Final

Environmental Assessment

for Geothermal Energy Development at
Mountain Home Air Force Base, Idaho

April
2020

ABBREVIATIONS AND ACRONYMS

°F	degrees Fahrenheit
ACAM	Air Conformity Applicability Model
ACM	asbestos-containing material
AFI	Air Force Instruction
AFMAN	Air Force Manual
APZ	accident potential zone
BGEPA	Bald and Golden Eagle Protection Act
bgs	below ground surface
BLM	Bureau of Land Management
BMPs	best management practices
CAA	Clean Air Act
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CO	carbon monoxide
CO_2e	carbon dioxide equivalent
CWA	Clean Water Act
CZ	clear zone
dB	decibels
dBA	A-weighted decibels
DNL	day-night sound level
DoD	Department of Defense
EA	Environmental Assessment
EIAP	Environmental Impact Analysis Process
EIS	Environmental Impact Statement
EISA	Energy Independence and Security Act
EO	Executive Order
EPCRA	Emergency Planning and Community Right-to-Know Act
ERP	Environmental Restoration Program
ESA	Endangered Species Act
ESQD	explosives safety quantity distance
FAA	Federal Aviation Administration
FONSI	Finding of No Significant Impact
FPPA	Farmland Protection Policy Act
FY	fiscal year
GHG	greenhouse gases
hp	horsepower
I-84	Interstate 84
IDAPA	Idaho Administrative Procedures Act
IDEQ	Idaho Department of Environmental Quality
IDFG	Idaho Department of Fish and Game
IDWR	Idaho Department of Water Resources
IPDES	Idaho Pollutant Discharge Elimination System
IRP	Installation Restoration Program
kg	kilogram
kVa	kilo-volt-ampere
LBP	lead-based paint
LEPA	Slickspot peppergrass (*Lepidium papilliferum*)
L_{eq}	equivalent sound level
LUC	land use control
MBTA	Migratory Bird Treaty Act
MHAFB	Mountain Home Air Force Base
MHCT	Mountain Home Community Transit
MMRP	Military Munitions Response Program
MW	megawatt
NAAQS	National Ambient Air Quality Standards
NCA	National Conservation Area
NEPA	National Environmental Policy Act
NO_2	nitrogen dioxide
NO_x	nitrogen oxides

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NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NREL	National Renewable Energy Laboratory
ntu	nephelometric turbidity unit
O_3	ozone
OSHA	Occupational Safety and Health Administration
PA	Programmatic Agreement
PCBs	polychlorinated biphenyls
pCi/L	picocuries per liter
PM_{10}	particulate matter measured less than or equal to 10 microns in diameter
$PM_{2.5}$	particulate matter measured less than or equal to 2.5 microns in diameter
PPE	personal protective equipment
RCRA	Resource Conservation and Recovery Act
RE	renewable energy
RI/FS	remedial investigation and feasibility study
ROD	Record of Decision
ROI	region of influence
SDS	Safety Data Sheet
SH 51	State Highway 51 (also known as Airbase Road)
SH 67	State Highway 67
SH 167	State Highway 167 (also known as Grand View Road)
SIP	state implementation plan
SO_2	sulfur dioxide
SWMU	solid waste management unit
SWPPP	Stormwater Pollution Prevention Plan
tpy	tons per year
TVT	Treasure Valley Transit
USACE	U.S. Army Corp of Engineers
USAF	U.S. Air Force
USC	United States Code
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
VOC	volatile organic compounds
WWTP	wastewater treatment plant

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FINDING OF NO SIGNIFICANT IMPACT (FONSI)

Name of the Proposed Action

Environmental Assessment (EA) for Geothermal Energy Development at Mountain Home Air Force Base (MHAFB), Idaho

Purpose of and Need for the Proposed Action

The purpose of the Proposed Action is to enable installation energy security and strategic flexibility in energy sources at MHAFB. Specifically, the purpose is to provide MHAFB the ability to generate 100 percent of its power through the development of a renewable energy (RE) source. An RE source would provide MHAFB the ability to be self-sufficient in maintaining resilient, reliable, uninterruptible, and adequate power to meet installation demand for mission-critical facilities and operations year-round without dependence on commercial or backup sources. The Proposed Action would act also as a pilot project for other U.S. Air Force (USAF) installations that have geothermal energy production potential.

The Proposed Action is needed to comply with USAF and Department of Defense (DoD) energy priorities and goals to improve resiliency, optimize demand, and assure supply as prescribed by the USAF Office of Energy Assurance and 10 United States Code 2911. The Proposed Action would secure baseline power for MHAFB, outlined by the DoD Operational Energy Strategy, and support federal, DoD, and USAF requirements for sustainable and RE use at the installation level.

Description of the Proposed Action and Alternatives

Proposed Action. USAF proposes to construct and operate a geothermal power facility on MHAFB that would provide the installation the ability to be self-sufficient in maintaining resilient power year-round. MHAFB estimates that construction and operation of the geothermal facility and supporting infrastructure would permanently disturb approximately 35 acres; however, up to 50 acres could be disturbed depending on final facility design, siting location, and availability of geothermal resources. The power facility would be capable of generating 100 percent power for MHAFB, up to 15 megawatts, and MHAFB would remain connected to the Idaho Power transmission lines currently servicing the installation. The Proposed Action includes the following activities:

- Facility construction, including:
    - Power plant (turbines, air-cooled condensers, substation, and hydraulic station)
    - Geothermal production wells and well pads
    - Injection wells and well pads
    - Aboveground pipelines
    - Support infrastructure to include reclamation and maintenance facilities, storage yard, access roads, test well pond, and utilities connections
- Facility operations

Alternative 1- Northwest. USAF would conduct all activities described under the Proposed Action in the northwest corner of the installation, as described in the attached *Environmental Assessment for Geothermal Energy Development at Mountain Home Air Force Base, Idaho* (EA), which is hereby incorporated by reference.

Alternative 2- Northeast. USAF would conduct all activities described under the Proposed Action in the northeast corner of the installation, as described in the EA.

No Action Alternative. USAF National Environmental Policy Action regulations require consideration of the No Action Alternative. The No Action Alternative serves as a baseline against which the impacts of the Proposed Action and other potential action alternatives can be evaluated. Under the No Action Alternative, USAF would not develop geothermal power capabilities on MHAFB, and would continue to rely on Idaho Power for power requirement. The No Action Alternative would not meet the purpose of and need for the Proposed Action.

Summary of Environmental Effects

The analysis of environmental effects focused on the following environmental resources: air quality, biological resources, geology and soils, hazardous materials and wastes, health and safety, infrastructure and utilities, noise, socioeconomics, transportation, and water resources. A cumulative effects assessment was also conducted. Details of the environmental effects can be found in the EA. The analysis in the EA for each of the environmental resource areas identified negligible to moderate adverse effects under the Proposed Action. Potential environmental effects are not expected to be significant.

Conclusion

Based on the description of the Proposed Action as set forth in the EA, all activities were found to comply with the criteria or standards of environmental quality and were coordinated with the appropriate federal, state, and local agencies. The Draft EA and this Finding of No Significant Impact (FONSI) were made available to the public for a 30-day review period. Agencies were coordinated with during the EA development process, and their comments were incorporated into the analysis of potential environmental effects performed as part of the EA.

Finding of No Significant Impact

Based on the information and analysis presented in the EA, which was prepared in accordance with the requirements of the National Environmental Policy Action, the Council on Environmental Quality regulations, implementing regulations set forth in 32 Code of Federal Regulations § 989 (*Environmental Impact Analysis Process*), as amended, and based on review of the public and agency comments submitted during the 30-day public comment period, I conclude that neither Alternative 1 or Alternative 2 would have significant environmental impacts, either cumulatively or with other projects at or near MHAFB, Idaho, that preparation of an Environmental Impact Statement is unnecessary, and that signing this FONSI completes the environmental impact analysis process.

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RICHARD A. GOODMAN, Colonel, USAF
Commander

9 Jun 2020

Date

Attachment: *Environmental Assessment for Geothermal Energy Development at Mountain Home Air Force Base, Idaho.*

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Cover Sheet

Final
Environmental Assessment for
Geothermal Energy Development
at Mountain Home Air Force Base, Idaho

Responsible Agencies: U.S. Air Force (USAF); Air Combat Command; 366th Fighter Wing.

Affected Location: Mountain Home Air Force Base (MHAFB), Idaho.

Report Designation: Final Environmental Assessment (EA).

Abstract: This EA was prepared in compliance with the USAF's *Environmental Impact Analysis Process* (EIAP) and the National Environmental Policy Act (NEPA) for the proposed development of geothermal energy at MHAFB. Under this proposal, USAF would construct and operate a geothermal power facility on MHAFB that would provide the base the ability to be self-sufficient in maintaining resilient, reliable, uninterruptible, and adequate power to meet installation demand for mission-critical facilities and operations year-round without dependence on commercial or back-up sources. Written inquiries regarding this document should be directed by email to Mr. Eddie Jackson at eddie.jackson.1@us.af.mil, or by postal mail at: Mr. Eddie Jackson, re: Geothermal EA, 366 FW/A7IE, 1100 Liberator St, Mountain Home AFB, ID 83648.

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FINAL

ENVIRONMENTAL ASSESSMENT

FOR

GEOTHERMAL ENERGY DEVELOPMENT AT MOUNTAIN HOME AIR FORCE BASE, IDAHO

AIR COMBAT COMMAND

APRIL 2020

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Table of Contents

Appendices

Tables

Figures

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1. Purpose of and Need for the Proposed Action

1.1 Introduction

This Environmental Assessment (EA) supports the U.S. Air Force's (USAF's) Environmental Impact Analysis Process (EIAP) for the proposed development of geothermal energy at Mountain Home Air Force Base (MHAFB). This EA analyzes the potential for significant environmental impacts associated with the Proposed Action and alternatives, including the No Action Alternative. The environmental documentation process associated with preparing this EA is carried out in compliance with the National Environmental Policy Act (NEPA); the regulations implementing NEPA (Title 40 Code of Federal Regulations [CFR] §§ 1500–1508); and the USAF implementing regulation for NEPA, the EIAP at 32 CFR § 989, as amended.

1.2 Background

As described in the 2018 Air Force Civil Engineer Renewable Energy (RE) Playbook, Headquarters USAF promotes the use of RE to produce local, clean, and inexhaustible energy for USAF, as concerns regarding energy security have grown. On-installation power generation assures power supply for operational resiliency and also decreases stress on the national electrical grid. Additionally, RE resources, over the long term, can provide energy at a known cost that is not susceptible to the unpredictability of fossil fuel supply and demand (USAF 2018a).

USAF's focus on RE production is also strategically aligned with their energy assurance goals to improve resiliency, optimize demand, and assure supply. These goals are designed to increase energy security and reduce energy costs. By optimizing energy demand and providing energy security and resiliency, USAF is able to increase its mission assurance. Ultimately, implementing on-installation RE provides the warfighter with a diverse energy source and can provide resiliency (USAF 2018a).

Idaho Power, a regulated power supply utility, currently supplies power to MHAFB, which is produced from multiple energy sources that fluctuate yearly due to, for example, snow pack, costs, and regulatory requirements. Therefore, electricity rates and availability for MHAFB's 15 megawatt (MW) power requirement also increase and/or decrease based on the fluctuation in Idaho Power. In accordance with USAF's RE program and energy assurance goals, MHAFB has considered viable alternatives for on-installation power that reduce or eliminate their reliance on Idaho Power and fluctuating rates. Providing energy independence for MHAFB translates to secure and consistent baseline power to support the 366th Fighter Wing mission.

1.3 Project Location Description

MHAFB is located in southwestern Idaho, approximately 40 miles southeast of Boise and 8 miles southwest of Mountain Home (**Figure 1.1**).

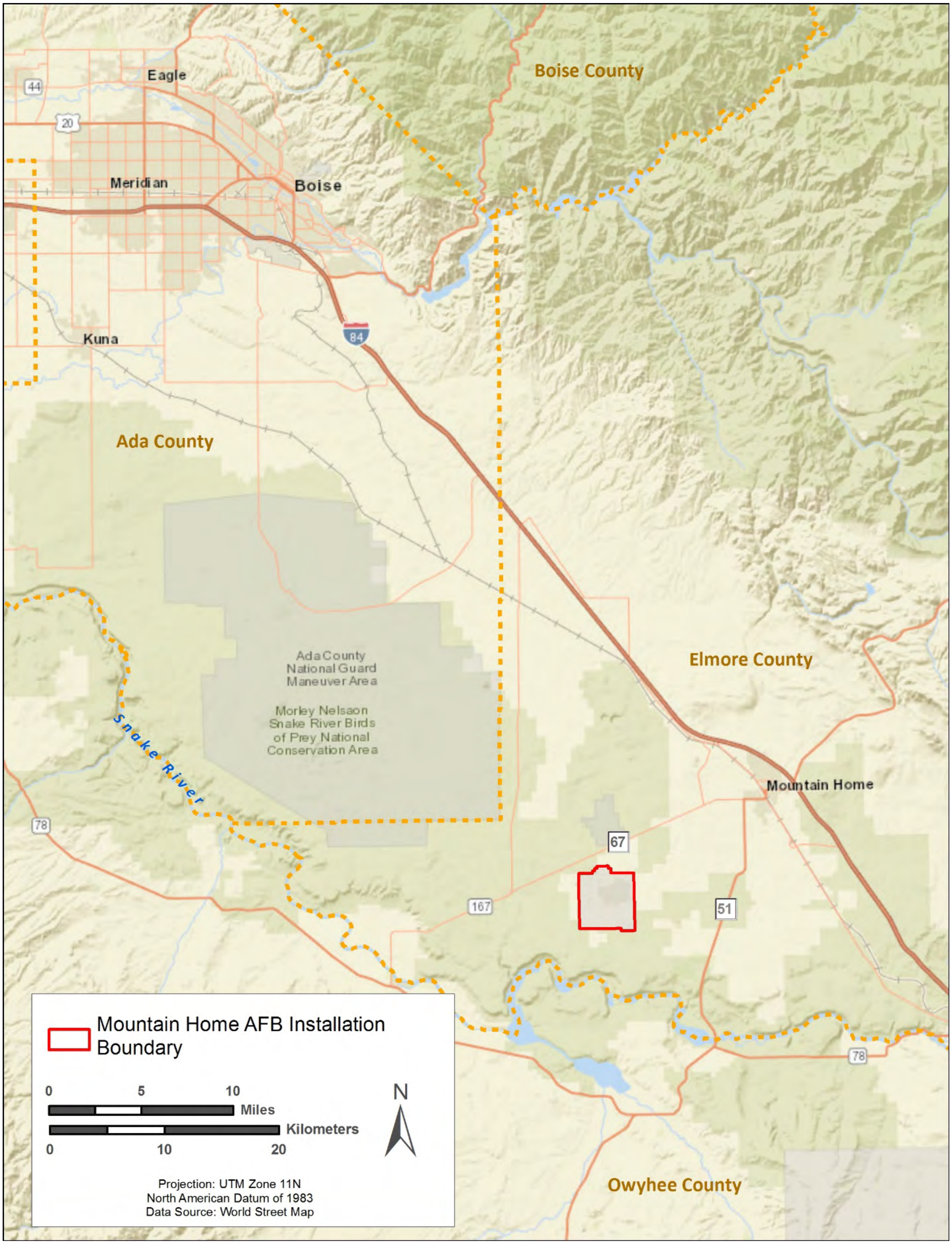

Figure 1.1. MHAFB and Surrounding Area

The installation occupies 6,844 acres of land and is located within the western Snake River Plain. The western Snake River Plain is adjacent to geologic volcanic centers generated by the migrating Yellowstone Hotspot. The geologic history of this area indicates high thermal gradients and a high potential for geothermal water to support geothermal energy production. Geothermal exploration successfully occurred at MHAFB in 1986 on the eastern side of the installation, and in 2012 in the northwest corner of the installation (Armstrong et al. undated; Nielson and Shervais 2014). All proposed geothermal energy production and supporting infrastructure would be located entirely on MHAFB.

1.4 Purpose of and Need for the Proposed Action

Purpose. The purpose of the Proposed Action is to enable installation energy security and strategic flexibility in energy sources at MHAFB. Specifically, the purpose is to provide MHAFB the ability to generate 100 percent of its power through the development of an RE source. An RE source would provide MHAFB the ability to be self-sufficient in maintaining resilient, reliable, uninterruptible, and adequate power to meet installation demand for mission-critical facilities and operations year-round without dependence on commercial or backup sources. The Proposed Action would act also as a pilot project for other USAF installations that have geothermal energy production potential.

Need. The Proposed Action is needed to comply with USAF and Department of Defense (DoD) energy priorities and goals to improve resiliency, optimize demand, and assure supply as prescribed by the USAF Office of Energy Assurance and 10 United States Code (USC) 2911. The Proposed Action would secure baseline power for MHAFB, outlined by the DoD Operational Energy Strategy, and support federal, DoD, and USAF requirements for sustainable and RE use at the installation level. Specifically, policies and regulations that outline energy performance goals for DoD and USAF, and mandate or support the transition to renewable, resilient energy, include, but are not limited to the following:

- **10 USC 2911, *Energy policy of the Department of Defense****:* States that the DoD goal is that, by 2025, 25 percent of the energy it consumes within its facilities should be produced or procured from RE sources. Also authorizes the use of energy security and energy resilience, including the benefits of on-site generation resources that reduce or avoid the cost of backup power, as factors in the cost-benefit analysis for energy procurement.
- **Air Force Instruction 90-1701, *Energy Management*:** States that USAF seeks to expand its RE portfolio and is committed to increasing the amount of energy supplies available to become more energy independent. Energy independence reduces the amount of energy required from foreign sources. Implementation objectives include developing RE resources on-installation.
- **Department of Defense Instruction 4170.11, *Installation Energy Management:*** States that it is DoD policy that DoD utility infrastructure be secure, safe, reliable, and efficient and requires that the DoD invest in cost-effective RE sources.

- **Department of Defense Strategic Sustainability Performance Plan for Fiscal Year 2016**: Describes DoD's commitment to sustainability through fiscal year (FY) 2025 and beyond.
- **Energy Policy Act of 2005**: States that, of the total amount of electric energy the federal government consumes during any fiscal year, a portion must be from RE, with RE use increasing over time.
- **National Defense Authorization Act for Fiscal Year 2010**: Adopted and amended the 2005 Energy Policy Act for applicability to DoD facilities.
- **Executive Order (EO) 13834, *Efficient Federal Operations,* dated May 17, 2018:** Directs federal agencies to manage their buildings, vehicles, and overall operations to optimize energy and environmental performance, reduce waste, cut costs, enhance the resilience of federal infrastructure and operations, to more effectively accomplish its mission.

1.5 NEPA and Other Compliance Requirements

NEPA is a federal statute requiring the identification and analysis of potential environmental impacts associated with proposed federal actions before those actions are taken. NEPA helps decision makers make well-informed decisions based on an understanding of the potential environmental consequences. NEPA established the Council on Environmental Quality (CEQ), which is charged with developing implementing regulations and ensuring federal agency compliance with NEPA. The process for implementing NEPA is outlined in 40 CFR §§ 1500–1508, *Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act*.

CEQ regulations specify that an EA be prepared to provide evidence and analysis for determining whether to prepare a Finding of No Significant Impact (FONSI) or an Environmental Impact Statement (EIS). The EA aids in an agency's compliance with NEPA when an EIS is unnecessary and facilitates preparation of an EIS when one is required.

Air Force Policy Directive 32-70, *Environmental Considerations in Air Force Programs and Activities*, states that USAF will comply with applicable federal, state, and local environmental laws and regulations, including NEPA. USAF's implementing regulation for NEPA is the EIAP, 32 CFR § 989.

In compliance with NEPA, USAF has determined preparation of an EA is the appropriate level of the EIAP for the Proposed Action described in **Section 2.1**. This EA determines whether the Proposed Action would result in significant impacts and guides USAF in implementing the Proposed Action in a manner consistent with USAF standards for environmental stewardship, should the Proposed Action be approved for implementation.

USAF is required to manage floodplains and wetlands in accordance with Air Force Instruction 32-7064, *Integrated Natural Resources Management*, which includes the USAF guidance for compliance with EO 11988, *Floodplain Management*, and with EO 11990, *Protection of Wetlands*. USAF has not identified any floodplains or wetlands that have the potential to be disturbed by the Proposed Action described in **Section 2.1**.

1.6 Intergovernmental and Stakeholder Coordination

NEPA requirements help ensure that environmental information is made available to the public during the decision-making process and prior to actions being taken. The Intergovernmental Cooperation Act and EO 12372, *Intergovernmental Review of Federal Programs* (amended by EO 12416), require federal agencies to cooperate with and consider state and local views when implementing a federal proposal.

In compliance with NEPA, the Intergovernmental Cooperation Act, EO 12372, and EO 12416, USAF notifies relevant agencies and stakeholders about the Proposed Action and alternatives, and potential impacts from the Proposed Action (see **Appendix A** for stakeholder distribution list). The notification process provides these relevant agencies and groups the opportunity to comment on the Proposed Action and potential impacts that could occur. A notice of availability for the Draft EA was published in the *Mountain Home News* on February 26, 2020. Copies of the Draft EA were also sent to local libraries. Public and agency comments on the Draft EA were considered prior to a decision being made on whether or not to sign a FONSI.

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2. Description of the Proposed Action and Alternatives

This section describes the Proposed Action and alternatives considered, including the No Action Alternative. As discussed in **Section 1.5**, the NEPA process evaluates potential environmental consequences associated with a Proposed Action and considers alternative courses of action. Reasonable alternatives must satisfy the purpose of and need for a Proposed Action, as defined in **Section 1.4**. USAF NEPA regulations also specify the inclusion of a No Action Alternative against which potential effects can be compared. While the No Action Alternative would not satisfy the purpose of or need for the Proposed Action, it is analyzed in accordance with CEQ and USAF NEPA regulations.

2.1 Proposed Action

USAF proposes to construct and operate a geothermal power facility on MHAFB that would provide the installation the ability to be self-sufficient in maintaining resilient power year-round. The power facility would be capable of generating 100 percent power for MHAFB, up to 15 MW (peak demand is in the summer). This section conceptually describes the activities and implementing actions associated with the Proposed Action. In summary, the Proposed Action includes the following activities:

- Facility construction, including:
  - Power plant (turbines, air-cooled condensers, substation, and hydraulic station)
  - Geothermal production wells and well pads
  - Injection wells and well pads
  - Aboveground pipelines
  - Support infrastructure to include reclamation and maintenance facilities, storage yard, access roads, test well pond, and utilities connections
- Facility operations

Sections 2.1.2 and **2.1.3** provide additional details regarding facility construction and operation.

2.1.1 Summary of the Geothermal Facility Process

The proposed geothermal facility would be based on the Rankine cycle, a binary cycle in which an organic fluid (motive fluid) absorbs heat from a heat source (geothermal fluid), causing the motive fluid to vaporize. In this facility, geothermal fluid would be pumped from geothermal production wells to the surface and conveyed through pipelines to the power plant. The geothermal fluid goes through a heat exchanger and then would be pumped back (re-injected) into the geothermal aquifer. The geothermal fluid is not exposed to the atmosphere or directly to equipment within the facility. The vaporized motive fluid (organic vapor) expands in the turbine, producing rotational shaft power by transforming kinetic energy gained by the vapors' expansion process. **Figure 2.1** provides a schematic diagram of the binary cycle power facility process.

