Mineral Mountains. Approximately 8,043 acres of black bear habitat is located within the analysis area.

Mule Deer

Mule deer are the most abundant big game animal in Utah and occur in a variety of habitats throughout the CCFO, although they are less abundant in desert areas (BLM 2019). Habitat is generally characterized by areas of thick brush or trees interspersed with small openings where forbs, grassy plants, and shrubs dominate. Mule deer populations throughout Utah have been declining for the past 30 years with loss and degradation of habitat having the most substantial impact on mule deer numbers (BLM 2019).

The preferred browse cover within the area dropped from 22.6% in 2003 (pre-Milford Flat wildfire) to 0.2% in 2008 (post-Milford Flat wildfire) (UDWR 2018b). Although preferred browse cover increased to 3.4% as of 2018 (UDWR 2018b); with the RFFAs in the analysis area, this area is likely to remain dominated by perennial grasses. The range trend studies conducted by UDWR evaluate deer habitat health, trend, and carrying capacity using the deer winter range desirable component index (DCI) and other vegetation data (UDWR 2020). The DCI rates the health of deer winter ranges on a qualitative scale ranging from "Very Poor Condition" to "Excellent". According to the Deer Herd Management Plan for Deer Herd Unit #22 Beaver, the Big Cedar Cove Study (22-12) resulted in a "Very Poor Condition" designation for the area based on the lack of preferred browse and high annual grass cover (UDWR 2020).

No crucial or substantial habitat for mule deer has been mapped within the project area; however, crucial wintering habitat for mule deer is mapped less than 1-mile east of the project area along the foothills of the Mineral Mountains. Approximately 42,301 acres of crucial winter habitat and approximately 3,947 acres of substantial summer habitat for mule deer is located within the analysis area. Additionally, a migration corridor utilized by mule deer has been mapped by UDWR approximately 1.5 miles east of the project area. The proposed project is not anticipated to affect this corridor. The FORGE site and Blundell Geothermal Plant are located to east of the project area, between the project area and migration corridor.

Rocky Mountain Elk

Rocky Mountain elk are year-long residents in Utah and are found on the Mineral Mountains (BLM 2019). Elk are generalists with a varied diet of grasses, forbs, and shrubs. Rocky Mountain elk are generally migratory and move seasonally between summer and winter ranges. They typically summer at higher elevation ranges in aspen and conifers where their diet consists primarily of grasses and forbs, and winter at mid to lower elevation ranges, occupying the sage-brush semi-desert, oak/mountain shrub, and pinyon-juniper woodland habitat types (BLM 2019).

No crucial or substantial habitat for Rocky Mountain elk has been mapped within the project area. Approximately 8,472 acres of substantial year-long habitat for Rocky Mountain elk is located within the analysis area. Potential impacts to elk are expected to be minimal due to the low overlap of the project area and mapped habitat and the relatively low population on the Mineral Mountains.

Desert Bighorn Sheep

Optimal bighorn sheep habitat is generally open, steep, and rocky slopes (BLM 2019). No suitable habitat for desert bighorn sheep has been mapped by UDWR within the project area; however, the analysis area is located within the Mineral Mountains Bighorn Sheep Management Unit boundary. Approximately 37,417 acres of modeled suitable desert bighorn sheep habitat (within the Mineral Mountains Bighorn Sheep Management Unit) is located within the analysis area.

Past and Present Surface-Disturbing Activities

Past and present land-disturbing activities in the big game species analysis area were estimated through acres of land with disturbed or developed SWReGAP land cover classes (Lowry et al. 2005). Disturbed or developed land cover classes within the big game analysis area are shown on Figure 3-1. Disturbed or developed land cover classes indicate impacts to big game species from sources related to human activity. Past and present surface-disturbing activities in the analysis area that have affected big game species include mineral exploration and development, renewable energy production facilities (geothermal, solar, and wind), utility lines, railways, and road construction, as well as livestock grazing and range improvement projects. Impacts to big game species from these land-disturbing activities include loss of habitat, habitat fragmentation, interruption of migration corridors, increased risk of vehicle-animal collisions, and auditory and visual disturbances. In addition, past and present surface disturbing activities impacting pronghorn can also include fencing. The Milford Flat wildfire also resulted in a loss of preferred browse cover for big game species (UDWR 2018b).

3.5.2. Environmental Impacts— No Action Alternative

Under the No Action Alternative, there would be no changes to big game habitat in the project area as a result of the Proposed Action; however, because of the existing geothermal leases within the AOI, exploration and development within the AOI are RFFAs under lease rights. Therefore, surface disturbance activities and structural developments associated with RFFAs (such as fences, signs, powerlines, meteorological towers, communication towers, and renewable energy developments) are likely to diminish the capacity of the analysis area to support big game species (BLM CCFO 2019) whether the Proposed Action is approved or not.

3.5.3. Environmental Impacts—Proposed Action

Project activities would result in a maximum of approximately 266 acres of disturbance (less than 0.5%) of the 72,430-acre analysis area for big game species. The entire project area is within crucial year-long habitat for pronghorn, and the analysis area contains crucial year-long habitat for black bear, crucial winter habitat for mule deer, substantial summer habitat for mule deer, and substantial year-long habitat for Rocky Mountain elk. Additionally, a portion of the Mineral Mountains Bighorn Sheep Management Unit is located within the analysis area. The acreages of surface disturbance within these habitat areas are shown below in Table 3-5.

Table 3-5. Proposed Surface Disturbances in Big Game Habitat

Species	Habitat	Habitat in Project Area Disturbed (acres)	Habitat Available in the Analysis Area (acres)	Habitat in the Analysis Area Disturbed (%)
Pronghorn	crucial year-long	266	52,770	<0.5%
Black bear	crucial year-long	0	4,924	0%
Mule deer	crucial winter	0	25,867	0%
Mule deer	substantial summer	0	2,417	0%
Rocky Mountain elk	substantial year-long	0	5,185	0%
Desert bighorn sheep	suitable (within management unit)	0	22,885	0%

Expected impacts on big game species would include the direct loss of habitat, shown in Table 3-5, from project surface disturbance and vegetation removal, as well as the loss of functional habitat (greater acreage that is species dependent) from avoidance behaviors after construction is completed. Potential short-term impacts include auditory and visual disturbances to big game present in or near the project area during construction or drilling activities and increased risk of trapping hazards at reserve pits. Potential long-term impacts include increased risk of vehicle-animal collisions, habitat fragmentation, interruption of migration/movement corridors, restriction of access to water and foraging habitat, and the introduction of invasive vegetation species.

With the exception of year-long crucial pronghorn habitat, the project area does not include crucial or substantial big game habitat. While other big game species (black bear, mule deer, elk, and desert bighorn sheep) may still utilize the project area, the area has not been designated as habitat that is crucial for population survival. Only the eastern portion of the analysis area overlaps designated big game habitat along the Mineral Mountains. The portions of big game habitats that are located within the analysis area are contiguous and represent only a portion of the entire designated habitat; therefore, any potential impacts of project activities within the project area would not be expected to be significant or contribute to habitat fragmentation of these species.

Surface disturbances from the Proposed Action would result in disturbance of up to 266 acres of crucial pronghorn habitat. The 266 acres of potential habitat disturbance represents less than 0.5% of the available crucial year-long pronghorn habitat in the analysis area. The proposed acreage of disturbance in crucial pronghorn habitat, when compared with the total amount of crucial habitat available for this species in the analysis area (52,770 acres), is not anticipated to affect the overall health of the habitat or the local pronghorn population. Additionally, disturbed areas that are no longer being used would be reclaimed immediately, and the reclamation of the project area following project completion would result in the best opportunity to avoid a long-term functional loss of crucial pronghorn habitat.

If pronghorn are present during project activities, individual pronghorn would likely leave the immediate area, resulting in a temporary, or perhaps permanent, spatial redistribution of individual pronghorn and habitat-use patterns. In addition to the direct loss of habitat, pronghorn may also be

indirectly impacted by effects from human activities which may cause habitat avoidance behaviors resulting in further habitat fragmentation, interruption of migration corridors, or restriction of access to water. As the project area is located in crucial habitat for pronghorn, surface use would be limited to avoid pronghorn fawning season. The BLM has defined pronghorn fawning season as May 1st through June 30th. Additionally, where fencing is necessary, EDR would use fencing consistent with the UDWR-recommended specifications for wildlife, including a smooth bottom wire to be compatible with big game species, and exclusionary fencing would be installed around reserve pits would help to minimize potential impacts to big game species (**Appendix C**). Additionally, as recommended by UDWR, EDR would contribute to a water development project or other approved project to mitigate for potential impacts to pronghorn.

Common to all big game and in addition to potential habitat impacts, noise from drill rigs and construction activities can disturb wildlife in adjacent habitats up to 2,500 feet away (U.S. Forest Service and BLM 2008). If big game species are present during project activities, individual big game would likely leave the immediate area, resulting in a temporary, or perhaps permanent spatial redistribution of big game species or habitat-use patterns. Additional stress could occur as a result of the increased noise and human activity that would likely result in changes in food intake and foraging rates which could cause individual animals to select suboptimal habitat. Big game would also use extra exertion to escape disruptions which could result in the depletion of energy stores at the expense of growth and reproduction. The energy spent avoiding noise and human activity could also impact the ability of big game to respond to other adverse conditions, either through distraction or lack of energy. Human activity and noise effects from the Proposed Action would be temporary for the proposed project; however, if a commercially viable geothermal resource is confirmed, a development well field and generation facility would likely be proposed in the future, which could result in permanent impacts in the AOI. The completion of the wells for production and injection, as well as the construction of the power plant, would require a separate NEPA analysis.

Clearing and grading activities for well pads and access road construction could result in direct injury or death of big game not mobile enough to avoid construction operations; however, mobile wildlife species, including adult big game species, may avoid the initial clearing activity by moving into habitats in adjacent areas (BLM and USFS 2008). Big game that relocate may face increased competition and may not survive if surrounding areas are unsuitable.

Due to human activities and associated noise, habitat loss may be greater due to avoidance behaviors; however, the total amount is difficult to assess and likely dependent on adjacent habitat quality and other disturbances. Impacts to big game species and their habitats would be minimized through the implementation of design features and adherence to lease stipulations (**Appendix C**).

Cumulative Impacts

Past actions, present actions, and RFFAs could cumulatively affect big game species through loss of habitat and habitat degradation, habitat fragmentation, disruption of seasonal patterns or migration corridors, displacement of big game, increase of collisions between big game and vehicles, and impacts of the health of big game due to stress (BLM 2016). The Proposed Action would add incrementally to the acreage of big game impacts from past and present surface-disturbing activities (572 acres) and quantifiable RFFAs (256 acres, Table 3-1) in the analysis area.

The approximately 266 acres of surface disturbance from the Proposed Action would represent a 46% increase to the approximately 572 acres of past and present surface disturbance to big game species in the analysis area (Figure 3-1). Including the quantifiable RFFAs within the analysis area, this proposed increase of surface disturbance would result in a cumulative 1.5% of disturbance within the big game analysis area. In addition to the direct impacts to big game habitat, indirect impacts to big game could result from habitat fragmentation and degradation of seasonal patterns and migration corridors extending beyond the direct approximately 266 acres of habitat disturbance. Functional habitat loss may also be greater due to avoidance behaviors resulting from construction and operation activities; however, the total amount is difficult to assess and likely dependent on adjacent habitat quality and other disturbances. The severity of the cumulative impacts would depend on factors such as the sensitivity of the species affected, seasonal intensity of use, and physical parameters (e.g., topography, forage, and cover availability) (BLM 2016).

All surface disturbing activities would progress incrementally, and well sites and associated access roads determined by the operator to be commercially non-viable would be reclaimed as the project progresses. Therefore, the actual acreage of disturbance to big game habitat at any given point in time would likely be lower than the proposed maximum of 266 acres of disturbance. However, due to the time it may take for vegetation to fully reestablish, complete reclamation of big game habitat may take several years which may contribute to the functional loss of the entire 266 acres of habitat.

The BLM recently offered a competitive geothermal lease sale for 11 parcels in Beaver and Millard Counties, totaling approximately 32,527 acres (BLM 2021a). Approximately 11,687 acres of the big game analysis area was included in the geothermal lease sale. Exploration and development on future leases could cause additional impacts to big game species; however, these impacts are not quantifiable at the leasing sale stage of the process because no specific projects have been proposed.

The incremental construction and concurrent reclamation of the proposed project, the implementation of design features, and the adherence to lease stipulations would help minimize long-term negative impacts for big game species (**Appendix C**).

3.6. ISSUE #4. WILDLIFE & FISH: HOW WOULD THE PROPOSED ACTION AFFECT FISH AND WILDLIFE SPECIES' POPULATIONS AND HABITATS, INCLUDING BLM SENSITIVE SPECIES?

3.6.1. Affected Environment

The USFWS Information for Planning and Consultation (IPaC) resource list was utilized to identify threatened and endangered species potentially present in Beaver County (USFWS 2021). In addition to managing for threatened/endangered species under the ESA, the BLM also manages for a larger number of rare or sensitive species that rely on public land in Utah. There are 21 sensitive species included on the BLM Utah sensitive species list for BLM-administered lands (IM 2011-037) that are listed as potentially present in Beaver County (BLM Utah State Office 2018). There is no USFWS-designated critical habitat for threatened and endangered species within or near the proposed project area.

Impacts to wildlife were analyzed by reviewing the potential for loss and degradation of habitat and how such impacts could affect species' overall population numbers and health. Vegetation is an important component in assessing potential impacts to wildlife as vegetation serves as both wildlife habitat and a food energy source for animal species (and, ultimately, to those that prey upon them) (BLM and USFS 2008). Ecoregions encompass large areas of similar climate with a geographically distinct assemblage of natural vegetation and wildlife communities and species (BLM and USFS 2008). The project area is located within the Sagebrush Basins and Slopes Level IV Ecoregion (EPA), which is typically dominated by sagebrush with perennial bunchgrasses occurring as available moisture increases.

Following the Milford Flat wildfire, vegetation within the project area transitioned from Wyoming Big Sagebrush to Annual-Perennial Grass, with cheatgrass persisting as a co-dominant species (UDWR 2018b). Although preferred browse cover has decreased relative to pre-fire conditions, the Invasive Annual Grassland habitat type that dominates the project area provides habitat for a variety of wildlife species.

A baseline ecological evaluation, including a wildlife habitat analysis, was conducted in the project area to inform decisions regarding project footprint location selection (i.e., avoid areas potentially containing sensitive resources) (GES 2021). The presence of potential habitat for wildlife was determined by comparing individual species' habitat requirements to existing habitat designations (EPA Ecoregions, SWReGAP land cover), and the availability of that habitat observed during the field assessment. Special status wildlife species that were determined to be potentially affected by the proposed project are discussed in Table 3-6.

Table 3-6. Special Status Species Potentially Affected by the Proposed Project.

Species (Scientific Name) USFWS Status/BLM Status	Species Habitat Description	Habitat Present	Adverse Effect	Pertinent Information
		Birds		
Bald eagle (*Haliaeetus leucocephalus*) NL/SS	Found primarily near rivers and large lakes; nests in tall trees or on cliffs near water; communally roosts, especially in winter; hunts live prey, scavenges, and pirates food from other birds.	**Potential**	***Potential***	Though no large bodies of water are located on or near the project area, and no suitable habitat for nesting was observed during the site reconnaissance; the bald eagle may still utilize the project area for foraging.
Burrowing owl (*Athene cunicularia*) NL/SS	Open grasslands, especially prairie, plains, and savanna, sometimes in open areas such as vacant lots near human habitation or airports; nests and roosts in abandoned burrows.	**Yes**	***Potential***	Preferred habitat appears to be present throughout the project area, and several large burrows were noted throughout the project area that could potentially be utilized by this species. A presence-absence survey would be conducted to ensure the proposed project does not negatively affect this species. If burrows are identified, the spatial buffer for this species is 0.25-mile. The seasonal buffer for this species is March 1 through August 31.
California condor *(Gymnogyps californianus)* EXPN/NL	Condors roost on large trees or snags, or on isolated rocky outcrops and cliffs. Nests are located in shallow caves and rock crevices on cliffs where there is minimal disturbance. Foraging habitat includes open grasslands and oak savanna foothills that support populations of large mammals such as deer and cattle.	**Potential**	***Potential***	Though no large trees or rocky outcrops are located within the project area, the California Condor may still utilize the project area for foraging.
Ferruginous hawk (*Buteo regalis*) NL/SS	Open country, primarily prairies, plains and badlands; sagebrush, saltbush-greasewood shrubland, periphery of pinyon-juniper and other woodland, desert. Nests in tall trees or willows along streams or on steep slopes, in junipers, on cliff ledges, river-cut banks, hillsides, on power line towers, sometimes on sloped ground on the plains or on mounds in open desert. Generally avoids areas of intensive agriculture or human activity.	**Yes**	***Potential***	Preferred habitat appears to be present throughout the project area. If project disturbance activities are to be conducted during the primary nesting season, a nest survey would be conducted to ensure the proposed project does not negatively affect this species. If nests are identified, the spatial buffer for this species is 0.5-mile. The seasonal buffer for this species is March 1 through August 1.

Species (Scientific Name) USFWS Status/BLM Status	Species Habitat Description	Habitat Present	Adverse Effect	Pertinent Information
Long-billed curlew (*Numenius americanus*) NL/SS	Nests in dry prairies and moist meadows. Nests on ground usually in flat areas with short grass, sometimes on more irregular terrain, often near rock or other conspicuous objects. Mating season is from mid-April through September.	**Yes** (BLM Cedar City Field Office wildlife biologists indicated that Long-billed Curlews currently occupy the project area.)	***Potential***	Grassy areas throughout the project area are limited with most areas having between 40-60% bare ground; however, the BLM has indicated that this species currently occupies the project area. If project disturbance activities are to be conducted during the primary nesting season, a nest survey would be conducted prior to construction to ensure that the proposed project would not negatively affect this species. If nests are identified, the spatial buffer for this species is a minimum of 100 feet. The seasonal buffer for this species is March 15 through July 15.
Short-eared owl (*Asio flammeus*) NL/SS	Live in large, open areas with low vegetation, including prairie and coastal grasslands, heathlands, meadows, shrub/steppe, savanna, tundra, marshes, dunes, and agricultural areas. Winter habitat is similar, but is more likely to include large open areas within woodlots, stubble fields, fresh and saltwater marshes, weedy fields, dumps, gravel pits, rock quarries, and shrub thickets. Breeding occurs in March through June.	**Yes**	***Potential***	Preferred habitat appears to be present throughout the project area. If project disturbance activities are to be conducted during primary nesting season, a nest survey would be conducted to ensure the proposed project does not negatively affect this species. If nests are identified, the spatial buffer for this species is 0.25-mile. The seasonal buffer for this species is March 1 through August 1.
Insects				
Monarch butterfly (*Danaus plexippus*) C/SS	Monarchs lay eggs on milkweed. After three to five days, eggs hatch and caterpillars feed exclusively on milkweed. The caterpillars grow and molt several times over roughly a two-week period. After this period, they will form a chrysalis in which they undergo metamorphosis.	**Yes**	***Potential***	No milkweed for laying eggs was observed within the project area; however, flowering forbs within the project area provide a suitable source of nectar for migrating monarch butterflies.
Mammals				
Big free-tailed bat (*Nyctinomops macrotis*) NL/SS	Prefers rocky and woodland habitats where roosting occurs in caves, mines, old buildings, and rock crevices. The species is typically active year-round, spending summers in temperate North America and migrating to warmer areas in North America and South America for the winter. Females may give birth to a single offspring during late spring or early summer each year.	**Potential**	***Potential***	Though no caves, mines, or buildings are located within the project area, this species may still utilize the project area for foraging.

Species (Scientific Name) USFWS Status/BLM Status	Species Habitat Description	Habitat Present	Adverse Effect	Pertinent Information
Dark kangaroo mouse (DKM) (*Microdipodops megacephalus*) NL/SS	Prefers sandy shrubland with sparse vegetative cover. In Utah, most localities are in stabilized dunes along the margins of historical Lake Bonneville. Appropriate habitat is naturally fragmented and isolated.	**Yes**	***Potential***	BLM wildlife biologists and UDWR conservation program biologists have indicated that the project area provides low modeled value habitat, and no established sand dunes were observed within the project area during the field assessment. Based on the low potential for DKM to utilize the project area, no presence-absence surveys or additional mitigation measures for this species were required.
Fringed myotis (*Myotis thysanodes*) NL/SS	Inhabits caves, mines, and buildings, most often in desert and woodland areas. The species commonly occurs in colonies of several hundred individuals.	**Potential**	***Potential***	Though no caves, mines, or buildings are located within the project area, this species may still utilize the project area for foraging.
Kit fox (*Vulpes macrotis*) NL/SS	Associated with desert soils, desert shrub vegetation (e.g., shadscale, saltbush, sagebrush, and greasewood), low elevation (<5500 ft.), and relatively mild winters. The species also appears to prefer relatively flat areas, likely for visibility. Fine, silty soils provide the proper substrate for digging dens. Kit fox does not require free water sources; individuals get adequate moisture from ingesting prey items.	**Yes**	***Potential***	Preferred habitat appears to be present throughout the project area, and several large burrows were noted throughout the project area that could be potential kit fox dens. A presence-absence survey would be conducted to ensure the proposed project does not negatively affect this species. No disturbance is permitted within 0.25-mile of an occupied burrow. Avoid disturbance in occupied kit fox habitat from February 1 through July 30 to protect breeding pairs, natal dens, neonates, and dispersing individuals.
Townsend's big-eared bat (*Corynorhinus townsendii*) NL/SS	A cave- and mine-dependent species. Caves and mines are the principal roosting habitats for this species in Utah, though natural caves are preferred over mines. This bat uses a variety of habitats for foraging, but appears to prefer forests, forest edges, and riparian zones, especially in association with cave and mine resources.	**Potential**	***Potential***	Though no caves or mines are located within or in the immediate vicinity of the project area, this species may still utilize the project area for foraging.
Western red bat (*Lasiurus blossevillii*) NL/SS	In Utah, nearly all observations of this species have come either from towns, or from cottonwood groves in lowland riparian areas. Although most authorities consider this bat a foliage-roosting species, two Utah roosting observations were from a cave and a mine.	**Potential**	***Potential***	Though no cottonwood groves, towns, or caves are located within or in the immediate vicinity of the project area, this species may still utilize the project area for foraging.

T = Threatened
E = Endangered
C = Candidate
EXPN = Experimental population, Non-essential
NL = Not listed
SS = Sensitive species

A Utah Natural Heritage Program (NHP) Online Species Search Report was requested for the project area. Based on the report, no animal or plant species observations were listed within a ½-mile of the project area. The burrowing owl and greater sage-grouse were listed within two miles of the project area. The Utah NHP dataset for threatened, endangered, and sensitive species occurrences by quadrangle indicates that there are records of occurrence for burrowing owl in the Ranch Canyon and Read quadrangles intersected by the project area, and records of occurrence for ferruginous hawk in the Lime Mountain and Pinnacle Pass quadrangles and burrowing owl in the Bearskin Mountain, Milford, Ranch Canyon, and Read quadrangles intersected by the analysis area (UDWR 2021a).

Based on the site reconnaissance, available desktop resources, and correspondence with UDWR, special status species that may inhabit or otherwise utilize the AOI include:

- bald eagle,
- big free-tailed bat,
- burrowing owl,
- California condor,
- dark kangaroo mouse,
- ferruginous hawk,
- fringed myotis,
- kit fox,
- long-billed curlew,
- monarch butterfly,
- short-eared owl,
- Townsend's big-eared bat, and
- western red bat.

Additionally, as previously stated, migratory birds and raptors are protected under the MBTA and the Bald and Golden Eagle Protection Act. Migratory birds of particular concern that may inhabit the project area based on the site reconnaissance, available desktop resources, and correspondence with UDWR include, but are not limited to, the evening grosbeak, Lewis' woodpecker, long-eared owl, pinyon jay, rufous hummingbird, and sage thrasher. Based on the development of migratory bird design features, including nest surveys, and adherence to the BLM-provided migratory bird stipulations (**Appendix C**), potential impacts to migratory birds would be minimized; therefore, migratory birds were dismissed from further analysis. As stated in **Appendix C**, if project activities are to be conducted during the primary nesting season for migratory birds (March 15th - July 31st), nesting surveys would be conducted by a qualified biologist.