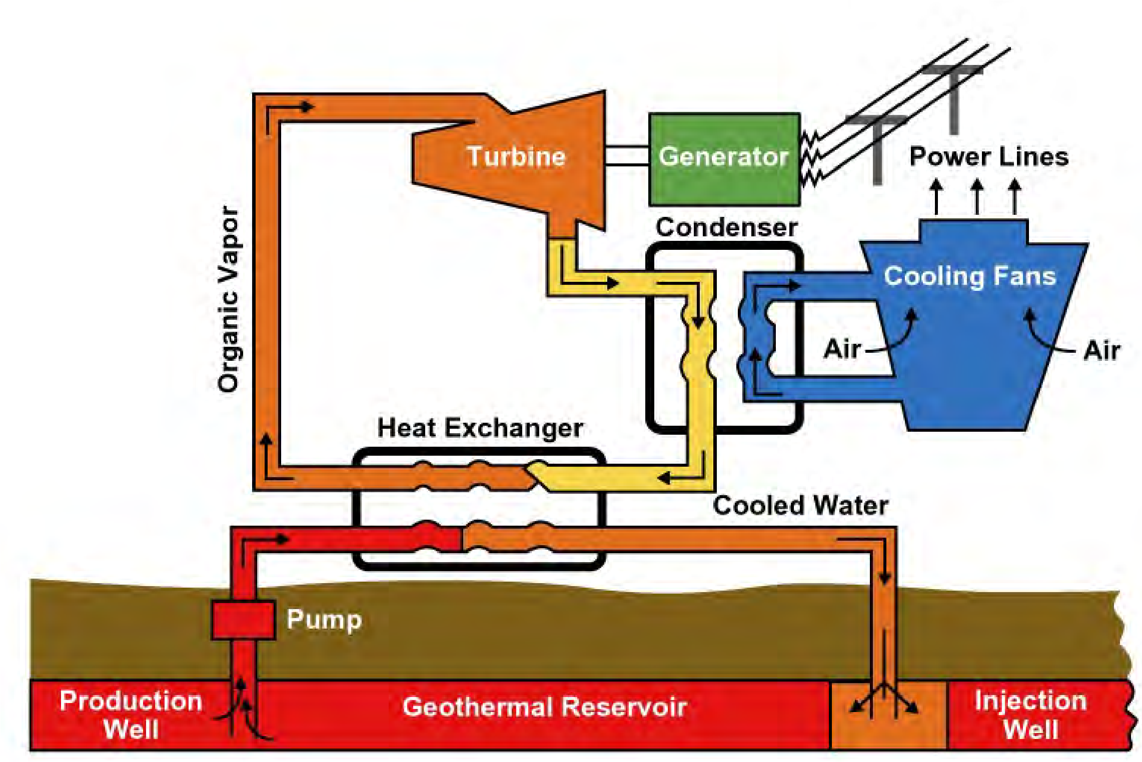

Figure 2.1. Example Binary Cycle Power Facility (Council of Canadians 2017)

The organic vapor generated during heat transfer must be cooled after it passes through the turbine. The organic vapor is cooled by moving through an air-cooled condenser where it changes back to a liquid; the facility generates no water discharge. The organic motive fluid used in the thermal cycle is a hydrocarbon, typically normal pentane or iso-butane, and is selected for optimal use of the available heat source. As illustrated in **Figure 2.1**, the geothermal fluid is a closed-loop system and does not physically contact the motive fluid flows (DOE 2011).

Although **Figure 2.1** portrays the entire heat exchange process occurring above the surface, the proposed geothermal power facility could use emerging technologies, such as a sealed, closed-loop system (e.g., EAVOR LOOP). A sealed, closed-loop system is similar to a binary cycle system, in that they are both entirely sealed in a closed loop and the geothermal fluid does not contact the organic motive fluid. However, in a sealed, closed-loop system, the organic motive fluid is pumped through a closed U-loop system below the surface to the geothermal formation for heating, and then returned in the closed U-loop system back to the surface to the heat exchanger at the power plant. Therefore, in a sealed, closed-loop system, the organic motive fluid is pumped below the surface, rather than the geothermal fluid being pumped up to the surface, to the power plant, and then re-injected.

The proposed geothermal facility and associated infrastructure described in **Sections 2.1.2** and **2.1.3** are at a conceptual design level that relies on information regarding the geothermal reservoir at MHAFB gathered during test drilling and related studies, existing geothermal facilities of similar sizes or in similar environments, literature reviews, and USAF understanding of current and emerging technologies. Unless otherwise noted, this EA, to include details for the Proposed Action presented in **Section 2**, and the analyses presented in **Sections 3** and **4,** is based on the proposal for a standard binary cycle system at MHAFB. Construction and operation of the binary cycle system would have greater surface disturbance than the sealed, closed-loop system (EAVOR LOOP) since it would require geothermal production and reinjection wells; additionally, the binary cycle system is a proven technology and more ripe for implementation. Specific details regarding construction and operation of the geothermal power facility, including but not limited to use of particular technologies, number of wells, and well spacing, would be determined as additional information is gathered to support the detailed siting and design of the geothermal power facility at MHAFB. Detailed siting and design could include, but may not be limited to, numerical modeling of the geothermal resource, and geochemistry testing of the geothermal fluid to evaluate baseline conditions.

2.1.2 Facility Construction

2.1.2.1 DESCRIPTION OF THE PROPOSED FACILITY

USAF would construct the geothermal power facility and supporting infrastructure in accordance with the Idaho Geothermal Resources Act, Idaho Code § 42-4001 et seq., and Idaho Department of Water Resources (IDWR) requirements, as applicable. MHAFB estimates that construction and operation of the geothermal facility and supporting infrastructure would permanently disturb approximately 35 acres; however, up to 50 acres could be disturbed depending on final facility design, siting location, and availability of geothermal resources. Disturbance estimates are approximated based on facility sizes at existing geothermal power facilities. It is assumed that regular vegetation maintenance would occur once the facility is operational and therefore, that all disturbance would be permanent. Construction and development would occur over the course of approximately 1 to 2 years. **Table 2-1** provides an approximation of land disturbance associated with the facility. **Figure 2.2** provides a notional site layout of the power facility and support infrastructure.

Table 2-1. Approximate Land Disturbance

Description	Approximated Land Disturbance (Acres)
Power plant and air-cooled condensers	6
Production well pads	10
Injection well pads	6
Aboveground pipelines	2
Water processing, reclamation, maintenance area	3
Storage yard	4
Access roads	2
Utilities connections	2
Total	**35***

*Note: Up to 50 acres could be disturbed depending on final facility design, siting location, and availability of geothermal resources

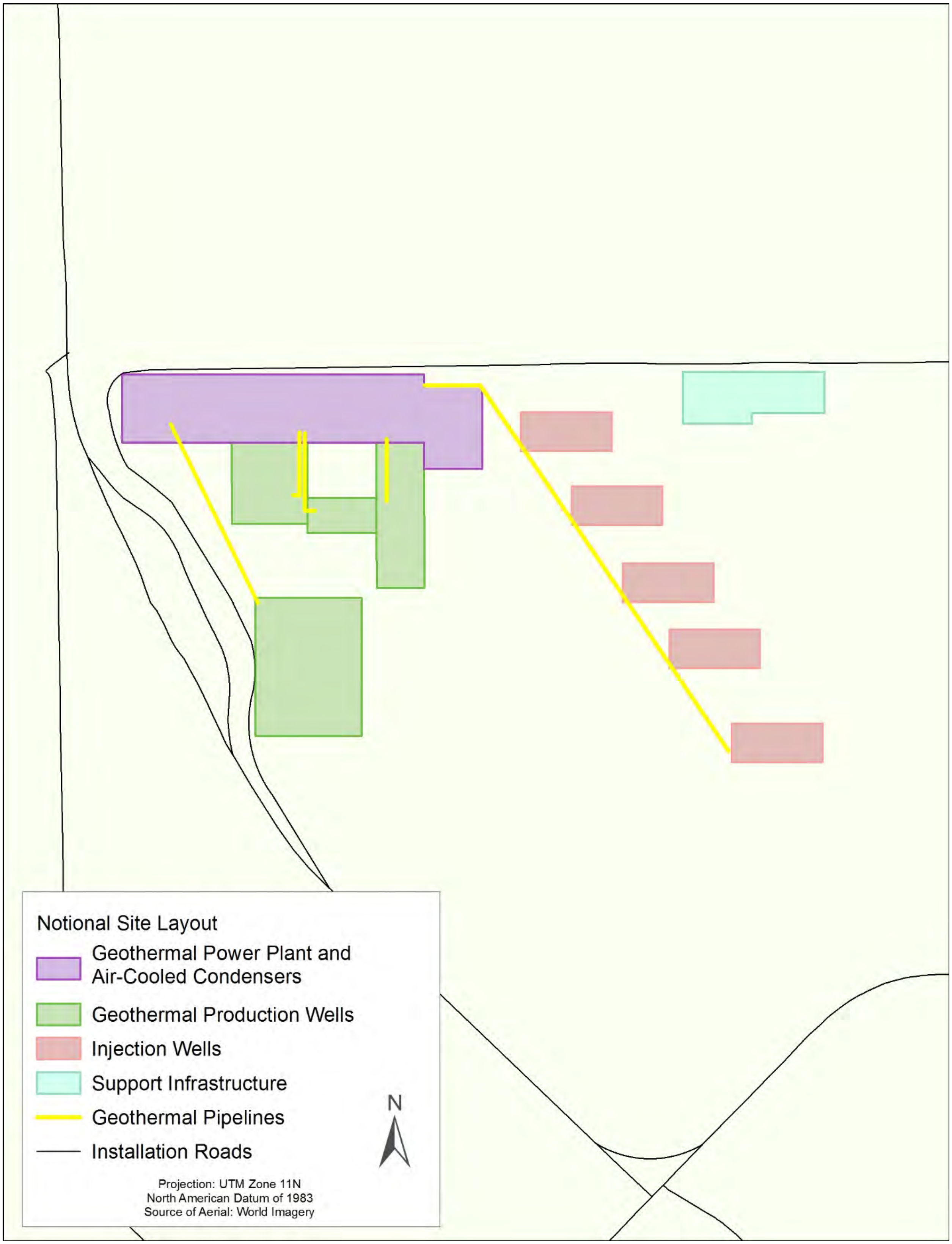

Figure 2.2. Notional Site Layout for Geothermal Power Facility and Support Infrastructure

2.1.2.2 POWER PLANT AND AIR-COOLED CONDENSERS

The power plant site would consist of an approximately 6-acre area containing the plant, heat exchanger equipment, turbine-generator and associated electrical switchgear, air-cooled condensers, pond for geothermal well testing, and parking and access areas. Geothermal power plants use three main cooling options: surface water (once-through systems), wet-type cooling, and dry-type cooling. The Proposed Action would use dry-type cooling condensers, which do not require water. The condenser facility would be within a cooling tower with a stack height of approximately 50 feet and would condense the motive liquid vapor off the turbine. **Figure 2.3** is an example photo of an air-cooled geothermal power plant site.

Photo courtesy of Ormat Technologies, Inc.

Figure 2.3. Example of an Air-Cooled Geothermal Power Plant Site

2.1.2.3 GEOTHERMAL PRODUCTION WELLS

Up to four geothermal production wells would be installed to produce enough geothermal fluid required for the 15-MW power facility. The geothermal production wells would be connected to the heat transfer loop at the power plant by aboveground piping. Depending on the well bottom-hole temperature, production wells would be constructed either in accordance with the Idaho Well Construction Standards, Idaho Administrative Procedures Act (IDAPA) 37.03.09, for low temperature geothermal resources, and/or the Idaho Drilling for Geothermal Resource Rules, IDAPA 37.03.04, for wells that have a bottom-hole temperature greater than 212 degrees Fahrenheit (°F). The number of production wells would be identified during the detailed facility design process, and would be based on geologic permeability, ground inclusions, artesian flow, well design, and geothermal water chemistry. For each of the geothermal production wells, a core would be drilled (typically 15 inches diameter) to 6,000 to 8,000 feet below ground surface (bgs). Drilling areas and well pads would be approximately 2.5 acres each and consist of dirt or gravel. A conductor pipe and surface casing would be installed at each of the wells. The annular space between the bore hole and casing would be sealed in accordance with an approved design per IDWR requirements to prevent geothermal fluids from contaminating nearby shallow aquifers. Construction of all geothermal production wells would be permitted by IDWR, as required. Additionally, per IDAPA 37.03.04, USAF would file a bond with IDWR for the construction, alteration, testing, or operation of each geothermal production well.

2.1.2.4 INJECTION WELLS

Up to five injection wells would be installed to re-inject (circulate) geothermal fluids back into the geothermal aquifer. Injection wells would be constructed in accordance with Idaho Rules and Minimum Standards for the Construction and Use of Injection Wells, IDAPA 37.03.03; and IDAPA 37.03.04 for wells that have a bottom-hole temperature greater than 212 °F. The number of injection wells would be identified during the detailed facility design process, and would be based on well geologic permeability, ground inclusions, artesian flow, well design, and geothermal water chemistry. For each of the geothermal injection wells, a core would be drilled (typically 15-inches diameter) to 6,000 to 8,000 feet bgs. Drilling areas and well pads would be approximately 1.2 acres each and consist of dirt or gravel. A conductor pipe and surface casing would be installed at each of the injection wells. The annular space between the bore hole and casing would be sealed in accordance with an approved design per IDWR requirements to prevent geothermal fluids from contaminating nearby shallow aquifers. Construction of all injection wells would be permitted by IDWR, as required. Additionally, per IDAPA 37.03.04, USAF would file a bond with IDWR for the construction, alteration, testing, or operation of each injection well.

2.1.2.5 GEOTHERMAL PIPELINES

Several aboveground pipelines would be constructed for conveying geothermal fluid to and from wells, and to and from the power plant site. Pipelines would be supported on conventional drilled pier supports or alternately, would use specialized insulation and jacketing placed directly on the ground. All pipes would be insulated to minimize thermal losses and provide personnel protection from burns. Approximately 1,000 feet of pipeline would be needed to convey geothermal fluid from the wells to the power plant. The pipelines from the geothermal production wells to the power plant would have a diameter of 12 to 24 inches and be constructed within a 20-foot-wide corridor. Following use of the geothermal fluid in the power plant, the fluid would be conveyed to the injection wells. Approximately 3,000 feet of pipeline would be needed from the power plant to the injection wells. These pipelines would have a diameter of 12 to 24 inches and be constructed within a 20-foot-wide corridor. The total disturbance associated with construction of the pipelines would be up to 2 acres.

2.1.2.6 SUPPORT INFRASTRUCTURE

Reclamation and Maintenance Facilities. Infrastructure to support facility operations would require approximately 3 acres of facilities. Facilities could include a control room, electrical room, machine shop, personnel offices, and bathrooms.

Storage Yard. A storage yard would be constructed on approximately 4 acres for maintenance and repair materials.

Roadways. Facility sites would be generally accessible via existing installation roadways. However, it is assumed that an additional 2 acres could be disturbed to create access between the power plant and wells. Roadways would be either gravel or paved; paved roadways would require excavating approximately 1 foot of material and laying a new 8-inch sub base; and finishing the surface with a new 3-inch asphalt cap.

Utilities. Existing on-installation potable water, communications, and sanitary wastewater systems would be extended to the power facility site for power plant operations and personnel. Potable water system extensions would be managed in accordance with IDAPA 58.01.08, as applicable; wastewater system extensions would be managed in accordance with IDAPA 58.01.16, as applicable; and related utilities systems would be approved by Idaho Department of Environmental Quality (IDEQ), as required. Power generated by the power facility would require connecting the facility, through new distribution lines, to the existing 69 kilo-volt-ampere (kVa) transmission line, or the 138 kVa existing transmission line, and a new substation; installing two to four overhead distribution poles; and installing three upgraded, pole-mounted transformers on a secondary line. It is assumed that approximately 2 acres could be disturbed for utilities extensions and connections outside of the proposed facility footprints.

Security. Security fencing, access gates, and alarm systems would be installed, as necessary, around the perimeter of the geothermal power plant and support infrastructure, along the geothermal pipelines, and at the geothermal production and injection well pads.

2.1.3 Facility Operation

USAF would operate the geothermal power facility and supporting infrastructure in accordance with the Idaho Geothermal Resources Act, Idaho Code § 42-4001 et seq., and IDWR requirements, as applicable. Plant operation for a binary cycle system would generally consist of flowing geothermal fluid through one side of the heat exchangers, boiling the organic motive (binary) fluid contained on the other side, flowing the vaporized binary fluid through the turbine-generator to produce electricity, and then flowing the binary fluid to the condenser and back to a storage tank. During operation, frequent inspections and ultrasonic testing of system pipelines would be conducted, the pipeline flow and pressure would be monitored, pumps and pipeline valves would be equipped with shutdown features, and monitoring would be conducted. The monitoring program would be designed to assess effectiveness of mitigation measures.

It is anticipated that general vegetation maintenance would be conducted within the site boundary adjacent to all facilities and infrastructure. Access roads, pipeline corridors, and geothermal well pads would be regularly maintained, and wells would be managed in accordance with IDAPA 37.03.04, to include compliance with bond requirements.

2.1.3.1 GEOTHERMAL FLUID

Geothermal production wells would supply hot geothermal fluid (heated water) at a rate to be determined during the facility design process. The pumped geothermal fluid would pass through aboveground heat exchangers in the thermal loop to heat the organic motive (binary) fluid. The cooled geothermal fluid would then be pumped, at a rate to be determined during the facility design process, to the injection wells. The system would be designed to bypass the heat exchangers if necessary (e.g., system maintenance), in which case, conditions of the injected fluid would be similar to the geothermal fluid initially extracted.

Geothermal fluid typically contains salts and other dissolved solids, which could cause deposition (scaling) in the geothermal pipelines and heat exchanger. Biodegradable liquid descalers or hydrochloric acid would be circulated within the geothermal fluid system to remove and prevent deposit buildup. Other descaling methods and technologies (e.g., electronic descaling system) would be identified during the geothermal power facility design and built into the operation of the facility.

As described in **Section 2.1.1**, the proposed geothermal power facility could use a sealed, closed-loop system (e.g., EAVOR LOOP), where a thermal fluid (similar to a binary fluid) is pumped into the geothermal formation in a closed U-loop piping system. This type of system uses directional borings to facilitate the belowground U-loop piping system, and is in early development stages for geothermal systems. Unless otherwise noted, the analyses presented in **Sections 3** and **4** is based on the proposal for a standard binary cycle system at MHAFB. Use of specific technologies would be determined during the detailed siting and design of the geothermal power facility at MHAFB.

2.1.3.2 BINARY FLUID AND COOLING

An air-cooled condenser would be used for cooling the binary fluid. The condenser would be designed based on geothermal water temperatures, fluctuating external temperatures, and the assumption the facility would run 24 hours per day, and 365 days per year. The cooling system would consist of cooling units containing an array of cooling fans, as a component of the power plant. Each fan unit would consist of steel and fiberglass frames mounted to draw air over the cooling system; motors would operate at approximately 100 horsepower (hp). The working fluid for the system is glycol mix typically used in boilers; ice could form on the return line (low pressure side) of the glycol loop. The fans would operate in a closed-loop system and would not emit steam.

2.1.3.3 GENERATING SYSTEM

The generating system would consist of a dual-entry turbine and a generator. The turbine-generator would have a combined gross output rating of, nominally 15 MW, which would go into the power grid for MHAFB. Specific information on the operation and output of the generating system would be developed and finalized during the detailed facility design process.

2.1.3.4 PERSONNEL

Approximately six full-time personnel would be required to operate the power facility. It is assumed that the power facility could be operated by contractors, civilians, or military personnel.

2.1.3.5 POWER GENERATION

The power facility would be capable of generating 100 percent power for MHAFB, which would be distributed on the installation using existing and proposed distribution lines. However, MHAFB would remain connected to the two Idaho Power transmission lines currently servicing MHAFB and could continue to receive a portion or all of their power from Idaho Power, as necessary.

Should the power facility generate more power than required by MHAFB; MHAFB would coordinate with Idaho Power to determine the fate of excess power. Power could either be reserved by Idaho Power as additional capacity for MHAFB, or sold back to Idaho Power.

Transfer of any power to Idaho Power would occur on the two existing transmission lines that currently service MHAFB.

2.2 Selection of Alternatives

Considering alternatives helps to avoid unnecessary impacts and allows for an analysis of reasonable ways to achieve the stated purpose. To warrant detailed evaluation, an alternative must be reasonable. To be considered reasonable, an alternative must be suitable for decision making and implementation, and sufficiently satisfactory with respect to meeting the purpose of and need for the action. During development of the Proposed Action, USAF considered alternatives in a three-tiered process. To be carried forward for analysis, alternatives to the Proposed Action must meet the following selection standards included in each of the tiers:

- Tier 1: RE Types
- Tier 2: Operational Alternatives
- Tier 3: Facility Site Locations

2.2.1 Evaluation of Alternatives

2.2.1.1 TIER 1

USAF considers RE to be energy which comes from natural resources such as sunlight, wind, rain, tides, and geothermal heat and are naturally replenished (USAF 2018a). To determine which RE type would satisfy the Purpose and Need, described in **Section 1.4**, to enable installation energy security and provide strategic flexibility in energy sources at MHAFB while meeting USAF and DoD energy priorities and goals, the energy type must meet the following criteria:

- Be resilient and secure; the energy type must be able to produce continuous power
- Be capable of producing 100 percent of power for MHAFB, and
- Not interfere with MHAFB missions and operations.

During the tier 1 selection process, geothermal, solar, and wind energy production were considered as reasonable RE alternatives. As shown in **Table 2-2**, solar and wind were eliminated from additional consideration because they are not resilient and because they could interfere with MHAFB missions and operations. A detailed comparison of the RE alternatives to the selection standards is provided in the following paragraphs.

Table 2-2. Summary of Evaluation of Potential Alternatives for Tier 1

Potential Alternatives	Selection Standards		
	Resilient	100% Power	Mission
Solar	X	✓	X
Wind	X	✓	X
Geothermal	✓	✓	✓

Note:
Resilient = Be resilient and secure; the energy type must be able to produce continuous power
100% Power = Be capable of producing 100 percent of power for MHAFB
Mission = Does not interfere with MHAFB missions and operations.
X = Does not meet the selection standard
✓ = Meets the selection standard

Solar. Solar energy is not considered a resilient RE without developing extensive power storage capabilities, as power production fluctuates during daylight and darkness. While solar is capable of producing 100 percent of the power for MHAFB, it would require a large-scale solar deployment and power storage facilities. Such deployment of solar energy requires significant land use; the National Renewable Energy Laboratory (NREL) estimates 5.5 to 9.5 acres are required to produce 1 MW for small-scale solar projects of 1 to 20 MW (NREL 2013). Therefore, an average of 113 acres would be required to produce the 15-MW requirement for MHAFB. This land requirement could encroach on existing MHAFB operations and limit the potential for mission expansions or changes in the future. Furthermore, a battery bank would be required to store power for nighttime electricity use and would also require additional acreage. Therefore, this alternative has been dismissed from further analysis.

Wind. Wind energy is not considered a resilient RE without developing extensive power storage capabilities, as power production fluctuates based on wind speed. While wind is capable of producing 100 percent of the power for MHAFB, it would require a large-scale wind deployment and power storage facilities. Such deployment of wind energy requires significant land use; the NREL estimates a total land area of 30 to 141 acres are required to produce 1 MW (NREL 2009). Therefore, an average of 1,283 acres would be required to produce the 15-MW requirement for MHAFB. This extensive land requirement would encroach on existing MHAFB operations and limit the potential for mission expansions or changes in the future. Additionally, wind turbines have the potential to interfere with existing airspace and flight operations and missions from MHAFB. Therefore, this alternative has been dismissed from further analysis.

Geothermal. Geothermal energy is considered a resilient RE because it is capable of producing continuous power without fluctuation based on external forces. Geothermal can also produce 100 percent of the power for MHAFB within an approximately 32-acre footprint. The required land use for geothermal is less than 3 times of that for solar and less than 16 times that of wind. Geothermal energy production also has no potential to interfere with existing flight operations at MHAFB. Therefore, this alternative is carried forward for further analysis.

2.2.1.2 TIER 2

Once the RE type was selected, USAF considered operational alternatives for the geothermal energy production, specifically the condenser cooling type for the plant. Selection criteria for operational cooling methods include the following:

- Meet seasonal fluctuations in power demand
- Minimize potable water usage due to concerns regarding water availability in the MHAFB region
- Use existing infrastructure on MHAFB to the extent practicable

During the tier 2 selection process, MHAFB considered use of an air-cooled condenser and a water-cooled condenser in the power plant. As shown in **Table 2-3**, the water-cooled condenser was eliminated from additional consideration because it would require withdrawing cooling water from the aquifer used for potable water, as no surface water source is available at MHAFB.

Table 2-3. Summary of Evaluation of Potential Alternatives for Tier 2

Potential Alternatives	Selection Standards		
	Seasonal	**Water Use**	**Infrastructure**
Air-cooled condenser	✓	✓	✓
Water-cooled condenser	✓	X	X

Note:
Seasonal = Able to meet seasonal fluctuations in power demand
Water Use = Minimizes potable water usage due to concerns regarding water availability in the MHAFB region
Infrastructure = Uses existing infrastructure on MHAFB to the extent practicable
X = Does not meet the selection standard
✓ = Meets the selection standard

While both condenser types would be designed to allow for seasonal fluctuations in power demand, use of the water-cooled condenser would increase demands on local water supply by approximately 15,000,000 to 25,000,000 gallons per year, and would require additional infrastructure for transporting the cooling water to and from the power plant. In addition, the generated wastewater (i.e., non-contact cooling water after used for cooling) would require disposal or reuse. Because a portion of the cooling water is evaporated in a water-cooled condenser system, the remaining wastewater is at a higher salt concentration compared to the original groundwater. The disposal or reuse of high salt wastewater creates management challenges (e.g., would need to be blended with low salt water for irrigation to crop land). The air-cooled condenser would be designed within the proposed plant footprint and would not require additional water for cooling. Therefore, the air-cooled condenser is carried forward for further analysis in power plant construction and operation.

2.2.1.3 TIER 3

Once USAF determined that geothermal energy production would be carried forward for analysis and the basic operational parameters of the plant, they considered the facility site location on MHAFB. During the tier 3 selection process, MHAFB identified undeveloped areas on the installation with reasonable proximity to geothermal test well sites that had been drilled in the northwest corner and on the east central side of the installation. Based on these parameters, MHAFB identified locations in the northeast corner, northwest corner, and southwest corner of the installation as potential sites for the geothermal power facility. The southeast corner was not considered because it is occupied by airfield infrastructure. See **Figure 2.4** for locations that were considered for the geothermal power facility.

Figure 2.4. Location Alternatives Considered on MHAFB for Geothermal Power Facility

MHAFB then compared these potential locations to the selection criteria for facility siting. Selection criteria for the facility siting were developed and include the following:

- Avoids interference with future MHAFB development
- Provides efficient tie-ins to existing transmission lines
- Easily accessible (both due to topography and relative location to the existing infrastructure)
- Avoids existing contaminated/Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)/disposal sites
- Properly sited for geothermal production.

As shown in **Table 2-4**, the southwest corner was eliminated from additional consideration because it does not meet multiple selection standards. The southwest corner would not allow for efficient tie-ins to existing transmission lines and would require transmission line extensions and upgrades for MHAFB to transfer of any excess power to Idaho Power. While the southwest corner is physically accessible by existing roadways on MHAFB, portions of the site fall within explosive safety quantity distance (ESQD) arcs, limiting accessibility to the site. Additionally, the southwest corner would require miles of geothermal pipelines to use existing proven geothermal resources in the northwest corner of MHAFB. Geothermal exploration could occur in the southwest corner; however, the southwest corner is immediately adjacent to a CERCLA site and would require extensive mitigations and controls for geothermal drilling in this area. The northeast corner and northwest corner locations both meet selection standards for the tier 3 criteria and are carried forward for analysis.

Table 2-4. Summary of Evaluation of Potential Alternatives for Tier 3

Potential Alternatives	Selection Standards				
	Dev't	Tie-Ins	Access	CERCLA	Geothermal
Northwest corner	✓	✓	✓	✓	✓
Northeast corner	✓	✓	✓	✓	✓
Southwest corner	✓	X	X	X	X

Note:
Dev't = Avoids interference with future MHAFB development
Tie-Ins = Provides efficient tie-ins to existing transmission lines
Access = Easy accessibility (both due to topography and relative location to the existing infrastructure)
CERCLA = Avoids existing contaminated/Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)/disposal sites
Geothermal = Properly sited for geothermal production
X = Does not meet the selection standard
✓ = Meets the selection standard

2.3 Alternatives Carried Forward for the Analysis

As described in **Section 2.2**, USAF evaluated three tiers of alternatives in comparison to selection standards for the Proposed Action. From this evaluation, USAF has identified two alternatives for the Proposed Action to carry forward for analysis, construction of the geothermal power facility in either the northeast corner or northwest corner of the installation. Additional information on these two alternatives is provided in **Sections 2.3.1** and **2.3.2**.

2.3.1 Alternative 1 - Northwest

Under Alternative 1, Northwest Alternative, the geothermal power facility would be constructed and operated in the northwest corner of the installation in the location shown in **Figure 2.5**. Facility construction and operation would occur in accordance with the description of the Proposed Action in **Section 2.1**. It is assumed that this facility would use the geothermal reservoir and test well sites in the northwest corner of the installation; disturbance acreage would be similar to that described in **Section 2.1**.

2.3.2 Alternative 2 - Northeast

Under Alternative 2, Northeast Alternative, the geothermal power facility would be constructed and operated in the northeast corner of the installation in the location shown in **Figure 2.5**. Facility construction and operation would occur in accordance with the description of the Proposed Action in **Section 2.1**. MHAFB would focus on using the geothermal reservoir beneath the test well site on the east central side of the base; under this option, disturbance acreage would be similar to that described in **Section 2.1.** However, geologic conditions in the vicinity of this test well site and the Northeast Alternative site may limit availability of geothermal resources in this region (Nielson et al. 2018). If MHAFB geothermal resources are proven to be limited within or adjacent to the Northeast Alternative site, MHAFB would use the geothermal reservoir in the northwest corner of the base; however, this option is not preferred. Under this option, disturbance acreage would be similar to that described in **Section 2.1** and could disturb up to 50 acres depending on the final design.

2.4 No Action Alternative

USAF NEPA regulations require consideration of the No Action Alternative. The No Action Alternative serves as a baseline against which the impacts of the Proposed Action and other potential action alternatives can be evaluated. Under the No Action Alternative, USAF would not develop geothermal power capabilities on MHAFB, and would continue to rely on Idaho Power for power requirement, as described in **Section 1.2**.

2.5 Identification of the Preferred Alternative

Of the two action alternatives described in **Section 2.3** carried forward for analysis, the preferred alternative is Alternative 1, Northwest Alternative, which would construct the geothermal power facility in the northwest corner of MHAFB, as described in **Section 2.3.1**. The Northwest Alternative is closest to known geothermal resources on MHAFB and the existing 138 kVa transmission line for MHAFB.

Figure 2.5. Alternative Site Locations on MHAFB Carried Forward for Analysis

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3. Affected Environment and Environmental Consequences

This section describes the resources being analyzed, the affected environment on MHAFB, and the analysis of potential impacts on the identified resources from the alternatives and No Action Alternatives. As applicable, the area for each alternative that could be physically disturbed is referred to as the "project area." The term "project area" encompasses the locations proposed for construction and operation for each particular alternative. The term "Region of Influence" (ROI) is used to describe the complete geographic scope of potential consequences for the resource area. Unless otherwise noted in **Sections 3.1** through **3.10**, the ROI for each resource analyzed in this EA is considered to be the same as the project area. For some resources, such as air quality, socioeconomics and transportation, the ROI extends beyond the project area.

All potentially relevant resources were initially considered for analysis in this EA. **Sections 3.1** through **3.10** present the existing environmental conditions and potential environmental impacts for the following resource categories: air quality, biological resources, geology and soils, hazardous materials and wastes, health and safety, infrastructure and utilities, noise, socioeconomics, transportation, and water resources.

In compliance with NEPA, CEQ, and EIAP 32 CFR § 989 guidelines, **Section 3** of this document focuses only on the resources potentially subject to impacts from the Proposed Action and No Action Alternative. Resource categories that have been eliminated from further detailed study in this document and the rationale for eliminating them are presented below.

Airspace Management. The Proposed Action does not consist of any proposals for new airspace or changes to existing airspace, including no changes to existing airspace configurations (i.e., size, shape, and location) or to the manner in which the existing airspace is used. The geothermal power facility would be sited on MHAFB, away from the flight line, and outside of the clear zone. The Northwest Alternative site would be located closer to the end of the runway than the Northeast Alternative site and would fall within the 7:1 transitional zone. At this location, structures cannot exceed 107 feet; the highest structure proposed within the Northwest Alternative site would be the cooling tower, which would be approximately 50 feet. Therefore, it is not anticipated that the Proposed Action would require changes to flight patterns, operations, or airspace. USAF would reconsider the potential effects of the geothermal power facility on airspace management during the detailed design and facility siting and would follow permitting requirements identified in 14 CFR 77.9, as applicable. Therefore, no impacts on airspace management are anticipated.

Cultural Resources. The Northwest and Northeast Alternative sites were identified, in part, due to the absence of National Register of Historic Places-eligible cultural resources, based on prior intensive-level archaeological and historic built environmental surveys. Therefore, the potential siting of the proposed geothermal power facility (undertaking) qualifies as a No Historic Properties determination under Section I (a)(b)(c) of the 2016 Programmatic Agreement (PA) for alternative compliance with the National Historic Preservation Act and its implementing regulations at 36 CFR 800. However, because construction of a geothermal power facility does not qualify as the type of undertaking eligible for streamlined review as defined in Section I (c) of the PA, and because there is currently no design from which to determine if the Area of Potential Effects is consistent with 36 CFR 800.16(d), the installation cultural resources manager will initiate consultation with the State Historic Preservation Officer during detailed design of the geothermal power facility, in accordance with Section II of the PA and 36 CFR 800.2-800.4.

Environmental Justice. The Proposed Action would have no conceivable impacts on the off-installation human population as construction would occur on federal property and physical impacts would not be expected to extend beyond the site boundary. Therefore, no disproportionate impacts on any off-installation populations, including low-income or minority populations, are anticipated. The Proposed Action could have negligible to moderate impacts during construction and operation on the on-installation population, as presented in **Sections 3.1** through **3.10**. Impacts from the Proposed Action could be experienced by personnel living or working throughout the installation. While minority or low-income populations on-installation may experience impacts from the Proposed Action, these impacts would be similarly experienced across the installation population, and disproportionate impacts on minority or low-income populations are not anticipated.

Land Use. The Proposed Action does not include any activities that would be incompatible with existing land uses and land use designations. The Proposed Action consists of construction on unoccupied land within the installation boundary and would not introduce new land uses or changes to existing land uses. Therefore, impacts on land use are not expected.

3.1 Air Quality

3.1.1 Definition of the Resource

Air quality is defined by the concentration of various pollutants in the atmosphere at a given location. Under the Clean Air Act (CAA), the six pollutants defining air quality, called “criteria pollutants,” include carbon monoxide (CO), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), ozone (O_3), suspended particulate matter (measured less than or equal to 10 microns in diameter [PM_{10}] and less than or equal to 2.5 microns in diameter [$PM_{2.5}$]), and lead. CO, SO_2, and some particulates are emitted directly into the atmosphere from emissions sources. SO_2 is used as the indicator for the larger group of gaseous sulfur oxides. NO_2, O_3, and some particulates are formed through atmospheric chemical reactions that are influenced by weather, ultraviolet light, and other atmospheric processes. Volatile organic compounds (VOCs) and nitrogen oxides (NO_x) emissions are used to represent O_3 generation because they are precursors of O_3. Lead emissions are not included in this air quality analysis because they are negligible for the types of emission sources under this Proposed Action.

The U.S. Environmental Protection Agency (USEPA) has established National Ambient Air Quality Standards (NAAQS) (40 CFR § 50) for criteria pollutants. NAAQS are classified as primary or secondary. Primary standards protect against adverse health effects; secondary standards protect against welfare effects, such as damage to farm crops and vegetation and damage to buildings. Some pollutants have short-term and long-term standards. Short-term standards are designed to protect against acute, or short-term, health effects, while long-term standards were established to protect against chronic health effects. Each state has the authority to adopt standards stricter than those established under the federal program. The State of Idaho has accepted the federal standards.

Areas that are and have historically been in compliance with the NAAQS, or have not been evaluated for NAAQS compliance, are designated as attainment areas. Areas that violate a federal air quality standard are designated as nonattainment areas. Areas that have transitioned from nonattainment to attainment are designated as maintenance areas and are required to adhere to maintenance plans to ensure continued attainment.

The USEPA General Conformity rule applies to federal actions occurring in nonattainment or maintenance areas when the total direct and indirect emissions of nonattainment pollutants (or their precursors) exceed specified thresholds. The emissions thresholds that trigger requirements for a conformity analysis are called *de minimis* levels. *De minimis* levels (in tons per year [tpy]) vary by pollutant and also depend on the severity of the nonattainment status for the air quality management area in question.

Idaho is among the states that have been delegated authority by the USEPA to issue air quality permits and enforce air quality regulations. States with this authority are authorized to develop plans demonstrating how they will achieve, maintain, and enforce air quality standards. Jointly, the state rules and these plans are known as state implementation plans (SIPs). A SIP is the framework for each state's program to protect the air. It is not a single plan, but the accumulated record of a number of air pollution documents showing what the state has done, is doing, or plans to do to ensure compliance with federal NAAQS. Idaho has adopted most of the federal NAAQS into the state Rules for the Control of Air Pollution in Idaho, IDAPA 58.01.01. Any business or industry (source) in Idaho that emits, or has the potential to emit, pollutants into the air is required to have an air pollution control permit from IDEQ. Permits are issued when new sources begin operation and when existing sources modify their facilities.

Geothermal power plants are also required to comply with the CAA Amendments of 1990, Section 112r, for chemical accident prevention at facilities using substances that pose the greatest risk of harm from accidental releases. These regulations were built upon existing industry codes and standards and require companies of all sizes that use certain listed regulated flammable and toxic substances to develop a risk management program.

This analysis considers impacts beyond the physical project area where construction and operation would occur; the term ROI is used to describe the complete geographic scope of potential consequences for air quality. The ROI for air quality is identified as Elmore County.

Climate Change and Greenhouse Gases. Global climate change refers to long-term fluctuations in temperature, precipitation, wind, sea level, and other elements of Earth's climate system. Ways in which the Earth's climate system may be influenced by changes in the concentrations of various gases in the atmosphere have been discussed worldwide. Of particular interest, greenhouse gases (GHGs) are gas emissions that trap heat in the atmosphere. These emissions occur from natural processes and human activities. Scientific evidence indicates a trend of increasing global temperature over the past century because of an increase in GHG emissions from human activities. The climate change associated with this global warming is predicted to produce negative economic and social consequences across the globe.

3.1.2 Existing Conditions

MHAFB is in Elmore County, Idaho, which has been designated by USEPA as in attainment for all criteria pollutants (USEPA 2019a). As a result, a General Conformity applicability analysis is not required for federal actions occurring on the installation.

MHAFB currently purchases electricity from the local utility supply provider, which is Idaho Power. This electricity is produced from multiple energy sources that fluctuate yearly. Some of these energy sources may be a great distance from MHAFB and include renewable and nonrenewable means. The installation does not operate an on-site power plant for everyday power; however, diesel-fueled emergency generators are at the hospital and other mission-critical buildings to provide uninterrupted power in the event of an outage (IDEQ 2016).

Climate Change and Greenhouse Gases. Ongoing global climate change has the potential to increase average temperatures and cause more frequent, intense, and prolonged droughts in the northwestern United States, including Idaho. Droughts may be interspersed with years featuring heavy rainfall. These changes to regional climate patterns could result in regional changes to flooding frequency, snow pack depth, and wildfire potential, and could potentially impact hydroelectric power generation, potable and agricultural water availability, air quality, and recreational opportunities in the region (USGCRP 2018).

3.1.3 Environmental Consequences

Because Elmore County is in attainment for the NAAQS, the General Conformity rule does not apply to the Proposed Action at MHAFB. Nevertheless, the General Conformity rule *de minimis* thresholds can be used as a surrogate to determine the level of impacts under NEPA. Effects on air quality that would be considered indicators of significance include whether or not the annual air emissions of an alternative would exceed the General Conformity rule *de minimis* threshold values, or if an alternative would contribute to a violation of any federal, state, or local air regulation. Significant impacts also would occur if an alternative meaningfully contributed to the potential effects of global climate change.

3.1.3.1 ALTERNATIVE 1 – NORTHWEST

Construction. Constructing the proposed geothermal power facility at the Northwest Alternative site would have a short-term, minor, adverse impact on air quality. Emissions of criteria pollutants and GHGs would be directly produced from construction, such as operating heavy equipment and drill rig engines, construction workers commuting daily to and from job sites in their personal vehicles, heavy duty diesel vehicles hauling construction materials and debris to and from the job sites, and ground disturbance. Construction emissions would be temporary and last only for the duration of construction. For the purposes of this air quality analysis, construction is conservatively assumed to occur during 2021.

The air pollutant of greatest concern is particulate matter, such as fugitive dust. The quantity of uncontrolled fugitive dust emissions from a site is proportional to the area of land being worked and the level of activity. Fugitive dust air emissions would be greatest during the initial site grading and excavation and would vary day-to-day depending on the work phase, level of activity, and prevailing weather conditions. Particulate matter emissions would also be produced from the combustion of fuels in vehicles and equipment needed for construction. Construction would incorporate best management practices (BMPs) and environmental control measures (e.g., wetting the ground surface) to minimize fugitive particulate matter air emissions. Additionally, work vehicles are assumed to be well maintained and to use diesel particulate filters to reduce particulate matter air emissions.

The USAF's Air Conformity Applicability Model (ACAM) was used to estimate the air emissions from the construction of a notional geothermal power facility. **Table 3-1** summarizes these air emissions, and **Appendix B** contains the ACAM detail report.

Table 3-1. Estimated Air Emissions from Construction of a Notional Geothermal Facility

	NO_x (tpy)	**VOC** (tpy)	**CO** (tpy)	**SO_2** (tpy)	**PM_{10}** (tpy)	**$PM_{2.5}$** (tpy)	**CO_2e** (tpy)
Estimated Construction Emissions (2021)	21.592	5.679	8.046	0.020	31.586	0.705	2,057.3

Notes:
NO_x = nitrogen oxides; VOC = volatile organic compounds, CO = carbon monoxide; SO_2 = sulfur dioxide; PM_{10} = particulate matter less than or equal to 10 microns in diameter; $PM_{2.5}$ = particulate matter less than or equal to 2.5 microns in diameter; CO_2e = carbon dioxide equivalent; tpy = tons per year

The ACAM assumed that construction of the notional geothermal power facility would require 35 acres of grading, 2 acres of trenching for utility connections, 8 acres of new building construction (6 acres for power plant and 2 acres for reclamation and maintenance area), and 6 acres of paving (2 acres for access roads and 4 acres for storage yard). To estimate the air emissions from drilling the four geothermal production wells and five injection wells, the engine of a 900-hp, diesel-fueled emergency generator was used as a surrogate for the drilling equipment. Drilling was assumed to take 20 days for each well with the engine operating 8 hours per day. Total drilling time for all of the wells was assumed to be 1,440 hours during a single year.

Operations. On a local level, long-term, negligible, adverse impacts on air quality would occur from operating the proposed geothermal power facility. Indirect air emissions would be produced from the daily commutes of the six additional personnel operating the proposed power facility. It is anticipated that no direct air emissions would be produced from operating the proposed geothermal power facility because it would be a binary (closed-loop) system, and the dry-condenser system would not emit steam. However, the potential for air emissions from operating the geothermal power facility would be determined by the final design of the plant; MHAFB would follow the Rules for the Control of Air Pollution in Idaho, IDAPA 58.01.01, and would obtain a permit to construct (PTC), if required. MHAFB would also comply with the CAA Amendments of 1990, Section 112r, for use of any listed regulated flammable and toxic substances, and develop a risk management program, as applicable.

The annual air emissions from additional personnel were estimated using the USAF's ACAM and are provided in **Table 3-2**. These air emissions are assumed to occur annually beginning in 2022. **Appendix B** contains the ACAM detail report.

Table 3-2. Estimated Air Emissions from Additional Personnel

Estimated Operations Emissions (2022 and Later)	NO_x (tpy)	VOC (tpy)	CO (tpy)	SO_2 (tpy)	PM_{10} (tpy)	$PM_{2.5}$ (tpy)	CO_2e (tpy)
	0.031	0.034	0.381	<0.001	0.001	0.001	32.4

Notes:
NO_x = nitrogen oxides; VOC = volatile organic compounds, CO = carbon monoxide; SO_2 = sulfur dioxide; PM_{10} = particulate matter less than or equal to 10 microns in diameter; $PM_{2.5}$ = particulate matter less than or equal to 2.5 microns in diameter; CO_2e = carbon dioxide equivalent; tpy = tons per year

The use of geothermal energy to supply MHAFB's everyday energy needs would have a long-term, beneficial impact on regional air quality. The proposed power facility would be capable of generating 100 percent of the electric power needed for MHAFB (i.e., 15 MWs); therefore, the installation would no longer need to purchase power from commercial suppliers and could supply excess power to Idaho Power. This could result in a decrease in the regional demand for energy supplied from nonrenewable sources, which could lead to beneficial impacts on regional air quality. However, the sources for the energy currently supplied to MHAFB depend on many different economic factors, and energy could be generated outside of the MHAFB region. Therefore, the level of long-term, beneficial impacts on regional air quality from constructing a geothermal power facility on MHAFB is unknown.

No changes to the MHAFB air emission inventory would occur; however, the overall carbon footprint for MHAFB would decrease. The emergency generators at the hospital and other buildings would remain and continue to provide uninterrupted power in the event of an outage.

Summary. As noted in **Section 3.1.2**, the General Conformity rule does not apply and neither an applicability analysis nor a conformity determination is required. However, for informational purposes, the estimated annual air emissions can be compared to the 100-tpy *de minimis* level for nonattainment and maintenance areas. Annual emissions of all criteria pollutants would be well below the 100-tpy significance indicator, as shown in **Table 3-1** and **Table 3-2**. Therefore, this alternative would not result in a significant impact on air quality.

Climate Change and Greenhouse Gases. Constructing and operating the geothermal power facility at the Northwest Alternative site would emit approximately 2,057 tons of carbon dioxide equivalent (CO_2e) during the greatest year of GHG emissions (i.e., 2021) and 32 tons of CO_2e during the subsequent years. By comparison, 2,057 tons of CO_2e is approximately the GHG footprint of 396 passenger vehicles driven for 1 year or 223 homes' energy use for 1 year (USEPA 2018). As such, the annual emissions of GHGs would not meaningfully contribute to the potential effects of global climate change because of insignificant annual CO_2e emissions. Therefore, significant adverse impacts on climate change are not expected. The use of renewable, geothermal energy for MHAFB's energy needs would have a long-term, minor, beneficial impact on global climate change by potentially reducing GHG emissions produced from the use of nonrenewable energy for MHAFB.

Ongoing changes to climate patterns in the northwestern United States are described in **Section 3.1.2**. These climate changes are unlikely to affect USAF's ability to construct and operate the geothermal power facility.

3.1.3.2 ALTERNATIVE 2 – NORTHEAST

Siting the proposed geothermal energy facility at the Northeast Alternative site would have identical impacts on air quality as siting it at the Northwest Alternative site, as described in **Section 3.1.3.1**. Identical amounts of criteria pollutants and GHGs would be produced as those presented in **Table 3-1** and **Table 3-2** from constructing the proposed geothermal facility at the Northeast Alternative site, and the daily commutes of the additional personnel needed to operate it. If greater lengths of pipeline or more disturbance would be required than the 35 acres presented in **Section 3.1.3.1** and **Table 2-1**, increased short-term emissions would be anticipated, but are not anticipated to be significant. Identical long-term, beneficial impacts on regional quality and global climate change would occur from decreasing the installation's reliance on nonrenewable energy sources.