Past and Present Surface-Disturbing Activities

Past and present land-disturbing activities in the wildlife analysis area were estimated through acres of land with disturbed or developed SWReGAP land cover classes (Lowry et al. 2005). Disturbed or developed land cover classes within the wildlife analysis area are shown on Figure 3-1. Disturbed or developed land cover classes indicate impacts to wildlife from sources related to human activity. Impacts to wildlife from these land-disturbing activities include loss of habitat, habitat fragmentation, interruption of seasonal patterns and migration routes, increased risk of

vehicle-animal collisions, and auditory and visual disturbances. Other past and present uses within the analysis area have included wildfires, grazing, range improvements, vegetation treatments, and recreational uses (BLM 2016).

3.6.2. Environmental Impacts—No Action Alternative

Under the No Action Alternative, there would be no changes to wildlife habitat in the project area as a result of the Proposed Action; however, because of the existing geothermal leases within the AOI, exploration and development within the AOI are RFFAs under lease rights. Therefore, surface disturbance activities and structural developments associated with RFFAs (such as fences, signs, powerlines, meteorological towers, communication towers, and renewable energy developments) are likely to diminish the capacity of the analysis area to support wildlife (BLM CCFO 2019) regardless of if the Proposed Action is approved.

3.6.3. Environmental Impacts—Proposed Action

Impacts to wildlife were analyzed by reviewing the potential direct injury and mortality of wildlife, the potential for loss and degradation of habitat, the potential auditory and visual disturbances to individual wildlife present in or near the project area during construction and drilling activities, and the potential affects to species' overall population numbers and health. Special-status species that may inhabit or otherwise utilize the project area include:

- bald eagle,
- big free-tailed bat,
- burrowing owl,
- California condor,
- dark kangaroo mouse,
- ferruginous hawk,
- fringed myotis,
- kit fox,
- long-billed curlew,
- monarch butterfly,
- short-eared owl,
- Townsend's big-eared bat, and
- western red bat.

According to the Geothermal Programmatic EIS (BLM and USFS 2008), the main impacts on wildlife resources from the exploration phase of geothermal development consist of habitat removal, the potential for direct injury and mortality from vehicles, noise and visual impacts, and potential long-term effects from the introduction of invasive species.

Surface disturbances from the Proposed Action would result in a disturbance of up to 266 acres of wildlife habitat (<0.5% of the analysis area), depending on the final number of well pads constructed. Habitat disturbance would occur during site clearing and grading, access road improvements and construction, utility line installation (within access road ROWs), well pad construction, well drilling, and vehicle travel. In addition to direct impacts to wildlife habitat, indirect impacts to wildlife habitat could result from habitat fragmentation and degradation of

movement corridors extending beyond the direct approximately 266 acres of habitat disturbance. Functional habitat loss may also be greater due to avoidance behaviors resulting from construction and operation activities; however, the total amount is difficult to assess and likely dependent on adjacent habitat quality and other disturbances. Overall, wildlife habitat disturbance would be limited because of the temporary nature of the project and the reclamation of disturbed areas following project completion (**Appendix C**). Indirect impacts to wildlife habitat from avoidance behaviors may be minimized by the available suitable habitat in the vicinity of the project area; however, these impacts would likely still result from RFFAs within the analysis area (Table 3-1).

Individual wildlife not mobile enough to avoid construction operations; wildlife that use burrows; wildlife that are defending nest sites would be most susceptible to injury or death resulting from clearing and grading activities for well pads and access road construction. Mobile wildlife species, including deer, birds, and large predators may avoid the initial clearing activity by moving into habitats in adjacent areas (BLM and USFS 2008). Individual wildlife that relocate may face increased competition for resources and habitat. The design features in **Appendix C** would minimize direct injury or death of wildlife.

Reserve pits collect rainwater that could have otherwise provided a potential water source, and wildlife may attempt to ingest fluids in the reserve pit that may contain high concentrations of minerals that could be toxic to wildlife. As stated in Section 2.2.4, the concentrations of fluid additives utilized for exploration are not expected to render the contents of reserve pits toxic. Reserve pits could also create increased risk of trapping hazards for wildlife. Larger wildlife species would be limited from entering the reserve put by installing 8-ft. fencing around each reserve pit. Exclosure fencing would consist of chain-link fence with a mesh overlay or other BLM-approved fencing recommendations. One side of the reserve pit walls would be sloped at an approximate 30 percent incline to prevent smaller wildlife species from becoming entrapped (**Appendix C**).

In addition to potential direct habitat impacts, noise from drill rigs and construction activities can disturb wildlife in adjacent habitats up to 2,500 feet away (U.S. Forest Service and BLM 2008). If wildlife are present during project activities, individual wildlife would likely leave the immediate area, resulting in a temporary or permanent spatial redistribution of wildlife or habitat-use patterns. Additional stress could occur as a result of the increased noise and human activity which could result in changes in foraging rates and cause individual wildlife to select suboptimal habitat. Individual wildlife would also use extra exertion to escape disruptions that could result in the depletion of energy stores at the expense of growth and reproduction. The energy spent avoiding noise and human activity could also impact the ability of the individual to respond to other adverse conditions, either through distraction or lack of energy. Human activity and noise effects from the Proposed Action would be temporary for the proposed project; however, if a commercially viable geothermal resource is confirmed, a development well field and generation facility would likely be proposed in the future which could result in permanent impacts in the AOI. The completion of the wells for production and injection, as well as the construction of the power plant, would require a separate NEPA analysis.

Overall, wildlife species' population numbers and health are unlikely to be affected due to the relatively small percentage of habitat disturbed in the analysis area and the ability of most wildlife to move into adjacent habitat as needed to avoid the disturbance. Impacts from exploration

activities are expected to be temporary, with the exception of the introduction of invasive species. Wildlife surveys would be conducted for kit fox, and migratory bird and raptor species prior to surface disturbance activities. If nests, burrows, or dens are observed, species-specific seasonal and spatial buffers would be implemented. Wildlife surveys, adherence to lease stipulations, and implementation of wildlife BMPs and design features (**Appendix C**) would minimize potential impacts to wildlife.

Cumulative Impacts

Past actions, present actions, and RFFAs (Table 3-1) could cumulatively affect wildlife species through loss of habitat and habitat degradation, habitat fragmentation, disruption of seasonal patterns or migration routes, displacement of individual wildlife, increase of collisions between wildlife and vehicles, and impacts of the health of individual wildlife due to stress (BLM 2016). These impacts could affect all wildlife, including special-status wildlife species and migratory birds. Generally, special-status wildlife species would be more susceptible to impacts due to their dependence on specific habitat types, sensitivity to disturbance, declining population numbers, and ongoing habitat losses (BLM 2016). Cumulative impacts may be greater for kit fox due to limited movement corridors and perpetual surface disturbance within the Milford Valley area. Potential impacts to kit fox are analyzed in Section 3.6.3.1.

The Proposed Action would add incrementally to the acreage of wildlife impacts from past and present surface-disturbing activities (572 acres) and quantifiable RFFAs (256 acres, Table 3-1) in the analysis area. The approximately 266 acres of surface disturbance from the Proposed Action would represent a 46% increase to the approximately 572 acres of past and present surface disturbance to wildlife in the analysis area (Figure 3-1). Including the quantifiable RFFAs within the analysis area, this proposed increase of surface disturbance would result in a cumulative 1.5% of disturbance within the wildlife analysis area. Additionally, indirect impacts to wildlife habitat could result from habitat fragmentation and degradation of movement corridors extending beyond the direct approximately 266 acres of habitat disturbance. The severity of the cumulative impacts would depend on factors such as the sensitivity of the species affected, seasonal intensity of use, and physical parameters (e.g., topography, forage, and cover availability) (BLM 2016).

The BLM recently offered a competitive geothermal lease sale for 11 parcels in Beaver and Millard Counties, totaling approximately 32,527 acres (BLM 2021a). Approximately 11,687 acres of the wildlife analysis area was included in the geothermal lease sale. Exploration and development on future leases could cause additional impacts to wildlife; however, these impacts are not quantifiable at the leasing sale stage of the process because no specific projects have been proposed.

All surface disturbing activities would progress incrementally, and well sites and associated access roads determined by the operator to be commercially non-viable would be reclaimed as the project progresses. Therefore, the actual acreage of disturbance to wildlife at any given point in time would likely be lower than the proposed maximum of 266 acres of disturbance. However, due to the time it may take for vegetation to fully reestablish, complete reclamation of wildlife habitat may take several years which may contribute to the functional loss of the entire 266 acres of habitat. . Cumulative impacts to wildlife species and their habitats would be minimized through the implementation of design features and adherence to lease stipulations (**Appendix C**).

Kit Fox Analysis

In addition to the general wildlife impacts discussed above, kit foxes are especially susceptible to impacts due to limited movement corridors and perpetual surface disturbance within the Milford Valley area. The kit fox is associated with desert soils and desert shrub vegetation and prefers fine, silty soils for burrowing. Natural habitats occupied by the kit fox throughout the western United States are being converted (agricultural, renewable energy) and threaten the long-term survival of the kit fox (Cypher and List 2014). Home range size for the kit fox varies from 620 acres (251 hectares) to 2,866 acres (1,160 hectares). For this analysis, a 4.5-mile radius of the project area (76,615 acres or 31,005 ha) was selected as a conservative analysis area for kit fox to include a possible home range from any location within the project area.

Past and present surface-disturbing activities in the analysis area that have affected kit fox habitat include mineral exploration and development, renewable energy production facilities (geothermal, solar, and wind), utility lines, railways, and road construction, as well as livestock grazing and range improvement projects. Based on the SWReGAP land cover classes within the analysis area (Lowry et al. 2005), 383 acres (0.5%) of the analysis area is classified as the Developed, Open Space – Low Intensity land cover type (Figure 3-1).

The BLM has classified kit fox habitat within the vicinity of the project area as 'Poor', 'Fair', 'Good', and 'Very Good'. Areas designated 'Very Good' and 'Good' are considered suitable kit fox habitat (Figure 3-6). Kit fox habitat within the analysis area is summarized in Table 3-7.

Table 3-7. Kit Fox Habitat in the Analysis Area.

Kit Fox Habitat	Habitat in Project Area Disturbed (acres)	Habitat in Analysis Area (acres)	Habitat in Analysis Area Disturbed (%)
Very Good	2	11,500	0.02%
Good	246	51,403	0.48%
Fair	4	7,945	0.05%
Poor	0	4,432	0.00%
Unmapped	14	1,335	1.05%

The Proposed Action would add incrementally to the acreage of impacts to kit fox from past and present surface-disturbing activities (383 acres) and quantifiable RFFAs (256 acres, Table 3-1) in the kit fox analysis area. The approximately 266 acres of surface disturbance from the Proposed Action would result in the loss of 248 acres of designated 'Very Good' and 'Good' kit fox habitat and would represent a 65% increase to the approximately 383 acres of past and present surface disturbance to kit fox habitat in the analysis area. Including the quantifiable RFFAs within the analysis area, this proposed increase of surface disturbance would result in a cumulative 0.8% of disturbance within the kit fox analysis area. In addition to direct impacts to kit fox habitat (maximum of 248 acres of suitable kit fox habitat), indirect impacts to kit

fox could result from habitat fragmentation and degradation of movement corridors. Functional habitat loss may also be greater due to avoidance behaviors resulting from construction activities; however, the total amount is difficult to assess and likely dependent on adjacent habitat quality and other disturbances. Indirect impacts to kit fox from avoidance behaviors may be minimized by the available suitable habitat in the vicinity of the project area; however, these impacts would likely still result from RFFAs within the analysis area. Kit fox surveys, adherence to lease stipulations, and implementation of wildlife BMPs and design features (**Appendix C**) would minimize potential impacts to kit fox.

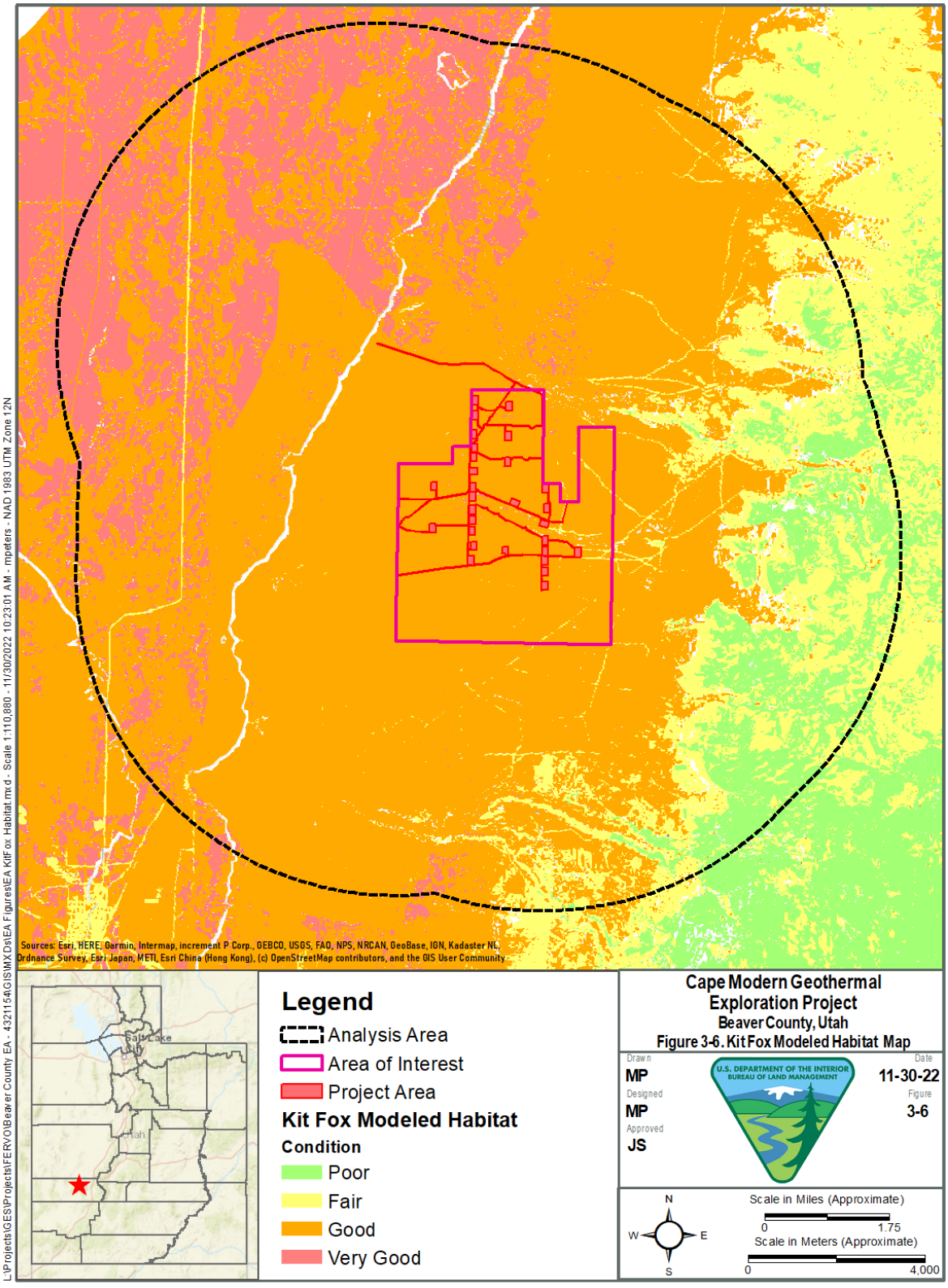

Figure 3-6. Kit Fox Modeled Habitat Map.

CHAPTER 4.0. CONSULTATION AND COORDINATION

4.1. SUMMARY OF CONSULTATION AND COORDINATION

4.1.1. Agencies and Organizations Consulted

Table 4-1 lists the agencies and organizations consulted during the preparation of this EA. Copies of the agency consultation letters, and any responses are included in the administrative record.

Table 4-1. List of Agencies and Organizations Consulted

Name	Purpose and/or Authorities for Consultation or Coordination	Findings and Conclusions
Beaver County	Consultation with the Planning & Zoning Department for Beaver County, Utah.	The proposed project would not impact flight patterns at the Milford Municipal Airport as the project area is outside the Primary Runway Approach Zone and Transitional Zone.
Federal Aviation Administration (FAA)	49 U.S.C. 106. Code of Federal Regulations (CFR) Title 14, Chapter I, Part 77 – Safe, Efficient Use, and Preservation of the Navigable Airspace.	The requirements for filing with the FAA for proposed structures (or equipment) vary based on a number of factors: height, proximity to an airport, location, and frequencies emitted from the structure, etc. The FAA Notice Criteria Tool indicates the proposed project does not exceed notice criteria.
FEMA Region VIII	CFR Title 44, Chapter I, Parts 60, 65, and 72. Consultation with the Floodplain Management & Insurance Branch for FEMA Region VIII.	An Early Coordination Review of the proposed project was initiated with the FEMA on September 27, 2022. No response to the request for comments has been receive as of February 1, 2023.
USACE	Section 10 of the Rivers and Harbors Act of 1899. Section 404 of the Clean Water Act. 33 CFR Part 330 -- C. Nationwide Permit General Conditions. Consultation with the USACE Nevada/Utah Regulatory Section.	Depending on impacts, the proposed project would be authorized under NWP 58 (Utility Line Activities for Water and Other Substances). If buried electrical utility lines through aquatic resources are also part of the project, NWP 57 would also be needed. NWP 58 also authorizes roads and substation fills. The acreage limitation is 0.5 acre. Over that acreage, you could qualify for a Letter of Permission up to 1.0 acre. Over 1.0 acre of impacts would require a standard individual permit (IP).

Name	Purpose and/or Authorities for Consultation or Coordination	Findings and Conclusions
USEPA	Consultation with the U.S. Environmental Protection Agency NEPA Branch.	An Early Coordination Review of the proposed project was initiated with the USEPA on September 16, 2022. A response from the USEPA was received on October 7, 2022. Comments received included the following: • Characterizing baseline conditions, including existing hydrologic studies, air quality data, existing geology and shallow or sensitive aquifers, biological assessment, and cultural resource surveys. • Consideration to resources including surface water and groundwater and air resources, • Detailing the mitigation and control measures to be implemented for the proposed project. • Consultation with the State and Tribal Historic Preservation Officers. • Engaging with rural communities and an assessment of environmental justice. A baseline field assessment was conducted by GES from February 7th – 11th, 2022. A Class III Cultural Resources Survey was conducted by Montgomery Archaeological Consultants from March 10th -18th, 2022. The aforementioned resource concerns were evaluated by the BLM in the ID Team Checklist (**Appendix B**). Those issues warranting further analysis are discussed in this EA.
USFWS	Section 7(a)(2) of the Endangered Species Act of 1973 (16 USC 1531 et seq.) directs federal agencies to consult with the USFWS regarding the potential impacts of actions authorized, carried out, or funded by federal agencies on species listed as threatened or endangered under the Endangered Species Act.	An Early Coordination Review of the proposed project was initiated with the Utah Ecological Services Field Office on September 14, 2022. No formal Section 7 consultation was required.

Name	Purpose and/or Authorities for Consultation or Coordination	Findings and Conclusions
UDEQ	Consultation with the Division of Environmental Quality for Utah.	An Early Coordination Review of the proposed project was initiated with the UDWR on September 21, 2022. No response to the request for comments has been receive as of February 1, 2023.
UDWR and Utah Public Lands Policy Coordinating Office (UPLPCO)	Consultation with the wildlife and public lands authority for Utah.	An Early Coordination Review of the proposed project was initiated with the UDWR on September 12, 2022. A response from the UPLPCO, in collaboration with UDWR, was received on October 11, 2022. Comments received included noting pronghorn use within the project area and recommendations for exclusionary fencing, with escape ramps for small wildlife, and contributing to a water development project or other approved project to mitigate for potential impacts to pronghorn. An additional comment was made noting the suitable minimization measures for potential impacts to kit fox and burrowing owls with an additional recommendation to avoid dark kangaroo mouse (DKM) habitat, if possible. Following additional consultation with UDWR, conservation program biologists noted the lack of established sand dunes on site and the low-value DKM habitat within the project area. The UDWR Conservation Mammal Coordinator noted no additional measures were necessary for DKM.
UDWRi Stream Alteration Program	Utah Code Section 73-3-29.	Based upon the UDWRi review of relevant information, UDWRi has determined that there are no watercourses within the project area that meet the State Engineer's definition of a natural stream. As such, no state stream alteration permits would be required for alteration to these channels.

Name	Purpose and/or Authorities for Consultation or Coordination	Findings and Conclusions
UDWRi Well & Geothermal Program	Utah Geothermal Resource Conservation Act (Utah Code, Title 73, Chapter 22). UAC) Rule R655-1.	The Utah Department of Natural Resources, UDWRi is given jurisdiction and authority over all geothermal resources in the State. As part of this authority, the Division requires that all wells for the discovery and production of water to be used for geothermal energy production in the State of Utah, be drilled, operated, maintained, and abandoned in a manner to safeguard life, health, property, the public welfare, and to encourage maximum economic recovery. Regarding this specific exploration project of up to 29 geothermal exploration wells in Beaver County, the following requirements would need to be met: --For geothermal exploration wells, a Plan of Operations must be submitted to the State for review and approval prior to commencement of work. This plan must contain the components outlined in R655-1-2 UAC. The plan must include blow-out prevention processes found in R655-1-3. Approval of this plan constitutes authorization to drill (permit). --The drilling of geothermal injection wells requires the same plan of operations but with additional requirements found in R655-1-5. The Division of Water Rights reviews and approves geothermal injection wells, (Class V injection well). The Utah Division of Water Quality has been given general jurisdiction by the EPA to regulate injection wells in the State of Utah. Because the Division of Water Rights has primacy to regulate geothermal injection wells, the Division of Water Quality generally permits geothermal injection wells by rules so long as the injection well plan of operations is also submitted to them with their required injection well inventory form and fee.

Name	Purpose and/or Authorities for Consultation or Coordination	Findings and Conclusions
Utah SHPO	Consultation as required by the NHPA (Public Law 89-665; 54 USC 300101 et seq.)	Consultation pursuant to Section 106 was initiated on November 1, 2022. Concurrence from SHPO was received on November 9, 2022.
Hopi Tribe	Government-to-government consultation as required by the American Indian Religious Freedom Act of 1978 (42 USC 1531), the Native American Graves Protection and Repatriation Act (25 USC 3001 et seq), and the NHPA (Public Law 89-665; 54 USC 300101 et seq.).	A notification letter was sent to the Hopi Tribe on October 4, 2022. Consultation is on-going.
Kaibab Band of Paiute Indians	Government-to-government consultation as required by the American Indian Religious Freedom Act of 1978 (42 USC 1531), the Native American Graves Protection and Repatriation Act (25 USC 3001 et seq), and the NHPA (Public Law 89-665; 54 USC 300101 et seq.).	A notification letter was sent to the Kaibab Band of Paiute Indians on October 4, 2022. Consultation is on-going.
Moapa Band of Paiute Indians	Government-to-government consultation as required by the American Indian Religious Freedom Act of 1978 (42 USC 1531), the Native American Graves Protection and Repatriation Act (25 USC 3001 et seq), and the NHPA (Public Law 89-665; 54 USC 300101 et seq.).	A notification letter was sent to the Moapa Band of Paiute Indians on October 4, 2022. Consultation is on-going.
Paiute Indian Tribe of Utah	Government-to-government consultation as required by the American Indian Religious Freedom Act of 1978 (42 USC 1531), the Native American Graves Protection and Repatriation Act (25 USC 3001 et seq), and the NHPA (Public Law 89-665; 54 USC 300101 et seq.).	A notification letter was sent to the Paiute Indian Tribe of Utah on October 4, 2022. A response was received on October 18, 2022 with no objections to the project.
San Juan Southern Paiute	Government-to-government consultation as required by the American Indian Religious Freedom Act of 1978 (42 USC 1531), the Native American Graves Protection and Repatriation Act (25 USC 3001 et seq), and the NHPA (Public Law 89-665; 54 USC 300101 et seq.).	A notification letter was sent to the San Juan Southern Paiute on October 4, 2022. Consultation is on-going.
Ute Indian Tribe	Government-to-government consultation as required by the American Indian Religious Freedom Act of 1978 (42 USC 1531), the Native American Graves Protection and Repatriation Act (25 USC 3001 et seq), and the NHPA (Public Law 89-665; 54 USC 300101 et seq.).	A notification letter was sent to the Ute Indian Tribe on October 4, 2022. Consultation is on-going.

Name	Purpose and/or Authorities for Consultation or Coordination	Findings and Conclusions
Ute Mountain Ute Tribe	Government-to-government consultation as required by the American Indian Religious Freedom Act of 1978 (42 USC 1531), the Native American Graves Protection and Repatriation Act (25 USC 3001 et seq), and the NHPA (Public Law 89-665; 54 USC 300101 et seq.).	A notification letter was sent to the Ute Mountain Ute Tribe on October 4, 2022. Consultation is on-going.
Pueblo of Zuni	Government-to-government consultation as required by the American Indian Religious Freedom Act of 1978 (42 USC 1531), the Native American Graves Protection and Repatriation Act (25 USC 3001 et seq), and the NHPA (Public Law 89-665; 54 USC 300101 et seq.).	A notification letter was sent to the Pueblo of Zuni on October 4, 2022. Consultation is on-going.
Navajo Nation	Government-to-government consultation as required by the American Indian Religious Freedom Act of 1978 (42 USC 1531), the Native American Graves Protection and Repatriation Act (25 USC 3001 et seq), and the NHPA (Public Law 89-665; 54 USC 300101 et seq.).	A notification letter was sent to the Navajo Nation on October 4, 2022. Consultation is on-going.

4.2. SUMMARY OF PUBLIC PARTICIPATION

The BLM conducted internal scoping on the Proposed Action and completed an ID Team Checklist in September 2022. Issues identified by the ID Team were incorporated into this EA for analysis.

During the preparation of the EA, the public was notified of the Proposed Action through a posting on the BLM's ePlanning website on December 22, 2022. The BLM provided a 30-day public review and comment period for the draft EA, beginning on December 22, 2022, and ending on January 20, 2023. Copies of the draft EA were available on the BLM's ePlanning website during the public review and comment period.

4.2.1. Public Comments Analysis

The BLM received six comments during the public comment period all of which were in support of the proposed project. Records of the comments received will be retained in the administrative record for this project. One of the six comments wrote that while they were in favor of the proposed project, they had concerns related to the use of groundwater and surface water resources. The comment in its entirety and the BLM's response to the comment regarding the concern for groundwater and surface water resources is shown below.

Public comment concerning the use of limited surface and groundwater resources:

"Kudos to BLM for this highly informative and comprehensive EA. I appreciate the hard work of those preparing it. I generally support this proposed action and other geothermal exploration and development projects.

My primary concern is with limited surface and groundwater resources that may be connected and that face greater depletion due to prolonged drought and possible excessive groundwater pumping. BLM should require appropriate design features, mitigation measures, and careful ongoing monitoring to ensure that geothermal and other human uses of water are sustainable. Depleted aquifers can harm natural and cultural resources on BLM lands. Utah State officials have improperly over allocated water rights in some aquifers. There are increasing human pressures on aquifers that could make already depleted aquifers even worse. Water is life. We must have the courage to manage it sustainably. Thank you very much for your consideration of my EA comments."

-A Utahn Worried About Water

BLM Response to the above comment:

The Applicant's (EDR) objective behind the Proposed Action is to explore geothermal energy production potential and to assess the viability of the geothermal resources in order to meet increased demand for energy in a highly sustainable fashion. See Chapter 1, section 1.1 of the EA for a summary of the proposed project.

While EDR's proposed water use and associated mitigation measures are discussed in Section 2.2.5. of the EA, the design and implementation of a water conservation program is outside the BLM's jurisdiction and scope of decision-making. The BLM does not have the authority to issue water rights or regulate water usage within the state of Utah, that authority resides with the Utah Division of Water Rights. Regardless of the BLM's decision regarding the approval of this EA for geothermal exploration, the applicant would be required to abide by all Federal, State, and local laws concerning water acquisition and use during the implementation of the geothermal exploration associated with this project. Specifically, as stated in Section 1.5 of the EA, EDR would apply for exploratory wells by submitting a Plan of Exploration (POE) and well design to the Utah DWRi and receive written approval before commencing with drilling operations. Any temporary water appropriations that are deemed to be required for drilling or testing would be applied for and obtained as part of the Utah Division of Water Rights' (UDWRi) geothermal drilling permit application process. More information on the Utah Division of Water Rights can be found at https://waterrights.utah.gov/

4.3. LIST OF PREPARERS

BLM staff specialists who determined the potentially affected resources for this document are listed in the ID Team Checklist in **Appendix B**. Those who contributed to the preparation of the EA and provided review comments on the EA are listed in Tables 4-2 and 4-3.

Table 4-2. Bureau of Land Management Cedar City Field Office Preparers and Reviewers

Name	Title	Responsibility
Ed Ginouves	Minerals Specialist, Project Leader	BLM Project Manager, EA Technical Review, Lands and Realty, Environmental Justice, Socio-Economics, Minerals, Air Quality, Paleontology
L. Callie Goff	Planning and Environmental Coordinator	EA Technical Review
Hayden Houston	Planning and Environmental Specialist	EA Technical Review
Roy Plank	Archaeologist	Archaeological and Cultural Resources, Native American Religious Concerns
David Jacobson	Outdoor Recreation Planner	Areas of Critical Environmental Concern, Wilderness Areas, National Historic Trails, Recreation, Visual Resources, Wild and Scenic Rivers
Colby Peterson	Forester	Woodland / Forestry
Jeremy Cox	Natural Resource Specialist	Fuels/Fire Management
Travis Carlson	Occupational Health and Safety Specialist	Hazardous and Solid Wastes
Chad Hunter	Wild Horse Specialist	Wild Horses
Dan Fletcher	Assistant Field Manager	Farmland, Livestock Grazing, Rangeland Health Standards, Floodplains, Wetlands/Riparian Zones, Invasive Species, Vegetation, Soils, Greenhouse Gas Emissions, Water Resources/Quality
Mitch Bayles	Rangeland Management Specialist	Threatened, Endangered, and Sensitive Plant Species
Dustin Schaible	Wildlife Biologist	Wildlife
Derek Christensen	Wildlife Biologist	Wildlife, Migratory Birds
Brooklynn Cox	Realty Specialist	Lands/Access

Table 4-3. GES - Environmental Consultants Preparers and Reviewers

Name	Title	Responsibility
Joseph Schwartz	Project Manager	Project Management, Document Preparation and Review
Madison Peters, WPIT	NEPA Specialist	Document Preparation and Biological Surveys
Ryan Cohen	NEPA Specialist	Biological Surveys
Jody J. Patterson, Ph.D.	Archaeologist/Principal Investigator	Cultural Resources Lead

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APPENDIX A

Operations Plan

OPERATIONS PLAN

(43 CFR SUBPART 3250)

CAPE MODERN GEOTHERMAL EXPLORATION PROJECT

FEDERAL GEOTHERMAL LEASES:
UTU-95314
UTU-95318

BEAVER COUNTY, UTAH

SEPTEMBER 2022

APPLICANT:

ESCALANTE DESERT RESOURCES LLC
114 MAIN ST
HOUSTON, TEXAS 77002

CAPE MODERN GEOTHERMAL EXPLORATION PROJECT

ESCALANTE DESERT RESOURCES LLC
OPERATIONS PLAN

TABLE OF CONTENTS

TABLES

FIGURES

APPENDIX

ACRONYMS AND ABBREVIATIONS

AOI	Area of Interest
BLM	Bureau of Land Management
DWMRC	Division of Waste Management and Radiation Control
E	East
EPA	United States Environmental Protection Agency
GPM	Gallons Per Minute
H_2S	Hydrogen Sulfide
LIDAR	Light Detection and Ranging
N	North
NCG	Non-Condensable Gas
NORM	Naturally Occurring Radioactive Materials
EDR	Escalante Desert Resources, Fervo Energy Company
Project	Cape Modern Geothermal Exploration Project
R	Range
ROW	Right of Way
SUAS	Small Unmanned Aerial System
SWPPP	Stormwater Pollution Prevention Plan
T	Township
TDEM	Time-Domain Electromagnetic
UDEQ	Utah Department of Environmental Quality
UDWRi	Utah Division of Water Rights
UTM	Universal Transverse Mercator

1.0 INTRODUCTION AND ORGANIZATION

1.1 Project Summary

Escalante Desert Resources LLC (EDR), a wholly owned subsidiary of Fervo Energy Company, is proposing to construct, operate, and maintain the Cape Modern Geothermal Exploration Project (Project) in Beaver County, Utah (**Figure 1**). The Project would include exploration activities, drilling and testing of geothermal wells, reservoir monitoring and characterization activities, and access road construction.

The wells proposed as part of the Project would be located within federal geothermal leases on public lands managed by the Bureau of Land Management (BLM) (**Figure 2, Table 1.1**). The Area of Interest (AOI) for the Project encompasses approximately 5641.25 acres (**Figure 3**).

Table 1.1: Federal Geothermal Leases

Lease Number	Township and Range	Section Number(s)	Acreage
UTU-95314	T.27S., R.9W.	All or portions of Sections 05, 06, 07, 08, 17, 18	3014.86
UTU-95314	T.26S., R.9W.	All or portions of Sections 31	326.78
UTU-95318	T.27S., R.10W.	All or portions of Sections 01, 12, 13	1,320

Table 1.2: Private Geothermal Leases

Lease Name	Township and Range	Section Number(s)	Acreage
EDR Cape LSE2	T.27S., R.9W.	All or portions of Section 07	329.11
EDR Cape LSE2	T.27S., R.10W.	All or portions of Section 13	320.00
EDR Cape LSE3	T.27S., R.10W.	All or portions of Section 18	330.50

1.2 Operations Plan Organization

The information contained in this Exploration Operations Plan is provided as requested in 43 Code of Federal Regulations 3261.12:

- Well pad layout and design;
- A description of existing and planned access;
- A description of any ancillary facilities;
- The source of drill pad and road building material;
- The water source;
- A statement describing surface ownership;
- Plans for surface reclamation;
- A description of procedures to protect the environment and other resources; and
- Additional information.

2.0 PROJECT DESCRIPTION

2.1 Geothermal Well Field

2.1.1 Well Field Location

EDR will explore for geothermal resource and verify the commercial viability of the generation of electricity. EDR expects that up to 29 geothermal exploration wells would be drilled and tested within the federal geothermal leases (**Figure 3** and **4, Table 2**). EDR's development strategy involves drilling multiple horizontal injection and production wells to recover the geothermal resource with maximum efficiency and with minimal impact to the environment. In addition to the horizontal wells, the wellfield development plan requires drilling several vertical observation wells for the purposes of measuring the formation temperature, verifying the lithologic structure of the formation, and potentially hosting data acquisition systems such as fiber optic cables or temporary downhole geophones. Approximately 21 horizontal wells and 8 vertical wells will be drilled in succession in order to confirm the viability of the geothermal resource within the AOI. EDR anticipates that the proposed exploration activities could yield development of 50-150 MW of 24/7 clean, firm, renewable power, which could lead to significant positive benefits to the environment and local economy.

Table 2: Cape Modern Well Sites on Federal Geothermal Leases

Well	LeaseNo	Legal Description	Lat WGS 84	Long WGS84	Easting UTM NAD83	Northing UTM NAD83	Acres (Est.)
1	UTU-095314	Section 31, NWSW	38.50469971	-112.9160004	332932.66	4263554.43	6.715
2	UTU-095314	Section 31, SWSW	38.50159836	-112.9160004	332925.49	4263210.18	6.715
3	UTU-095314	Section 31, SWNE	38.50360107	-112.9069977	333715.13	4263416.15	6.715
4	UTU-095314	Section 6, NWNW	38.49779892	-112.9160004	332916.71	4262788.58	6.715
5	UTU-095314	Section 6, NWNE	38.49750137	-112.9069977	333701.1	4262739.2	6.715
6	UTU-095314	Section 6, SWNW	38.49499893	-112.9160004	332910.24	4262477.85	6.715
7	UTU-095314	Section 6, SWNW	38.49309921	-112.9160004	332905.85	4262267	6.715
8	UTU-095314	Section 6, NWSE	38.49240112	-112.9069977	333689.37	4262173.23	6.92
9	UTU-095314	Section 6, NWSW	38.49029922	-112.9160004	332899.38	4261956.27	6.63
10	UTU-095314	Section 6, SWSW	38.48709869	-112.9160004	332891.98	4261601.15	6.715
11	UTU-095314	Section 6, SWSW	38.48509979	-112.9160004	332887.37	4261379.31	6.715
12	UTU-095314	Section 7, NWNE	38.48400116	-112.9049988	333844.42	4261237.42	6.715
13	UTU-095314	Section 7, SWNW	38.48239899	-112.9160004	332881.13	4261079.56	6.715
14	UTU-095314	Section 7, NWNW	38.4803009	-112.9160004	332876.28	4260846.74	6.715
15	UTU-095314	Section 7, SWNW	38.47800064	-112.9160004	332870.97	4260591.49	6.715
16	EDR Cape LSE2	Section 7, NWSW	38.47499847	-112.9160004	332864.03	4260258.23	6.07
17	EDR Cape LSE2	Section 7, SWSW	38.4720993	-112.9160004	332857.33	4259936.52	6.92
18	EDR Cape LSE2	Section 7, NESE	38.47430038	-112.9079971	333560.6	4260166.27	6.11
19	UTU-095318	Section 5, SWSW	38.48699951	-112.8970032	334548.76	4261555.83	6.715
20	UTU-095314	Section 8, NWNW	38.48300171	-112.8970032	334539.62	4261112.15	6.55
21	UTU-095314	Section 8, SWNW	38.47990036	-112.8980026	334445.29	4260769.71	6.715
22	UTU-095314	Section 8, NWSW	38.47639847	-112.8970032	334524.51	4260379.28	6.715
23	UTU-095314	Section 8, NWSW	38.47430038	-112.8970032	334519.71	4260146.45	6.715
24	UTU-095314	Section 8, SWSW	38.47240067	-112.8970032	334515.37	4259935.71	6.715
25	UTU-095314	Section 17, NWNW	38.4701004	-112.8970032	334510.11	4259680.36	6.715
26	UTU-095314	Section 17, NWNW	38.46720123	-112.8970032	334503.48	4259358.64	6.715
27	UTU-095314	Section 8, NWSE	38.4742012	-112.8889999	335217.67	4260121.11	6.715
28	UTU-095318	Section 1, SESW	38.48709869	-112.9260025	332019.56	4261619.36	6.715
29	UTU-095318	Section 12, SENW	38.47850037	-112.9260025	331999.6	4260665.08	6.715

2.1.2 Construction Procedures and Surface Disturbance

Well pads would be constructed incrementally, individually or in small groups, before drilling activity begins. Each well pad would be approximately 400 feet by 600 feet (approximately 5.51 acres per pad) (**Figure 5**), with 25 feet additional around the entire perimeter for topsoil and other soil storage, resulting in 450 feet by 650 feet (approximately 6.715 acres per pad) disturbance for each pad (Table 2). Actual dimensions of the well pads would be modified to best match the specific physical and environmental characteristics of the site and to minimize grading (cut and fill). Wells would be drilled in succession. Well sites deemed by the operator to be commercially non-viable will be reclaimed as describe in Section 2.5. Depending on the subsurface properties, drilling conditions, and resource characteristics, EDR may consider drilling multiple wells from a single pad in this Project area. In some cases, drilling multiple wells from a single pad may require increasing the dimensions of the well pad, however, because this method would require fewer total well pads to complete the project, it would likely result in a reduction of the total surface disturbance. The maximum surface disturbance associated with new well pad construction on federal leased land would be approximately 193.645 acres (6.715 acres per pad, for 29 pads). In addition, a right of way (ROW) will be required for the "off-lease" well pads, as three of the well pads (18, 19, 20) are located on split estate parcels where the BLM owns the surface estate, and the subsurface estate is privately owned. This ROW would contain 19.375 acres of impact on privately leased lands (**Figures 3 and 4**) and will require an SF-299 form and supplemental Plan of Development, which will be provided separately. In cases where the resource and logistics allow, multiple wells could potentially be drilled on each pad, resulting in as few as 15 well pads in the development phase, reducing overall well pad disturbance area to as little as 100 acres for the entire 150MW development.

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

Each drill pad would be prepared to create a level pad for the drill rig and a graded surface for the support equipment. Storm water runoff from undisturbed areas around the constructed drill pads would be directed into ditches surrounding the drill pad and back onto undisturbed ground, consistent with best management practices for storm water. The pad surface would be graded to prevent the movement of storm water off the constructed site but rather into the reserve pit and has been designed for a 100-year storm. Pad boundary erosion mitigation measures may include drainage bars, check dams, and berms.

Reserve pits would be constructed in accordance with best management practices identified in the "Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development (The Gold Book)" (Fourth Edition – Revised 2007) on each pad for the containment and temporary

storage of water, drill cuttings and circulating drilling mud during drilling operations. Geothermal fluid produced from the well during flow testing would also drain to the reserve pit.

The reserve pits would be fenced with an eight-foot exclosure fence on three sides and then fenced on the fourth side once drilling has been completed to prevent access by persons, wildlife, or livestock (**Figure 6**). Exclosure fencing would consist of chain-link fence with a mesh overlay or other BLM-approved fencing recommendations. The fence would remain in place until pit reclamation begins. To prevent livestock, wildlife, and persons from becoming entrapped, one side of the reserve pit walls would be sloped at an approximate 30 percent incline. The reserve pit would measure approximately 100 feet by 200 feet by 10 feet deep.

Once drilling is complete, the shoulders of the pad could be reclaimed, but the majority of the pad must be kept clear for ongoing operations and the potential need to work on or re-drill the wells contained therein. Disturbed areas that are no longer being used will be reclaimed, and the reclamation procedures for the Project area following project completion are described in Section 2.5.

A SWPPP would be implemented for the construction activities associated with the proposed project. The SWPPP would include measures designed to prevent excess sediment from discharging to surface waters in the analysis area.

All eligible concentrations of archeological and/or cultural resources found in the PA will be avoided entirely. This will be accomplished by access route and/or pad re-location. Additionally, fencing and/or construction site monitors will be utilized in situations where construction will be immediately adjacent to eligible sites.

2.1.3 Seismic Monitoring

Proposed sites for the seismic monitoring stations are to be determined. Locations will depend on the exploration wells actually drilled and will be subject to spatial and timing avoidance requirements to protect sensitive species or eligible cultural sites. Seismic monitoring stations will consist of a 50-300 foot drill hole installed by a standard size truck, with no drill pad constructed and minimal site surface disturbance. The station would be powered by a small solar panel and would host either a broadband geophone or accelerometers. An area of approximately 10 feet by 10 feet around station would be fenced for livestock. All sites are within walking distance of existing or planned roads.

2.1.4 Well Drilling and Testing

Specific drilling information is provided in **Table 3**.

Well Drilling

Table 3: Well Drilling Details

Rig Type	Rig Height (ft.)	Trucks Needed (on average)	Drilling Time (days) [1]	Workers On-Site	Vertical Depth (ft.)
Large rotary drilling rig	160-180	25+ tractor/trailer 8 small trucks	60[2]	Avg. = 15-20 Max = 30	~ 8,000

[1] Difficulties encountered during the drilling process, including the need to re-drill the well, could as much as double the time required to successfully complete each well.
[2] Drilling would be conducted 24 hours a day, 7 days a week.

A drilling supervisor will be on site at all times and would typically sleep in a trailer on the active drill site while the well is being drilled. The drilling crew may also live "on-site" during the drilling operations in a self-contained, mobile "bunkhouse" (comparable in size to a double-wide trailer, containing sleeping quarters, galley, water tank, and septic tank) or portable trailers. These quarters for the drilling crew would in most cases be placed on the active well pad. If for any reasons the crew cannot be housed on the active pad, the living facilities would be placed on an inactive pad. Alternatively, the drilling crew may acquire accommodations in Milford, Utah, depending on lodging availability. Drilling crews for a 24-hour operation typically include two drillers, two company representatives, two mud loggers, one tool pusher, two derrickmen, two motormen, up to four floor hands, 2 roustabouts, 2 directional drillers, 2 mud engineers, and a mechanic on duty.

"Blow-out" prevention equipment would be utilized while drilling below the surface casing. Rig up and testing of the blow-out prevention equipment will be performed as per BLM Onshore Order 2. Company Representatives and drilling crew will be trained in well control.

The well bore would be drilled using non-toxic, temperature-stable water-based drilling fluid that may include bentonite clay or polymers for increased viscosity and carrying capacity. If required to improve the success of drilling operations, EDR may utilize underbalanced drilling with air, mist, foam, or aerated mud.

Variable concentrations of additives would be added to the drilling fluids as needed to prevent corrosion, increase mud weight, and prevent mud loss. Some of the mud additives may be hazardous substances, but they would only be used in low concentrations that would not render the drilling mud hazardous or toxic. Additional drilling mud would be mixed and added to the mud system as needed to maintain the required quantities. The specific drilling methodology, including drilling fluids, would be reviewed and approved by Utah Division of Water Rights (UDWRi) as part of the geothermal drilling permit application process.

Target depths at the Cape Modern geothermal field range between 3,500 and 12,000 feet below ground surface (True Vertical Depth) but may change pending new well data, well testing results, and increased understanding of the subsurface. Directional drilling may be employed to drill horizontal geothermal wells. Well casing would meet all requirements outlined in Geothermal Resources Operational Order No. 2, where the surface casing string would be set at no less than 200 feet to prevent co-mingling of the geothermal fluids with underground aquifers.
The horizontal injection and production wells will be designed to target a true vertical depth that

meets the resource temperature requirements for commercial production, which is anticipated to be approximately 8,000 feet (true vertical depth). The wells will be drilled vertically to a pre-determined kick-off point, at which point directional drilling techniques will be employed to build the curve section of the well from an inclination of zero degrees (vertical) to an inclination of approximately 90 degrees (horizontal) at a build rate of approximately 5 - 10 degrees per 100 feet of drilled length. The wells will then continue to be drilled horizontally, maintaining an approximately constant inclination and azimuth. The target azimuth for the curve section and lateral section will in part be determined based on the state of stress in the local geologic conditions of the formation and the temperature gradients of the formation. The curve section may be drilled at a combination of target inclinations, azimuths, and build rates to achieve the target landing point. The length of the lateral section will depend on formation characteristics but is expected to be approximately 5,000 feet. If the formation and resource characteristics support it, multiple horizontal wells may be drilled from a single well pad, significantly reducing the surface footprint required to meet the target system capacity.

The vertical observation wells will be drilled to a similar depth as the true vertical depth of the horizontal wells, approximately 8,000 feet, or deeper. In some cases, the vertical observation wells may be drilled deeper than the target true vertical depth of the horizontal wells, as deep as approximately 12,000 feet, in order to further characterize the resource. The vertical observation well locations will generally be targeted near the mid-point of the lateral sections of offset horizontal injection or production wells.

Each well may need to be worked over or redrilled. Depending on the circumstances encountered, working over a well may consist of lifting the fluid in the well column with air or gas or stimulation of the formation using fresh water and proppant. Well redrilling may 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.

While the drill rig is still over the well, the residual drilling mud and cuttings would be flowed from the well bore and discharged to the reserve pit. Furthermore, a single well may be drilled by more than one drilling rig, where for example the surface casing is set by a dedicated smaller rig prior to the main drilling rig arriving on location.

Well Completion

The horizontal injection and production wells will be completed with multiple casing sections. The wells will be completely cased and cemented to the total depth (TD) of the well. Hydraulic communication between the wellbore and the formation will then be established through a series of sequential perforation operations. In addition, reservoir stimulation techniques may be employed. The reservoir stimulation treatment involves performing several stimulation “stages” along the lateral section and curve sections of the wellbore. In each stage, a temporary plug is set at a pre-determined location along the well and a series of perforation holes are placed along a pre-determined length of the wellbore that defines the stage, typically around 100 to 300 feet

long. A slurry of water, proppant, and fluid additives is then pumped to stimulate the formation. That process is repeated several times along the length of the wellbore. Once all stages are completed, the temporary plugs are either drilled out or dissolve naturally, at which point the well is prepared for well testing or production. Although the stimulation treatment method described here is the most common stimulation technique, other similar techniques may be used, such as the use of sliding sleeves.

Short-Term Well Testing

Short-term well tests may be performed on wells. The short-term well tests will last up to seven days on average. Short-term well tests on injection wells will involve injecting fluid into the well, typically using pump trucks to inject fresh water or geothermal brine, while monitoring temperature, pressure, flow rate, chemistry, and other parameters. Short-term well tests on production wells will involve producing fluid from the well, typically using a workover rig or coiled tubing unit to airlift the well in order to initiate flow and flowing the fluid into the reserve pit or portable steel tanks while monitoring temperatures, pressure, flow rate, chemistry, and other parameters. In some cases, short-term injection tests may also be performed on a production well in order to measure reservoir properties. Each short-term injection test will involve injecting or producing fluid at rates typically ranging from 500 gpm to 2000 gpm, with total injection or production volumes ranging from approximately 5 to 20 million gallons.