3.1.3.3 NO ACTION ALTERNATIVE

Under the No Action Alternative, the proposed geothermal power facility would not be constructed or operated on MHAFB and the existing conditions discussed in **Section 3.1.2** would remain unchanged. No air emissions from construction and additional personnel would be produced. MHAFB would continue to rely on local utility supply providers for electricity. Implementation of the No Action Alternative would not result in any new or additional impacts on air quality.

3.2 Biological Resources

3.2.1 Definition of the Resource

Biological resources include native or naturalized plants and animals and the habitats (e.g., grasslands, forests, wetlands) in which they exist. Protected and sensitive biological resources include Endangered Species Act (ESA)-listed species (threatened or endangered), those proposed for ESA-listing as designated by the U.S. Fish and Wildlife Service (USFWS) (terrestrial and freshwater organisms), and migratory birds. Migratory birds are protected species under the Migratory Bird Treaty Act (MBTA). Sensitive habitats include those areas designated or proposed by USFWS as critical habitat protected by the ESA, and as sensitive ecological areas designated by state or other federal rulings. Sensitive habitats also include wetlands, plant communities that are unusual or limited in distribution, and important seasonal use areas for wildlife (e.g., migration routes, breeding areas, crucial summer and winter habitats).

The ESA (16 USC § 1531 et seq.) establishes a federal program to protect and recover imperiled species and the ecosystems upon which they depend. The ESA requires federal agencies, in consultation with USFWS, to ensure that actions they authorize, fund, or carry out are not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of designated critical habitat of such species. Under the ESA, "jeopardy" occurs when an action is reasonably expected, directly or indirectly, to diminish numbers, reproduction, or distribution of a species so that the likelihood of survival and recovery in the wild is appreciably reduced. An "endangered species" is defined by the ESA as any species in danger of extinction throughout all or a significant portion of its range. A "threatened species" is defined by the ESA as any species likely to become an endangered species in the foreseeable future. The ESA also prohibits any action that causes a "take" of any listed animal.

"Take" is defined as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect or attempt to engage in any such conduct." Listed plants are not protected from take, although it is illegal to collect or maliciously harm them on federal land.

Critical habitat is designated if USFWS determines that the habitat is essential to the conservation of a threatened or endangered species. Federal agencies must ensure that their activities do not adversely modify designated critical habitat to the point that it will no longer aid in the species' recovery.

The MBTA of 1918 (16 USC 703–712), as amended, and EO 13186, *Responsibilities of Federal Agencies to Protect Migratory Birds*, require federal agencies to minimize or avoid impacts on migratory birds. Unless otherwise permitted by regulations, the MBTA makes it unlawful to (or attempt to) pursue, hunt, take, capture, or kill any migratory bird, nest, or egg. Federal agencies with activities that could have measurable negative impacts on migratory birds are directed by EO 13186 to develop and implement a memorandum of understanding (MOU) with USFWS to promote the conservation of migratory bird populations.

Bald eagles (*Haliaeetus leucocephalus*) and golden eagles (*Aquila chrysaetos*) are protected under the Bald and Golden Eagle Protection Act (BGEPA), which prohibits the "take" of bald or golden eagles in the United States without a 50 CFR § 22.26 permit. BGEPA defines "take" as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest, or disturb." For purposes of these guidelines, "disturb" means "to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause: (1) injury to an eagle; (2) a decrease in its productivity by substantially interfering with normal breeding, feeding, or sheltering behavior; or (3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior." In addition to immediate impacts, this definition also covers impacts that result from human-induced alterations initiated around a previously-used nest site during a time when eagles are not present, if, upon the eagle's return, such alterations agitate or bother an eagle to a degree that interferes with or interrupts normal breeding, feeding, or sheltering habits, and causes injury, death, or nest abandonment.

The Federal Noxious Weed Act (Public Law [P.L.] 93-629) mandates control of noxious weeds by limiting possible weed seed transport from infested areas to noninfested sites. EO 13112, *Invasive Species*, requires all federal agencies to prevent the introduction of invasive species; provide for their control; and minimize their economic, ecological, and human health impacts. Under EO 13112, installations shall not, to the extent practicable, authorize, fund, or carry out management actions that are likely to cause the introduction or spread of invasive species.

3.2.2 Existing Conditions

Vegetation. MHAFB lies within the landform and vegetation classification known as the Intermountain Sagebrush Province/Sagebrush Steppe Ecosystem, which is widespread throughout of southern Idaho, eastern Oregon, eastern Washington, and portions of northern Nevada, California, and Utah. This ecosystem is very diverse with various vegetation types, ranging from vast expanses of flat sagebrush-covered plateaus to mountains blanketed with juniper woodlands and grasslands (MHAFB 2012).

MHAFB was historically covered with Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) communities with an understory of native forbs and grasses. Rabbitbrush species (*Chrysothamnus* sp.) were once a minor component of mature sagebrush stands or major component of plant communities that had undergone fires that removed the sagebrush component. Often forming within the Wyoming big sagebrush were mosaics of salt desert shrub communities such as shadscale (*Atriplex confertifolia*), greasewood (*Sarcobatus vermiculatus*), and four-wing saltbush (*Atriplex canescens*), especially in drier, more saline, lower elevation sites. However, significant declines in the amount and quality of sagebrush habitat have occurred over the last 15 years. A few remnant patches of sagebrush still exist and most have a weedy understory. These remnant patches have been greatly degraded by off-highway vehicle activity, use during military exercises, and weed invasion.

Most open space on the installation is covered by a mix of weedy annual grasses, invasive species such as annual kochia (*Bassia scoparia*), Russian thistle (*Salsola kali*), and bur buttercup (*Ceratocephala testiculata*). Seedings and weed control treatments on MHAFB have improved some areas by establishing perennial grasses and removing cheatgrass (*Bromus tectorum*) and annual weeds (MHAFB 2012).

The Northwest Alternative site consists of over 42 acres of open space that is currently undeveloped. There are 25 acres of natural ground and over 17 acres of scattered brush and grass vegetation within the project area (**Figure 3.1**). Areas of natural ground are likely composed of a mix of weedy annual grasses and invasive species that also comprise most open space on the installation. The scattered brush and grass areas are likely highly disturbed with nonnative species such as cheatgrass and annual kochia as the dominant vegetation, with other shrub species present.

The Northeast Alternative site consists of over 112 acres of undeveloped open space. The vegetation in the Northeast Alternative site is dominated by shrub species. Over 89 acres are classified as the Wyoming big sagebrush community, 23 acres are classified as scattered brush and grass, and less than an acre is mapped as natural ground (**Figure 3.2**). Various shrub species likely occur in this area include Wyoming big sagebrush, rabbitbrush, shadscale, greasewood, and four-wing saltbush. The understory in undisturbed conditions is dominated by perennial grasses such as bluebunch wheatgrass (*Pseudoroegneria spicata*), sandberg bluegrass (*Poa secunda*), and Idaho fescue (*Festuca idahoensis*) (Tisdale 1986). It is likely that cheatgrass is encroaching on this vegetation community.

Idaho-listed noxious weed species on MHAFB include rush skeletonweed (*Chondrilla juncea*), with small, incidental infestations of field bindweed (*Convolvulus arvensis*), buffalobur (*Solanum rostratum*), black henbane (*Hyoscyamus niger*), puncturevine (*Tribulus terrestris*), perennial sowthistle (*Sonchus arvensis*), perennial pepperweed (*Lepidium latifolium*), whitetop (*Cardaria draba*), and Canada thistle (*Cirsium arvense*). Noxious weeds are those species as defined by the State of Idaho as having the potential to cause injury to public health, crops, livestock, land, or other property. Landowners are required by Idaho law to control noxious weeds on their lands (MHAFB 2012).

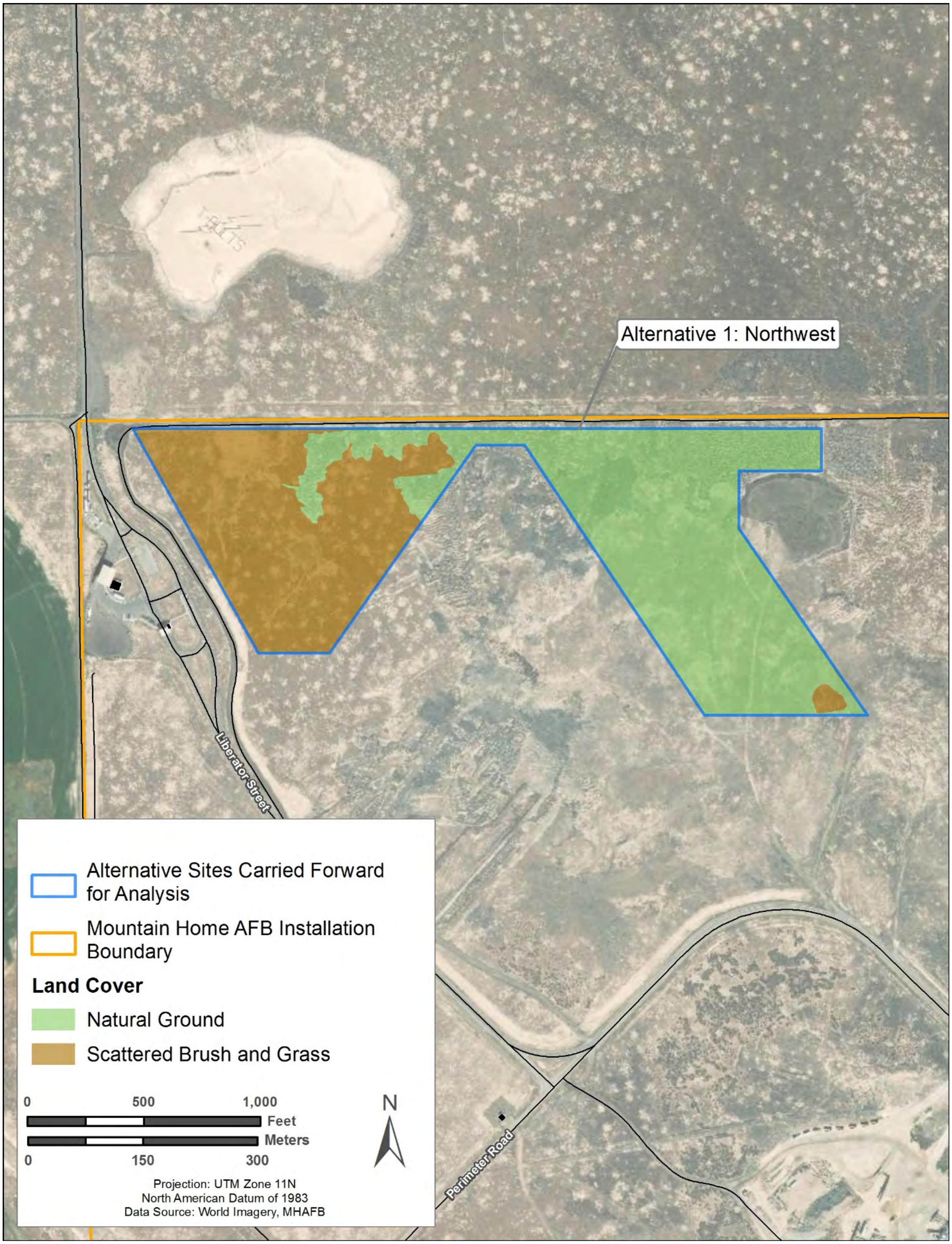

Figure 3.1. Vegetation within the Northwest Alternative

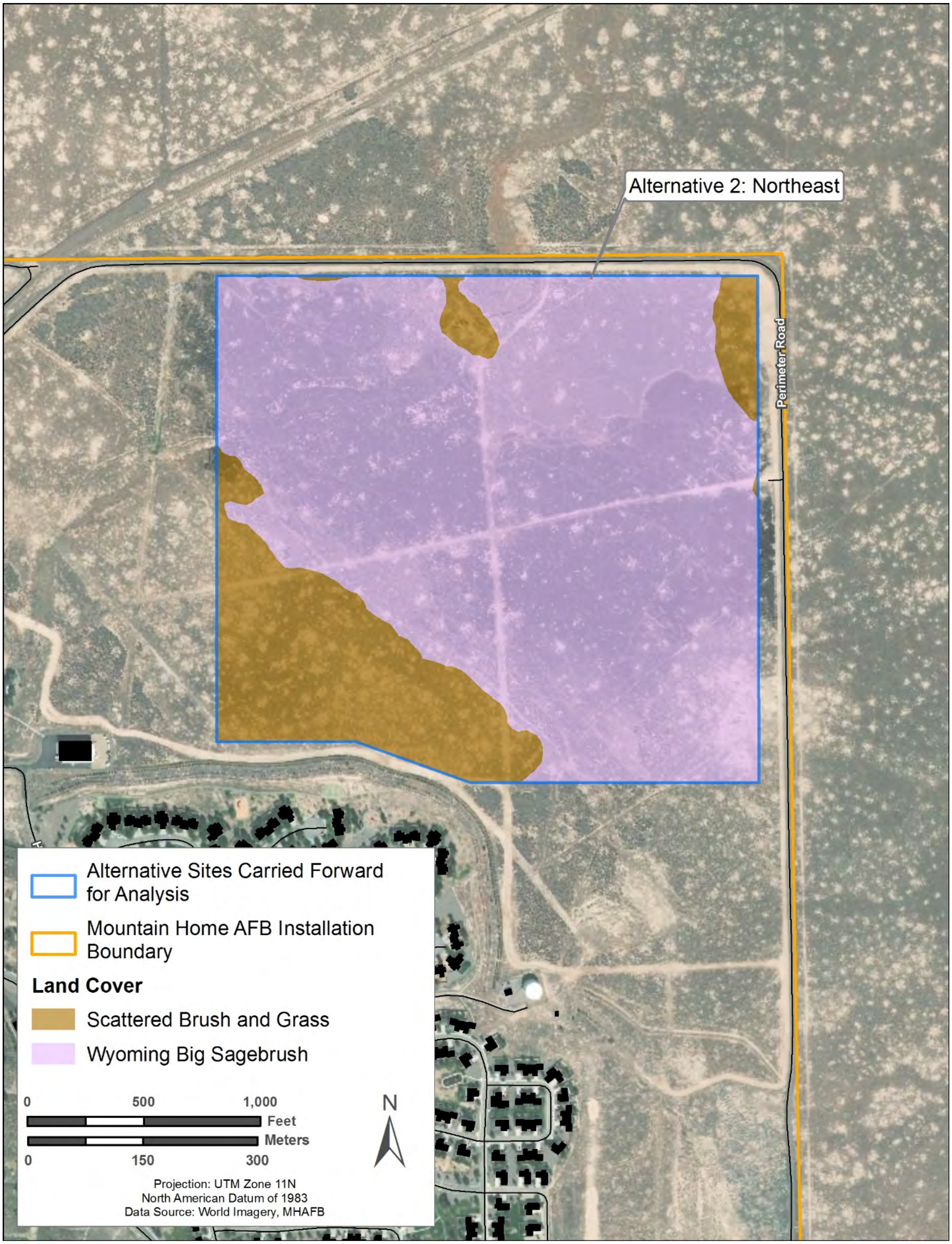

Figure 3.2. Vegetation within the Northeast Alternative

Wildlife. MHAFB actively manages wildlife in cooperation with the Idaho Department of Fish and Game (IDFG), USFWS, and the Bureau of Land Management (BLM). Wildlife habitat is maintained or removed through vegetation manipulation and ground disturbance, and is largely managed through post-fire rehabilitation and grazing practices. Wildlife found on MHAFB consist of species that easily habituate to noise and human presence. There are four dominant wildlife habitat types as defined by topography and vegetation: (1) landscaped areas around residential and installation facilities, (2) isolated sagebrush flats, (3) flat areas dominated by exotic annual weed species, and (4) rubble piles dominated by exotic annual weed species.

During the vegetation surveys of the installation, only small, isolated stands of native habitat were located (MHAFB 2012). Most lands on and surrounding the installation have been converted to non-native species by fires, agriculture, and development. This limited habitat and small patch size cannot support wide-ranging species, such as mule deer (*Odocoileus hemionus*), pronghorn antelope (*Antilocapra americana*), and sage-grouse (*Centrocercus urophasianus*). However, many smaller mammal, reptile, and bird species have adapted to urban areas and human disturbance.

Common mammals on the installation include mountain cottontails (*Sylvilagus nuttalii*), Great Basin ground squirrels (*Spermophilus mollis*), voles (*Microtus* spp.), deer mice (*Peromyscus maniculatus*), American badgers (*Taxidea taxus*), coyotes (*Canis latrans*), and various bat species. Great Basin ground squirrels are especially abundant around the developed areas. Voles have been reported as hindering the development of tree shelterbelts. American badgers and coyotes occur on MHAFB and dens occur throughout the installation. Bats might roost in buildings and trees and forage around lights (MHAFB 2011).

The Morley Nelson Snake River Birds of Prey National Conservation Area (NCA) surrounds MHAFB. The NCA provides habitat for one of the largest concentration of raptors in North America and contains 484,873 acres of land along the Snake River corridor and adjacent uplands. Many raptors have been observed on the installation, including the prairie falcon (*Falco mexicanus*), American kestrel (*Falco sparverius*), red-tailed hawk (*Buteo jamaicensis*), burrowing owl (*Athene cunicularia*), and great-horned owl (*Bubo virginianus*). Prairie falcons are known to nest in the Snake River Canyon to the south of MHAFB, but suitable nesting substrate does not occur on the installation. Great-horned owls readily habituate to urban areas and nest in the trees on the installation. Burrowing owls are found on the installation around the golf course, near rubble piles, and in annual grasslands with suitable abandoned badger holes. Other raptors that might forage on the installation include the northern harrier (*Circus cyaneus*), short-eared owl (*Asio flammeus*), and golden eagle. Bald eagles could use storage lagoons in the western portion of MHAFB; however, no recent observations of bald eagles have been made on the installation (MHAFB 2011).

A variety of songbirds use trees, shrubs, utility lines, ditches, annual grassland areas, and sagebrush flats on the installation, including American robins (*Turdus migratorius*), house finches (*Haemorhous mexicanus*), killdeer (*Charadrius vociferus*), horned larks (*Eremophila alpestris*), western meadowlarks (*Sturnella neglecta*), Brewer's blackbirds (*Agelaius phoeniceus*), common grackles (*Quiscalus quiscula*), brown-headed cowbirds (*Molothrus ater*), sage sparrows (*Artemisiospiza nevadensis*), savannah sparrows (*Passerculus sandwichensis*), and vesper sparrows (*Pooecetes gramineus*). Turkey vultures (*Cathartes aura*) have been seen on the west side of MHAFB near the landfill. Long-billed curlews (*Numenius americanus*) occur in great numbers near the golf course, rapid infiltration basins, and the annual grasslands near the northern end of the flight line. Waterfowl concentrate along Snake River and use it year-round. Several waterfowl species use the storage lagoons in the western portion of the installation; however, MHAFB has an active program to discourage waterfowl use of these lagoons for bird/wildlife aircraft strike hazard (BASH) prevention. A greater number of waterfowl migrate through the area during the spring and fall, but some birds are found year-round (MHAFB 2011).

Because aquatic and sagebrush habitat is limited, few amphibians and reptiles likely occur on the installation. Pacific tree frogs *(Hyla regilla*) and garter snakes (*Thamnophis* spp.) could potentially inhabit locations near areas or facilities where irrigation and landscaping practices maintain artificially moist conditions. Gopher snakes (*Pituophis catenifer deserticola*) and rattlesnakes (*Crotalus viridus*) are occasionally found on MHAFB (MHAFB 2011).

Sensitive and Protected Species. Based on the *USFWS Information for Planning and Consultation (IPaC) System Report* (USFWS 2019), one federally-listed threatened species has the potential to occur on MHAFB, the slickspot peppergrass (*Lepidium papilliferum*) (LEPA). LEPA is a small annual or biennial plant species with small white flowers. Habitat is restricted to semi-arid sagebrush-steppe ecosystems. LEPA grows primarily within slickspots, which are unique microenvironments consisting of bare areas that temporarily pool water and contain soils that are significantly higher in sodium and clay content (MHAFB 2012). The known range for this species is Idaho's western Snake River Plain and neighboring foothills in Owyhee, Payette, Gem, Canyon, Ada, and Elmore counties (MHAFB 2012). MHAFB and BLM extensively surveyed areas of the main installation and ground areas underlying the air-ground range complexes outside of the main installation boundary (MHAFB 2012). Neither the species, nor suitable habitat to support the species, has been observed on MHAFB. No habitat for any other federally-listed threatened or endangered species is present on MHAFB and no state-listed species have been observed on the installation.

There are 13 species of special concern listed by IDFG that have been documented or may occur on MHAFB (MHAFB 2011). **Table 3-3** lists the 11 birds and 2 mammal species, their preferred habitat, and potential to occur in the project area.

Table 3-3. Species of Special Concern that May Occur in the Project Area

Species	Habitat Description*	Potential Occurrence
Birds		
American white pelican (*Pelecanus erythrorhynchos*)	Breeds mainly on isolated islands in freshwater lakes or reservoirs. They forage on inland marshes, lakes, or rivers. Winter habitat includes southern and western coastal marine habitats. Pelicans favor shallow coastal bays, inlets and estuaries that have forage fish and loafing sites. During spring and fall migration birds stop at aquatic foraging and loafing areas similar to those used during breeding season.	Not Likely- No suitable habitat present
Bald eagle (*Haliaeetus leucocephalus*)	Bald Eagles are associated with aquatic ecosystems, including lakes, rivers, coastlines, marshes, and reservoirs. They feed primarily on fish, but the diet also includes waterfowl, carrion, and small mammals.	Not Likely- No suitable habitat present
Brewer's sparrow (*Spizella breweri*)	Primarily breeds in sagebrush steppe habitats and are considered to be sagebrush steppe obligates. Also sometimes associated with salt desert scrub habitats. Nests are usually constructed in the mid to upper canopy of tall, dense sagebrush or greasewood.	Possible, habitat present in northwest corner
California gull (*Larus californicus*)	California gulls breed almost exclusively on barren or sparsely vegetated islands in natural lakes, reservoirs, and rivers. A wide variety of fairly open habitats is used for foraging, including reservoirs, lakes, irrigation canals, weirs, garbage dumps, feed lots, irrigated agricultural fields, and pastures.	Not Likely- No suitable habitat present
Golden eagle (*Aquila chrysaetos*)	Inhabits partially or completely open country, especially around mountains, hills, and cliffs. They use a variety of habitats ranging from arctic to desert, including tundra, shrublands, grasslands, coniferous forests, farmland, and areas along rivers and streams.	Possible, habitat present in northwest corner
Loggerhead shrike (*Lanius ludovicianus*)	Loggerhead shrikes nest in isolated trees or large shrubs. They use scattered, tall shrubs and fences as perches to feed on a variety of pretty, which includes small birds, lizards and mice.	Possible, habitat present in northwest corner
Long-billed curlew (*Numenius americanus*)	Short-growth grasslands, mixed-grass prairies, meadows, grazed mixed-grass and scrub communities, cultivated fields, lawns, mud flats, grassy floodplains, sandy islands, shoals, salt marshes along coastal shorelines, and edges of ponds, lakes, and other non-flowing bodies of water comprise common habitats used by long-billed curlews.	Possible, habitat present in northwest corner
Sage sparrow (*Amphispiza belli*)	Preferred habitat includes areas containing shrubs at least 18 inches tall with 10-25 percent ground cover. A sparse grass and forb component is necessary within the shrub interspaces to support insects.	Possible, habitat present in northwest corner
Sage thrasher (*Oreoscoptes montanus*)	Sage thrashers primarily inhabit sagebrush areas, but can also occur in salt desert scrub habitat. Nests are either constructed in the branches of sagebrush (occasionally greasewood) or placed underneath the shrub.	Possible, habitat present in northwest corner

Species	Habitat Description*	Potential Occurrence
Western burrowing owl (*Athene cunicularia*)	Suitable habitat for this species consists of shrubs spaced far apart or low stature vegetation. Ideal habitats are also closely associated with burrowing animals (such as ground squirrels and badger), as burrowing owls use holes created by these species as nest sites.	Possible, habitat present in northwest corner
White-faced ibis (*Plegadis chihi*)	Typical breeding habitat includes freshwater wetlands, ponds, swamps and marshes with pockets of emergent vegetation. They also use flooded hay meadows and agricultural fields as feeding locations. Ibises nest in areas where water surrounds emergent vegetation, bushes, shrubs, or low trees. This species is a migrant through Idaho.	Not Likely- No suitable habitat present
Mammals		
Long-eared myotis (*Myotis evotis*)	This species occupies a wide range of rocky and forested habitats over a broad elevation gradient. Summer day roosts include abandoned buildings, bridges, hollow trees, stumps, under loose bark, and rock fissures. Hibernacula include caves and abandoned mines. Occurs year round throughout Idaho.	Not Likely- No suitable habitat present
Yuma myotis (*Myotis yumanensis*)	Found near water in dry coniferous forests and arid shrublands. Summer day roosts include buildings, bridges, mines, and bat houses, sometimes caves and trees. Hibernacula not described. Year round resident in southern Idaho.	Possible- Shrub habitat present in northwest corner

*Source: IFWIS 2010

The Davis' peppergrass (*Lepidium davisii*), a BLM-listed species of concern also has been documented on MHAFB. Davis' peppergrass is a regional endemic plant restricted mainly to Ada, Elmore, and Owyhee counties, Idaho. In addition to a narrow distribution, it is also restricted to a very narrow set of habitat conditions: flat, hard floors of dry lake beds known as vernal pools or playas. These small, isolated habitats are subjected to numerous and varied disturbances. Rare plant surveys conducted at MHAFB between 1991 and 1995 revealed the presence of four populations of Davis's peppergrass on the Small Arms Range, and a playa within the installation (Bernatas and Moseley 1991, USAF ACC 1995). The Small Arms Range area is over a mile north of the main installation and the project area. Furthermore, there are no mapped playas within the northwest or northeast corners of MHAFB. This species is unlikely to occur within the project area.