Long-Term Well Testing

One or more long-term flow test(s) of each well drilled would likely be conducted following the short-term flow test(s), to more accurately determine long-term well and geothermal reservoir productivity. For production wells, the long-term flow test(s), each lasting between seven and 30 days, would be conducted by pumping the geothermal fluids from the well through on-site test equipment, typically by using a workover rig to airlift the well or using a line shaft pump, to the reserve pit. A surface booster pump would then pump the residual produced geothermal water/fluid through a temporary eight 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 hand laid either “cross-country” or on the surface of the disturbed shoulders on the access roads connecting the full-size geothermal wells (as required, roads would be crossed by trenching and burying the temporary pipe in the trench). The on-site test equipment would include standard flow metering, recording, and sampling apparatus. For injection wells, long-term flow test(s) would be performed by injecting fluid into the wellbore, typically using pump trucks to pump fresh water or geothermal brine, while monitoring temperature, pressure, flow rate, chemistry, and other parameters. Each long-term well test is expected to flow approximately 20 to 50 million gallons of geothermal brine. In some cases, long-term well tests on production wells and injection wells will be performed concurrently, in which case a significant portion of the produced fluid, typically up to 70%, may be recycled for reinjection.

2.2 Site Access and Road Construction

Principal access to the Project area is via Geothermal Plant Road, which heads east from Utah State Route 257, approximately four miles north of Milford, Utah, or alternatively take North Antelope Point Road north from Geothermal Plant Road to East Salt Cove Road and enter the site across approximately 800 feet of private lands. The Project area is traversed by numerous roads and "two-tracks." Geothermal Plant Road and East Salt Cove Road will not require upgrade. All of the existing "two-track" roads are not existing authorized routes and would require surface disturbance for improvement. New access roads would require a total of 45 feet width of surface disturbance in order to accommodate a 40-foot- wide drivable roadbed and 2.5 additional feet on either side to facilitate placing or burying power and communications lines, such as fiber optics cable, and stormwater drainage. The width of the roads reflects the anticipated need for safe navigation of the area by large trucks often moving in two-way traffic and carrying oversized loads. New and improved access roads would be constructed using a dozer and/or road grader and would be constructed in succession and as needed to allow access to well pads. New and/or improved access roads would be required as identified in **Table 4** (**Figures 3** and **4**):

Table 4: On-Lease Road Construction Lengths and Disturbance Totals

Access Road Type	Road Length (feet)	Road Length (miles)	Disturbance (acre)
New Road[1]	67,791.60	12.84	70.03
Total	**67,791.60**	**12.84**	**70.03**

Includes new access road construction within the Project AOI located within federal geothermal leases.

The total estimated area of surface disturbance required for new access road construction that will occur on-lease, assuming a 40-foot-wide drivable roadbed (45-foot wide total width of surface disturbance) would be approximately 70.03 acres (67,791.60 feet of road * 45-foot-wide surface disturbance). Total estimated area of surface disturbance required for improvements to existing two-track roads have been included as new disturbance in the above calculations.

In addition, a ROW will be required for the "split-estate" access roads to the Project AOI (**Figures 3 and 4**). An SF-299 form and Plan of Development will be provided separately. A summary of the split estate access roads located on public lands managed by the BLM is provided in **Table 5**.

Table 5: Off-Lease Access Roads Construction Lengths and Disturbance Totals

Access Road Type	Road Length (feet)	Road Length (miles)	Disturbance (acre)
New Roads - ROW Required[1]	2637.10	0.50	2.72
Total	**2637.10**	**0.50**	**2.72**

Includes new road construction within the Project AOI located on split estate federal surface-private subsurface.

As there are no road upgrades required, it is estimated that a total of 70.03 acres of disturbance on EDR's BLM leases would be required for access road construction within the Project AOI. Another 2637.10 feet, or 2.72 acres of disturbance would occur for access roads constructed via rights of way on adjacent BLM lands with privately held geothermal rights that are leased to EDR. Constructed access roads crossing existing drainages may require installation of culverts. Culvert

installation would follow BLM design criteria and would be constructed pursuant to standards established in the Gold Book (Fourth Edition - Revised 2007).

2.3 Water Requirements and Source

The water requirements typically vary considerably between the drilling, completion, and well testing phases for a given well. During the drilling phase, the total water requirement is anticipated to be approximately 50,000 barrels. The drilling phase is anticipated to last approximately 60 days, as listed in Table 3, which equates to an average water requirement of approximately 833 barrels per day. During the completion phase, the total water requirement is approximately 350,000 barrels. However, the completions phase occurs over a significantly shorter duration compared to the drilling phase, typically taking about 7 days total. Therefore, the average water requirement during the completions phase is approximately 50,000 barrels per day over the 7-day period. Water requirements for grading, construction, and dust control would average substantially less at around 143 barrels (6,000 gallons) per day. One or more portable water tank(s), holding a combined total of at least 238 barrels (10,000 gallons), would be maintained on the well sites during drilling operations.

Water necessary for these activities would be obtained from shallow water well(s) drilled from one or more proposed drill sites, as approved by the BLM and under a waiver for the temporary use of ground water from the Utah Division of Water Rights, where each well location would be determined upon individual need, likely at a pad central to the Project area. Each water well would be temporary, drilled by a licensed water well driller and cemented with seven-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 below the surface). An electric submersible pump on four-inch column pipe would then be run to below the producing interval. The well would be plugged and abandoned in accordance with Utah Administrative Code R655-4-14, with cement plugs across the bottom of the casing and, if needed, with additional plugs to isolate individual producing zones if identified as present. No additional surface disturbance would be associated with the drilling of each temporary water well because, if drilled, they would be located on existing geothermal well pads.

Alternatively, if a waiver for temporary use of groundwater is not granted, water could be obtained from a private source and trucked to each drill site. If water is trucked to the Project area, the frequency of trips would depend on the rate of fluid loss down the well while drilling and the capacity of the available water trucks. EDR would determine the water source while a BLM Geothermal Drilling Permit (BLM Form 3260-2) and drilling program is being prepared for the specified well site location to be drilled.

2.4 Aggregate Requirements and Source

Aggregate material would be obtained from a local source such as the Martin Marietta Milford Quarry, located approximately 6 miles southwest of the Project AOI (**Figures 3** and **4**, **Table 6**).

Table 6: Aggregate Sources

Aggregate Source Area	Township, Range, Section		Approximate UTM Coordinates (NAD83)	
			Easting (m)	Northing (m)
Martin Marietta Milford Quarry	T.27S., R.10W.	Sec. 20	324970	4258296

Drill pads and access roads were selected 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 six inches of gravel. While the Project would likely utilize much less, a conservative estimate for the total aggregate required for well pad construction is estimated at 98,542.58 cubic yards (approximately 3,398.02 cubic yards/pad * 29 standard 400 by 600 feet pads).

Access roads would be covered with up to four inches of gravel, as necessary to create an all-weather surface and to prevent the formation of ruts. Total aggregate required for access road construction for both the Project AOI and proposed ROW is estimated at 34,779.60 cubic yards (approximately 13.34 miles of access roads * 40-foot width * 4-inch depth).

Total aggregate required for the well pad and access road construction is estimated at 133,322.18 cubic yards.

2.5 Surface Reclamation

After the well drilling and testing operations are completed, the liquids from the reserve pits would either naturally evaporate or be removed as necessary to reclaim the reserve pits. The solid contents remaining in each of the reserve pits, typically consisting of non-hazardous, non-toxic drilling mud and rock cuttings, would be tested in accordance with the Gold Book (BLM 2007), existing state standards, or with project-specific requirements of the drilling and water permitting agencies to confirm that they are not hazardous. Typical tests may include the Toxicity Characteristic Leaching Procedure (United States Environmental Protection Agency [EPA] Method 1311), tested for heavy metals; pH (EPA method 9045D); Total Petroleum Hydrocarbons/Diesel (EPA Method 8015B); and Oil and Grease (EPA Method 413.1). Non-hazardous and non-toxic drilling mud and cuttings would be buried in the reserve pit, and any drilling mud and/or cuttings identified as hazardous, and toxic would be disposed of according to Utah Department of Environmental Quality (UDEQ) – Division of Waste Management and Radiation Control (DWMRC) regulations.

If a well is judged by EDR to have no commercial potential, it may continue to be monitored, but would eventually be plugged and abandoned in conformance with the well abandonment requirements of the BLM and Utah Division of Water Rights. Abandonment typically involves placement of two or more tested cement plugs in the wellbore to isolate formations and prevent interzonal fluid migration. The well head (and any other equipment) would then be removed, the casing cut off well below ground surface, and the hole backfilled to the surface.

The portions of the cleared well sites not needed for operational and safety purposes (i.e., the "shoulders" of the pad) would be recontoured to a final or intermediate contour that would blend

with the surrounding topography as much as possible. Areas able to be reclaimed would be ripped, tilled, or disked on contour, as necessary and reseeded with native grasses and forbs. The stockpiled topsoil would also be spread on the area to aid in revegetation.

2.6 Summary of Surface Disturbance

Total surface disturbance for the Project could be as few as 172.75 acres, up to 266.395 acres maximum, resulting in a surface disturbance of roughly 3.0-4.75% of the AOI (**Table 7**).

Table 7: Maximum Project Surface Disturbance

Facility	Maximum Disturbance (ac)
Lease Well Pads	174.27
ROW Well Pads	19.375
Well Pad Subtotal:	**193.645**
Existing Roads Improvement	-
On-Lease New Roads	70.03
ROW New Roads	2.72
Roads Subtotal:	**72.75**
Total:	**266.395**

3.0 ENVIRONMENTAL PROTECTION

3.1 Adopted Environmental Protection Measures

EDR would comply with all special lease stipulations attached to leases UTU-95314 and UTU-95318, which are applicable to Project operations. In addition to measures described in the previous sections, EDR would also institute the following measures:

- Water would be applied to the ground during the construction and utilization of the drill pads, access roads, and other disturbed areas as necessary to control dust.
- A speed limit of 25 miles per hour will be observed on unpaved roads in the project area to limit fugitive dust.
- Portable chemical sanitary facilities would be available and used by all personnel during periods of well drilling and/or flow testing, and construction. These facilities would be maintained by a local contractor.
- To prevent the spread of invasive species and noxious weeds, all vehicles, heavy earth-moving construction equipment, mobile trailers and RV 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/or 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/or re-vegetation of all disturbed areas related to this Project would be certified as weed-free, per BLM standards.
- All construction and operating equipment would be equipped with applicable exhaust spark arresters. Fire extinguishers would be available on the active sites. Water that is used for construction and dust control would be available for firefighting. Personnel would be allowed to smoke only in designated areas.
- Following Project construction, areas of disturbed land no longer required for operations would be reclaimed to promote the reestablishment of vegetation and wildlife habitat.
- Any areas containing eligible and unevaluated cultural sites would be avoided, or the potential for impacts mitigated in a manner acceptable to the BLM. EDR employees, contractors, and suppliers would be reminded that all cultural resources are protected and if uncovered shall be left in place and reported to the EDR representative and/or their supervisor.
- The wellheads would each be painted a color that blends with the surrounding landscape to minimize visibility.

3.2 Fire Prevention and Control

Fire Contingency Plan

1. Any small fires which occur around the well pad during drilling and/or testing operations should be able to be controlled by rig personnel utilizing on-site firefighting equipment
2. The BLM Cedar City Field Office (435.865.3000) would be notified of any wildland fire, even if the available personnel can handle the situation or the fire poses no threat to the surrounding area. Additionally, the Color Country Interagency Fire Center (435.865.4611).
3. A roster of emergency phone numbers would be available on-site so that the appropriate firefighting agency can be contacted in case of a fire.
4. All vehicles travelling off road shall carry at a minimum a conventional fire extinguisher.
5. Adequate firefighting equipment (a shovel, a Pulaski or other trenching tool, standard fire extinguisher(s), and at least a 100-gallon water tank with pump) shall be kept readily available at each active drill site.
6. Vehicle catalytic converters (on vehicles that would enter and leave the drill site on a regular basis) shall be inspected often and cleaned of all flammable debris.
7. All cutting/welding torch use, electric-arc welding, and grinding operations shall be conducted in an area free, or mostly free, from vegetation. At least a 100-gallon water tank with pump and shovel shall be on hand to extinguish any fires created from sparks. A welding tent would be used, as appropriate. At least one person in addition to the cutter/welder/grinder shall be at the work site to promptly detect fires created by sparks.
8. Personnel would be responsible for being aware of and complying with the requirements of any fire restrictions or closures issued by the BLM Cedar City Field Office, as publicized in the local media or posted at various sites throughout the field office district.

3.3 Surface and Ground Water Protection

Exclusive of short- and long-term flow testing wherein fluids would be discharged to the reserve pit, geothermal fluids would not be discharged to the ground under normal operating conditions. Also, each drill pad is graded towards the reserve pit to prevent movement of storm water runoff from the pad. Further, geothermal wells are cased to prevent co-mingling of the geothermal fluids with underground aquifers.

Each drill pad would be prepared to create a level pad for the drill rig and a graded surface for the support equipment. Storm water runoff from undisturbed areas around the constructed drill pads would be directed into ditches surrounding the drill pad and back onto undisturbed ground, consistent with best management practices for storm water. The site would be graded to prevent the movement of storm water from the pad off the constructed site and has been designed for a 100-year storm event. During project activities, the disturbance corridor would be maintained to preserve the natural runoff regime and prevent excessive erosion.

3.4 Wildlife Protection

Erosion control measures after construction would include revegetation and periodic maintenance. Disturbed areas that would not be used after construction would be revegetated with the proper seed mixture and planting procedures prescribed by the BLM. Any topsoil enriched in organic material may be stockpiled on previously disturbed areas and applied to enhance areas to be reclaimed by revegetation.

To prevent undue degradation and removal of habitat, cover and food, existing roads would be used whenever possible and cross-country travel would be restricted to designated construction areas. Speed limits of 25 miles per hour would be observed on all unpaved roads in the Project area in order to minimize dust and avoid collision and incidental death of local wildlife.

Eight-foot exclosure fencing around reserve pits will be utilized to prevent access by persons, wildlife, or livestock. Exclosure fencing would consist of chain-link fence with a mesh overlay or other BLM-approved fencing recommendations. To prevent livestock, wildlife, and persons from becoming entrapped, one side of the reserve pit walls would be sloped at an approximate 30 percent incline.

To prevent a violation of the Migratory Bird Treaty Act and per lease stipulations, EDR would contract a qualified wildlife biologist to conduct a preconstruction survey for nesting migratory birds during the breeding season (March 15 – July 31) and prior to any ground clearing or other surface disturbance. The survey would include the proposed footprint of disturbance and an appropriate-sized buffer area. If disturbance is not completed within the timeframe established as a condition in the Geothermal Drilling Permit for the preconstruction 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 disturbance activities would occur within the survey validity timeframe.

3.5 Cultural Resource Protection

Cultural resource surveys have been conducted. In consultation with BLM and with the Utah State Historic Preservation Office concurrence, any areas which contain cultural resources of significance or whose eligibility for inclusion on the National Register of Historic Places is unevaluated, would be mitigated or "treated" and recorded as appropriate. EDR employees, contractors, and suppliers would be reminded that all cultural resources are protected and if uncovered, the resource shall be left in place, work would cease, and notification would be made to the EDR representative and the appropriate BLM authorized officer, by telephone, with written confirmation to follow, immediately upon such discovery.

3.6 Minimization of Air Pollution

EDR would comply with any air quality requirements prescribed by the UDEQ – Division of Air Quality. EDR would implement the required actions to minimize fugitive dust emissions during the well drilling and construction phases of the Project. Water would be applied to the ground during the construction and utilization of the drill pads and access roads, as necessary to control fugitive dust. A speed limit of 25 miles per hour will be observed on unpaved, or untreated, roads in the Project area to limit fugitive dust.

3.7 Minimization of Noise Pollution

To abate noise pollution, mufflers would be used on all drilling rig engines. The rock mufflers needed to abate noise created by steam during convention geothermal well testing, are not required for EDR's well testing programs. However, during permitted operations where compressed air drilling methods were utilized, rock mufflers could be used to attenuate noise produced from steam venting. These are approximately 30 feet tall and approximately 10 feet in diameter. All operations would be performed in a manner consistent with federal, state, county noise regulations as well as conform with any noise pollution lease stipulations attached to the portion of federal lands on which the operations are occurring.

3.8 Minimization of Hazards to Public Health and Safety

Construction and operation activities would be conducted in a manner to avoid creating any hazards to public health and safety. The Project is located outside of residential areas and would not likely cause hazards to public health and safety. Injury contingency, spill or discharge contingency, and hydrogen sulfide (H_2S) contingency plans are provided below.

3.8.1 Emergency Plans

Injury Contingency Plan

Drilling operators are required by law to safety train workers and to have first aid equipment on-site. EDR supervises the drilling operations to ensure that all safety procedures and best safety practices are in place and adhered to throughout the drilling program. EDR's drilling operations are required to be in compliance with all existing laws pertaining to safety and environmental protection. Safety meetings are held prior to any major operation, such as running casing,

cementing, or unloading the well. Drilling contractors would typically have daily safety meeting with crews and review any issues that could come up during the 12 hours that each crew is at work.

In the event injuries occur in connection with an EDR operation, specific and immediate attention would be given, along with proper transportation to a medical facility.

- Ambulance (911)

- Milford Valley Memorial Hospital
  850 N. Main Street
  Milford, UT 84751

Spill or Discharge Contingency Plan

1) Potential Sources of Accidental Spills or Discharges
   a) Geothermal Fluid
      i) Accidental geothermal fluid spills or discharges are very unlikely because the hole would be cased, and blowout prevention equipment would be utilized. However, accidental discharges or spills could result from any of the following:
         (1) Loss of well control (blowout);
         (2) Pipeline leak or rupture; or
         (3) Leakage from test tank.
   b) Drilling Fluids
      i) Muds are a mixture of water, non-toxic chemicals and solid particles used in the drilling operations to lubricate and cool the bit in the hole, to carry cuttings out of the hole, to maintain the hole condition and to control formation pressure. Drilling muds are prepared and stored in metal tanks at the drilling site. Waste drilling mud and cuttings are discharged into the reserve pit, which is open and is adequately sized to hold the volume necessary for the operation. Accidental discharges of drilling mud are unlikely, but could occur by:
         (1) Overflow of the reserve pit;
         (2) Reserve pit wall seepage or wall failure;
         (3) Discharge from equipment failure on location; or
         (4) Shallow lost circulation channeling to the surface.

   c) Lubricating or Fuel Oils and Petroleum Products
      i) A discharge of this type would probably be very small and from equipment used in the field. To minimize the potential for spills, all petroleum products on-site are labeled, stored, and handled in conformance with applicable federal and state requirements. All materials except diesel fuel are stored in the original shipping containers. Diesel fuel is stored in on-board tanks on the drill rig and replenished from a bulk tank truck using an electric transfer pump and hard lines. Supervisors trained in spill prevention, containment and clean-up are on-site, 24 hours a day. Potential locations for accidental spills are:

(1) Drilling equipment and machinery at and around the drilling location;
(2) Other miscellaneous equipment and machinery at well site and roads;
(3) Storage areas; and
(4) Equipment servicing areas.

d) Construction/Maintenance Debris
   i) Trash shall be contained on-site and hauled to an approved landfill. Burial of trash on-site shall not be permitted.

e) Plan for Cleanup and Abatement
   i) In the event of discharge of formation fluids, drilling fluids or petroleum products, the person responsible for the operation would immediately contact the Drilling Supervisor to advise them of the spill and conduct an investigation. The Drilling Supervisor would in turn call out equipment, regulate field operations, or do other work as applicable for control and cleanup of the spill, as follows:

(1) Action - Small, Containable Spill
If the spill is small (i.e., less than 25 gallons) and easily containable without endangering the watershed, the Drilling Supervisor would direct and supervise complete cleanup and return to normal operations.

(2) Action - Large or Uncontainable Spill
If the spill is larger than 25 gallons, or is not easily contained, endangers, or has entered the watershed, the Drilling Supervisor would proceed to take necessary action to curtail, contain and cleanup the spill, as above, and notify personnel as listed below.

(3) Notification
The Drilling Supervisor would, as quickly as practicable:
(a) Call out contractor(s), as required.
(b) Notify the EDR Project Manager.
(c) Notify the local and state law enforcement agencies if the public safety is threatened.
(d) The EDR Project Manager would notify the following as soon as practical and work closely with them in all phases of the curtailment, containment, and cleanup operations:

Utah Division of Water Rights
1594 West North temple, Suite 220
P.O. Box 146300
Salt Lake City, UT 84114-6300
801.538.7240

UDEQ
DWMRC
P.O. Box 144880
Salt Lake City, UT 84114-4880
801.536.0200
After hours: 801.536.4123

BLM Cedar City Field Office
(within 24 hours of the knowledge of a reportable release) 176 East D.L. Sargent Drive
Cedar City, UT 84721
435.865.3000
National Response Center
800.424.8802

The Drilling Supervisor would also advise local population and affected property owners, if spill affects residents or property.

f) Specific Procedures
   (1) For geothermal fluid spills:
   Contain spillage with dikes if possible and haul to disposal site by vacuum or water trucks or dispose of in a manner acceptable to the Utah Division of Water Rights and BLM.
   (2) For drilling mud:
   Repair reserve pit or contain with dikes. Haul liquid to another reserve pit, available tanks, or approved disposal site.
   (3) For petroleum products:
   Contain spill with available manpower. Use absorbents and dispose of same in approved disposal area. Spills of petroleum products in excess of 25 gallons must be reported to DWMRC as soon as possible, but no later than the end of the first working day of the release at:
   - In-state: 801.536.0200
   - Out-of-state: 888.331.6337

For (1) through (3) above, EDR would have the source of spill repaired at the earliest practical time and continue working crews and equipment on cleanup until all concerned agencies are satisfied.

g) Confirm notification to agencies and regulatory bodies.
Telephone notification shall be confirmed by the EDR Project Manager in writing, within two weeks of telephone notification. Written confirmation would contain:
(1) Reason for the discharge or spillage.
(2) Duration and volume of discharge or spillage.
(3) Steps taken to correct problem.
(4) Steps taken to prevent recurrence of problem.

<u>Hydrogen Sulfide Contingency Plan</u>

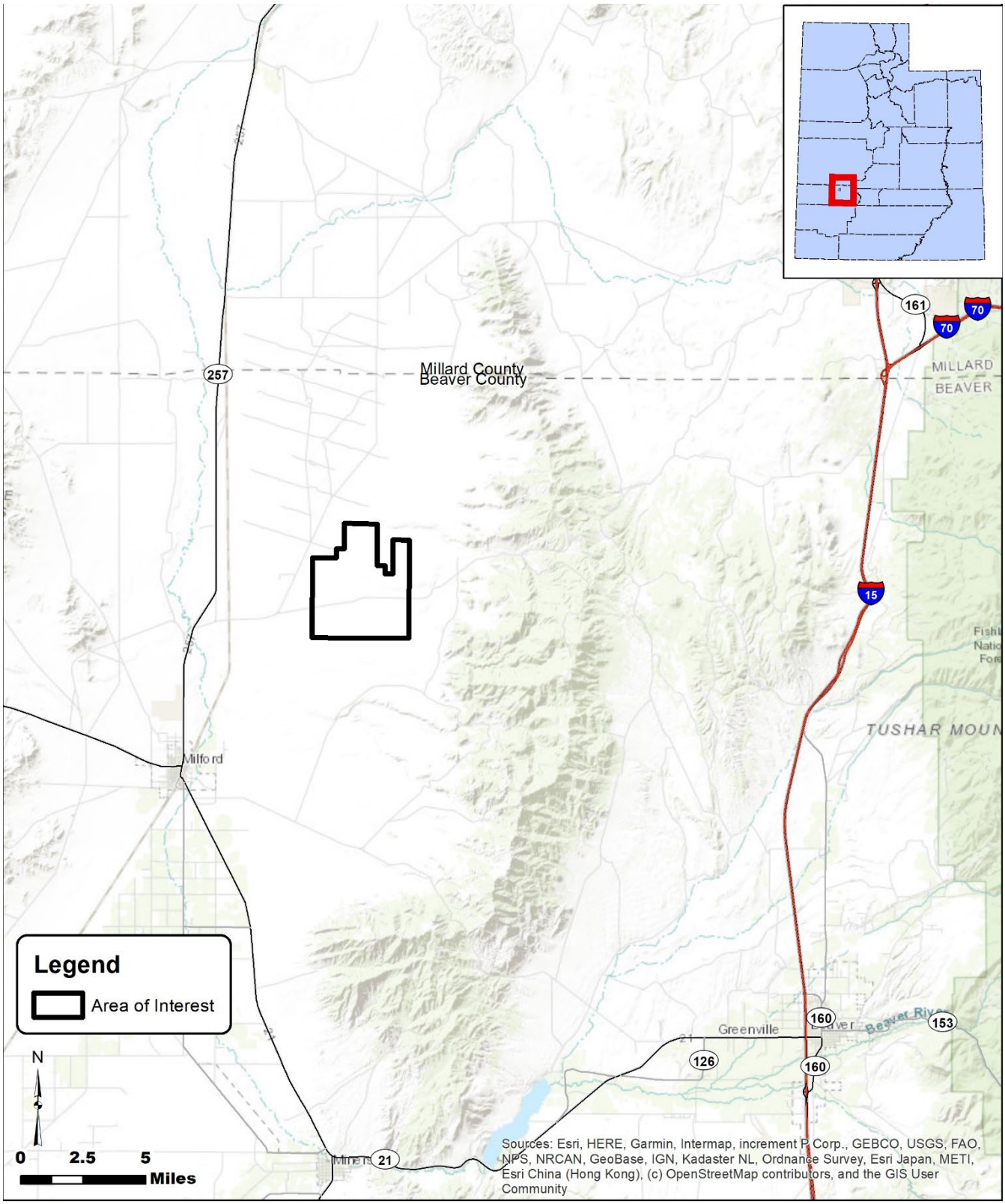
Non-condensable gas (NCG) concentrations within geothermal systems can vary greatly and depend on the temperature, geologic setting, and rock types. The Project is considered a non-magmatic, low-enthalpy type geothermal system so it is reasonable to assume hydrogen sulfide concentrations are low and do not need abatement. During exploration drilling, well control

practices keep the geothermal fluids in the reservoir so there is no exposure pathway. During flow tests, brine is directed to a flash vessel which directs steam and exsolved NCGs, such as H_2S, upwards and well above head level. Additionally, the steps below would be taken to help prevent exposure to H_2S during exploration drilling and testing:

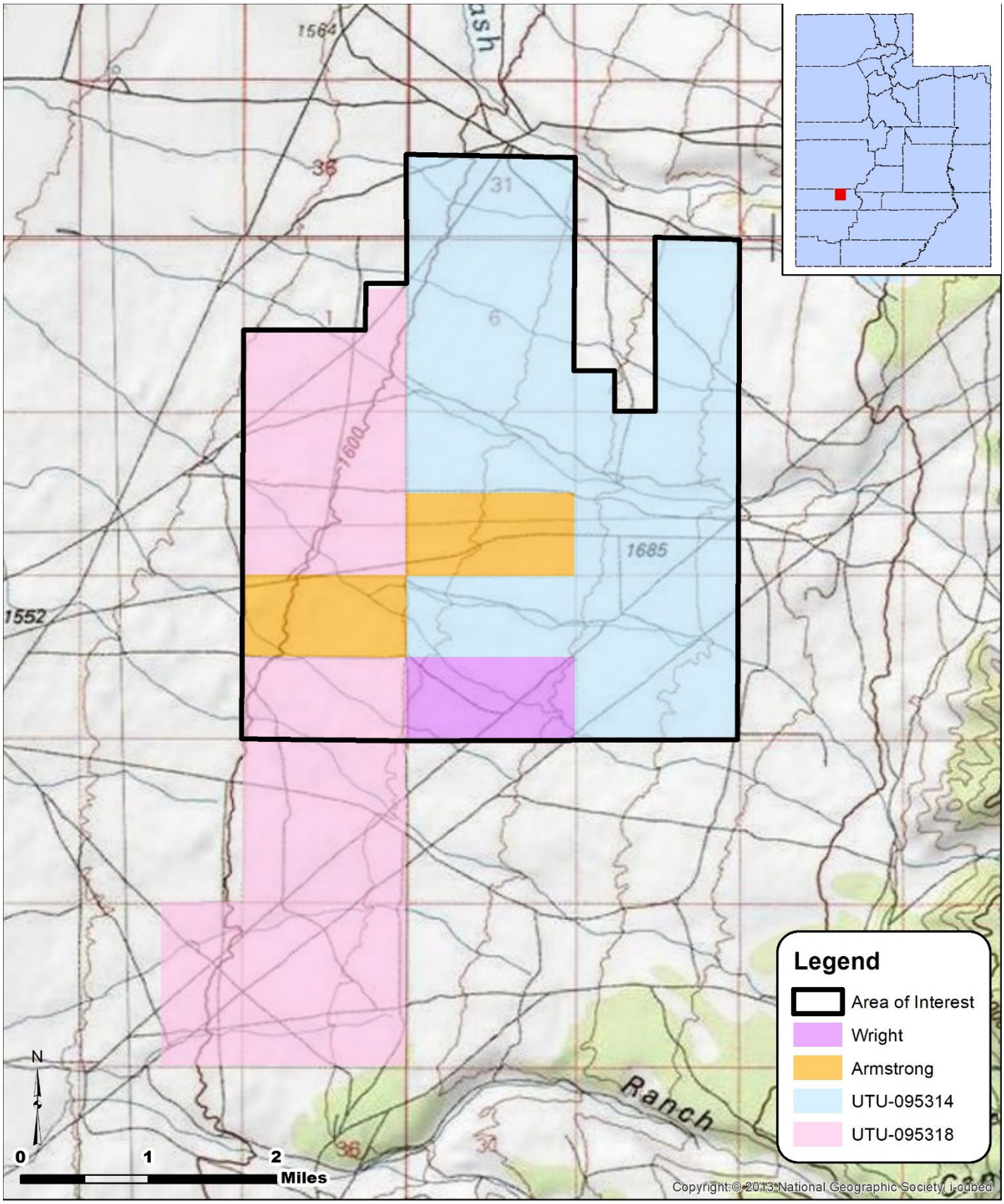
1. Although there is very little chance that drilling in these moderate-temperature geothermal reservoirs would encounter substantial hydrogen sulfide, continuous H_2S monitors would be on the rig floor and at the mud tanks and shaker to alert workers should elevated H_2S levels be detected. Personal H_2S monitors would be required for all on-site drilling personnel. Signs would be posted to inform workers and visitors of any potential issues.
2. Drilling parameters would be continuously monitored, and any changes in gas concentrations, formation pressures, or potential for flow are provided to the driller and supervisor. The blowout prevention equipment would be in place to shut off any unexpected gas flows. In the event any evidence of high gas concentrations are detected in the drilling fluids, the drilling fluids consultant would obtain materials and design a program to safely circulate out the gas bubble and to treat and remove any H_2S using caustic soda, peroxide, soda ash, lime, or other technology as appropriate.

Naturally Occurring Radioactive Materials (NORM)

There is no known source of elevated NORM at the Project, such as young marine shales or potassium-rich granitic bodies. The main rock units in the Project area include granite, gneiss, basalt, diorite, rhyolite, and alluvium. Additionally, exposure to NORM through geothermal scale should not be a consideration since there would be no long-term production through piping during this exploration phase of the Project.

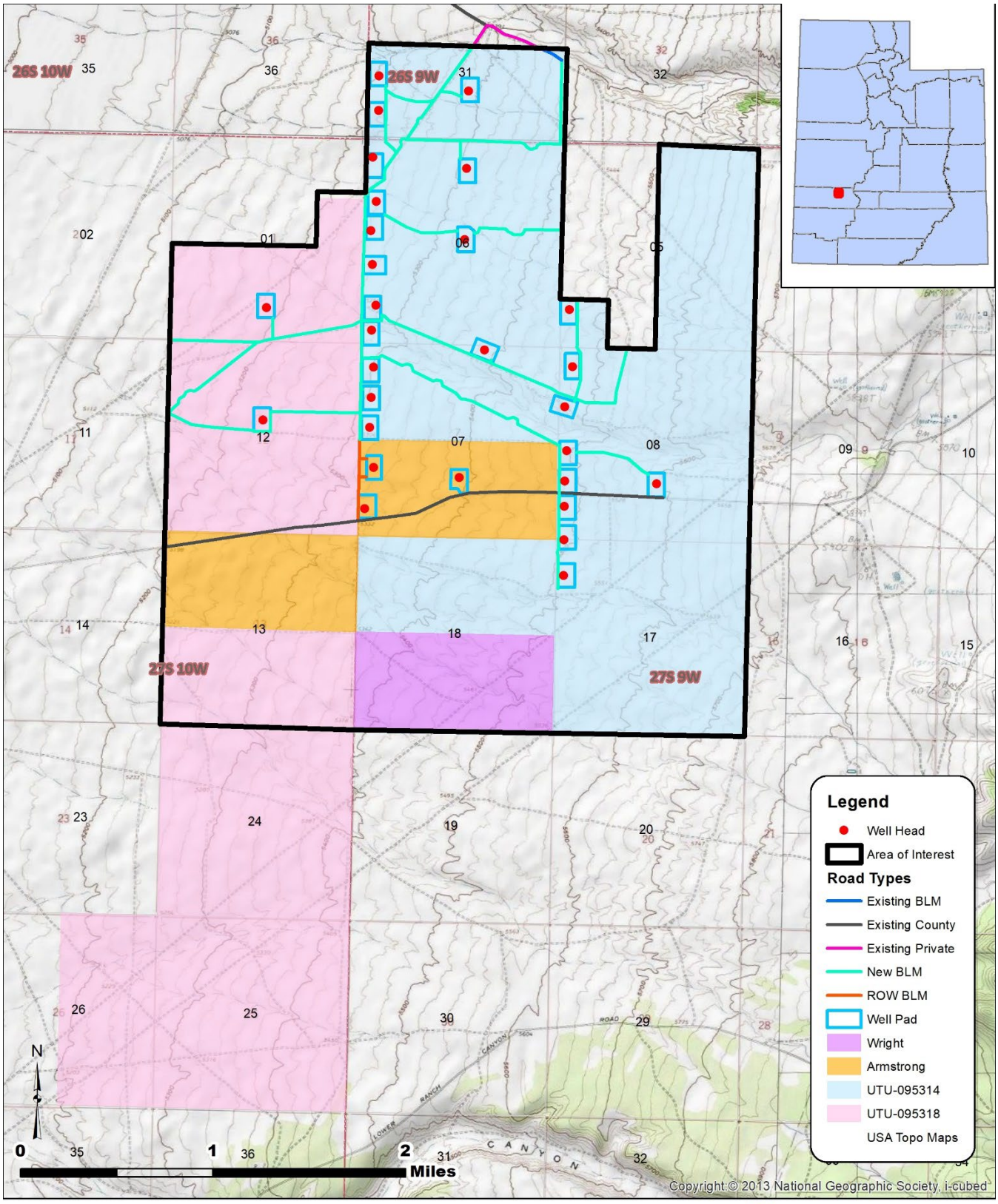


Cape Modern Geothermal Exploration Project
Beaver County, Utah
Figure 1: Project Vicinity Map

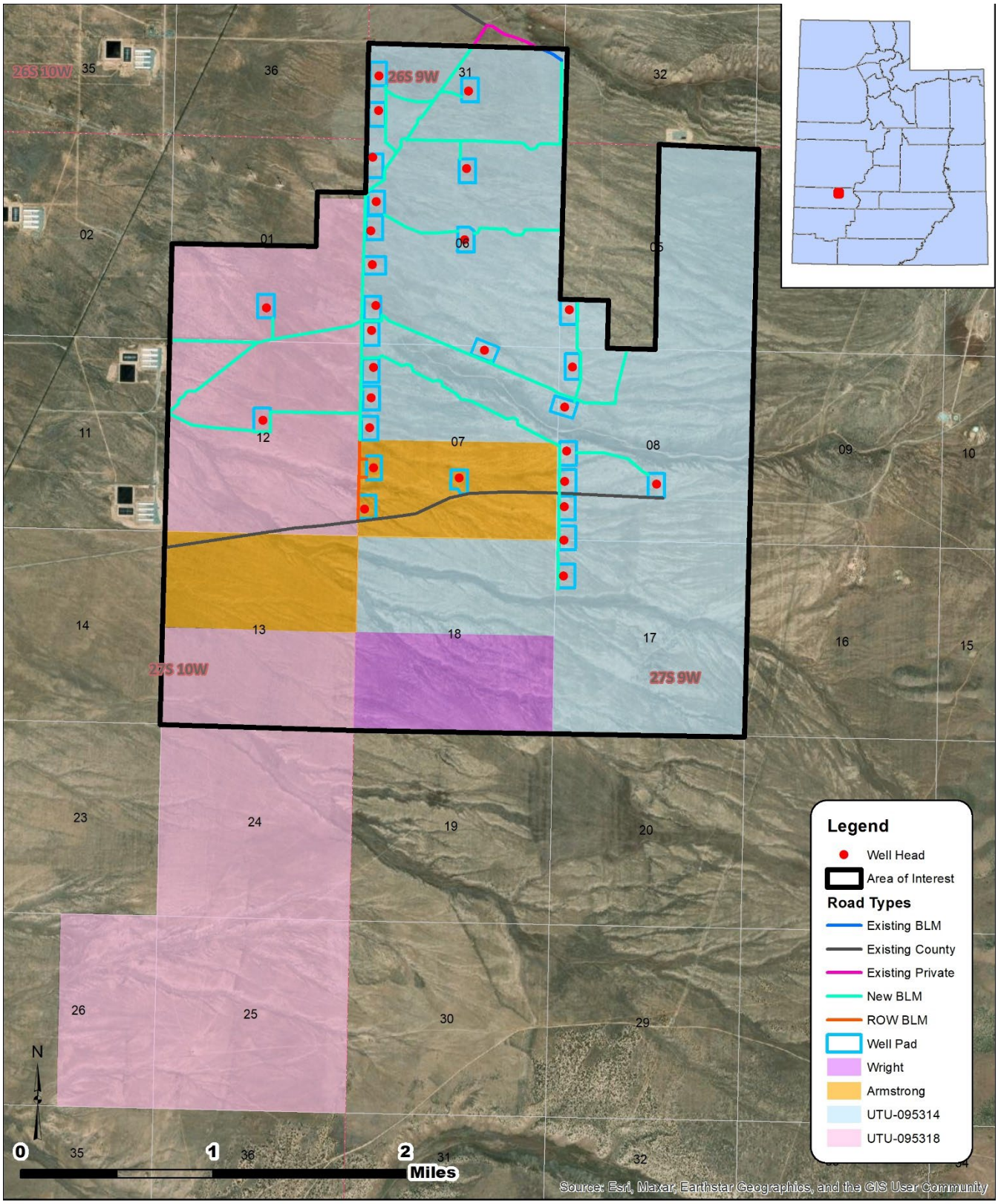


Cape Modern Geothermal Exploration Project
Beaver County, Utah
Figure 2: Federal Geothermal Lease Map

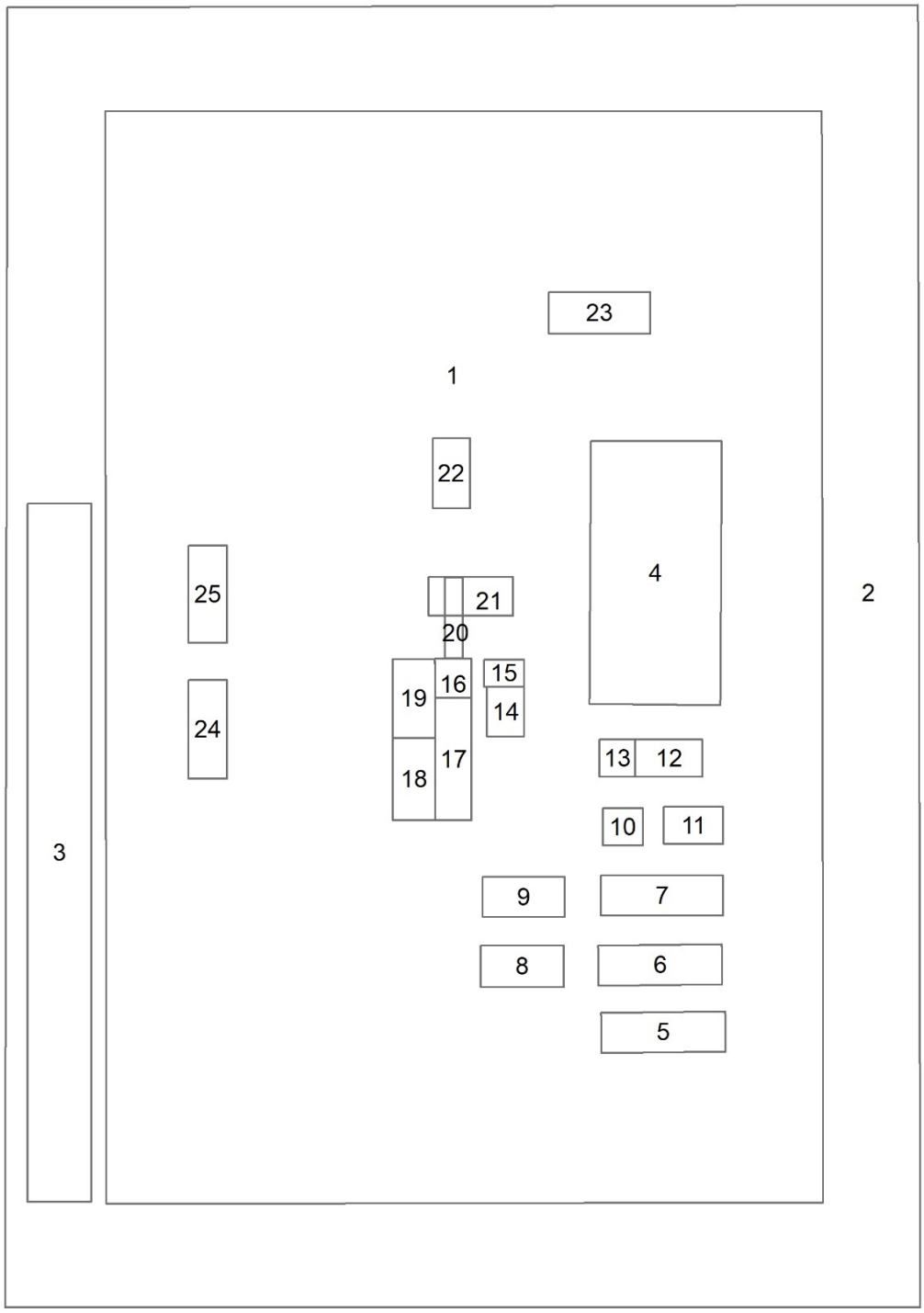
FERVO ENERGY



Cape Modern Geothermal Exploration Project
Beaver County, Utah
Figure 3: Proposed Action Map (Topographic)



Cape Modern Geothermal Exploration Project
Beaver County, Utah
Figure 4: Proposed Action Map (Aerial)



1. Pad	6. Air Compressor	11. Generator	16. Rig Floor	21. Pipe Rack
2. Outer Pad	7. Mud Tank	12. Change House	17. Draw Works	22. Electric Logger
3. Topsoil Stockpile	8. Fuel Tank	13. Accumulator	18. Storage	23. Mud Logger
4. Reserve Pit	9. Water Tank	14. Mud Pit	19. Dog House	24. Trailer House
5. Air Compressor	10. Mud Storage	15. Shale Shaker	20. Catwalk	25. Trailer Office

Cape Modern Geothermal Exploration Project
Beaver County, Utah
Figure 5: Well Pad Layout and Design

1.Supplemental Design BMPs, such as fencing for livestock

A Landowner's Guide to Fences and Wildlife

Practical Tips to Make Your Fences Wildlife Friendly

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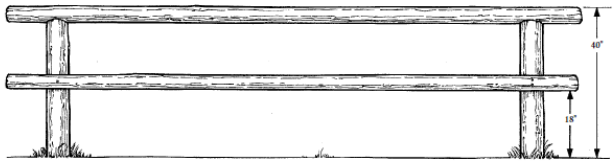
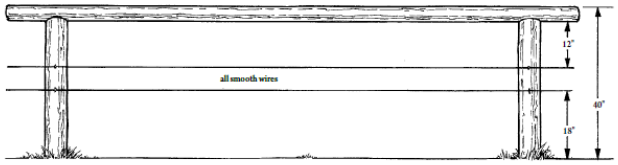
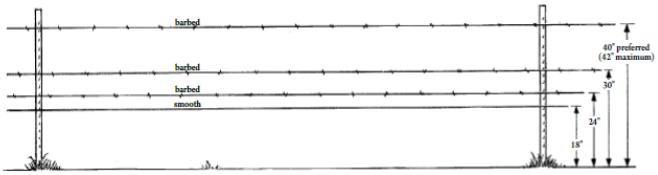
POST AND RAIL FENCE



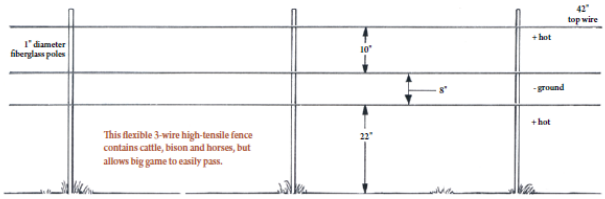
POST AND WIRE FENCE



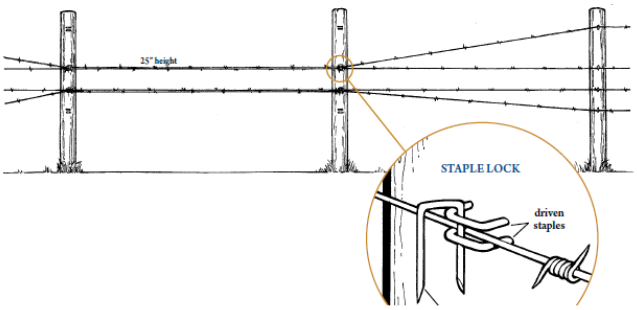
4-STRAND BARBED WIRE WITH BOTTOM SMOOTH WIRE



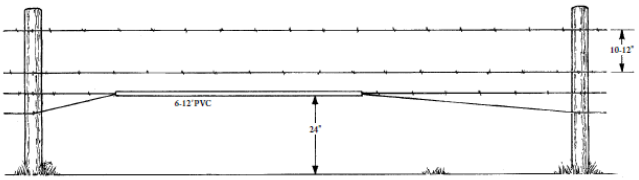
3-WIRE HIGH-TENSILE ELECTRIC FENCE



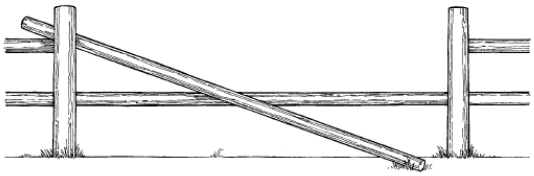
ADJUSTABLE FENCE FOR SEASONAL WILDLIFE PASSAGE



PRONGHORN UNDERPASS FENCE WITH GOAT BAR



DROPPED RAIL FOR WILDLIFE JUMP



Wyoming Wildlife – The Foundation
www.whfw.org

USDA NRCS
United States Department of Agriculture
Natural Resources Conservation Service
www.nrcs.usda.gov

Wyoming Land Trust
wyominglandtrust.org

Wyoming Wild Sheep Foundation
www.wyomingwildsheep.org

National Parks Conservation Association
www.npca.org

Jackson Hole Wildlife Foundation
www.jhwildlife.org

Teton County Wyoming
www.tetonwyo.org

Wyoming Game & Fish Department
wgfd.wyo.gov

Teton Conservation District
Est. 1946
www.tetonconservation.org

Forest Service – Department of Agriculture
Bridger-Teton National Forest
www.fs.usda.gov/btnf

This guide was made possible with the support of these partners, dedicated to conserving Wyoming's land, wildlife and agricultural heritage.

Appendix A to Operations Plan:

Federal Geothermal Lease Stipulations

UTU-95314
UTU-95318

STIPULATIONS

HQ-ESA: THREATENED AND ENDANGERED SPECIES ACT

The lease area may now or hereafter contain plants, animals or their habitats determined to be threatened, endangered, or other special status species. BLM may recommend modifications to exploration and development proposals to further its conservation and management objective to avoid BLM-approved activity that would contribute to a need to list such species or their habitat. BLM may require modifications to or disapprove proposed activity that is likely to result in jeopardy to the continued existence of a proposed or listed threatened or endangered species or result in the destruction or adverse modification of a designated or proposed critical habitat. BLM will not approve any ground-disturbing activity until it completes its obligations under applicable requirements of the Endangered Species Act as amended, 16 U.S.C. 1531 et seq. including completion of any required procedure for conference or consultation.