3.2.3 Environmental Consequences

For vegetation and wildlife, each species has unique, fundamental needs for food, shelter, water, and space and can be sustained only where their specific combination of habitat requirements are available. Removing sustaining elements of a species' habitat impacts its ability to exist. Therefore, the evaluation of impacts on wildlife and vegetation is based on whether the action would cause habitat displacement resulting in reduced feeding or reproduction, removal of critical habitat for sensitive species, and/or behavioral avoidance of available habitat as a result of noise or human disturbance. The level of impacts on biological resources is based on (1) the importance (i.e., legal, commercial, recreational, ecological, or scientific) of the resource, (2) the proportion of the resource that would be affected relative to its occurrence in the region, (3) the sensitivity of the resource to the proposed activities, and (4) the duration of ecological ramifications. Impacts on biological resources are considered significant if species or special habitats are adversely affected over large areas, or disturbances cause reductions in population size or distribution of a species of special concern.

3.2.3.1 ALTERNATIVE 1 – NORTHWEST

Vegetation. Short- and long-term, adverse, direct, and indirect effects on vegetation would be expected from constructing and operating the geothermal facility at the Northwest Alternative site. Permanently removing up to 35 acres of currently undisturbed vegetation would occur with the construction of the geothermal facility. The construction footprint is not finalized and therefore the amount of permanently removed vegetation may change. The vegetation in this region of MHAFB is largely disturbed with invasive species dominating the area, especially annuals like cheatgrass. Long-term impacts on vegetation would also occur during construction from the potential encroachment of noxious weeds and other invasive species. To avoid or minimize impacts on vegetation from spreading noxious weeds, construction crews should avoid infested areas and clean their equipment prior to coming on site to ensure it is weed and weed seed free. Any fill should be taken from an on-site location that is weed-free to prevent the introduction of new weed species. Once construction is complete, revegetation with native species should occur where possible to prevent soil erosion and overall site deterioration.

Temporary disturbances to vegetation would also occur during construction. Incidental crushing and trampling of vegetation would occur from heavy equipment and increased foot traffic. To minimize the temporary impact on vegetation during construction, crews should restrict travel to areas within the designated construction footprint.

Operating the geothermal facility would have long-term, direct, and indirect adverse impacts on vegetation. Vegetation would be permanently removed and unable to return to a naturalized state. Furthermore, routine maintenance of vegetation would occur to reduce the risk of wildfire in and adjacent to the facility, not allowing the community to return to a more naturalized state. The increase in activity and soil disturbance from operating crews would increase the risk of spreading and encroachment of noxious weeds and other invasive species. To minimize or avoid impacts, personnel should restrict their travel to designated roads and pathways.

Wildlife. Short- and long-term, adverse, direct, and indirect effects on wildlife would be expected from constructing and operating the geothermal facility in the northwest portion of MHAFB. Although the vegetation in the area is highly disturbed, it still provides marginal foraging habitat for various songbirds, raptors, reptiles and small mammals. Some smaller species that are less mobile or have smaller home ranges may be permanently displaced or killed during ground disturbing activities associated with construction. Individuals not habituated to human presence would likely be displaced to adjacent undeveloped areas. Wildlife that is more mobile would temporarily avoid the area or alter their behavior during construction due to the increased noise and activity. After construction is completed, wildlife would gradually acclimate to the disturbance and use remaining open space in the project area. Because there is comparable habitat in the vicinity, these impacts are expected to affect individuals and would not impact local or regional wildlife populations.

Increased vehicular traffic, during construction and operation, is expected. Vehicles could crush or collide with a variety of wildlife, especially less mobile species, such as rodents, small mammals, and lizards. These impacts would be minimized by implementing speed restrictions during construction and operation of the facility.

Long-term, direct, adverse impacts on wildlife are expected from operating the geothermal facility. Wildlife may avoid habitat affected by the longer-term noise generated, low-level noise could be continually generated by injection wells or other aspects of the facilities. These effects may displace individuals or reduce breeding success of species sensitive to noise and human activity. These impacts are expected to affect individuals and would not impact local or regional wildlife populations. Permanent structures associated with the facility (wells, pipeline, and access roads) could impact foraging wildlife using the habitat in the vicinity of the proposed features. The permanent features would be beneficial for some wildlife since it may increase perches for raptors to hunt, while also being adverse for small prey species.

Special Status Species. No impacts, and therefore no adverse effects, would be expected on the federally-threatened LEPA since it has not been recorded within MHAFB boundaries and no suitable habitat to support the species occurs on the installation (MHAFB 2012).

Short- and long-term, adverse, direct, and indirect effects on species of special concern would be expected from constructing and operating the geothermal facility in the northwest portion of MHAFB. Species of special concern may use the area for foraging. Once construction is complete, it would result in permanently removing suitable to marginal foraging habitat. Individuals would permanently or temporarily avoid the area during construction and operation. Species that are habituated to human activity would return to the area and normal behavior once construction is complete. Similar to the wildlife analysis, the permanent features would provide perches for raptor species to use for hunting.

3.2.3.2 ALTERNATIVE 2 – NORTHEAST

Vegetation. Similar to the Northwest Alternative described in **Section 3.2.3.1**, constructing and operating the geothermal power facility at the Northeast Alternative site would have short- and long-term, adverse, direct, and indirect effects on vegetation in the northeast portion of MHAFB. Constructing the geothermal facility would result in permanently removing up to 35 acres of otherwise undisturbed vegetation. The construction footprint is not finalized and therefore the amount of vegetation permanently impacted could be up to 50 acres. Impacts on vegetation would be similar between both alternatives. The northeast corner does contain more native shrubby vegetation; therefore reseeding should be considered in areas where it is applicable to prevent the spread of noxious weeds into existing native vegetation, as well as prevent soil erosion and overall site deterioration.

Wildlife. Impacts on wildlife would be similar to the Northwest Alternative described in **Section 3.2.3.1**. Short- and long-term, adverse, direct, and indirect effects on wildlife would be expected from constructing and operating the geothermal facility in the northeast portion of MHAFB. The northeast corner provides more native shrubby vegetation that provides suitable foraging and nesting habitat for various wildlife species. Impacts on wildlife would be similar to those described for the Northwest Alternative.

Special Status Species. No impacts, and therefore no adverse effects, would be expected on the federally-threatened LEPA since it has not been recorded within MHAFB boundaries and no suitable habitat to support the species occurs on the installation (MHAFB 2012).

Short- and long-term, adverse, direct, and indirect effects on species of special concern would be expected from constructing and operating the geothermal facility in the northeast portion of MHAFB. Species of special concern may use the area for foraging. Once construction is complete, it would result in permanently removing suitable to marginal foraging habitat. Individuals would permanently or temporarily avoid the area during construction and operation. Species that are habituated to human activity would return to the area and normal behavior once construction is complete. Similar to the wildlife analysis, the permanent features would provide perches for raptor species to use for hunting.

3.2.3.3 NO ACTION ALTERNATIVE

Under the No Action Alternative, the proposed geothermal power facility would not be constructed or operated on MHAFB and the existing conditions discussed in **Section 3.2.2** would remain unchanged. MHAFB would continue to rely on local utility supply providers for electricity and neither the northwest nor northeast corner would be permanently developed. Therefore, no impacts on vegetation, wildlife, or special status species would occur from implementation of the No Action Alternative.

3.3 Geology and Soils

3.3.1 Definition of the Resource

Geological resources consist of the Earth's surface and subsurface materials. Within a given physiographic province, these resources typically are described in terms of topography and physiography, geology, soils, and, where applicable, geologic hazards, and paleontology.

Topography and physiography pertain to the general shape and arrangement of a land surface, including its height and the position of its natural and human-made features. Geology is the study of the Earth's composition and provides information on the structure and configuration of surface and subsurface features. Such information derives from field analysis based on observations of the surface and borings to identify subsurface composition.

Soils are the unconsolidated materials overlying bedrock or other parent material. Soils typically are described in terms of their complex type, slope, and physical characteristics. Differences among soil types in terms of their structure, elasticity, strength, shrink-swell potential, and erosion potential affect their abilities to support certain applications or uses. In appropriate cases, soil properties must be examined for their compatibility with particular construction activities or types of land use.

Prime farmland is protected under the Farmland Protection Policy Act (FPPA) of 1981. Prime farmland is defined as land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops, and is also available for these uses. The soil qualities, growing season, and moisture supply are needed for a well-managed soil to produce a sustained high yield of crops in an economic manner. The land could be cropland, pasture, rangeland, or other land, but not urban built-up land or water. The intent of the FPPA is to minimize the extent that federal programs contribute to the unnecessary conversion of farmland to nonagricultural uses. The FPPA also ensures that federal programs are administered in a manner that, to the extent practicable, will be compatible with private, state, and local government programs and policies to protect farmland.

The Natural Resources Conservation Service (NRCS) is responsible for overseeing compliance with the FPPA and has developed the rules and regulations for its implementation (7 CFR Part 658). The implementing procedures of the FPPA and NRCS require federal agencies to evaluate the adverse effects (direct and indirect) of their activities on prime and unique farmland, as well as farmland of statewide and local importance, and to consider alternative actions that could avoid adverse effects.

3.3.2 Existing Conditions

Geology. MHAFB is in the Columbia Plateau, in the western Snake River Plain. The Snake River Plain is a northwest-trending basin surrounded by high-angle faults, which are believed to be the result of tectonic rifting that ended 3 million years ago. Volcanic activity is evidenced at MHAFB by basaltic and rhyolitic rock formations and by remnant volcanic features, such as cones, vents, and shield volcanoes. These volcanic deposits form the bedrock underlying the region. The thick basaltic lava flows and interbedded sedimentary units around MHAFB are known as the Idaho Group and the Snake River Group. Overlying the volcanic deposits are thick layers of lake bed deposits and recent alluvium and colluviums, including silt, sand, clay, ash, and gravel. These sediments were deposited by the now extinct Lake Idaho (MHAFB 2011). There are no known geologic hazards in the project area.

Geoscientific data collected from the MHAFB geothermal field indicates the existence of a large, moderate temperature geothermal resource. Geothermal exploration occurred at MHAFB in 1986 on the eastern side of the installation at test well MH-1, and in 2012 in the northwest corner of the installation at test well MH-2, which indicated that the geothermal strata in these locations is similar (Armstrong et al. undated; Nielson and Shervais 2014). Maximum temperatures vary between 200 to 302 °F at depths between 3,960 feet in MH-1 to 5,882 feet in MH-2 (Lewis and Stone 1988; Armstrong et al. undated). The temperature depth measurements for MH-1 and MH-2 are generally consistent. The hydrothermal system is hosted by a fault zone containing hydrothermal breccias. Analysis of fracturing suggests that the fault is steeply dipping (~80º) and has a strike of about 300º, and temperatures decrease after drilling deeper into the footwall block; thus, the fault confines the geothermal system on the south (Nielson et al. 2018). The resource reservoir geothermal gradient is confirmed in two wells and regional in extent; however, the resource permeability has not been evaluated.

Topography. Topography of the project areas is characterized by flat to gently rolling hills and plateaus, and elevations that average from 2,900 to 3,100 feet above mean sea level (MHAFB 2011).

Soils. Soils at MHAFB are loamy, which are typical of semi-arid regions. Within the project area for the Northwest Alternative site, soils include the Bahem silt loam and the Minidoka-Minveno silt loam. Within the project area for the Northeast Alternative site, soils include the Minidoka-Minveno silt loam, Minveno silt loam, and the Minveno-Minidoka stony silt loam. These soils are poorly drained with slopes ranging from 0 to 8 percent, and have a moderate erosion potential through precipitation and riverine and eolian processes (MHAFB 2011).

Soils mapped in the northern half of MHAFB and soil limitations are shown in **Table 3-4**. Soil limitations to construction were determined based on data available in the NRCS web soil survey (NRCS 2019). Soil limitations were rated for building construction and dwellings. The Bahem and Garbutt silt loams are not limited, and the Minidoka-Minveno silt loam is rated as somewhat limited for building construction due to the depth to a thin cemented pan. Both the Minveno silt loam and Minveno-Minidoka stony silt loam were rated as very limited due to depth to bedrock and depth to a thin cemented pan (NRCS 2019).

Table 3-4. Properties of Soils Mapped in the Northern Half of MHAFB

Unit	Texture	Area within the Northern Half MHAFB	Farmland Classification	Construction Limitations
Bahem	silt loam (0 to 4 percent slopes)	Largest area, occupies most of the southwestern portion of the northern half of MHAFB	Prime farmland soil if irrigated	Not limited for building construction
Minidoka-Minveno	silt loam (0 to 4 percent slopes)	Southern three-quarter of the Northwest Alternative site project area	Not prime farmland soil	Somewhat limited due to depth to thin cemented pan
Minveno	silt loam (0 to 4 percent slopes)	Northern two-thirds of the Northeast Alternative site project area	Not prime farmland soil	Somewhat limited due to depth to thin cemented pan
Minveno-Minidoka	stony silt loam (0 to 8 percent slopes)	Eastern edge of MHAFB	Not prime farmland soil	Very limited for building construction due to depth to bedrock and depth to a thin cemented pan
Garbutt	silt loam (4 to 8 Percent slopes)	Eastern edge of MHAFB, golf course area	Not prime farmland soil	Not limited for building construction

Source: NRCS 2019

Prime Farmland. The Bahem silt loam is considered a prime farmland soil if irrigated. However, this land is not available for agriculture because its status within MHAFB is considered to be urban or developed, which by definition cannot be prime farmland. Therefore, the portion of the project area where prime farmland soils are mapped, would not be considered prime farmland.

3.3.3 Environmental Consequences

The methodology for identifying and evaluating impacts on geology and soils involves establishing baseline conditions through review and evaluation of maps, reports, and other relevant data showing the location and known status of geology, topographic features, soil types, and geologic hazards. This information is then correlated to elements of a proposed action and alternatives to determine potential impacts. The impact assessment for geology, topography, soils, and geologic hazards considers the following:

- potential to destroy unique geological features
- effects on important geologic features (including large-scale soil or rock removal)

- potential to impact soil or geological structures that control groundwater quality or groundwater availability
- substantial alteration of the surrounding landscape
- diminished slope stability
- physical disturbance that would substantially increase the rate of erosion and soil loss
- physical disturbance that would substantially increase impervious surfaces
- substantial alteration of soil structure or function
- change to soil and/or bedrock conditions that would increase the vulnerability of people or property to a geologic hazard (e.g., seismic activity, tsunami, landslides, and liquefaction) and the probability that such a hazard could result in injury or property damage.

Potential impacts are evaluated based on the degree of project-induced change in a particular factor (e.g., soil erosion) relative to existing conditions, as well as by regulatory standards, where applicable. Generally, direct and indirect impacts can be avoided or minimized if proper construction techniques, erosion control measures, and structural engineering design are incorporated into project development.

3.3.3.1 ALTERNATIVE 1 – NORTHWEST

Topography. Long-term, negligible, adverse effects would be expected on the natural topography as a result of geothermal development within the Northwest Alternative site. Constructing the geothermal power facility would occur within currently undeveloped areas. Modifying existing microtopography would occur as a result of grading, excavating, and filling to accommodate construction. Impacts would be expected to be negligible because the natural topography is so flat.

Geology. Long-term, negligible, adverse effects would be expected on the geology within the Northwest Alternative site. Geothermal development may have a low potential for inducing seismic events. Drilling for geothermal resources, and removing fluid from and injecting it back into underground reservoirs can increase seismic activity (Lofthouse et al. 2015). Geothermal-induced seismicity has resulted in microseismic events, which have Richter magnitudes below 2 or 3 and are generally not felt by humans. The Proposed Action would be designed to balance geothermal reservoir pressures and not increase pressure or induce rock fracture; therefore, the Proposed Action is not expected to induce seismic events.

The proposed binary cycle geothermal power facility at the Northwest Alternative site would have similar water temperatures and geologic conditions to binary cycle power facilities that have been operating in California, Nevada, and Idaho without incident. In the case of binary cycle power facilities, there are no evaporative losses such that all of the extracted fluid is returned to the reservoir. In the proposed binary cycle water facility, fluid would be pumped from the geothermal reservoir located along localized fractures or faults; heat would be extracted; and then the fluid would be injected back into the reservoir to maintain a constant pressure. So long as the injected fluid is returned to the same reservoir as was extracted for a net fluid balance, there is generally little if any loss of pore pressure and little cause exists for the operations to produce significant induced seismicity (Council 2013, Committee 2013). Additionally, prior to construction, USAF would conduct an analysis of stress conditions on a fault plane to identify fluid injection pressures that would be below failure conditions.

The fluid recharge techniques used in binary cycle projects have not been shown to induce seismic events; therefore, seismic events are much less likely to occur than in those geothermal projects that use techniques that increase pressure in the underground reservoir or fracture rock (these are called “enhanced geothermal projects”) (Council 2013). Enhanced geothermal systems, by contrast, inject water from the surface into deep formations of hot, dry rock to induce fracturing and produce heated water that is then pumped to the surface to extract heat.

There are several reasons why the binary cycle technology has a lower seismic risk than enhanced geothermal systems. First, there is a much lower differential between the reservoir temperature and the injection water. Also, in a binary system, the injection and pumping are shallow, relative to regional fault zones and earthquake activity. For example, reservoir and injection zones for the Proposed Action are approximately 4,000 and 5,800 feet deep; whereas, injection zones for enhanced geothermal projects have been estimated at greater than 3 miles deep. Most importantly, a binary system is designed to intercept a geothermal reservoir in a rock unit with sufficient permeability to pump required flow rates, not to create new rock fractures as is done in an enhanced system. Therefore, although production wells at the Northwest Alternative site would be drilled into an existing fault, drilling would not induce seismicity and would have no effects on tectonics or geology in the project region. Constructing the geothermal power facility would require ground disturbance but would not induce a seismic event.

Adequate distance between production wells, and also between production wells and injections wells is often a critical factor in the success or failure of a power facility. Well locations and well spacing is dependent upon reservoir structure and permeabilities, extents of the reservoir and permeability, the system enthalpy, and pumping rates. No information has been collected to date that addresses these reservoir parameters that would affect final well field design for the Northwest Alternative. To confirm reservoir parameters that would affect final well field design, USAF would conduct formation permeability testing prior to construction. The analysis in this EA assumes that the wells would be placed within the project area; however, later data collection and well field design may dictate a larger well spacing that would extend outside the project area.

As noted in **Section 2.1.1**, the proposed geothermal power facility could potentially use a sealed, closed-loop system (e.g., EAVOR LOOP), rather than a binary cycle system. In a sealed, close-loop system, the thermal fluid (similar to the binary fluid) is pumped below the surface in a U-loop piping system to the geothermal formation for heating, and then returned to the surface to the heat exchanger at the power plant. Therefore, in a sealed, closed-loop system, the geothermal fluid is not extracted from the geothermal formation and there is no potential for the system to alter geothermal reservoir pressures, induce rock fracture, or induce seismic events. However, a sealed, closed-loop system would require horizontal drilling within the geothermal rock formation. The design process for the geothermal power facility would consider the facility siting, underlying geology, and geothermal strata, among other factors, to determine if it is feasible to use a sealed, closed-loop system for the power facility at MHAFB.

Geothermal resources are a leasable mineral and given that the resource is not consumed during operations, geothermal resources should not be affected.

Soils. Short- and long-term, minor, adverse impacts on soils would be expected from constructing and operating the geothermal power facility at the Northwest Alternative site. During construction, total ground disturbance would be approximately 35 acres, which would be expected to result in long-term disturbance as the project area would be regularly maintained. Disturbance to the soils would include destroying the soil structure in areas where grading is required. This would increase the susceptibility of the soils to wind and water erosion, resulting in soil loss from erosion. In areas where grading is not required but traffic would be present, soils would be compacted and vegetation destroyed. This would result in increased susceptibility to wind and water erosion. Most of the impacts to soils at the Northwest Alternative site would occur in the Minidoka- Minveno silt loam. Other soils impacted would include the Bahem silt loam.

Under the National Pollutant Discharge Elimination System (NPDES) stormwater program, construction sites that disturb greater than 1 acre are required to obtain from USEPA a Construction General Permit, develop a construction Stormwater Pollution Prevention Plan (SWPPP), and implement BMPs to ensure that soil disturbed during construction activities does not pollute nearby water bodies. Management and oversight of the NPDES program in Idaho is in the process of being phased over from the USEPA to IDEQ. Beginning July 1, 2021, permits for stormwater discharges will be under the Idaho Pollutant Discharge Elimination System (IPDES) permit application process. Depending on construction date of the geothermal power facility, USAF would comply with the requirements of the IPDES program, and also develop a construction SWPPP and implement BMPs as under the NPDES program. Implementation of the construction SWPPP and BMPs during construction would reduce effects of soil erosion. Refer to **Section 3.10** for a discussion of stormwater infrastructure and water resources.

A long-term increase in impervious surfaces associated with construction of structures and pads would be expected to increase volume and velocity of stormwater runoff and associated potential erosion and off-site transport of sediments. Stormwater runoff would be in compliance with Section 438 of the Energy Independence and Security Act (EISA) and the Clean Water Act (CWA) Final Rule regarding non-numeric effluent limitations. Section 438 of the EISA would be adhered to, to the extent practicable, so that pre-development hydrology would be maintained. Refer to **Section 3.10** for a discussion of stormwater infrastructure and water resources.