HQ-CRP: CULTURAL RESOURCE PROTECTION

This lease may be found to contain historic properties and/or resources protected under the National Historic Preservation Act (NHPA), American Indian Religious Freedom Act, Native American Graves Protection and Repatriation Act, E.O. 13007, or other statutes and executive orders. The BLM will not approve any ground disturbing activities that may affect any such properties or resources until it completes its obligations under applicable requirements of the NHPA and other authorities. The BLM may require modification to exploration or development proposals to protect such properties, or disapprove any activity that is likely to result in adverse effects that cannot be successfully avoided, minimized or mitigated.

UT-GEO-S-01: NO SURFACE OCCUPANCY – NATIONAL REGISTER OF HISTORIC PLACES, CULTURAL RESOURCES (SITES, STRUCTURES, OBJECTS, AND TRADITIONAL USE AREAS)

In accordance with the No Surface Occupancy Lease Stipulations in Section 2.3.2 of the December 2008 Bureau of Land Management Record of Decision for the Geothermal Leasing Environmental Impact Statement and the suggested mitigating measures, No Surface Occupancy within the boundary of properties designated or eligible for the National Register of Historic Places, including National Landmarks and National Register Districts and Sites, and additional lands outside the designated boundaries to the extent necessary to protect values where the setting and integrity is critical to their designation or eligibility.

Exception: The Authorized Officer may grant an exception if an environmental review determines that the action, as proposed or otherwise restricted, does not affect the resource and/or the resource the resource is no longer National Register quality. An exception may also be granted if the proponent, BLM, and other affected interests negotiate mitigation that would satisfactorily offset the anticipated negative impacts. An exception may be granted for actions designed to enhance the long-term utility or availability of the cultural resources.

Modification: The Authorized Officer may modify the size and shape of the restricted area if an environmental analysis indicates the actual suitability of the land for the resource differs from that in the otherwise applicable restriction.

STIPULATIONS (Cont.)

UT-GEO-S-04: CONTROLLED SURFACE USE – RIPIARIAN HABITAT BUFFER

Controlled Surface Use (CSU) will be applied within 500 feet of riparian-wetland vegetation to protect the values and functions of these areas. An engineering plan or a study may be required by the operator that identifies the extent of the resource or how the resource will be managed or protected. To protect the values and functions of riparian and wetland areas based on the nature, extent, and value of the area potentially affected.

Exception: The Authorized Officer may grant an exception if an environmental review determines that the action, as proposed or otherwise restricted, does not affect the resource. An exception may also be granted if the proponent, BLM, and other affected interests negotiate mitigation that would satisfactorily offset the anticipated negative impacts. An exception may be granted for actions designed to enhance the long-term utility or availability of the riparian habitat.

Modification: The Authorized Officer may modify the size and shape of the restricted area if an environmental analysis indicates the actual suitability of the land for the resource differs from that in the otherwise applicable restriction.

Waiver: The restriction may be waived if it is determined that the described lands do not contain the subject resource, or are incapable of serving the requirements of the resource and therefore no longer warrant consideration as a component necessary for protection of the resource.

UT-GEO-S-08: NO SURFACE OCCUPANCY– WATER BODIES, WETLANDS, AND/OR 100-YEAR FLOODPLAINS

No Surface Occupancy (NSO) on water bodies, wetlands and/or 100-year floodplains.

Exception: The Authorized Officer may grant an exception if an environmental review determines that the action, as proposed or otherwise restricted, does not affect the resource. An exception may also be granted if the proponent, BLM, and other affected interests negotiate mitigation that would satisfactorily offset the anticipated negative impacts. An exception may be granted for actions designed to enhance the long-term utility or availability of the water bodies, wetlands, and/or 100-year floodplains resource.

Modification: The Authorized Officer may modify the size and shape of the restricted area if an environmental analysis indicates the actual suitability of the land for the resource differs from that in the otherwise applicable restriction.

Waiver: The restriction may be waived if it is determined that the described lands do not contain the subject resource, or are incapable of serving the requirements of the resource and therefore no longer warrant consideration as a component necessary for protection of the resource.

NOTICES

UT-GEO-LN-03: PALEONTOLOGICAL AND CULTURAL RESOURCES

Before any specific permits are issued under leases, treatment of cultural resources will follow the procedures established by the Advisory Council on Historic Preservation for compliance with Section 106 of the National Historic Preservation Act. A pedestrian inventory will be undertaken of all portions that have not been previously surveyed or are identified by BLM as requiring inventory to identify properties that are eligible for the National Register of Historic Places (NRHP). Those sites not already evaluated for NRHP eligibility will be evaluated based on surface remains, subsurface testing, archival, and/or ethnographic sources. Subsurface testing will be kept to a minimum whenever possible if sufficient information is available to evaluate the site or if avoidance is an expected mitigation outcome. Recommendations regarding the eligibility of sites will be submitted to the BLM, and a treatment plan will be prepared to detail methods for avoidance of impacts or mitigation of effects. The BLM will make determinations of eligibility and effect and consult with SHPO as necessary based on each proposed lease application and project plans. The BLM may require modification to exploration or development proposals to protect such properties, or disapprove any activity that is likely to result in adverse effects that cannot be successfully avoided, minimized or mitigated. Avoidance of impacts through project design will be given priority over data recovery as the preferred mitigation measure. Avoidance measures include moving project elements away from site locations or to areas of previous impacts, restricting travel to existing roads, and maintaining barriers and signs in areas of cultural sensitivity. Any data recovery will be preceded by approval of a detailed research design, Native American Consultation, and other requirements for BLM issuance of a permit under the Archaeological Resources Protection Act (BLM 2007a).

If cultural resources are present at the site, or if areas with a high potential to contain cultural material have been identified, a cultural resources management plan (CRMP) will be developed. This plan will address mitigation activities to be taken for cultural resources found at the site. Avoidance of the area is always the preferred mitigation option. Other mitigation options include archaeological survey and excavation (as warranted) and monitoring. If an area exhibits a high potential, but no artifacts were observed during an archaeological survey, monitoring by a qualified archaeologist could be required during all excavation and earthmoving in the high-potential area. A report will be prepared documenting these activities. The CRMP also will (1) establish a monitoring program, (2) identify measures to prevent potential looting/vandalism or erosion impacts, and (3) address the education of workers and the public to make them aware of the consequences of unauthorized collection of artifacts and destruction of property on public land (BLM 2005).

Operators will determine whether paleontological resources exist in a project area on the basis of the sedimentary context of the area, a records search for past paleontological finds in the area, and/or, depending on the extent of existing information, a paleontological survey.

NOTICES (Cont.)

UT-GEO-LN-09: WATER RESOURCES (Cont.)

Operators will gain a clear understanding of the local hydrogeology. Areas of groundwater discharge and recharge and their potential relationships with surface water bodies will be identified.

Operators will avoid creating hydrologic conduits between discrete aquifers during foundation excavation and other activities.

Freshwater-bearing and other usable water aquifers will be protected from contamination by assuring all well casing (excluding the liner) is required to be cemented from the casing shoe to the surface.

Periodic testing and monitoring via observation wells will be conducted in a manner to assure maximum protection of water resources from geothermal fluids or alterations in reservoir pressure.

UT-LN-13: PRONGHORN WINTER HABITAT

The lessee/operator is given notice that lands in this lease have been identified as containing crucial pronghorn winter habitat. Surface use or otherwise disruptive activity may be restricted for up to 60 days during pronghorn fawning season, as determined by BLM, including exploration, drilling and other development activities. Modifications may be required in the Surface Use Plan of Operations including seasonal timing restrictions to protect the species and its habitat.

UT-LN-44: RAPTORS

Appropriate seasonal and spatial buffers shall be placed on all known raptor nests in accordance with Utah Field Office Guidelines for Raptor Protection from Human and Land use Disturbances (USFWS 2002) and Best Management Practices for Raptors and their Associated Habitats in Utah (BLM 2006). All construction related activities will not occur within these buffers if pre-construction monitoring indicates the nests are active, unless a site-specific evaluation for active nests is completed prior to construction and if a BLM wildlife biologist, in consultation with USFWS and UDWR, recommends that activities may be permitted within the buffer. The BLM will coordinate with the USFWS and UDWR and have a recommendation within 3-5 days of notification. Any construction activities authorized within a protective (spatial and seasonal) buffer for raptors will require an on-site monitor. Any indication that activities are adversely affecting the raptor and/or its' young the on-site monitor will suspend activities and contact the BLM Authorized Officer immediately. Construction may occur within the buffers of inactive nests. Construction activities may commence once monitoring of the active nest site determines that fledglings have left the nest and are no longer dependent on the nest site. Modifications to the Surface Use Plan of Operations may be required in accordance with section 6 of the lease terms and 43CFR3101.1-2.

NOTICES (Cont.)

UT-LN-53: RIPARIAN AREAS

The lessee/operator is given notice that this lease has been identified as containing riparian areas. No surface use or otherwise disruptive activity allowed within 100 meters of riparian areas unless it can be shown that (1) there is no practicable alternative; (2) that all long-term impacts are fully mitigated; or (3) that the construction is an enhancement to the riparian areas. Modifications to the Surface Use Plan of Operations may be required in accordance with section 6 of the lease terms and 43CFR3101.1-2.

UT-LN-55: WATER AND WATERSHED PROTECTION

The lessee/operator is given notice that this lease may need modifications to the Surface Use Plan of Operations in order to prevent water pollution and protect municipal and non-municipal watershed areas. No surface use or otherwise disruptive activity allowed within 500 feet of live water or the reservoirs located in the Beaver, Milford and Sevier River drainages, Parowan and Cedar Valley drainages, or Pinto Creek/Newcastle Reservoir drainage in order to prevent water quality degradation in accordance with section 6 of the lease terms and 43CFR3101.1-2.

UT-LN-96: AIR QUALITY MITIGATION MEASURES

The lessee is given notice that the Bureau of Land Management (BLM) in coordination with the U.S. Environmental Protection Agency and the Utah Department of Air Quality, among others, has developed the following air quality mitigation measures that may be applied to any development proposed on this lease. Integration of and adherence to these measures may help minimize adverse local or regional air quality impacts from oil and gas development (including but not limited to construction, drilling, and production) on regional ozone formation.

- All internal combustion equipment would be kept in good working order.
- Water or other approved dust suppressants would be used at construction sites and along roads, as determined appropriate by the Authorized Officer.
- Open burning of garbage or refuse would not occur at well sites or other facilities.
- Drill rigs would be equipped with Tier II or better diesel engines.
- Vent emissions from stock tanks and natural gas TEG dehydrators would be controlled by routing the emissions to a flare or similar control device which would reduce emissions by 95% or greater.
- Low bleed or no bleed pneumatics would be installed on separator dump valves and other controllers.
- During completion, flaring would be limited as much as possible. Production equipment and gathering lines would be installed as soon as possible.
- Well site telemetry would be utilized as feasible for production operations.
- Stationary internal combustion engine would comply with the following standards: 2g NOx/bhp-hr for engines <300HP; and 1g NOx/bhp-hr for engines >300HP.

NOTICES (Cont.)

UT-LN-156: POLLINATORS AND POLLINATOR HABITAT

In order to protect pollinators and pollinator habitat, in accordance with BLM policy outlined in Instruction Memorandum No. 2016-013, Managing for Pollinators on Public Lands, and Pollinator-Friendly Best Management Practices for Federal Lands (2015), the following avoidance, minimization, and mitigation measures would apply to this parcel:

1. Give a preference for placing well pads in previously disturbed areas, dry areas that do not support forbs, or areas dominated by nonnative grasses.
2. Utilize existing well pads where feasible.
3. Avoid disturbance to native milkweed patches within Monarch migration routes to protect Monarch butterfly habitat.
4. Avoid disturbance of riparian and meadow sites, as well as small depressed areas that may function as water catchments and host nectar-producing species, to protect Monarch butterfly habitat and nectaring sites.
5. Minimize the use of pesticides that negatively impact pollinators.
6. During revegetation treatments:
   a. Include pollinator-friendly site-appropriate native plant seeds or seedlings in seed mixes.
   b. Where possible, increase the cover and diversity of essential habitat components for native pollinators by:
   a. Use minimum till drills where feasible.
      - Using site-appropriate milkweed seeds or seedlings within Monarch migration routes through priority sage-grouse habitat.
      - Using seed mixes with annual and short-lived perennial native forbs that will bloom the first year and provide forage for pollinators.
      - Using seed mixes with a variety of native forb species to ensure different colored and shaped flowers to provide nectar and pollen throughout the growing season for a variety of pollinators.
      - Seeding forbs in separate rows from grasses to avoid competition during establishment.
      - Avoiding seeding non-native forbs and grasses that establish early and out compete slower-growing natives.

STIPULATIONS

HQ-ESA: THREATENED AND ENDANGERED SPECIES ACT

The lease area may now or hereafter contain plants, animals or their habitats determined to be threatened, endangered, or other special status species. BLM may recommend modifications to exploration and development proposals to further its conservation and management objective to avoid BLM-approved activity that would contribute to a need to list such species or their habitat. BLM may require modifications to or disapprove proposed activity that is likely to result in jeopardy to the continued existence of a proposed or listed threatened or endangered species or result in the destruction or adverse modification of a designated or proposed critical habitat. BLM will not approve any ground-disturbing activity until it completes its obligations under applicable requirements of the Endangered Species Act as amended, 16 U.S.C. 1531 et seq. including completion of any required procedure for conference or consultation.

HQ-CRP: CULTURAL RESOURCE PROTECTION

This lease may be found to contain historic properties and/or resources protected under the National Historic Preservation Act (NHPA), American Indian Religious Freedom Act, Native American Graves Protection and Repatriation Act, E.O. 13007, or other statutes and executive orders. The BLM will not approve any ground disturbing activities that may affect any such properties or resources until it completes its obligations under applicable requirements of the NHPA and other authorities. The BLM may require modification to exploration or development proposals to protect such properties, or disapprove any activity that is likely to result in adverse effects that cannot be successfully avoided, minimized or mitigated.

UT-GEO-S-01: NO SURFACE OCCUPANCY – NATIONAL REGISTER OF HISTORIC PLACES, CULTURAL RESOURCES (SITES, STRUCTURES, OBJECTS, AND TRADITIONAL USE AREAS)

In accordance with the No Surface Occupancy Lease Stipulations in Section 2.3.2 of the December 2008 Bureau of Land Management Record of Decision for the Geothermal Leasing Environmental Impact Statement and the suggested mitigating measures, No Surface Occupancy within the boundary of properties designated or eligible for the National Register of Historic Places, including National Landmarks and National Register Districts and Sites, and additional lands outside the designated boundaries to the extent necessary to protect values where the setting and integrity is critical to their designation or eligibility.

Exception: The Authorized Officer may grant an exception if an environmental review determines that the action, as proposed or otherwise restricted, does not affect the resource and/or the resource the resource is no longer National Register quality. An exception may also be granted if the proponent, BLM, and other affected interests negotiate mitigation that would satisfactorily offset the anticipated negative impacts. An exception may be granted for actions designed to enhance the long-term utility or availability of the cultural resources.

Modification: The Authorized Officer may modify the size and shape of the restricted area if an environmental analysis indicates the actual suitability of the land for the resource differs from that in the otherwise applicable restriction.

NOTICES

UT-GEO-LN-03: PALEONTOLOGICAL AND CULTURAL RESOURCES

Before any specific permits are issued under leases, treatment of cultural resources will follow the procedures established by the Advisory Council on Historic Preservation for compliance with Section 106 of the National Historic Preservation Act. A pedestrian inventory will be undertaken of all portions that have not been previously surveyed or are identified by BLM as requiring inventory to identify properties that are eligible for the National Register of Historic Places (NRHP). Those sites not already evaluated for NRHP eligibility will be evaluated based on surface remains, subsurface testing, archival, and/or ethnographic sources. Subsurface testing will be kept to a minimum whenever possible if sufficient information is available to evaluate the site or if avoidance is an expected mitigation outcome. Recommendations regarding the eligibility of sites will be submitted to the BLM, and a treatment plan will be prepared to detail methods for avoidance of impacts or mitigation of effects. The BLM will make determinations of eligibility and effect and consult with SHPO as necessary based on each proposed lease application and project plans. The BLM may require modification to exploration or development proposals to protect such properties, or disapprove any activity that is likely to result in adverse effects that cannot be successfully avoided, minimized or mitigated. Avoidance of impacts through project design will be given priority over data recovery as the preferred mitigation measure. Avoidance measures include moving project elements away from site locations or to areas of previous impacts, restricting travel to existing roads, and maintaining barriers and signs in areas of cultural sensitivity. Any data recovery will be preceded by approval of a detailed research design, Native American Consultation, and other requirements for BLM issuance of a permit under the Archaeological Resources Protection Act (BLM 2007a).

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Operators will determine whether paleontological resources exist in a project area on the basis of the sedimentary context of the area, a records search for past paleontological finds in the area, and/or, depending on the extent of existing information, a paleontological survey.

NOTICES (Cont.)

UT-GEO-LN-09: WATER RESOURCES (Cont.)

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Operators will avoid creating hydrologic conduits between discrete aquifers during foundation excavation and other activities.

Freshwater-bearing and other usable water aquifers will be protected from contamination by assuring all well casing (excluding the liner) is required to be cemented from the casing shoe to the surface.

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UT-LN-44: RAPTORS

Appropriate seasonal and spatial buffers shall be placed on all known raptor nests in accordance with Utah Field Office Guidelines for Raptor Protection from Human and Land use Disturbances (USFWS 2002) and Best Management Practices for Raptors and their Associated Habitats in Utah (BLM 2006). All construction related activities will not occur within these buffers if pre-construction monitoring indicates the nests are active, unless a site-specific evaluation for active nests is completed prior to construction and if a BLM wildlife biologist, in consultation with USFWS and UDWR, recommends that activities may be permitted within the buffer. The BLM will coordinate with the USFWS and UDWR and have a recommendation within 3-5 days of notification. Any construction activities authorized within a protective (spatial and seasonal) buffer for raptors will require an on-site monitor. Any indication that activities are adversely affecting the raptor and/or its' young the on-site monitor will suspend activities and contact the BLM Authorized Officer immediately. Construction may occur within the buffers of inactive nests. Construction activities may commence once monitoring of the active nest site determines that fledglings have left the nest and are no longer dependent on the nest site. Modifications to the Surface Use Plan of Operations may be required in accordance with section 6 of the lease terms and 43CFR3101.1-2.

NOTICES (Cont.)

UT-LN-71: PALEONTOLOGICAL

The lessee/operator is given notice that this lease has been identified as containing paleontological resources. Surveys will be required whenever surface disturbances and/or occupancy is proposed in association with fluid mineral exploration and development within geological strata that may contain important paleontological resources. Field surveys will be conducted as determined by the authorized officer of the Bureau of Land Management. Exploration, drilling and other development activities may be restricted based on the result of the field survey; the authorized officer will determine appropriate mitigations. Modifications to the Surface Use Plan of Operations may be required in accordance with section 6 of the lease terms and 43CFR3101.1-2.

UT-LN-96: AIR QUALITY MITIGATION MEASURES

The lessee is given notice that the Bureau of Land Management (BLM) in coordination with the U.S. Environmental Protection Agency and the Utah Department of Air Quality, among others, has developed the following air quality mitigation measures that may be applied to any development proposed on this lease. Integration of and adherence to these measures may help minimize adverse local or regional air quality impacts from oil and gas development (including but not limited to construction, drilling, and production) on regional ozone formation.

- All internal combustion equipment would be kept in good working order.
- Water or other approved dust suppressants would be used at construction sites and along roads, as determined appropriate by the Authorized Officer.
- Open burning of garbage or refuse would not occur at well sites or other facilities.
- Drill rigs would be equipped with Tier II or better diesel engines.
- Vent emissions from stock tanks and natural gas TEG dehydrators would be controlled by routing the emissions to a flare or similar control device which would reduce emissions by 95% or greater.
- Low bleed or no bleed pneumatics would be installed on separator dump valves and other controllers.
- During completion, flaring would be limited as much as possible. Production equipment and gathering lines would be installed as soon as possible.
- Well site telemetry would be utilized as feasible for production operations.
- Stationary internal combustion engine would comply with the following standards: 2g NOx/bhp-hr for engines <300HP; and 1g NOx/bhp-hr for engines >300HP.

Additional site-specific measures may also be employed to avoid or minimize effects to local or regional air quality. These additional measures will be developed and implemented in coordination with the U.S. Environmental Protection Agency, the Utah Department of Air Quality, and other agencies with expertise or jurisdiction as appropriate based on the size of the project and magnitude of emissions.

NOTICES (Cont.)

UT-LN-156: POLLINATORS AND POLLINATOR HABITAT (Cont.)

4. Avoid disturbance of riparian and meadow sites, as well as small depressed areas that may function as water catchments and host nectar-producing species, to protect Monarch butterfly habitat and nectaring sites.
5. Minimize the use of pesticides that negatively impact pollinators.
6. During revegetation treatments:
   a. Include pollinator-friendly site-appropriate native plant seeds or seedlings in seed mixes.
   b. Where possible, increase the cover and diversity of essential habitat components for native pollinators by:
   a. Use minimum till drills where feasible.
      - Using site-appropriate milkweed seeds or seedlings within Monarch migration routes through priority sage-grouse habitat.
      - Using seed mixes with annual and short-lived perennial native forbs that will bloom the first year and provide forage for pollinators.
      - Using seed mixes with a variety of native forb species to ensure different colored and shaped flowers to provide nectar and pollen throughout the growing season for a variety of pollinators.
      - Seeding forbs in separate rows from grasses to avoid competition during establishment.
      - Avoiding seeding non-native forbs and grasses that establish early and out compete slower-growing natives.

APPENDIX B

Bureau of Land Management
Interdisciplinary Team Checklist

INTERDISCIPLINARY TEAM NEPA CHECKLIST

Project Title: FERVO Energy, Cape Modern Geothermal Exploration Plan
NEPA Log Number: DOI-BLM-UT-C010-2023-0004-EA
File/Serial Number: UTU-95314, 95318
Project Leader: Ed Ginouves

DETERMINATION OF STAFF: ***(Choose one of the following abbreviated options for the left column)***

NP = not present in the area impacted by the proposed or alternative actions
NI = present, but not affected to a degree that detailed analysis is required
PI = present with potential for relevant impact that need to be analyzed in detail in the EA. **The NEPA Handbook states that issues need to be analyzed in detail if: 1) Analysis of the issue is necessary to make a reasoned choice between alternatives; 2) The issue is significant...or where analysis is necessary to determine the significance of impacts.**

RESOURCES AND ISSUES CONSIDERED:

Determi-nation	Resource	Rationale for Determination	Signature	Date
NI	Air Quality	The exploration project would only create short-term and temporary dust or small of amounts of equipment emissions which would be well within state air quality standards.	E. Ginouves	7/11/2022
NP	Areas of Critical Environmental Concern	There are no ACECs within the field office.	D. Jacobson	7/19/2022
PI	Cultural Resources	A Class III cultural survey was completed. Eligible contributing concentrations of cultural resources will be avoided entirely. This will be accomplished by access route and/or pad re-location and the utilization of fencing and/or construction site monitors in situations where construction will be immediately adjacent to eligible sites. For areas where an existing road traverses a contributing concentration, all vehicle traffic will remain within the confines of the existing access road. Concurrence from SHPO regarding eligibility determinations, avoidance measures, and the management of eligible cultural resource sites was received on November 9, 2022.	R. Plank	12/16/2022
NI	Environmental Justice	There are no minority or economically challenged populations in the project area which would be disproportionately affected by the exploration project.	E. Ginouves	7/11/2022
NP	Farmlands (Prime or Unique)	There are no prime or unique farmlands within the area	D. Fletcher	07/11/22
NI	Floodplains	Several intermittent/ephemeral drainages are within the project area. The floodplains should not be affected by the proposed action if mitigation measures identified in the soils section are followed.	D. Fletcher	07/11/22
NI	Fuels/Fire Management	There would be no impact to fuels or fire management as a result of the proposed action. Precautions should be taken to prevent any fire ignition with construction activities or vehicles.	J. Cox	7/20/22
PI/NI	Geology / Mineral Resources/Energy Production	The only minerals-related authorizations presently encumbering the project lands are the applicant's valid geothermal leases. (NI) The known mineral resources of the project lands are geothermal resources and common varieties of mineral	E. Ginouves	7/11/22

Determi-nation	Resource	Rationale for Determination	Signature	Date
		materials. The goal of the proposal is to assess the commercial viability of the leased geothermal resources. Should this effort disclose that the resource is commercially viable, it would likely lead to the completion of some or all the exploration wells into production and injection wells and the connection of these wells via pipelines to a geothermal powerplant. (NI) The exploration plan identifies aggregate needs of up to 139,000 cyds for the surfacing of the well pads and access roads, if all of the sites and roads were actually constructed and surfaced. If this aggregate was recovered on lease or off-lease through a new federal authorization, it would necessarily involve additional disturbed acreage not identified in the operations plan. Alternatively, the aggregate could be acquired from existing suppliers and transported to the project area. (NI if off-site supply utilized; PI if specific on-site source is utilized)		
NI	Greenhouse Gas Emissions	Some greenhouse gasses will be emitted from machinery during construction. This action may lead to a successful geothermal project, which may reduce the proportion of energy that is generated from fossil fuels.	D. Fletcher	07/11/22
PI/NI	Invasive Species/Noxious Weeds	The BLM coordinates with County and local governments to conduct an active program for control of invasive species. NI – if project vehicles are power-washed prior to arrival in the project area to guard against the introduction of noxious weed species. If noxious weeds (e.g., scotch thistle) are discovered these areas will need to be avoided to limit the spread of noxious weeds.	D. Fletcher	07/11/22
NI	Lands/Access	The proposed project would not interfere with prior existing rights-of-way in the project area. ROWs include UTU-83067, UTU-0-33540F, UTU-48017, and UTU-94130 (powerlines, and UTU-94133 (road). One well is directly adjacent to the FORGE strain meter testing wells project currently pending in CCFO. Coordination with the FORGE would be recommended to avoid resource conflicts, post authorization. Access to the project area would be by using the Beaver County Class B roads adjacent and intersecting the area. The "Geothermal Plant Road" intersects the project area, and "Salt Cove Road" would provide northern access. These roads are maintained as public use roads and restricting of public access on these roads would warrant additional approval.	B.Cox	7/22/22
NP	Lands with Wilderness Characteristics	The project is not within an area that was identified as having wilderness characteristics in the 2011 and updated 2014 inventory.	D. Jacobson	7/19/2022
NI	Livestock Grazing	The project will occur within the Hanson and Milford Bench Allotment. The livestock grazing season of use within the project area is from November 1st – May 15th. A three allotment (Hanson, Milford Bench and Whitaker) grazing management system has been identified to limit critical growing period use to two out of three years within each allotment. If the project occurs outside the season of use, there would be no impacts to livestock grazing. If project is implemented during the season of use, livestock may be disturbed by construction equipment.	D. Fletcher	07/11/22

Determi-nation	Resource	Rationale for Determination	Signature	Date
		Range Improvement Projects including fences, water pipelines and cattle guards that would be impacted would be replaced or restored. It is expected that livestock fences could be cut to allow ingress/egress of construction equipment; fence reconstruction would be required immediately following the completion of the project. In addition, any disturbed areas within the project area would be reclaimed utilizing a BLM approved seed mix.		
	Native American Religious Concerns	Tribal consultation for this project is being conducted on a government-to-government basis by the BLM. Notification letters were sent to Native American tribal groups on October 4, 2022. Letters were sent to the following Native American tribal groups: Hopi Tribe Kaibab Band of Paiute Indians Moapa Band of Paiute Indians Paiute Indian Tribe of Utah San Jan Southern Paiute Tribe Ute Indian Tribe Ute Mountain Ute Tribe Pueblo of Zuni Navajo Nation A response from the Paiute Indian Tribe of Utah was received on October 18, 2022 with no objections to the project. Consultation with the remaining tribal groups is on-going.	R. Plank	12/16/2022
NP	National Historic Trails	The proposed project is not near any designated national historic trails.	D. Jacobson	7/19/2022
NI	Paleontology	The surficial geology of the project area is Quaternary-age alluvium composed of decomposed Tertiary-age igneous and Precambrian-aged metamorphic rocks eroded from the western slopes of the Mineral Mountains. Using the Bureau's Potential Fossil Yield Classification System, the geologic units have a very low potential to have recognizable fossil remains. The probability for impacting fossils is negligible and no assessment or mitigation for paleontological resources is necessary.	E. Ginouves	7/11/22
NI/PI	Rangeland Health Standards	Design Features including the following would limit the impact to the Rangeland Health Standards Any disturbed areas within the project area would be reclaimed utilizing a BLM approved seed mix. Parameters for limiting public access following completion of the project along the survey lines would reduce the number of new roads within the area.	D. Fletcher	07/11/22
NI	Recreation	The proposed project is in an area that dispersed recreation occurs such as hunting, vehicular exploration and wildlife viewing. The proposed project may disrupt these activities for a short period time though not to a degree that those opportunities would be lost completely.	D. Jacobson	7/19/2022
NI	Socio-Economics	The exploration effort will result in minor and transitory positive impacts to the local economy, primarily through increasing demand for fuel and services to support the drilling	E. Ginouves	7/11/22

Determi-nation	Resource	Rationale for Determination	Signature	Date
		effort. It is likely that some or all of the gravel needs for the project will be satisfied by purchasing materials from Martin Marietta's Milford Quarry.		
PI	Soils	266 acres of soil disturbance will likely result from the proposed action. The disturbance corridor will be maintained to preserve the natural runoff regime and prevent excessive erosion. Erosion mitigation measures may include drainage bars, check dams and berms. Disturbed areas that are no longer being used will be reclaimed immediately	D. Fletcher	07/11/22
NP	Special Status Plants	No BLM Special Status plants occur within the proposed project area. The IPaC report from the U.S. Fish & Wildlife Service shows potential Ute Ladies Tresses habitat within the area. However, the proposed area does not have any of the habitat criteria that is associated with the species that includes wet meadows, stream banks, abandoned oxbow meanders, marshes, and raised bogs.	M. Bayles	7/20/22
PI	Vegetation	It is expected that the project may lead to the development of new roads within the area. Reclaimed roads would need to be blocked so public does not access and create new roads. It would be required that any disturbed areas within the project area would be reclaimed utilizing a BLM approved seed mix.	D. Fletcher	07/11/22
NI	Visual Resources	The proposed project is within in VRM class IV and will meet the objectives of that VRM class.	D. Jacobson	7/19/2022
NI	Wastes (hazardous or solid)	There are no known waste issues in the proposed area. The Project Operation Plan addresses hazardous materials in that any release of reportable quantities will follow state and federal regulation should a release occur. In such a case, notifications will be made to the appropriate agencies. In addition to the notifications, regulation will require mitigation to follow. Use of construction equipment introduces a threat only if an unforeseen incident or malfunction occurs with the equipment. However, this threat is unlikely due to the probability and minimal quantities of product utilized.	T. Carlson	7/19/22
NI	Water Resources/Quality (drinking/surface/ground)	Any impacts to utilizing water rights through the project would be analyzed in the analysis of the geothermal well.	D. Fletcher	07/11/22
NP	Wetlands/Riparian Zones	There are no wetland/riparian zones within the project area.	D. Fletcher	07/11/22
NP	Wild and Scenic Rivers	There are no Wild and Scenic River segments within the field office.	D. Jacobson	7/19/2022
NP	Wilderness/WSA	There are no wilderness areas or wilderness study areas in the project area.	D. Jacobson	7/19/2022
NP	Wild Horses	The proposed project is not within or adjacent to any wild horse Herd Areas (HA) or Herd Management Areas (HMA).	C. Hunter	7/20/22
PI	Wildlife & Fish	Project area is within year-long pronghorn habitat. Migration corridors should be analyzed, and design features/cumulative impacts should address measures to avoid/minimize any short and long-term negative impacts for big game (pronghorn, mule deer, and bighorn sheep) as per Secretarial Order 3362.	D. Schaible	8/2/22
PI/NI	Wildlife - Greater Sage-Grouse	Project is not within PHMA but is within opportunity habitat identified by UDWR SGMA. Further coordination with	D. Schaible	8/2/22

Determi-nation	Resource	Rationale for Determination	Signature	Date
		UDWR within this area should take place and design features identified.		
PI/NI	Wildlife – Migratory Birds	Plan project activities outside of migratory bird nesting season (January 1 – August 31) to the greatest extent possible. If this is not possible, then avoid any habitat alteration, removal, or destruction during the primary nesting season for migratory birds (March 15 - July 31). If project activities must occur during primary nesting season for migratory birds, then nesting surveys would be required by a qualified biologist and surveys would not occur more than 72 hours prior to when work begins on the project site. Any active nests found would be given appropriate spatial buffers and seasonal timing restrictions. At least a 100-foot buffer for nests would be applied for passerine species and 0.25 - 1.00 mi buffer for raptors depending on species. Spatial buffers and seasonal timing restrictions for active raptor nests would follow the Utah Office Guidelines for Raptor Protection from Human and Land Use Disturbances (Romin and Muck, 2002). Additional conservation measures and migratory bird stipulations would be required (see attached).	D. Christensen	7/21/2022
PI	Wildlife-Special Status (not TEC)	Special status species that may inhabit the project area include but are not limited to bald eagle, big free-tailed bat, burrowing owl, dark kangaroo mouse, ferruginous hawk, fringed myotis, golden eagle, lewis woodpecker, long-billed curlew, kit fox, short-eared owl, townsends big-eared bat, and western red bat. Cumulative impacts may be substantial for kit fox due to limited movement corridors and perpetual surface disturbance within the Milford Valley area which would require additional analysis.	D. Schaible	8/2/22
NI	Wildlife T&E and Candidate	There is no designated critical habitat for threatened and endangered species within or reasonably near the proposed project area. The monarch butterfly is a candidate species that has the potential to utilize the proposed project area. The monarch butterfly currently receives no statutory protection under the Endangered Species Act. However, the USFWS recommends the BLM to take advantage of any opportunity to conserve the species by following the Western Monarch Butterfly Conservation Recommendations including, but not limited to documenting, mapping, and protecting milkweed (primarily *Asclepias spp*.) for breeding monarch butterflies.	D. Christensen	7/21/2022
NP	Woodland / Forestry	Woodland/Forestry resources are not present in the area impacted by the proposed actions	C. Peterson	07/11/2022

FINAL REVIEW:

Reviewer Title	eSignature & Date	Comments
Environmental Coordinator	HAYDEN HOUSTON Digitally signed by HAYDEN HOUSTON Date: 2023.02.09 16:25:30 -07'00'	
Field Manager	Paul N. Briggs Digitally signed by Paul N. Briggs Date: 2023.02.09 16:32:23 -07'00'	

APPENDIX C

Design Features and Lease Stipulations

Cape Modern Geothermal Exploration Project
Design Features

Air, Soil, Vegetation

- Where feasible, multiple wells would be drilled on a single pad to reduce surface disturbance impacts.
- All surface disturbing activities would progress incrementally, with well pads, ancillary facilities, and access roads constructed individually or in groups of two or three, rather than all well pads and access roads constructed at one time. Well sites, and associated access roads, deemed by the operator to be commercially non-viable would be reclaimed as the project progresses to reduce the cumulative acreage of surface disturbance at any given time.
- An established local aggregate producer would be utilized to limit additional surface disturbance.
- A speed limit of 25 miles per hour would be observed on unpaved roads in the project area to limit fugitive dust.
- Water would be applied to the ground during construction as necessary to control fugitive dust.
- Topsoil would be stripped (typically to the rooting depth) and salvaged during the construction of all pads, as feasible. Salvaged topsoil (and cleared organic material, stumps, brush, and slash, if saved) would be stockpiled on the pads for use during subsequent reclamation of the disturbed areas.
- Soil stockpiles that are to be stored for more than 6 months would be stabilized with vegetative cover.
- Following construction, any disturbed areas within the project area no longer required for operations would be reclaimed utilizing a BLM-approved seed mix.
- Parameters for limiting public access following completion of the project along the survey lines would reduce the number of new roads within the area. Common parameters include berming and blocking off access roads when not in use and texturing reclaimed areas to discourage driving and prevent additional use of area from the general public.
- Disturbed areas within ROWs would be stabilized by reestablishing vegetative cover, using a BLM-approved seed mix, to reduce soil erosion.
- All vehicles, earth-moving construction equipment, mobile trailers and RV campers would be power-washed prior to arriving in the project area to limit the potential for the introduction of invasive species / noxious weeds.
- If noxious weeds are discovered, these areas would be avoided to limit the spread of noxious weeds. The proponent would be responsible for noxious weed treatment (using certified chemicals) necessary in the disturbed portions of the project area and for reporting to the BLM's noxious weed coordinator.

Water Resources

- Implement Erosion and Sediment Control Measures “drainage bars, check dams and berms.”

- Any impacts to utilizing water rights through the project would be analyzed in the analysis of the geothermal well.

- The project site would be graded to prevent the movement of storm water from well pad construction areas off site and would be designed for a 100-year storm event.

- Each drill pad would be graded towards the reserve pit to prevent movement of stormwater runoff from the pad.

- Stormwater runoff from undisturbed areas around the constructed drill pads would be directed into ditches surrounding the drill pad and back onto undisturbed ground, consistent with best management practices for stormwater.

- Disturbed areas that are no longer being used would be reclaimed as soon as possible to limit stormwater runoff.

- Geothermal wells would be cased to prevent co-mingling of the geothermal fluids with underground aquifers. Well casing would meet all requirements outlined in Geothermal Resources Operational Order No. 2 (DOI Geological Survey Conservation Division 1975), or Onshore Oil and Gas order No. 2 (BLM 1988), with consent and approval from the BLM and UDWRi.

- With the exception of fluids discharged to the reserve pit during flow testing, no geothermal fluids would be discharged to the ground.

Wildlife / Livestock

- Eight-foot exclosure fencing around reserve pits would be utilized to prevent access by persons, wildlife, or livestock. Exclosure fencing would consist of chain-link fence with a mesh overlay or other BLM-approved fencing recommendations.

- To prevent livestock, wildlife, and persons from becoming entrapped, one side of the reserve pit walls would be sloped at an approximate 30 percent incline.

- Where fencing is necessary, EDR would use fencing consistent with the UDWR-recommended specifications for wildlife, including a smooth bottom wire to be compatible with big game species (Autenrieth et al. 2006).

- Equipment would be inspected prior to operation to ensure no wildlife are located in or near the equipment.

- If big game species enter the work area during construction, work would stop until the big game species have exited the work area.

- EDR will cooperate directly with UDWR to contribute funds to a pronghorn water improvement project (ex. big game guzzlers) within the Milford Valley area to mitigate for potential impacts to pronghorn using a 4:1 mitigation to disturbance ratio. The improvement project will be analyzed under a separate NEPA review.

- If any rangeland improvement projects are impacted, they would be repaired as soon as possible and/or reconstructed following the completion of the project.
- Any disturbed areas within the project area that are not associated with viable wells would be reclaimed utilizing a BLM-approved seed mix.
- Dust control measures would be employed to reduce impacts on wildlife / livestock forage during construction.
- A speed limit of 25 miles per hour would be observed on unpaved roads in the project area to avoid collisions with wildlife / livestock.
- Existing roads would be utilized, where possible, to limit surface disturbance from constructing new roads.
- No off-road travel or ground disturbing activity would be allowed from May 1 through June 30 within identified crucial pronghorn fawning habitat.
- A presence-absence survey(s) as per the Fillmore Field Office protocol would be conducted to minimize impacts to kit fox. No disturbance would occur within 0.25-mile of an occupied kit fox burrow, and disturbance in occupied kit fox habitat would be avoided from February 1 through July 30 to protect breeding pairs, natal dens, neonates, and dispersing individuals.

Migratory Birds

- Project activities would be conducted outside of migratory bird nesting season (January 1 – August 31) to the greatest extent possible, if not possible then avoid any habitat alteration, removal, or destruction during the primary nesting season for migratory birds (March 15 - July 31). When not possible, nesting surveys would be conducted by a qualified biologist to ensure no active nests are impacted. Any active nests found would be given appropriate spatial buffers and seasonal timing restrictions. Non-raptor species would be given a minimum of a 100-foot buffer.
- Migratory bird nest surveys would be completed 72 hours prior to any disturbance activities.
- If active nests are identified, biological monitors would continue to monitor active nests until it has been determined by the BLM-authorized officer that the nest is no longer active and buffers could be lifted.
- Nests with eggs or young cannot be moved until young are no longer dependent on the nest. Confirmation that all young have fledged would be made by a qualified biologist.
- The BLM would be contacted prior to any maintenance activities within the primary nesting season, with the possible exception of emergency maintenance.
- Any raptor nest found in proximity to an area targeted for disturbance would be protected and managed according to Utah Field Office Guidelines for Raptor Protection from Human and Land Use Disturbances (Romin and Muck 2002). Raptor nests would be protected through incorporation of spatial and seasonal buffers.

- Appropriate steps to prevent migratory birds from establishing nests in the potential impact area may be taken including covering equipment that may be stationary and could provide a nesting structure for a bird, and covering or excluding birds from any supplies (i.e. pipes) where birds may nest.

Cultural

- A Class III Cultural Resource Survey was conducted. In consultation with BLM and with SHPO concurrence, any areas containing eligible and unevaluated cultural sites would be avoided, or the potential for impacts mitigated in a manner acceptable to the BLM. EDR employees, contractors, and suppliers would be reminded that all cultural resources are protected and if uncovered shall be left in place and reported to the EDR representative and/or their supervisor.
- In situations where construction would be immediately adjacent to eligible sites, fencing and/or construction site monitors would be utilized to ensure complete avoidance of eligible contributing concentrations of cultural resources.
- For areas where an existing road traverses a contributing concentration, all vehicle traffic would remain within the confines of the existing access road.

General

- Removal of trash, junk, waste, and other materials not in current use.
- All construction and operating equipment would be equipped with applicable exhaust spark arresters.
- Fire extinguishers would be available on the active sites.
- Water that is used for construction and dust control would be available for firefighting.
- Personnel would be allowed to smoke only in designated areas.
- Wellheads would each be painted a color that blends with the surrounding landscape to minimize visibility.

STIPULATIONS

HQ-ESA: THREATENED AND ENDANGERED SPECIES ACT

The lease area may now or hereafter contain plants, animals or their habitats determined to be threatened, endangered, or other special status species. BLM may recommend modifications to exploration and development proposals to further its conservation and management objective to avoid BLM-approved activity that would contribute to a need to list such species or their habitat. BLM may require modifications to or disapprove proposed activity that is likely to result in jeopardy to the continued existence of a proposed or listed threatened or endangered species or result in the destruction or adverse modification of a designated or proposed critical habitat. BLM will not approve any ground-disturbing activity until it completes its obligations under applicable requirements of the Endangered Species Act as amended, 16 U.S.C. 1531 et seq. including completion of any required procedure for conference or consultation.

HQ-CRP: CULTURAL RESOURCE PROTECTION

This lease may be found to contain historic properties and/or resources protected under the National Historic Preservation Act (NHPA), American Indian Religious Freedom Act, Native American Graves Protection and Repatriation Act, E.O. 13007, or other statutes and executive orders. The BLM will not approve any ground disturbing activities that may affect any such properties or resources until it completes its obligations under applicable requirements of the NHPA and other authorities. The BLM may require modification to exploration or development proposals to protect such properties, or disapprove any activity that is likely to result in adverse effects that cannot be successfully avoided, minimized or mitigated.

UT-GEO-S-01: NO SURFACE OCCUPANCY – NATIONAL REGISTER OF HISTORIC PLACES, CULTURAL RESOURCES (SITES, STRUCTURES, OBJECTS, AND TRADITIONAL USE AREAS)

In accordance with the No Surface Occupancy Lease Stipulations in Section 2.3.2 of the December 2008 Bureau of Land Management Record of Decision for the Geothermal Leasing Environmental Impact Statement and the suggested mitigating measures, No Surface Occupancy within the boundary of properties designated or eligible for the National Register of Historic Places, including National Landmarks and National Register Districts and Sites, and additional lands outside the designated boundaries to the extent necessary to protect values where the setting and integrity is critical to their designation or eligibility.

Exception: The Authorized Officer may grant an exception if an environmental review determines that the action, as proposed or otherwise restricted, does not affect the resource and/or the resource the resource is no longer National Register quality. An exception may also be granted if the proponent, BLM, and other affected interests negotiate mitigation that would satisfactorily offset the anticipated negative impacts. An exception may be granted for actions designed to enhance the long-term utility or availability of the cultural resources.

Modification: The Authorized Officer may modify the size and shape of the restricted area if an environmental analysis indicates the actual suitability of the land for the resource differs from that in the otherwise applicable restriction.

STIPULATIONS (Cont.)

UT-GEO-S-04: CONTROLLED SURFACE USE – RIPIARIAN HABITAT BUFFER

Controlled Surface Use (CSU) will be applied within 500 feet of riparian-wetland vegetation to protect the values and functions of these areas. An engineering plan or a study may be required by the operator that identifies the extent of the resource or how the resource will be managed or protected. To protect the values and functions of riparian and wetland areas based on the nature, extent, and value of the area potentially affected.

Exception: The Authorized Officer may grant an exception if an environmental review determines that the action, as proposed or otherwise restricted, does not affect the resource. An exception may also be granted if the proponent, BLM, and other affected interests negotiate mitigation that would satisfactorily offset the anticipated negative impacts. An exception may be granted for actions designed to enhance the long-term utility or availability of the riparian habitat.

Modification: The Authorized Officer may modify the size and shape of the restricted area if an environmental analysis indicates the actual suitability of the land for the resource differs from that in the otherwise applicable restriction.

Waiver: The restriction may be waived if it is determined that the described lands do not contain the subject resource, or are incapable of serving the requirements of the resource and therefore no longer warrant consideration as a component necessary for protection of the resource.

UT-GEO-S-08: NO SURFACE OCCUPANCY– WATER BODIES, WETLANDS, AND/OR 100-YEAR FLOODPLAINS

No Surface Occupancy (NSO) on water bodies, wetlands and/or 100-year floodplains.

Exception: The Authorized Officer may grant an exception if an environmental review determines that the action, as proposed or otherwise restricted, does not affect the resource. An exception may also be granted if the proponent, BLM, and other affected interests negotiate mitigation that would satisfactorily offset the anticipated negative impacts. An exception may be granted for actions designed to enhance the long-term utility or availability of the water bodies, wetlands, and/or 100-year floodplains resource.

Modification: The Authorized Officer may modify the size and shape of the restricted area if an environmental analysis indicates the actual suitability of the land for the resource differs from that in the otherwise applicable restriction.

Waiver: The restriction may be waived if it is determined that the described lands do not contain the subject resource, or are incapable of serving the requirements of the resource and therefore no longer warrant consideration as a component necessary for protection of the resource.

NOTICES

UT-GEO-LN-03: PALEONTOLOGICAL AND CULTURAL RESOURCES

Before any specific permits are issued under leases, treatment of cultural resources will follow the procedures established by the Advisory Council on Historic Preservation for compliance with Section 106 of the National Historic Preservation Act. A pedestrian inventory will be undertaken of all portions that have not been previously surveyed or are identified by BLM as requiring inventory to identify properties that are eligible for the National Register of Historic Places (NRHP). Those sites not already evaluated for NRHP eligibility will be evaluated based on surface remains, subsurface testing, archival, and/or ethnographic sources. Subsurface testing will be kept to a minimum whenever possible if sufficient information is available to evaluate the site or if avoidance is an expected mitigation outcome. Recommendations regarding the eligibility of sites will be submitted to the BLM, and a treatment plan will be prepared to detail methods for avoidance of impacts or mitigation of effects. The BLM will make determinations of eligibility and effect and consult with SHPO as necessary based on each proposed lease application and project plans. The BLM may require modification to exploration or development proposals to protect such properties, or disapprove any activity that is likely to result in adverse effects that cannot be successfully avoided, minimized or mitigated. Avoidance of impacts through project design will be given priority over data recovery as the preferred mitigation measure. Avoidance measures include moving project elements away from site locations or to areas of previous impacts, restricting travel to existing roads, and maintaining barriers and signs in areas of cultural sensitivity. Any data recovery will be preceded by approval of a detailed research design, Native American Consultation, and other requirements for BLM issuance of a permit under the Archaeological Resources Protection Act (BLM 2007a).