An erosion and sediment control plan would be developed and implemented both during and following site development to contain soil and stormwater runoff on site, and would reduce the potential for adverse effects associated with erosion and sedimentation and transport of sediments in runoff. Erosion and sediment control techniques could include erosion control mats, silt fences, straw bales, diversion ditches, riprap channels, water bars, water spreaders, and sediment basins, and would be used as appropriate. Short-term, adverse effects would be minimized with implementation of BMPs, including wetting of soils. Wetting soils would occur on a daily basis as needed to prevent erosion and dust generation (see discussion on air quality in **Section 3.1**).

3.3.3.2 ALTERNATIVE 2 – NORTHEAST

Impacts on geology and soils from constructing and operating the geothermal power facility at the Northeast Alternative site would be similar to, but could be greater than, those presented in **Section 3.3.3.1** for the Northwest Alternative.

The hydrothermal system at MHAFB is hosted by a fault zone containing hydrothermal breccias. Analysis of fracturing suggests that the fault is steeply dipping (~80º) and has a strike of about 300º, and temperatures decrease after drilling deeper into the footwall block; thus the fault confines the geothermal system on the south (Nielson et al. 2018), and the resource will be closely aligned with the fault dip towards the north. Final design and siting of the geothermal power facility at the Northeast Alternative site would be dependent on further investigation of the availability of geothermal resources in this region of MHAFB, which would include an analysis of stress conditions on a fault plane and formation permeability testing prior to construction. While MHAFB would focus on using the geothermal reservoir beneath the test well site on the east central side of the base (MH-1), availability of geothermal resources may be limited due to the steeply dipping fault. If MHAFB geothermal resources are proven to be limited within or adjacent to the Northeast Alternative site, MHAFB would use the geothermal reservoir in the northwest corner of the base; however, this option is not preferred. Under this option, disturbance acreage would be greater than that described in **Section 3.3.3.1** and would be associated with construction of increased pipeline lengths to carry geothermal fluid from the well field to and from the power plant.

3.3.3.3 NO ACTION ALTERNATIVE

Under the No Action Alternative, the proposed geothermal power facility would not be constructed or operated on MHAFB and the existing conditions discussed in **Section 3.3.2** would remain unchanged. No disturbance from construction or drilling would occur. MHAFB would continue to rely on local utility supply providers for electricity. Implementation of the No Action Alternative would not result in any new or additional impacts on geology and soils.

3.4 Hazardous Materials and Wastes

3.4.1 Definition of the Resource

Hazardous materials are defined by 49 CFR § 171.8 as "hazardous substances, hazardous wastes, marine pollutants, elevated temperature materials, materials designated as hazardous in the Hazardous Materials Table (49 CFR §172.101), and materials that meet the defining criteria for hazard classes and divisions" in 49 CFR § 173. Transportation of hazardous materials is regulated by the U.S. Department of Transportation regulations within 49 CFR §§ 105–180.

Hazardous wastes are defined by the Resource Conservation and Recovery Act (RCRA) at 42 USC § 6903(5), as amended by the Hazardous and Solid Waste Amendments, as "a solid waste, or combination of solid wastes, which because of its quantity, concentration, or physical, chemical, or infectious characteristics may (a) cause, or significantly contribute to an increase in, mortality or an increase in serious irreversible, or incapacitating reversible, illness; or (b) pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed." Idaho Water Quality Standards, IDAPA 58.01.02, include requirements for hazardous and deleterious-materials storage, disposal, or accumulation adjacent to or in the immediate vicinity of state waters (IDAPA 58.01.02.800); the cleanup and reporting of oil-filled electrical equipment (IDAPA 58.01.02.849); hazardous materials (IDAPA 58.01.02.850); and used-oil and petroleum releases (IDAPA 58.01.02.851 and 852).

A toxic substance is a chemical or mixture of chemicals that may present an unreasonable risk of injury to health or the environment. Toxic substances are addressed separately from other hazardous substances. Toxic substances include asbestos-containing materials (ACMs), lead-based paint (LBP), and polychlorinated biphenyls (PCBs), which are typically found in building and utility infrastructure. USEPA is given the authority to regulate these substances by the Toxic Substances Control Act (15 USC § 53). USEPA has established that any material containing more than one percent asbestos by weight is considered an ACM. ACMs are generally found in building materials such as floor tiles, mastic, roofing materials, pipe wrap, and wall plaster. USEPA implemented bans on various ACMs between 1973 and 1990. LBP was commonly used in building construction prior to its ban in 1978. PCBs are man-made chemicals that persist in the environment and were widely used in buildings materials (e.g., caulk) and electrical products prior to its ban in 1979.

Radon is a naturally occurring odorless and colorless radioactive gas found in soils and rocks that can lead to the development of lung cancer. Radon tends to accumulate in enclosed spaces, usually those that are below ground and poorly ventilated (e.g., basements). USEPA established a guidance radon level of 4 picocuries per liter (pCi/L) in indoor air for residences, and radon levels above this amount are considered a health risk to occupants.

DoD developed the Environmental Restoration Program (ERP) to facilitate thorough investigation and cleanup of contaminated sites on military installations (i.e., active installations, installations subject to Base Realignment and Closure, and Formerly Used Defense Sites). The Installation Restoration Program (IRP) and Military Munitions Response Program (MMRP) are components of the ERP. The IRP requires each DoD installation to identify, investigate, and clean up hazardous waste disposal or release sites. MMRP addresses non-operational rangelands that are suspected or known to contain unexploded ordnance, discarded military munitions, or munitions constituent contamination. A description of ERP activities provides a useful gauge of the condition of soils, water resources, and other resources that might be affected by contaminants. It also aids in the identification of properties and their usefulness for given purposes (e.g., activities dependent on groundwater usage might be restricted until remediation of a groundwater contamination plume has been completed).

3.4.2 Existing Conditions

Hazardous Materials and Petroleum Products. Chapter 3 of Air Force Manual (AFMAN) 32-7002, *Environmental Compliance and Pollution Prevention* provides USAF hazardous material management guidance for all of USAF.

MHAFB uses hazardous materials and petroleum products such as liquid fuels, aircraft deicer, pesticides, and solvents for everyday operations. Using these hazardous materials and petroleum products results in the generation and storage of hazardous wastes and used petroleum products on the installation. MHAFB institutes waste minimization measures to reduce waste quantities. These measures include seeking out less hazardous or nonhazardous replacements (i.e., green alternatives) for hazardous materials, managing shelf life and quantities of hazardous materials, and ordering only what is needed to complete the job (MHAFB 2017a). Because the proposed project areas are undeveloped, hazardous materials and petroleum products are not used or stored within these areas.

Hazardous and Petroleum Wastes. MHAFB is a RCRA large-quantity generator under USEPA Identification Number ID3572124557 (MHAFB 2017a). RCRA large-quantity generators generate 1,000 kilograms (kg) or more of hazardous waste per month or 1 kg per month of acutely hazardous waste. MHAFB implemented an installation-specific hazardous waste management plan that defines roles and responsibilities, addresses record-keeping requirements, and provides spill contingency and response requirements (MHAFB 2017a). The installation also maintains an integrated contingency plan that identifies specific procedures and responsibilities for responding to a spill of a hazardous substance or oil (MHAFB 2017b). Because the proposed project areas are undeveloped, hazardous and petroleum wastes are not generated or stored within these areas.

Toxic Substances. The proposed project areas are undeveloped and no buildings are proposed for demolition or renovation.

Radon. USEPA rates Elmore County, Idaho, as radon zone 1. Counties in zone 1 have a predicted average indoor radon screening level greater than 4 pCi/L (USEPA 2019b).

Environmental Restoration Program. All known or suspected environmental contamination sites at MHAFB are organized into solid waste management units (SWMUs). SWMUs include ERP and MMRP sites. Each SWMU is investigated and appropriate remedial actions are taken under IDEQ's supervision. When no further remedial action is necessary for a SWMU, the unit is closed and it no longer presents a threat to human health. The project areas are not within ERP or MMRP sites. However, ERP Site LF-02, B Street Landfill SWMU, is immediately south of the Northwest Alternative site and ERP Site LF043, Asbestos Debris Disposal Landfill, also referred to as the Construction Debris SWMU, is approximately 0.25 mile south of the Northeast Alternative site (MHAFB 2017c). See **Figure 3.3** for environmental contamination sites on MHAFB.

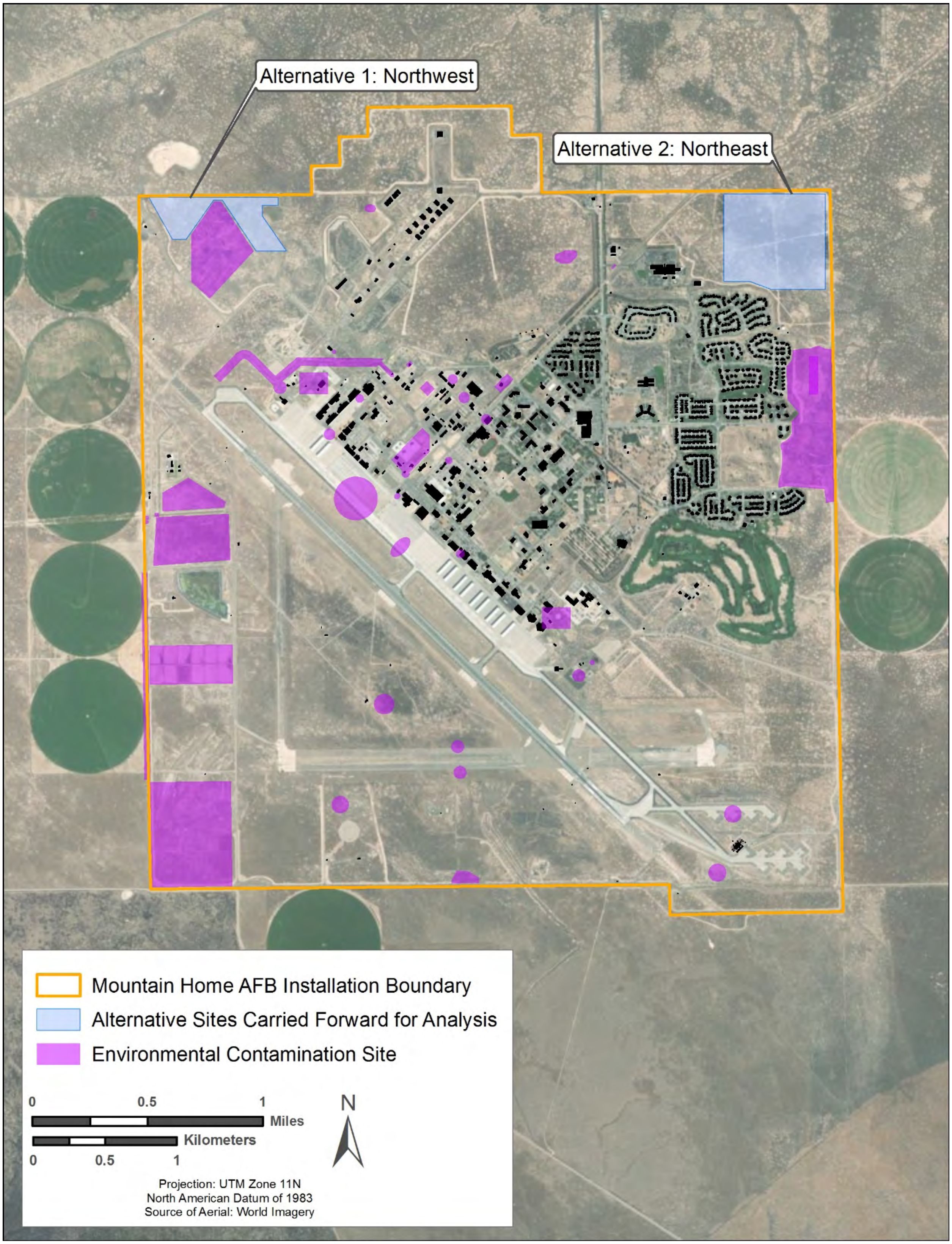

Figure 3.3. Environmental Contamination Sites on MHAFB

ERP Site LF-02 is an inactive landfill covering approximately 130 acres. It served as the main sanitary landfill on the installation from 1956 to 1969 and consists of three areas of concern: the trench area, coal ash disposal area, and drum disposal area. Materials disposed of included household garbage, yard waste, construction debris, and industrial waste. The 1993 Operable Unit 2 record of decision (ROD) selected "No Action" as the remedy for ERP Site LF-02 based on the assumption that the current use of the site, an inactive landfill, would continue. The 2006 explanation of significant differences to the Operable Unit 2 ROD for LF-02 concluded that the selected remedy of "No Action" was not protective to human health and the environment, and recommended land use controls (LUCs) to restrict access and ensure no digging or dumping occurred. As part of the LUCs, ERP Site LF-02 is inspected annually to assess and assure the integrity of the site and a perimeter fence was installed. No monitoring wells are located within the Site LF-02 boundaries (AFCEC 2019, MHAFB 2019a).

ERP Site LF043 is a 70-acre, former construction debris landfill adjacent to the family housing area on the installation. Based upon aerial photographs of the site, dumping of construction debris and basalt rock began in 1953. Use of the site for disposal of construction debris is believed to have continued until 2007; however, the site may have received solid waste from installation residents and personnel until 2014 when a fence was constructed around the site to restrict access. ACM was discovered at the site in May 2014 and the USAF prepared a remedial investigation and feasibility study (RI/FS). Observations made during the site visits to ERP Site LF043 indicated that other than randomly and widely dispersed pieces of concrete asbestos piping and empty 5- to 10-gallon containers, which were believed to have contained paints and lacquers, the site had minimal signs of potential hazardous contamination. During the RI, air samples were collected; up to three bulk samples of each suspect ACM were collected; 10 trenches were excavated to bedrock, which was encountered at depths between 2.5 and 8.5 feet bgs; and one composite soil sample was collected at each of the 10 trenches. ACM was found at the surface and in the trenches at depth. No hazardous materials or intact containers of hazardous materials were encountered and no stained soils or petroleum hydrocarbons were observed; however, two metals, arsenic and thallium, exceeded risk-based screening levels and were identified as chemicals of potential concern. Air samples showed asbestos to be below the Occupational Safety and Health Administration (OSHA) permissible exposure level for workers. The quantified human health risk assessment determined that risks to current receptors from arsenic and thallium in the soil and asbestos in the air were well within or below the generally acceptable cancer risk and below a hazard index of 1, indicating no unacceptable health effects. However, risks to potential future receptors could not be reasonably quantified because of the unpredictable potential for exposed ACM to deteriorate and become friable. The FS selected four remedial action alternatives with their associated costs for detailed analysis – 1) no action; 2) continue existing institutional/engineering controls and long-term monitoring; 3) ACM removal with existing institutional/engineering controls, additional institutional controls, and long-term monitoring; and 4) landfill removal. As requested by USEPA, the Air Force Civil Engineer Center (AFCEC) has planned and programmed in FY2020 for additional sampling along with an addendum to the FS to include an additional alternative to consolidate and cap the ACM in a landfill (MHAFB 2019a, AFCEC 2017).

3.4.3 Environmental Consequences

Impacts on or from hazardous materials and wastes would be significant if a proposed action would result in noncompliance with applicable federal or state regulations, or increase the amounts generated or procured beyond current management procedures, permits, and capacities. Impacts on contaminated sites would be considered significant if a proposed action would disturb or create contaminated sites resulting in negative impacts on human health or the environment, or if a proposed action would make it substantially more difficult or costly to remediate existing contaminated sites.

Constructing and operating the geothermal power facility is not anticipated to change or result in short- or long-term impacts on the following hazardous materials and wastes topics: toxic substances and ERP. The project areas are undeveloped and no buildings are proposed for demolition or renovation. The projects areas are not within SWMUs under remediation or with known contamination, and USAF would coordinate with IDEQ if environmental contamination was discovered during project construction. Therefore, toxic substances and ERP are not discussed further.

3.4.3.1 ALTERNATIVE 1 – NORTHWEST

Hazardous Materials and Petroleum Products. Short- and long-term, minor, adverse impacts on hazardous materials and petroleum products would occur from constructing and operating the geothermal power facility. Hazardous materials that could be used during facility construction and operation include paints, welding gases, solvents, biodegradable liquid descalers, hydrochloric acid, glycol, preservatives, and sealants. Additionally, hydraulic fluids and petroleum products, such as diesel and gasoline, would be used in vehicles and equipment supporting facility construction and operation. Hazardous materials could be used for minor equipment servicing and repair activities. Hazardous materials and petroleum products used during construction and operation would be contained, stored, and managed appropriately (e.g., secondary containment, inspections, spill kits) in accordance with AFMAN 32-7002, and Idaho Water Quality Standards, as applicable, to minimize the potential for release. Construction equipment would be maintained according to manufacturer’s specifications and drip mats would be placed under parked equipment as needed. Significant impacts on hazardous materials and petroleum products management are not expected.

Hazardous and Petroleum Wastes. Short- and long-term, minor, adverse impacts would occur from generating hazardous and petroleum wastes during construction and operation of the geothermal power facility. Construction and maintenance activities, including drilling of the geothermal wells, would require the use of hazardous materials and petroleum products, which would result in generating hazardous wastes and used petroleum products. Hydraulic fluids and petroleum products would be used in vehicles and equipment supporting facility construction and operations.

Implementing BMPs would reduce the potential for an accidental release of hazardous and petroleum wastes. Construction equipment would be maintained according to manufacturer’s specifications and drip mats would be placed under parked equipment as needed. Additional BMPs for potential drilling wastes and their containment would include the following:

- Ensuring proper storage of on-site drilling materials and chemicals to prevent spills;
- Keeping use of chromate and other heavy metals to a minimum to prevent environmental contamination;
- Avoiding disposal of chemicals, fuels, oils, lubricants, or noxious fluids at drilling sites, reserves or flow pits or down the wells;
- Cleaning up any chemicals, fuels, oils, lubricants, and/or noxious fluid spills during drilling operations;
- Having absorbent materials on site for spill containment;
- Removing substances and any contaminated material from the drill site after cleanup; and
- Disposing of contaminated material at an approved disposal facility.

Further, the installation-specific hazardous waste management plan and integrated contingency plan would be revised to include hazardous wastes generated by the geothermal facility (though no hazardous waste generation is anticipated), and specific response strategies for geothermal facilities, respectively. All hazardous and petroleum wastes generated would be handled, stored, and disposed of in accordance with the MHAFB hazardous waste management plan and federal, state, and local regulations.

Should unknown contamination be discovered or unearthed during ground disturbing activities, the construction contractor would immediately stop work, contact appropriate installation personnel, and implement appropriate safety measures. Sampling and analysis would be conducted, as necessary, and commencement of construction would not continue until the concern is investigated and resolved. Any soils determined to be contaminated or hazardous would be managed or disposed of in accordance with applicable federal, state, and local laws and regulations. Significant impacts from hazardous and petroleum wastes are not expected.

Radon. Long-term, negligible, adverse impacts from radon are possible. Based on the USEPA rating of radon zone 1 for Elmore County, it is possible that new facilities could have indoor screening levels greater than 4 pCi/L. Although basements and poorly-ventilated areas are most commonly affected by radon, any indoor space in contact with the ground (i.e., first-floor of a slab building) is at risk. Radon would be managed in new construction by incorporating passive features that would limit the ability of radon to enter the building into the design. These features could include placing aggregate material and matting below the concrete floor to encourage lateral, rather than vertical, flow of soil gas; designing the heating, ventilation, and air conditioning system to avoid depressurization of the first floor; and using air tight seals around pipes and wires where they protrude from below ground. Periodic radon testing would occur as needed. Post-construction radon management measures, such as installing ventilation systems to remove radon that has entered the building, would be installed in buildings that test higher than 4 pCi/L. Therefore, significant impacts from radon are not expected.

3.4.3.2 ALTERNATIVE 2 – NORTHEAST

Impacts on hazardous materials and wastes for the Northeast Alternative would be the same as those described for the Northwest Alternative. Short- and long-term, minor, adverse impacts on hazardous materials and petroleum products and wastes would be anticipated from constructing and operating the geothermal power facility. Additionally, long-term, negligible, adverse impacts from radon are possible. BMPs and regulations outlined in **Section 3.4.3.1** would be followed to reduce impacts on hazardous materials and wastes.

3.4.3.3 NO ACTION ALTERNATIVE

Under the No Action Alternative, the proposed geothermal power facility would not be constructed or operated on MHAFB and the existing conditions discussed in **Section 3.4.2** would remain unchanged. No additional hazardous materials and wastes would be used or produced. MHAFB would continue to rely on local utility supply providers for electricity. Implementation of the No Action Alternative would not result in any new or additional impacts on hazardous materials and wastes.

3.5 Health and Safety

3.5.1 Definition of the Resource

A safe environment is one in which there is no, or an optimally-reduced, potential for death, serious bodily injury or illness, or property damage. Health and safety addresses workers' and the public's health and safety during a specific activity such as construction, military operations, or mechanical operation.

There are a number of DoD and USAF documents that outline construction site safety requirements that aim to reduce the risks of illness, injury, death, and property damage. The health and safety of on-site military and civilian personnel is also safeguarded by the federal OSHA, USEPA, and state and regional occupational health and safety agencies. Standards specified in documents and by agencies include the amount and type of training required for participation in industrial and construction activities, the required use of personal protective equipment (PPE), administrative controls, engineering controls, and permissible exposure limits for workplace stressors. The following documents provide guidelines for the health and safety of personnel:

- ***AFI 91-202 The US Air Force Mishap Prevention Program*** establishes a deputy chief of staff logistics, engineering and force protection, whose job it is to ensure that USAF civil engineering procedures, operations, technical publications, and designs for new construction meet or exceed OSHA and Air Force Occupational Safety and Health (AFOSH) guidance, as well as other criteria. AFI 91-202 also requires installation civil engineers to ensure an environmental review and coordination of new construction, facility modification projects, or work requests with installation safety, fire protection, environmental management and bioenvironmental engineering officials (USAF 2019a).

- ***AFI 91-207 The US Air Force Traffic Safety Program*** established traffic safety programs and vehicle operator requirements for on-installation traffic and transport activities. Some protections include the use of all vehicle safety features such as seatbelts and lighting/signaling components, use of highly visible clothing, and safe traffic management procedures for construction actions (USAF 2019b).

- ***AFMAN 91-203 Air Force Occupational Safety, Fire, and Health Standards*** provides specific work procedures for a safe and healthful workplace and details safety components of construction work, including but not limited to, civil engineering activities, communications systems, motor vehicles operations and maintenance, materials handling, mishap prevention signage, welding, confined spaces, flammable and combustible materials, pipe systems labeling, electrical safety, fire prevention, and tools and machinery operations (USAF 2019c).

Health and safety hazards pertaining to the Proposed Action may include transportation, construction, maintenance and repair activities, high decibels (dB) of noise, or potential fire hazards. Proper operation, maintenance, and repair of vehicles, equipment, and facilities can greatly reduce health and safety risks. Contractors and personnel who perform construction or demolition activities are required to follow ground safety regulations and participate in worker compensation programs. Construction activities must be completed in a manner that does not pose any risk to workers or personnel, and all safety standards must be met.

Operation of geothermal power plants also requires compliance with federal requirements and any applicable state and county regulatory programs for emergency planning and community protection. The CAA Amendments of 1990, Section 112r, regulate chemical accident prevention at facilities using substances that pose the greatest risk of harm from accidental releases. These regulations were built upon existing industry codes and standards and require companies of all sizes that use certain listed regulated flammable and toxic substances to develop a risk management program. EPCRA was passed in 1986 in response to concerns regarding the environmental and safety hazards posed by the storage and handling of toxic chemicals. These requirements covered emergency planning and "Community Right-to-Know" reporting on hazardous and toxic chemicals. EPCRA provisions help increase the public's knowledge and access to information on chemicals at individual facilities, their uses, and releases into the environment. States and communities, working with facilities, can use the information to improve chemical safety and protect public health and the environment.