If cultural resources are present at the site, or if areas with a high potential to contain cultural material have been identified, a cultural resources management plan (CRMP) will be developed. This plan will address mitigation activities to be taken for cultural resources found at the site. Avoidance of the area is always the preferred mitigation option. Other mitigation options include archaeological survey and excavation (as warranted) and monitoring. If an area exhibits a high potential, but no artifacts were observed during an archaeological survey, monitoring by a qualified archaeologist could be required during all excavation and earthmoving in the high-potential area. A report will be prepared documenting these activities. The CRMP also will (1) establish a monitoring program, (2) identify measures to prevent potential looting/vandalism or erosion impacts, and (3) address the education of workers and the public to make them aware of the consequences of unauthorized collection of artifacts and destruction of property on public land (BLM 2005).

Operators will determine whether paleontological resources exist in a project area on the basis of the sedimentary context of the area, a records search for past paleontological finds in the area, and/or, depending on the extent of existing information, a paleontological survey.

NOTICES (Cont.)

UT-GEO-LN-09: WATER RESOURCES (Cont.)

Operators will gain a clear understanding of the local hydrogeology. Areas of groundwater discharge and recharge and their potential relationships with surface water bodies will be identified.

Operators will avoid creating hydrologic conduits between discrete aquifers during foundation excavation and other activities.

Freshwater-bearing and other usable water aquifers will be protected from contamination by assuring all well casing (excluding the liner) is required to be cemented from the casing shoe to the surface.

Periodic testing and monitoring via observation wells will be conducted in a manner to assure maximum protection of water resources from geothermal fluids or alterations in reservoir pressure.

UT-LN-13: PRONGHORN WINTER HABITAT

The lessee/operator is given notice that lands in this lease have been identified as containing crucial pronghorn winter habitat. Surface use or otherwise disruptive activity may be restricted for up to 60 days during pronghorn fawning season, as determined by BLM, including exploration, drilling and other development activities. Modifications may be required in the Surface Use Plan of Operations including seasonal timing restrictions to protect the species and its habitat.

UT-LN-44: RAPTORS

Appropriate seasonal and spatial buffers shall be placed on all known raptor nests in accordance with Utah Field Office Guidelines for Raptor Protection from Human and Land use Disturbances (USFWS 2002) and Best Management Practices for Raptors and their Associated Habitats in Utah (BLM 2006). All construction related activities will not occur within these buffers if pre-construction monitoring indicates the nests are active, unless a site-specific evaluation for active nests is completed prior to construction and if a BLM wildlife biologist, in consultation with USFWS and UDWR, recommends that activities may be permitted within the buffer. The BLM will coordinate with the USFWS and UDWR and have a recommendation within 3-5 days of notification. Any construction activities authorized within a protective (spatial and seasonal) buffer for raptors will require an on-site monitor. Any indication that activities are adversely affecting the raptor and/or its' young the on-site monitor will suspend activities and contact the BLM Authorized Officer immediately. Construction may occur within the buffers of inactive nests. Construction activities may commence once monitoring of the active nest site determines that fledglings have left the nest and are no longer dependent on the nest site. Modifications to the Surface Use Plan of Operations may be required in accordance with section 6 of the lease terms and 43CFR3101.1-2.

NOTICES (Cont.)

UT-LN-53: RIPARIAN AREAS

The lessee/operator is given notice that this lease has been identified as containing riparian areas. No surface use or otherwise disruptive activity allowed within 100 meters of riparian areas unless it can be shown that (1) there is no practicable alternative; (2) that all long-term impacts are fully mitigated; or (3) that the construction is an enhancement to the riparian areas. Modifications to the Surface Use Plan of Operations may be required in accordance with section 6 of the lease terms and 43CFR3101.1-2.

UT-LN-55: WATER AND WATERSHED PROTECTION

The lessee/operator is given notice that this lease may need modifications to the Surface Use Plan of Operations in order to prevent water pollution and protect municipal and non-municipal watershed areas. No surface use or otherwise disruptive activity allowed within 500 feet of live water or the reservoirs located in the Beaver, Milford and Sevier River drainages, Parowan and Cedar Valley drainages, or Pinto Creek/Newcastle Reservoir drainage in order to prevent water quality degradation in accordance with section 6 of the lease terms and 43CFR3101.1-2.

UT-LN-96: AIR QUALITY MITIGATION MEASURES

The lessee is given notice that the Bureau of Land Management (BLM) in coordination with the U.S. Environmental Protection Agency and the Utah Department of Air Quality, among others, has developed the following air quality mitigation measures that may be applied to any development proposed on this lease. Integration of and adherence to these measures may help minimize adverse local or regional air quality impacts from oil and gas development (including but not limited to construction, drilling, and production) on regional ozone formation.

- All internal combustion equipment would be kept in good working order.
- Water or other approved dust suppressants would be used at construction sites and along roads, as determined appropriate by the Authorized Officer.
- Open burning of garbage or refuse would not occur at well sites or other facilities.
- Drill rigs would be equipped with Tier II or better diesel engines.
- Vent emissions from stock tanks and natural gas TEG dehydrators would be controlled by routing the emissions to a flare or similar control device which would reduce emissions by 95% or greater.
- Low bleed or no bleed pneumatics would be installed on separator dump valves and other controllers.
- During completion, flaring would be limited as much as possible. Production equipment and gathering lines would be installed as soon as possible.
- Well site telemetry would be utilized as feasible for production operations.
- Stationary internal combustion engine would comply with the following standards: 2g NOx/bhp-hr for engines <300HP; and 1g NOx/bhp-hr for engines >300HP.

NOTICES (Cont.)

UT-LN-156: POLLINATORS AND POLLINATOR HABITAT

In order to protect pollinators and pollinator habitat, in accordance with BLM policy outlined in Instruction Memorandum No. 2016-013, Managing for Pollinators on Public Lands, and Pollinator-Friendly Best Management Practices for Federal Lands (2015), the following avoidance, minimization, and mitigation measures would apply to this parcel:

1. Give a preference for placing well pads in previously disturbed areas, dry areas that do not support forbs, or areas dominated by nonnative grasses.
2. Utilize existing well pads where feasible.
3. Avoid disturbance to native milkweed patches within Monarch migration routes to protect Monarch butterfly habitat.
4. Avoid disturbance of riparian and meadow sites, as well as small depressed areas that may function as water catchments and host nectar-producing species, to protect Monarch butterfly habitat and nectaring sites.
5. Minimize the use of pesticides that negatively impact pollinators.
6. During revegetation treatments:
   a. Include pollinator-friendly site-appropriate native plant seeds or seedlings in seed mixes.
   b. Where possible, increase the cover and diversity of essential habitat components for native pollinators by:
   a. Use minimum till drills where feasible.
      - Using site-appropriate milkweed seeds or seedlings within Monarch migration routes through priority sage-grouse habitat.
      - Using seed mixes with annual and short-lived perennial native forbs that will bloom the first year and provide forage for pollinators.
      - Using seed mixes with a variety of native forb species to ensure different colored and shaped flowers to provide nectar and pollen throughout the growing season for a variety of pollinators.
      - Seeding forbs in separate rows from grasses to avoid competition during establishment.
      - Avoiding seeding non-native forbs and grasses that establish early and out compete slower-growing natives.

STIPULATIONS

HQ-ESA: THREATENED AND ENDANGERED SPECIES ACT

The lease area may now or hereafter contain plants, animals or their habitats determined to be threatened, endangered, or other special status species. BLM may recommend modifications to exploration and development proposals to further its conservation and management objective to avoid BLM-approved activity that would contribute to a need to list such species or their habitat. BLM may require modifications to or disapprove proposed activity that is likely to result in jeopardy to the continued existence of a proposed or listed threatened or endangered species or result in the destruction or adverse modification of a designated or proposed critical habitat. BLM will not approve any ground-disturbing activity until it completes its obligations under applicable requirements of the Endangered Species Act as amended, 16 U.S.C. 1531 et seq. including completion of any required procedure for conference or consultation.

HQ-CRP: CULTURAL RESOURCE PROTECTION

This lease may be found to contain historic properties and/or resources protected under the National Historic Preservation Act (NHPA), American Indian Religious Freedom Act, Native American Graves Protection and Repatriation Act, E.O. 13007, or other statutes and executive orders. The BLM will not approve any ground disturbing activities that may affect any such properties or resources until it completes its obligations under applicable requirements of the NHPA and other authorities. The BLM may require modification to exploration or development proposals to protect such properties, or disapprove any activity that is likely to result in adverse effects that cannot be successfully avoided, minimized or mitigated.

UT-GEO-S-01: NO SURFACE OCCUPANCY – NATIONAL REGISTER OF HISTORIC PLACES, CULTURAL RESOURCES (SITES, STRUCTURES, OBJECTS, AND TRADITIONAL USE AREAS)

In accordance with the No Surface Occupancy Lease Stipulations in Section 2.3.2 of the December 2008 Bureau of Land Management Record of Decision for the Geothermal Leasing Environmental Impact Statement and the suggested mitigating measures, No Surface Occupancy within the boundary of properties designated or eligible for the National Register of Historic Places, including National Landmarks and National Register Districts and Sites, and additional lands outside the designated boundaries to the extent necessary to protect values where the setting and integrity is critical to their designation or eligibility.

Exception: The Authorized Officer may grant an exception if an environmental review determines that the action, as proposed or otherwise restricted, does not affect the resource and/or the resource the resource is no longer National Register quality. An exception may also be granted if the proponent, BLM, and other affected interests negotiate mitigation that would satisfactorily offset the anticipated negative impacts. An exception may be granted for actions designed to enhance the long-term utility or availability of the cultural resources.

Modification: The Authorized Officer may modify the size and shape of the restricted area if an environmental analysis indicates the actual suitability of the land for the resource differs from that in the otherwise applicable restriction.

NOTICES

UT-GEO-LN-03: PALEONTOLOGICAL AND CULTURAL RESOURCES

Before any specific permits are issued under leases, treatment of cultural resources will follow the procedures established by the Advisory Council on Historic Preservation for compliance with Section 106 of the National Historic Preservation Act. A pedestrian inventory will be undertaken of all portions that have not been previously surveyed or are identified by BLM as requiring inventory to identify properties that are eligible for the National Register of Historic Places (NRHP). Those sites not already evaluated for NRHP eligibility will be evaluated based on surface remains, subsurface testing, archival, and/or ethnographic sources. Subsurface testing will be kept to a minimum whenever possible if sufficient information is available to evaluate the site or if avoidance is an expected mitigation outcome. Recommendations regarding the eligibility of sites will be submitted to the BLM, and a treatment plan will be prepared to detail methods for avoidance of impacts or mitigation of effects. The BLM will make determinations of eligibility and effect and consult with SHPO as necessary based on each proposed lease application and project plans. The BLM may require modification to exploration or development proposals to protect such properties, or disapprove any activity that is likely to result in adverse effects that cannot be successfully avoided, minimized or mitigated. Avoidance of impacts through project design will be given priority over data recovery as the preferred mitigation measure. Avoidance measures include moving project elements away from site locations or to areas of previous impacts, restricting travel to existing roads, and maintaining barriers and signs in areas of cultural sensitivity. Any data recovery will be preceded by approval of a detailed research design, Native American Consultation, and other requirements for BLM issuance of a permit under the Archaeological Resources Protection Act (BLM 2007a).

If cultural resources are present at the site, or if areas with a high potential to contain cultural material have been identified, a cultural resources management plan (CRMP) will be developed. This plan will address mitigation activities to be taken for cultural resources found at the site. Avoidance of the area is always the preferred mitigation option. Other mitigation options include archaeological survey and excavation (as warranted) and monitoring. If an area exhibits a high potential, but no artifacts were observed during an archaeological survey, monitoring by a qualified archaeologist could be required during all excavation and earthmoving in the high-potential area. A report will be prepared documenting these activities. The CRMP also will (1) establish a monitoring program, (2) identify measures to prevent potential looting/vandalism or erosion impacts, and (3) address the education of workers and the public to make them aware of the consequences of unauthorized collection of artifacts and destruction of property on public land (BLM 2005).

Operators will determine whether paleontological resources exist in a project area on the basis of the sedimentary context of the area, a records search for past paleontological finds in the area, and/or, depending on the extent of existing information, a paleontological survey.

NOTICES (Cont.)

UT-GEO-LN-09: WATER RESOURCES (Cont.)

Operators will gain a clear understanding of the local hydrogeology. Areas of groundwater discharge and recharge and their potential relationships with surface water bodies will be identified.

Operators will avoid creating hydrologic conduits between discrete aquifers during foundation excavation and other activities.

Freshwater-bearing and other usable water aquifers will be protected from contamination by assuring all well casing (excluding the liner) is required to be cemented from the casing shoe to the surface.

Periodic testing and monitoring via observation wells will be conducted in a manner to assure maximum protection of water resources from geothermal fluids or alterations in reservoir pressure.

UT-LN-13: PRONGHORN WINTER HABITAT

The lessee/operator is given notice that lands in this lease have been identified as containing crucial pronghorn winter habitat. Surface use or otherwise disruptive activity may be restricted for up to 60 days during pronghorn fawning season, as determined by BLM, including exploration, drilling and other development activities. Modifications may be required in the Surface Use Plan of Operations including seasonal timing restrictions to protect the species and its habitat.

UT-LN-44: RAPTORS

Appropriate seasonal and spatial buffers shall be placed on all known raptor nests in accordance with Utah Field Office Guidelines for Raptor Protection from Human and Land use Disturbances (USFWS 2002) and Best Management Practices for Raptors and their Associated Habitats in Utah (BLM 2006). All construction related activities will not occur within these buffers if pre-construction monitoring indicates the nests are active, unless a site-specific evaluation for active nests is completed prior to construction and if a BLM wildlife biologist, in consultation with USFWS and UDWR, recommends that activities may be permitted within the buffer. The BLM will coordinate with the USFWS and UDWR and have a recommendation within 3-5 days of notification. Any construction activities authorized within a protective (spatial and seasonal) buffer for raptors will require an on-site monitor. Any indication that activities are adversely affecting the raptor and/or its' young the on-site monitor will suspend activities and contact the BLM Authorized Officer immediately. Construction may occur within the buffers of inactive nests. Construction activities may commence once monitoring of the active nest site determines that fledglings have left the nest and are no longer dependent on the nest site. Modifications to the Surface Use Plan of Operations may be required in accordance with section 6 of the lease terms and 43CFR3101.1-2.

NOTICES (Cont.)

UT-LN-71: PALEONTOLOGICAL

The lessee/operator is given notice that this lease has been identified as containing paleontological resources. Surveys will be required whenever surface disturbances and/or occupancy is proposed in association with fluid mineral exploration and development within geological strata that may contain important paleontological resources. Field surveys will be conducted as determined by the authorized officer of the Bureau of Land Management. Exploration, drilling and other development activities may be restricted based on the result of the field survey; the authorized officer will determine appropriate mitigations. Modifications to the Surface Use Plan of Operations may be required in accordance with section 6 of the lease terms and 43CFR3101.1-2.

UT-LN-96: AIR QUALITY MITIGATION MEASURES

The lessee is given notice that the Bureau of Land Management (BLM) in coordination with the U.S. Environmental Protection Agency and the Utah Department of Air Quality, among others, has developed the following air quality mitigation measures that may be applied to any development proposed on this lease. Integration of and adherence to these measures may help minimize adverse local or regional air quality impacts from oil and gas development (including but not limited to construction, drilling, and production) on regional ozone formation.

- All internal combustion equipment would be kept in good working order.
- Water or other approved dust suppressants would be used at construction sites and along roads, as determined appropriate by the Authorized Officer.
- Open burning of garbage or refuse would not occur at well sites or other facilities.
- Drill rigs would be equipped with Tier II or better diesel engines.
- Vent emissions from stock tanks and natural gas TEG dehydrators would be controlled by routing the emissions to a flare or similar control device which would reduce emissions by 95% or greater.
- Low bleed or no bleed pneumatics would be installed on separator dump valves and other controllers.
- During completion, flaring would be limited as much as possible. Production equipment and gathering lines would be installed as soon as possible.
- Well site telemetry would be utilized as feasible for production operations.
- Stationary internal combustion engine would comply with the following standards: 2g NOx/bhp-hr for engines <300HP; and 1g NOx/bhp-hr for engines >300HP.

Additional site-specific measures may also be employed to avoid or minimize effects to local or regional air quality. These additional measures will be developed and implemented in coordination with the U.S. Environmental Protection Agency, the Utah Department of Air Quality, and other agencies with expertise or jurisdiction as appropriate based on the size of the project and magnitude of emissions.

NOTICES (Cont.)

UT-LN-156: POLLINATORS AND POLLINATOR HABITAT (Cont.)

4. Avoid disturbance of riparian and meadow sites, as well as small depressed areas that may function as water catchments and host nectar-producing species, to protect Monarch butterfly habitat and nectaring sites.
5. Minimize the use of pesticides that negatively impact pollinators.
6. During revegetation treatments:
   a. Include pollinator-friendly site-appropriate native plant seeds or seedlings in seed mixes.
   b. Where possible, increase the cover and diversity of essential habitat components for native pollinators by:
   a. Use minimum till drills where feasible.
      - Using site-appropriate milkweed seeds or seedlings within Monarch migration routes through priority sage-grouse habitat.
      - Using seed mixes with annual and short-lived perennial native forbs that will bloom the first year and provide forage for pollinators.
      - Using seed mixes with a variety of native forb species to ensure different colored and shaped flowers to provide nectar and pollen throughout the growing season for a variety of pollinators.
      - Seeding forbs in separate rows from grasses to avoid competition during establishment.
      - Avoiding seeding non-native forbs and grasses that establish early and out compete slower-growing natives.

APPENDIX D

Utah State Historic Preservation Office

Spencer J. Cox
Governor

Deidre M. Henderson
Lieutenant Governor

Jill Remington Love
Executive Director
Utah Department of Cultural and Community Engagement

Utah SHPO

Christopher Merritt
State Historic Preservation Officer
Utah State Historic Preservation Office

November 9, 2022

Paul Briggs
Field Office Manager
Bureau of Land Management - Cedar City Field Office
176 East DL Sargent Drive
Cedar City, Utah 84721

RE: Class III Cultural Resource Survey of FERVO's Proposed Geothermal Plant, Beaver County, Utah

For future correspondence, please reference Case No. 22-2176

Dear Paul,

The Utah State Historic Preservation Office received your submission and request for our comment on the above-referenced undertaking on November 01, 2022.

We concur with your determinations of eligibility and effect for this undertaking.

This letter serves as our comment on the determinations you have made within the consultation process specified in §36CFR800.4. If you have questions, please contact me at 801-245-7263 or by email at cmerritt@utah.gov.

Sincerely,

Christopher W. Merritt
State Historic Preservation Officer

Management Recommendations

While the Class III survey identified two eligible sites (42BE52/88 and 42BE2198), only one eligible site is associated with the proposed geothermal plant undertaking (42BE52/88); site 42BE2198, the Milford to Roosevelt Hot Springs Road, was originally overlapped by proposed access for one mile but this access route has been dropped from the final geothermal plant plan and site 42BE2198 is avoided by the proposed undertaking. Avoidance measures are proposed for each of the 62 contributing artifact concentrations enrolled into Site 42BE52/88. In 35 of these instances, no disturbance is proposed within 100 ft. of the artifact concentration, and so no additional mitigation measures are recommended as necessary. In 13 instances, proposed disturbance is from between 50 – 100 ft. No additional measures are likewise recommended as necessary for these concentrations. In 14 instances, proposed disturbance is within 50 ft. of a contributing artifact concentration. Proposed disturbance within Concentration V is via an existing road and well 18; recommended mitigation for this concentration is a requirement that all vehicle traffic remain within the confines the existing access road and the erection of avoidance fencing along the edge of the proposed pad. For Concentration CR, recommended mitigation is the erection of avoidance fencing along the edge of proposed access. For the remaining concentrations (BE, CV, CZ, DA, DB, DF, DH, DN, DO, EC, ED, and EM) recommended mitigation is avoidance fencing along the edge of the proposed pads. Fencing is a minimum mitigation measure, and some archaeological monitoring may be required. Proposed disturbance distances and recommended mitigation measures are summarized in Table 6 and Figure 5.

Table 6. Proposed Disturbance Distances and Recommended Mitigation Measures.

Unique Conc. ID	Contributing Element?	Avoided	Avoidance Distance	Recommendation
K	Yes	Yes	Access: 60 ft; Well 25: 81 ft	
V	Yes	Yes	Access (existing road): 0 ft; Well 18: 20 ft	Fencing along edge of pad
Z	Yes	Yes	No Proposed Disturbance	
AA	Yes	Yes	No Proposed Disturbance	
AE	Yes	Yes	No Proposed Disturbance	
AF	Yes	Yes	No Proposed Disturbance	
AG	Yes	Yes	No Proposed Disturbance	
AK	Yes	Yes	Access: 60 ft	
AM	Yes	Yes	Access: 60 ft	
AP	Yes	Yes	No Proposed Disturbance	
AV	Yes	Yes	Access: 56 ft	
AX	Yes	Yes	No Proposed Disturbance	
AY	Yes	Yes	No Proposed Disturbance	
AZ	Yes	Yes	No Proposed Disturbance	
BE	Yes	Yes	Well 8: 21 ft	Fencing along edge of pad
BG	Yes	Yes	No Proposed Disturbance	
BH	Yes	Yes	No Proposed Disturbance	
BI	Yes	Yes	No Proposed Disturbance	
BK	Yes	Yes	No Proposed Disturbance	
BL	Yes	Yes	No Proposed Disturbance	
BN	Yes	Yes	Access: 58 feet	
BO	Yes	Yes	Access: 58 feet	
BP	Yes	Yes	Access: 58 feet	
BS	Yes	Yes	No Proposed Disturbance	
BV	Yes	Yes	No Proposed Disturbance	
BW	Yes	Yes	No Proposed Disturbance	
BX	Yes	Yes	Access: 52 ft	
CD	Yes	Yes	No Proposed Disturbance	
CK	Yes	Yes	No Proposed Disturbance	
CR	Yes	Yes	Access: 24 ft; Well 10: 45ft	Fencing along edge of access.
CS	Yes	Yes	Access: 60 ft	
CV	Yes	Yes	Access: 74 ft; Well 4: 28 ft	Fencing along edge of pad
CX	Yes	Yes	No Proposed Disturbance	
CZ	Yes	Yes	Well 9: 27 ft	Fencing along edge of pad
DA	Yes	Yes	Well 9: 26 ft	Fencing along edge of pad
DB	Yes	Yes	Access: 90 ft; Well 13: 40 ft	Fencing along edge of pad
DF	Yes	Yes	Access: 81 ft; Well 16: 18 ft	Fencing along edge of pad
DH	Yes	Yes	Well 17: 15 ft	Fencing along edge of pad
DK	Yes	Yes	Well 17: 97 ft	
DN	Yes	Yes	Access: 52 ft; Well 4: 28 ft	Fencing along edge of pad
DO	Yes	Yes	Well 7: 28 ft	Fencing along edge of pad
DQ	Yes	Yes	Access: 59 ft	
DS	Yes	Yes	No Proposed Disturbance	
DU	Yes	Yes	No Proposed Disturbance	

DV	Yes	Yes	No Proposed Disturbance	
DW	Yes	Yes	No Proposed Disturbance	
DX	Yes	Yes	No Proposed Disturbance	
DY	Yes	Yes	No Proposed Disturbance	

Unique Conc. ID	Contributing Element?	Avoided	Avoidance Distance	Recommendation
DZ	Yes	Yes	No Proposed Disturbance	
EC	Yes	Yes	Well 20: 25 ft	Fencing along edge of pad
ED	Yes	Yes	Well 20: 17 ft	Fencing along edge of pad
EE	Yes	Yes	No Proposed Disturbance	
EF	Yes	Yes	No Proposed Disturbance	
EH	Yes	Yes	No Proposed Disturbance	
EI	Yes	Yes	No Proposed Disturbance	
EK	Yes	Yes	No Proposed Disturbance	
EM	Yes	Yes	Access: 56 ft; Well 8: 9 ft	Fencing along edge of pad
EN	Yes	Yes	No Proposed Disturbance	
EO	Yes	Yes	No Proposed Disturbance	
ER	Yes	Yes	Access: 52 feet	
ES	Yes	Yes	No Proposed Disturbance	
EX	Yes	Yes	Access: 65 ft	

Based on the findings and adherence to mitigation recommendations detailed above, a determination of *no historic properties adversely affected* is proposed for the undertaking pursuant to 36 CFR 800 of the historic Preservation Act.