3.5.2 Existing Conditions

MHAFB is a secure military installation that limits access to authorized personnel. The installation provides emergency services, including fire response, emergency medical response, force protection, and law enforcement to all installation facilities. Therefore, emergency situations can be responded to within a quick timeframe (MHAFB 2017c).

Construction Safety. All military personnel and civilian contractors are required to follow governing health and safety policy while performing construction activities. Governing requirements include, but are not limited to, AFI 91-202, AFI 91-207, AFMAN 91-203, and federal OSHA standards. Industrial hygiene programs address worker exposure to hazardous materials, use of PPE, and availability of safety data sheets (SDS). It is the responsibility of the employer to ensure that personnel are up-to-date on all applicable requirements, to use all available safety equipment, monitor personal exposure to workplace chemicals, avoid all physical and biological hazards, and to ensure a medical surveillance program is in place. PPE may include safety glasses, hard hats, respirators, gloves, durable pants, long-sleeved shirts, fire protection, and safety-toed shoes.

Ground Safety. Natural and man-made environmental hazards may be present at MHAFB at any time due to the varied activities that take place on the installation. Naturally-occurring potential health and safety hazards include wildlife such as snakes and insects, naturally-occurring fires, and climatic conditions. Potential man-made health and safety hazards include aircraft noise exposure, fire/explosions, and ground traffic conditions that may contribute to motor vehicle accidents. MHAFB is located in southwestern Idaho, which experiences a range of climatic conditions throughout the year and the most common natural disasters of the region include flooding, wildfires, and earthquakes.

IRP Sites. As discussed in **Section 3.4**, many areas of concern (AOCs) and IRP sites are located at MHAFB (see **Figure 3.3**). Primary remediation sites at MHAFB include the B Street Landfill located in the northwest corner of the installation, fire training areas, and fuel and solvent spills. LUCs have been put in place on IRP sites throughout the installation to protect personnel health and safety by restricting access and ensuring digging or dumping occurs (MHAFB 2017c).

Explosive Safety Quantity Distance (ESQD) Arcs. MHAFB has several activities that require explosive safety clearance zones, and these must be established around facilities used for storage, handling, or maintenance of munitions. ESQD arcs at MHAFB cover 1,356 acres of land and are primarily located north and southeast within the installation. The arcs range in size from 100 to 3,151 feet depending on the type and quantity of explosive. The munitions storage area, located at the north end of the installation, has an ESQD arc that covers 921 acres. There are no munitions stored or handled in the immediate area of either alternative; however, the ESQD arc associated with the munitions storage area overlaps the eastern portion of the Northwest Alternative site (MHAFB 2017c). See **Figure 3.4** for a depiction of the ESQD arcs.

Aircraft Safety. Clear zones (CZs) and accidental potential zones (APZs) are areas at each end of a runway that possess a high potential for aircraft accidents, and their use is highly restrictive due to safety concerns. The CZ begins immediately adjacent to each end of the runway and is the area of highest aircraft accident potential. There are two APZs (APZ I and APZ II) that lie beyond each CZ and have increasingly less aircraft accident potential, but still enough to warrant land use restrictions and safety concerns. Because MHAFB supports aircraft operations, CZs and APZs are present and make up approximately 413 acres of on- and off-installation lands. The Proposed Action is not anticipated to affect flight operation or occur within any CZ or APZ and thus, will not be discussed further (MHAFB 2017c). See **Figure 3.4** for a depiction of the CZ and APZs.

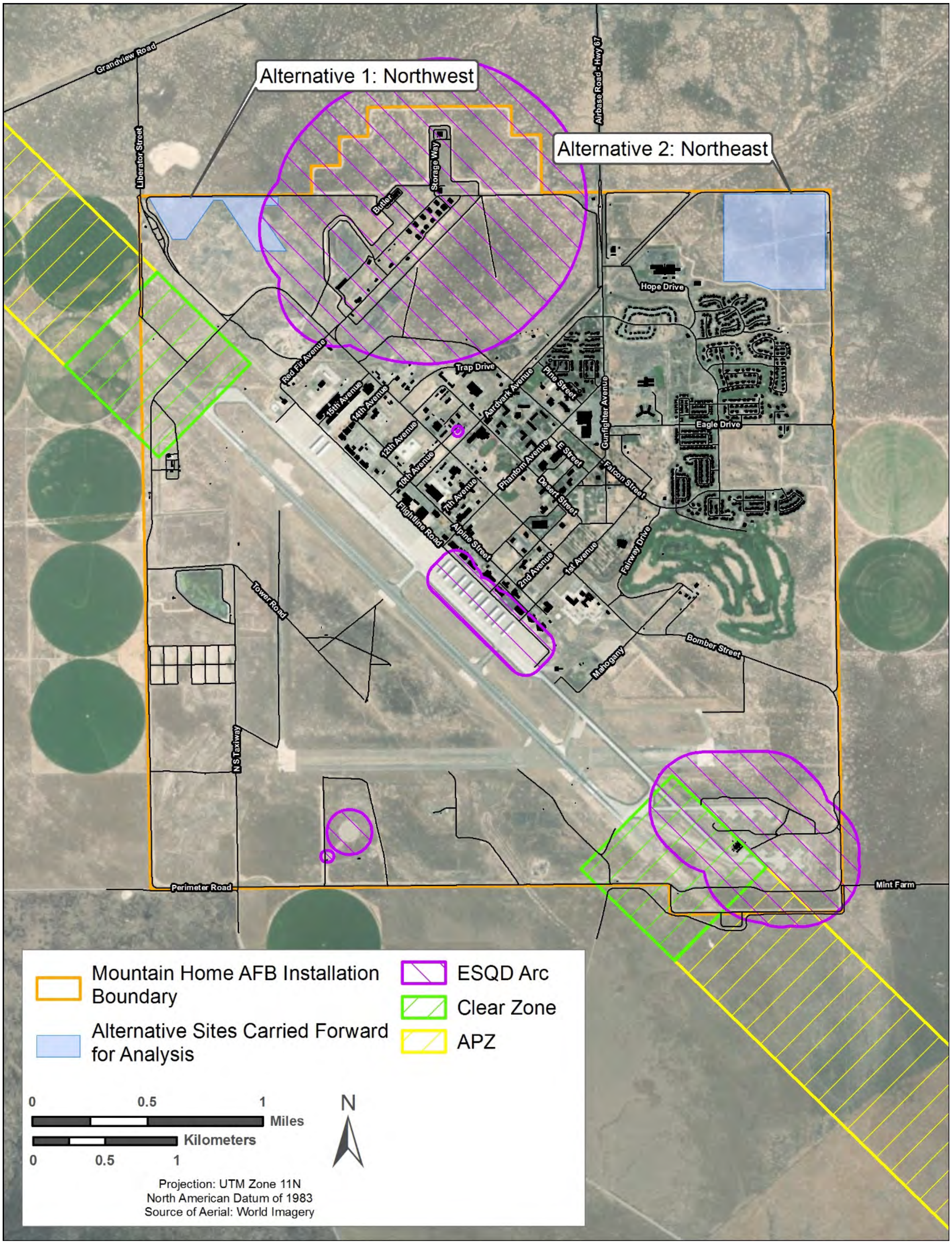

Figure 3.4. ESQD Arcs, CZs, and APZs on MHAFB

3.5.3 Environmental Consequences

Adverse impacts to health and safety would occur if the following resulted from implementation of the Proposed Action:

- Risks associated with the safety of USAF personnel, construction personnel, contractors, or the local community were substantially increased.
- the ability to respond to an emergency was substantially hindered.
- New health or safety risks were introduced for which the installation is not prepared or does not have adequate management and response plans in place.

3.5.3.1 ALTERNATIVE 1 – NORTHWEST

Constructing and operating the geothermal power facility at the Northwest Alternative site would result in short-term, minor, adverse impacts to the health and safety of personnel directly involved in the construction. Long-term, negligible to minor, adverse impacts would occur to the health and safety of proposed facility operations and maintenance personnel.

Construction and Ground Safety. Due to the use of large, powerful, and noisy pieces of equipment, construction activities are inherently dangerous. Geothermal power facility construction includes certain actions such as deep drilling, high-temperature (up to 302ºF) fluid management, and underground piping installation, and can cause hazards such as earthquakes, flooding, and trench collapse (DOE 2011). To minimize health and safety risks, all construction personnel would be required to follow and implement OSHA standards, use appropriate PPE, and establish and maintain site-specific health and safety programs. SDS for all hazardous materials and chemicals introduced to the worksite would be provided and kept on site for immediate review. Additionally, use of heavy equipment would be limited to the designated site and operations of equipment would only occur during designated times. All applicable construction safety measures would be followed to the fullest extent to avoid adverse impacts to health and safety.

Construction personnel would not be unnecessarily exposed to biological or climatic hazards. All efforts to avoid ground safety hazards and limit work when ground safety hazards are present and unavoidable would be maximized.

Operations and Maintenance Safety. Geothermal power generation requires the indirect handling of hot geothermal fluid that may contain high concentrations of hazardous chemicals. Site-specific health and safety planning would be required to minimize risks. All applicable safety guidelines and regulations, including the CAA Amendments of 1990, Section 112r, and EPCRA, would be adhered to in order to avoid all health and safety risks to the greatest extent.

There is one IRP site located in the vicinity of the Northwest Alternative site (see **Figure 3.3** in **Section 3.4**). The B Street Landfill, located directly adjacent to the south end of the site, has established LUCs to restrict access and ensure no digging or dumping. The IRP site has residual contaminant levels that are safe for industrial activities but not for residential or recreational uses. Additionally, a portion of the B Street Landfill is designated as a hazardous materials storage area. MHAFB would prevent construction personnel from conducting any land disturbing activities within the boundaries of the IRP site, and no impacts on construction personnel health and safety would be expected.

There are no munitions stored or handled in the immediate area of the Northwest Alternative site; however, the ESQD arc associated with the munitions storage area overlaps the east end of the site. To minimize health and safety risks, all construction and operations related to the geothermal power facility would remain outside of the ESQD arc unless permitted for use in accordance with DoD regulatory requirements. All facility construction within an ESQD arc must comply with the requirements found in DoD Manual 6055.09-M and Air Force Manual 91-201. All facility construction or use within ESQD arcs requires review for compliance with explosives safety criteria and must have either an approved explosives safety site plan or an approved explosives safety deviation.

3.5.3.2 ALTERNATIVE 2 – NORTHEAST

The construction and operation of the geothermal power facility at the Northeast Alternative site would present short-term minor impacts to health and safety for construction and contracting personnel. Long-term impacts to operations and maintenance personnel would be negligible to minor. Because the project area is located within the MHAFB housing district, and is adjacent to a pedestrian trail, specific health and safety guidelines would be implemented to reduce health and safety risks for both construction personnel and the public. Impacts to health and safety would be mitigated by implementing fences and warning signs around the perimeter of the project site and a thorough site evaluation would be conducted to identify all hazards.

Construction and Ground Safety. The type of potential health and safety impacts that would be expected during construction would be similar to those described for the Northwest Alternative in **Section 3.5.3.1.** All applicable construction safety measures would be followed to the fullest extent to avoid adverse impacts to health and safety.

Operations and Maintenance Safety. The type of potential health and safety impacts that would be expected during geothermal facility operation would be similar to, but less than, those described for the Northwest Alternative in **Section 3.5.3.1.** There are no IRP sites immediately adjacent to the proposed Northeast Alternative site, so there would be no potential impacts from IRP site activity. Additionally, munitions are not stored or handled in or around the area proposed for the Northeast Alternative site. The closest ESQD arc is approximately 0.6 miles away from the Northeast Alternative site and belongs to the munitions storage area.

3.5.3.3 NO ACTION ALTERNATIVE

Under the No Action Alternative, the proposed geothermal power facility would not be constructed or operated on MHAFB and the existing conditions discussed in **Section 3.5.2** would remain unchanged. Implementation of the No Action Alternative would not result in any new or additional impacts on health and safety.

3.6 Infrastructure and Utilities

3.6.1 Definition of the Resource

Infrastructure consists of the systems and physical structures that enable a population in a specified area to function. Infrastructure is wholly human-made, with a high correlation between the type and extent of infrastructure and the degree to which an area is characterized as "urban" or developed. The availability of infrastructure and its capacity to support growth are generally regarded as essential to the economic growth of an area. The infrastructure components discussed include utilities and solid waste management. As an important component of surface water, stormwater is discussed in **Section 3.10** with the analysis for water resources.

3.6.2 Existing Conditions

Electrical System. MHAFB purchases its electrical power from Idaho Power. The primary transmission line feeder for MHAFB provides 138 kVa and the second transmission line feeder provides 69 kVa. Both electrical feeders provide power to the 33.6 megavolt-ampere (MGA) substation on MHAFB. Current demand is 10 to 12 MW hours during summer months and 5 to 7 MW hours during winter months. The electrical distribution system on the installation has been well maintained, upgraded in recent years, and is in excellent condition. Recent upgrades include switch gear upgrades to the substation, placement of electrical lines underground, and replacement of the electrical distribution systems in the family housing areas. No electrical infrastructure is within the project areas (MHAFB 2017c).

Natural Gas System. MHAFB purchases natural gas from Intermountain Gas Company. The installation has a pipeline distribution capacity of up to 1,000,000 million cubic feet per year. Current demand at the installation is 20,000 million cubic feet per year. Therefore, the installation is only using 2 percent of the natural gas that can be supplied and has abundant capacity. The natural gas distribution system consists of 344,569 linear feet of natural gas mains throughout the installation. Most of the distribution system has been improved, with 80 percent being constructed with polyethylene valves and piping and the remaining 20 percent being coated steel. The installation is working to replace all steel valves and lines with polyethylene. Overall, the system is in good condition. No natural gas lines are within the project areas (MHAFB 2017c).

Liquid Fuel System. MHAFB receives jet fuel (Jet-A) via a 4-inch pipeline from Holly Corps. The liquid fuel system is primarily used to store and distribute jet fuel from the bulk fuel storage area to the refueling hydrants on the aircraft parking ramps. The bulk fuel storage tanks were recently constructed and are in excellent condition. The liquid fuel system consists of approximately 19,000 linear feet of pipeline. The hydrant systems are Phase I and Phase II and include two Jet-A fueling aboveground storage tanks with a 500,000-gallon capacity each. The installation is considering the installation of a Type III hydrant system that would provide a pressurized loop with constant flow. No liquid fuel infrastructure is within the project areas (MHAFB 2017c).

Water Supply System. MHAFB draws drinking water directly from an unconfined aquifer via three of seven active wells that provide approximately 9.3 million gallons per day. MHAFB is planning for one of the existing non-potable wells, Well 14, to also produce potable water. There are five water storage tanks on the installation that hold 1.8 million gallons of water, including one elevated water tank that is used to equalize pressure in the water distribution system. Current water demand uses approximately 28 percent of the installation's water supply during peak demand. Of this, approximately 70 percent is used for irrigation purposes, which the installation is actively reducing by using treated effluent from the wastewater treatment plant (WWTP), xeriscape projects, and other conservation efforts.

Despite meeting current demands with additional headroom, the aquifer is being over pumped and is depleting by approximately 2 feet per year. Although the aquifer is projected to be a viable source of water for the next 30 years, the nitrate levels are increasing in the groundwater (MHAFB 2017c). Therefore, the installation is working with the State of Idaho to secure additional water rights and determine a long-term solution for water.

The water distribution system was constructed in 1943 and has been upgraded and replaced over time. The system is in adequate condition with most of the distribution lines being polyvinyl chloride. There are approximately 573,750 linear feet of water distribution lines on the installation, which are all rated in good to excellent condition. No water system infrastructure is within the project areas (MHAFB 2017c).

Sanitary Wastewater System. The MHAFB wastewater collection and treatment system consists of a contractor-operated WWTP, 16 lifting stations, the pipeline collection system, 11 septic tank systems, and a lagoon. The WWTP has a capacity of 850,000 gallons per day with an average peak demand of 503,000 gallons per day. A tertiary treatment facility was constructed to improve effluent from Class C to Class A. Once the effluent is Class A, it can be used for irrigation purposes at the golf course to reduce the amount of well water that is used for irrigation. Additional disposal options for Class A effluent include storage, rapid infiltration, and discharge, such as to surface water or underground where it leaches through a drainfield.

The wastewater system at MHAFB is in good condition and meets the current mission with expansion potential. The collection systems consist of 153,400 linear feet of sewer mains and laterals that range in size from 6 to 24 inches in diameter. The lines are a combination of asbestos cement, vitrified clay, concrete, iron, and polyvinyl chloride piping. The sanitary sewer system has undergone a six-phase replacement project, with the final phase remaining. No sanitary sewer infrastructure is within the project areas (MHAFB 2017c).

Communications System. The communications system on MHAFB consists of Air Force Network nonsecure and secure networks, telephone, giant voice, and Land Mobile Radio. There are four communications towers and 27 communications nodes on the installation. The communications system has available capacity for a moderate mission increase. No communications infrastructure is within the project areas (MHAFB 2017c).

Solid Waste Management. Solid waste from the installation is sent to a nearby private landfill managed by Idaho Waste Systems. Recycling is handled on the installation at a recycling center operated by civilian personnel (MHAFB 2017c).

3.6.3 Environmental Consequences

The analysis to determine whether impacts on infrastructure systems are significant primarily considers whether the Proposed Action would exceed capacity or place unreasonable demand on a specific utility. Impacts might arise from energy needs created by direct or indirect workforce or population changes related to installation activities. Construction contractors would be informed of utility locations prior to any ground-disturbing activities that could result in unintended utility disruptions or human safety hazards. All construction would be conducted in accordance with federal and state safety guidelines. Any permits required for excavation and trenching would be obtained prior to beginning construction activities.

Developing and operating the geothermal power facility is not anticipated to change or result in short- or long-term impacts on the liquid fuel system. Equipment or construction vehicles would not use the installation's liquid fuel supply. Therefore, the liquid fuel system is not discussed further.

Negligible, adverse impacts would result on the installation's natural gas, water supply, sanitary wastewater, and communications systems. Existing on-installation natural gas, potable water, sanitary wastewater, and communications systems would be extended to the project area for power facility operations. Service interruptions may be experienced when extending lines associated with these systems to the project area. Construction and maintenance would require minimal amounts of water, primarily for dust suppression. Because the installation is using 2 percent of its natural gas capacity, the addition of the geothermal facility would not result in adverse impacts on natural gas. The addition of six personnel would have negligible impacts on the water, sanitary wastewater, and communications systems. Operation of the geothermal power facility with either a binary cycle or sealed, close-loop system would not require additional consumption from the aquifer. Therefore, the installation's natural gas, water supply, sanitary sewer/wastewater, and communications systems are not discussed further.

3.6.3.1 ALTERNATIVE 1 – NORTHWEST

Electrical System. Short-term, minor, adverse impacts on the installation electrical system could result during construction of the geothermal power facility. Service interruptions may be experienced when extending or rerouting existing electrical lines, integrating the geothermal power system into the installation's electrical distribution system or facility infrastructure, and during maintenance and repair activities.

Long-term, moderate, beneficial impacts would result on the installation's electrical system. Developing and operating the geothermal power facility on MHAFB would result in compliance with USAF and DoD energy priorities and provide the installation with the ability to be self-sufficient in maintaining resilient, reliable, uninterruptible, and adequate power to meet installation demand for missions-critical facilities and operations year-round without dependence on commercial or backup source of electricity.

Solid Waste Management. Short- and long-term, minor, adverse impacts on solid waste management would result from constructing and operating the geothermal power facility. Construction debris would consist primarily of recyclable and reusable building materials such as concrete, metals (e.g., conduit, piping, and wiring), and removed vegetation. Small quantities of typical office and nonhazardous industrial trash would be generated during facility operations. This waste would be handled with other solid waste from the installation, which is sent to a nearby private landfill managed by Idaho Waste Systems.

3.6.3.2 ALTERNATIVE 2 – NORTHEAST

Impacts on infrastructure and utilities from constructing and operating the geothermal power facility at the Northeast Alternative site would be similar to those described for the Northwest

Alternative site in **Section 3.6.3.1**. Negligible, adverse impacts would result on the installation's natural gas, water supply, sanitary wastewater, and communications systems. Short-term, minor, adverse impacts would be anticipated on the installation electrical system and on solid waste management. Long-term, moderate, beneficial impacts would result on the installation's electrical system. Although the installation's preference is to use a proven geothermal reservoir within or adjacent to the Northeast Alternative site, if that is not feasible, additional ground disturbance would be necessary to run geothermal pipelines to a proven reservoir. The additional ground disturbance would increase the potential to unintentionally sever other utility lines along the route and result in short-term, moderate, adverse impacts until connections could be restored.

3.6.3.3 NO ACTION ALTERNATIVE

Under the No Action Alternative, the proposed geothermal power facility would not be constructed or operated on MHAFB and the existing conditions discussed in **Section 3.6.2** would remain unchanged. MHAFB would continue to rely on local utility supply providers for electricity and would continue to have an unsecure fluctuating power supply. Implementation of the No Action Alternative would not result in any new or additional impacts on infrastructure and utilities.

3.7 Noise

3.7.1 Definition of the Resource

Sound is a physical phenomenon consisting of vibrations that travel through a medium, such as air, and are sensed by the human ear. Noise is defined as any sound that is undesirable because it interferes with communication, is intense enough to damage hearing, or is otherwise intrusive. Human response to noise varies depending on the type and characteristics of the noise, distance between the noise source and the receptor, receptor sensitivity, and time of day. A sensitive receptor could be a specific location (e.g., schools, housing, hospitals) or an expansive area (e.g., nature preserves, historic preservation districts) in which occasional or persistent sensitivity to noise above ambient levels exists. Noise is often generated by activities essential to a community's quality of life, such as construction, vehicular traffic, or aircraft operations.

Sound varies by both intensity and frequency. Sound pressure level, described in dBs, is used to quantify sound intensity. The dB is a logarithmic unit that expresses the ratio of a sound pressure level to a standard reference level. Hertz are used to quantify sound frequency. The human ear responds differently to different frequencies. "A-weighting," measured in A-weighted decibels (dBA), approximates a frequency response expressing the perception of sound by humans. Sounds encountered in daily life and their approximate sound levels are provided in **Table 3-5**.

Table 3-5. Common Sounds and Their Levels

Outdoor	Sound Level A-weighted decibels (dBA)	Indoor
Impact pile driver at 50 feet	100	Rock band
Gasoline lawnmower at 3 feet	90	Food blender at 3 feet
Downtown (large city)	80	Garbage disposal
Heavy traffic at 150 feet	70	Vacuum cleaner at 10 feet
Normal conversation	60	Normal speech at 3 feet
Quiet urban daytime	50	Dishwasher in next room
Quiet urban nighttime	40	Theater, large conference room

Source: USEPA 1971

The sound pressure level noise metric describes steady noise levels, although few noises are, in fact, constant. Therefore, additional noise metrics such as the following have been developed to describe noise:

- **Equivalent Sound Level (L_{eq})** – L_{eq} is the average sound level in dB of a given event or period of time.
- **Day-night Sound Level (DNL)** – DNL is the average sound energy in a 24-hour period with a penalty added to the nighttime levels. Due to the potential to be particularly intrusive, noise events occurring between 10 p.m. and 7 a.m. are assessed a 10 dB penalty when calculating DNL. DNL is a useful descriptor for aircraft noise because it: (1) averages ongoing yet intermittent noise, and (2) measures total sound energy over a 24-hour period. DNL provides a measure of the overall acoustical environment, but it does not directly represent the sound level at any given time.

Annoyance is a subjective response that is often triggered by noise interfering with activities. Although the reaction of an individual to noise depends on a wide variety of factors, surveys have found a correlation between the time-averaged noise level as measured in DNL and the percentage of the affected population that is highly annoyed. It is widely accepted that 65 dBA DNL is the noise level at which a substantial percentage of the population can be expected to be annoyed by noise (AFI 32-1015, *Integrated Installation Planning,* Chapter3).

Regulatory Review. The Noise Control Act of 1972 directs federal agencies to comply with applicable federal, state, and local noise control regulations. The minimum requirement states that constant noise exposure for workers must not exceed 90 dBA over an 8-hour period. The highest allowable sound level to which workers can be constantly exposed is 115 dBA and exposure to this level must not exceed 15 minutes within an 8-hour period. The standards limit instantaneous exposure to 140 dBA. If noise levels exceed these standards, employers are required to provide PPE to reduce sound levels to acceptable limits (29 CFR § 1910.95). Additionally, workers would be required to use proper personal hearing protection in accordance with AFI 48-127, *Occupational Noise and Hearing Conservation Program*. According to USAF, Federal Aviation Administration (FAA), and U.S. Department of Housing and Urban Development criteria, residential units and other noise-sensitive land uses are “clearly unacceptable" in areas where the noise exposure exceeds 75 dBA DNL, "normally unacceptable" in regions exposed to noise between 65 and 75 dBA DNL, and "normally acceptable" in areas exposed to noise of 65 dBA DNL or less.

Neither the State of Idaho nor Elmore County maintain a noise ordinance, but the Elmore County zoning guidelines address zoning for all airports within Elmore County, including MHAFB. This zoning ordinance is consistent with the recommendations contained in the MHAFB *Air Installations Compatible Use Zones Program* (AICUZ). The ordinance establishes an Airport Hazard Zone for MHAFB that protects the installation from encroachment (Elmore County Zoning and Development Ordinance § 6-36). The City of Mountain Home maintains a nuisance noise ordinance that exempts construction activities between 8 a.m. and 10 p.m. (City of Mountain Home Code §7 Noise).

Construction Noise. Construction can cause an increase in sound that is well above the ambient level. A variety of sounds are emitted from loaders, trucks, saws, and other work equipment. **Table 3-6** lists noise levels associated with common types of construction equipment. Construction equipment usually exceeds the ambient sound levels by 20 to 25 dBA in an urban environment and up to 30 to 35 dBA in a quiet suburban area. Construction noise is short-term because it occurs only when construction activities are occurring.

Table 3-6. Average Noise Levels for Construction Equipment

Construction Category and Equipment	Predicted Noise Level at 50 feet (dBA)	Predicted Noise Level at 500 feet (dBA)	Predicted Noise Level at 1,000 feet (dBA)
Clearing and Grading			
Grader	80–93	60–73	54–67
Truck	83–94	63–74	57–68
Excavation			
Backhoe	72–93	52–73	46–67
Jackhammer and Rock Drill	81–98	61–78	55–72
Building Construction			
Concrete mixer	74–88	54–68	48–62
Welding generator	71–82	51–62	45–56
Pile driver	91–105	71–85	65–78
Crane	75–87	55–67	49–61
Paver	86–88	66–68	60–62

Sources: USEPA 1971, TRS Audio Undated a

Note: Construction equipment equipped with noise control devices (e.g., mufflers) and use of sound barriers would be expected to result in lower noise levels than shown in this table.

dBA = A-weighted decibels

3.7.2 Existing Conditions

Existing sources of noise on and adjacent to MHAFB include military aircraft overflights, road traffic, and other noises such as lawn maintenance equipment, construction, and bird and animal vocalizations. The dominate noise source on the installation is aircraft operations mainly from the installation's F-15s. **Figure 3.5** shows the existing DNL noise contours of MHAFB's airfield plotted at 5-dB increments ranging from 65 to 85 dBA DNL. The areas surrounding MHAFB are primarily rural and agricultural with estimated background noise levels of 38 dBA in the daytime, 32 dBA at night, with a DNL of 40 dBA (ANSI 2013).

The Northwest Alternative site is within the 70 to 74 dBA noise zone. There are no noise sensitive receptors (e.g., housing, hospitals, schools, places of worship) within 1 mile of the Northwest Alternative site; the nearest occupied facility is the Grand View Gate (**Figure 3.5**).

The Northeast Alternative site is just outside of the 65 dBA noise contour. The nearest noise sensitive receptors are the accompanied housing area, which is located approximately 250 feet to the south, and the installation's hospital, which is located approximately 900 feet to the west of the Northeast Alternative site boundary (**Figure 3.5**).

3.7.3 Environmental Consequences

The noise environmental consequences section discusses noise from the proposed geothermal power facility's construction and operations; potential changes to land use compatibility from noise; and the potential for human annoyance from noise. Changes in noise would be considered significant if they would lead to a violation of any federal, state, or local noise regulation, or substantially increase areas of incompatible land use outside or inside of the installation.

3.7.3.1 ALTERNATIVE 1 – NORTHWEST

Construction. Constructing the proposed geothermal power facility at the Northwest Alternative site would have a short-term, negligible, adverse impact on noise. Construction would require the use of heavy equipment that would generate temporary noise near the project area. Construction would require excavation, grading, paving, building construction, and rock drilling. Individual pieces of heavy equipment would be expected to produce noise levels between approximately 71 and 105 dBA at a distance of 50 feet (**Table 3-6**). Noise levels at the upper end of this range would be associated with equipment such as pile drivers and limited to intermittent spurts. Sound levels on the lower end of the range would be more constant during construction activities. The most probable common noise source would be rock drills used for constructing the geothermal production and injection wells. Construction noise levels would decrease with distance from the project area.

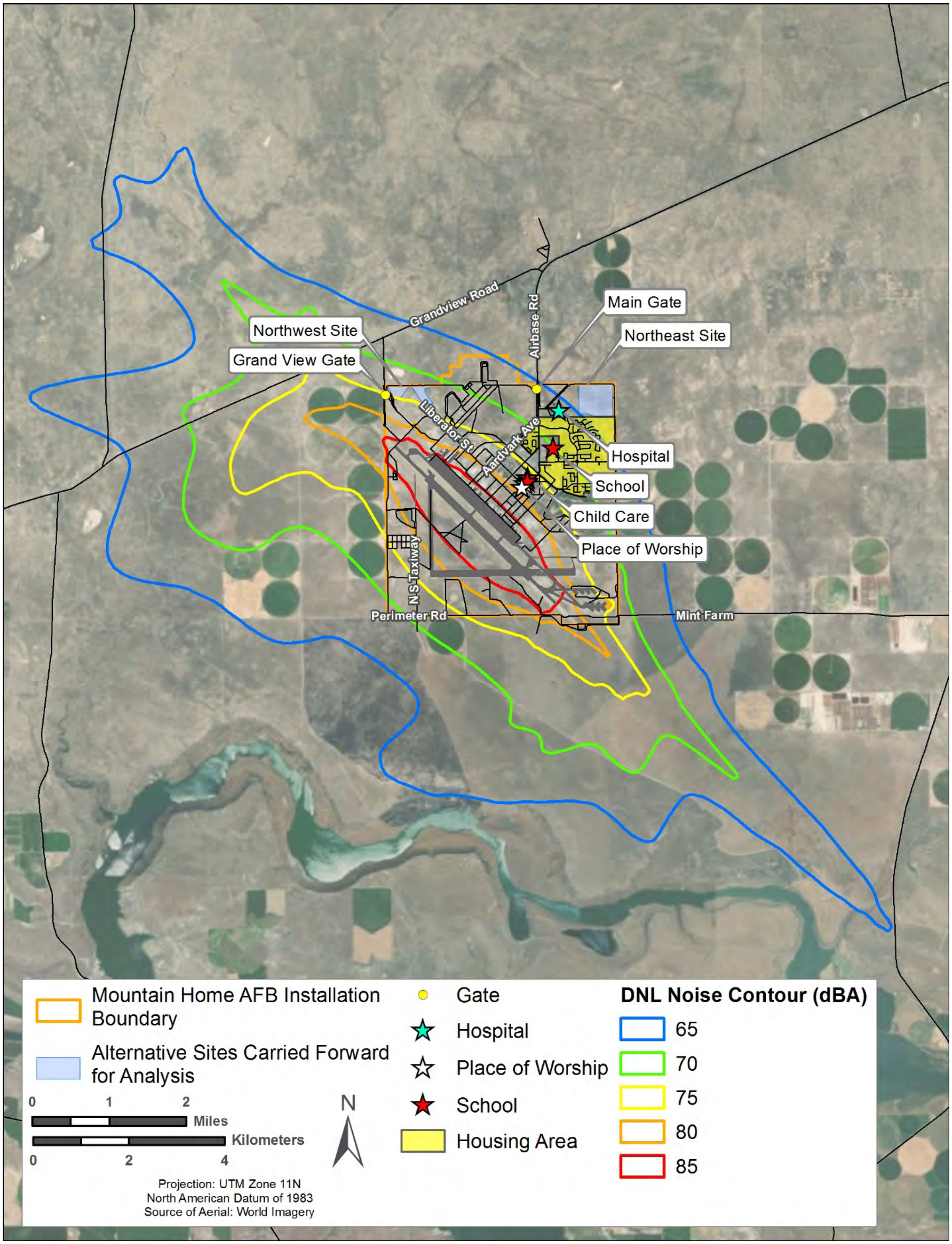

Figure 3.5. MHAFB's DNL Noise Contours and Sensitive Noise Receptors

Several pieces of heavy equipment likely would be used simultaneously to construct the proposed geothermal facility. **Table 3-7** presents typical additive noise levels (dBA L_{eq}) for the main phases of construction. In general, the addition of a piece of equipment with identical noise levels to another piece of equipment would add approximately 3 dB to the overall noise environment (TRS Audio Undated b). Noise from construction would be expected to attenuate to or below 65 dBA within 250 feet during the foundation phase, within 500 feet during the ground clearing and structural phases, and within 1,000 feet during the excavation/grading and finishing phases (USEPA 1971, TRS Audio Undated a).

Table 3-7. Additive Noise Levels Associated with Construction in an Urban Area

Construction Phase	L_{eq} (dBA at 50 feet)	L_{eq} (dBA at 250 feet)	L_{eq} (dBA at 500 feet)	L_{eq} (dBA at 1,000 feet)
Ground clearing	84	70	64	58
Excavation, grading, drilling	89	75	69	63
Foundations	78	64	58	52
Structural	85	71	65	59
Finishing	89	75	69	63

Sources: USEPA 1971, TRS Audio Undated a

Note: Construction equipment equipped with noise control devices (e.g., mufflers) and use of sound barriers would be expected to result in lower noise levels than shown in this table.

L_{eq} = equivalent sound level; dBA = A-weighted decibels

Construction noise could be reduced by using exhaust mufflers or other noise attenuation for construction equipment. Additionally, adhering to all federal, state, and local noise regulations and implementing the following BMPs would further reduce construction noise impacts:

- Heavy equipment use would occur primarily during normal weekday business hours (i.e., 8 a.m. to 5 p.m.).
- Heavy equipment mufflers or other noise attenuation equipment would be maintained properly and in good working order.
- Personnel, particularly equipment operators, would wear adequate PPE to limit exposure and ensure compliance with federal health and safety regulations.

Construction would occur within the MHAFB boundary on undeveloped land where there are no noise sensitive receptors within 1 mile. Construction noise at such distance would be approximately 50 dBA and indistinguishable in the ambient noise environment. The nearest occupied facility to the Northwest Alternative site is the Grand View Gate, which commonly experiences noise from vehicle movements. No off-installation facilities are near the Northwest Alternative site. As such, few people living, working, or using outdoor recreation areas near the project area would notice or potentially be annoyed by construction noise. All noise generated during construction would end with the completion of such activities. Therefore, given the temporary nature of the proposed construction activities, distance to nearby noise-sensitive areas, and the existing noise environment, impacts on receptors would be negligible.

During construction, heavy delivery trucks and the personal vehicles of construction workers would travel to and from the project area. Because of the existing ambient noise environment of the installation, negligible impacts would occur from the increase in vehicle traffic noise, as these sounds would not incrementally increase existing ambient noise levels.

Operations. A long-term, negligible, adverse impact on the ambient noise environment would result from operating the proposed geothermal power facility at the Northwest Alternative site. The proposed geothermal power facility would be largely silent during operation and the only appreciable noise would result from supporting infrastructure such as the cooling fans within the condenser that cools the binary fluid. Each cooling fan would operate from a 100-hp motor and is assumed to be enclosed within a noise dampened space. As a result, noise from the cooling fans would be similar to those from air-conditioning systems, which are typically measured at approximately 60 dBA at a distance of 100 feet (Purdue 2000). As such, operational noise would be perceptible only in close proximity to the proposed geothermal power facility. A slight increase in vehicle traffic noise would occur due to the addition of six personnel to operate the power plant; however, this increase would not appreciably contribute to the existing noise environment of the installation.

3.7.3.2 ALTERNATIVE 2 – NORTHEAST

Constructing and operating the geothermal power facility at the Northeast Alternative site would have similar but greater adverse impacts on noise as described for the Northwest Alternative in **Section 3.7.3.1**. The levels of noise produced from constructing and operating the proposed geothermal power facility at the Northeast Alternative site would be identical to that of the Northwest Alternative site; however, the Northeast Alternative site is closer to noise-sensitive receptors and could, therefore, have greater impacts. The nearest noise-sensitive receptors to the Northeast Alternative site are the accompanied housing area, which is located approximately 250 feet to the south, and the installation's hospital, which is located approximately 900 feet to the west of the Northeast Alternative site boundary. These receptors would experience construction noise levels similar to those described in **Table 3-7** for 250- and 1,000-foot distances, which may annoy some individuals. Similar BMPs as described for the Northeast Alternative site would be implemented to reduce construction noise. Noise from operating the power plant, including the cooling fans, would be barely perceptible at the accompanied housing area.

3.7.3.3 NO ACTION ALTERNATIVE

Under the No Action Alternative, the proposed geothermal power facility would not be constructed and the existing conditions discussed in **Section 3.7.2** would remain unchanged. No noise from construction and operations would be produced. Implementation of the No Action Alternative would not result in any new or additional impacts on noise.

3.8 Socioeconomics

3.8.1 Definition of the Resource

Socioeconomics refers to the basic attributes and resources associated with the human environment and the economy. There are several indicators of economic conditions for a specific geographic area and they include such attributes as demographics, employment, and economic impact. Demographics and employment data help identify population levels and population level fluctuations, and can be used to identify a region's characteristics.

This analysis considers impacts beyond the physical project area where construction and operation would occur; the term ROI is used to describe the complete geographic scope of potential consequences for socioeconomics. The ROI is identified as MHAFB, whose economy would benefit from independent power production and decreased reliance on regional power supply, along with Elmore and Ada counties, whose regional economy is influenced by the economic activity at MHAFB. Information regarding population and economic activity, including employment for Elmore and Ada counties is compared with Idaho State data to characterize baseline conditions and regional trends. Because increases in permanent personnel for the Proposed Action would be minimal, this socioeconomics section will not discuss community components such as housing, education, or public services.

3.8.2 Existing Conditions

Demographics. Data from the 2000 Census, 2010 Census, 2013-2017 American Community Survey (ACS) 5-year estimates, and the MHAFB FY 2016 economic impact statement were used to identify population. Demographic information for the ROI and Idaho is presented in **Table 3-8**. Since 2001, the number of active-duty personnel at MHAFB has fluctuated (USAF 2018b).The latest official population of MHAFB was measured in 2016 as 9,193, a 44.7 percent increase since 2010 (MHAFB 2016, USCB 2010). As of 2016, civilians make up around 1,074, or 22.92 percent of workforce personnel at MHAFB (MHAFB 2016). Of the total population, there were 3,612 active/reserve military personnel and 1,074 civilian personnel (MHAFB 2016). Of the 1,074 civilian personnel at MHAFB, 464 were appropriated fund civilians, 299 were contract civilians, 183 were non-appropriated fund civilians, 113 were base exchange, and 15 were employed by private businesses (MHAFB 2016). Additionally, there were 4,507 dependents on the installation. Most recently, MHAFB estimates the installation population to be nearly 10,000, which includes 4,800 military and civilian personnel, and 5,200 family members (MHAFB 2019b).

Table 3-8. Population Trends

Population	Ada County	Elmore County	Idaho
2000 Census	300,904	29,130	1,293,953
2010 Census	392,365	27,038	1,567,582
2017 ACS 5-year Estimates	435,117	26,232	1,657,375
Percent Change (2000-2010)	+30.4%	-7.2%	+21.1%
Percent Change (2010-2017	+10.9%	-3.0%	+5.7%

Sources: USCB 2017d, USCB 2017e, USCB 2017f
Key: ACS = American Community Survey

The population within Ada County, where the city of Boise is located, is estimated to have increased 30.4 percent between 2000 and 2010, and 10.9 percent between 2010 and 2017.The population within Elmore County is estimated to have decreased 7.2 percent between 2000 and 2010 and 3.0 percent between 2010 and 2017. The population within the State of Idaho is estimated to have increased 21.1 percent between 2000 and 2010 and 5.7 percent between 2010 and 2017 (USCB 2017d, USCB 2017e, USCB 2017f).

Employment. Employment characteristics, including the percent civilian and percent Armed Forces in Elmore County, Idaho, and at MHAFB, are listed in **Table 3-9**. Armed Forces personnel made up 10.3 percent of the workforce in Elmore County and 0.2 percent of the workforce in the State of Idaho. Employment statistics for civilian personnel at MHAFB have remained consistent, but at a steady incline since 2001. The civilian personnel population has increased approximately 3.6 percent between 2001 and 2015 (USAF 2018b).

Table 3-9. Employment Characteristics by Industry

Employment	Ada County	Elmore County	Idaho
Total Labor Force	225,475	12,565	794,662
Population employed by the Armed Forces	0.2%	10.3%	0.3%
Population employed in the civilian labor force	66.1%	52.5%	62.2%
Percent of Population by Industry in the Civilian Labor Force			
Agriculture, Forestry, Fishing, Hunting, and Mining	1.5	7.6	5.3
Construction	5.8	6.6	7.1
Manufacturing	8.8	11.9	9.7
Wholesale Trade	2.8	1.2	2.6
Retail Trade	12.0	10.7	12.1
Transportation and Warehousing, and Utilities	4.3	7.2	4.9
Information	2.3	1.1	1.8
Finance, Insurance, Real Estate, and Rental and Leasing	7.1	4.2	5.3
Professional, Scientific, Management, Administrative, and Waste Management Services	12.6	5.2	10.1
Education, Health, and Social Services	23.2	17.9	22.4
Arts, Entertainment, and Recreation	8.9	6.9	9.0
Other Services (except public administration)	4.3	4.4	4.5
Public Administration	6.4	15.2	5.0

Sources: USCB 2017a, USCB 2017b, USCB 2017c

The civilian regional labor force is spread out across many different industries. The largest labor industries in Elmore County are the education, health, and social services industry (17.9 percent), and the public administration industry (15.2 percent). In Ada County, the largest labor industries are the education, health, and social services industries (23.3 percent), and the professional, scientific, management, administrative, and waste management services industries (12.6 percent). In the State of Idaho, the education, health, and social services industry (22.4 percent), and the retail trade industry (12.1 percent) are the largest labor industries (USCB 2017a, USCB 2017b, USCB 2017c).

Economic Activity. **Table 3-10** outlines the economic impact for MHAFB as of FY 2016. The total economic impact to the local region around MHAFB was approximately $356 million in FY 2016 (MHAFB 2016). Additionally, MHAFB is one of the largest employers in the Mountain Home region. During FY 2016, payroll expenditures associated with active-duty military and civilian personnel on the installation totaled approximately $227.2 million. MHAFB also purchased numerous quantities of goods and services from local regional firms that include construction services, service contracts, materials, supplies, and installation equipment that totaled approximately $15.5 million in FY 2016 (MHAFB 2016).

Table 3-10. MHAFB Economic Activity for FY 2016

Economic Activity	MHAFB (in thousands of dollars)
Total Military Pay	$190,813
Total Civilian Pay	$36,418
Estimated Annual Dollar Value of Jobs Created	$113,528
Construction Expenditures	$10,028
Service Contracts Expenditures	$5,526
Materials/Equip/Supply Procurement Expenditures	$41,916
Total Economic Impact	$356,000

Sources: MHAFB 2016

***Commercial Power Grid*.** MHAFB currently relies on power that is supplied by Idaho Power, a regulated power supply utility, and produced from multiple energy sources that fluctuate yearly. Therefore, electricity rates and availability for MHAFB's power requirement also increase and/or decrease based on the fluctuation in Idaho Power. In 2018, MHAFB spent nearly $6.3 million for the supply of energy to the installation (Holley 2019). Even though Idaho Power has one of the lowest commercial rates in the state for power supply, there has been a steady increase in price, requiring MHAFB to allocate more funds to the energy supply effort (Idaho Power 2018).

3.8.3 Environmental Consequences

Socioeconomic impacts would be considered adverse if changes associated with the Proposed Action substantially affected the local economy, employment, or economic stability in the region.

For the purpose of the Proposed Action, the socioeconomic ROI was identified as the areas within which potential impacts on the local economy could occur because of the proposed increase in personnel related to constructing and operating the proposed geothermal power plant. Elmore and Ada counties would likely be the source for construction personnel and materials. Construction would be performed by local companies over a 1-year period, which would require a temporary workforce to construct the geothermal power facility. A permanent workforce of five to six workers would be required to operate and maintain the new geothermal power facility. Because a negligible number of additional permanent personnel would be required to operate and maintain the facility, impacts to personnel and related conditions are not discussed in detail.

3.8.3.1 ALTERNATIVE 1 – NORTHWEST

Constructing the geothermal power plant at the Northwest Alternative site would provide a direct temporary increase in income for local construction workers, and indirect increases in retail trade revenues through the purchase of equipment, supplies, and materials. It is anticipated that the majority of the proposed work would be completed by the labor force located within the region. There are approximately 12,500 construction workers in Ada County and 650 in Elmore

County, which comprise a sufficient construction workforce in the region to support the geothermal power facility's construction. There would also likely be a temporary increase in workers from outside of the region to execute specialty high skill construction jobs such drilling the geothermal wells and constructing components of the power plant. It is assumed workers from outside of the region would be accommodated in locally in commercial lodging, resulting in a short-term negligible increase in the purchase of goods and services, and tax revenue.

Approximately five to six full-time personnel would be required to operate the proposed geothermal power plant. It is assumed that the power plant could be operated by contractors, civilian, or military personnel and the plant would operate 24 hours per day, and 365 days per year. The average annual salary of a new job at MHAFB was $46,700 in 2016, which means that the addition of five to six salaried workers would produce an increase of approximately $233,500 to $280,200 in beneficial economic impact. This total represents, approximately, a 0.1 percent increase in total payroll according to the FY 2016 economic impact statement (MHAFB 2016). Therefore, this increase in payroll would not significantly impact MHAFB, but would provide long-term, negligible, beneficial impact on the local economy.

Because the power grid can be unreliable, MHAFB risks undergoing a power outage and compromising critical mission operations and personnel safety. Continued use of Idaho Power's unreliable and potentially costly power supply could result in a decline MHAFB's ability to benefit the regional economically. Once the geothermal power facility becomes operational, MHAFB could independently produce some or all of its 15-MW energy requirement. If an excess of power were produced from the facility, MHAFB would send the excess to the commercial power grid, which Idaho Power could store for MHAFB's future, or which Idaho Power could buy back as another source of RE for the company. As a result, long-term indirect beneficial impacts would result from the geothermal power facility's operation. Geothermal power generation would increase energy security and resiliency, make MHAFB more energy independent, reduce energy costs, and enhance the economic impact of MHAFB as a contributor to the regional economy.

3.8.3.2 ALTERNATIVE 2 – NORTHEAST

Socioeconomic impacts from constructing and operating the geothermal power facility at the Northeast Alternative site would be identical to the impacts described for the Northwest Alternative in **Section 3.8.3.1**. Constructing the geothermal power facility would result in temporary, beneficial impacts on the local economy through increase of the local construction work force and construction and retail industries. The increase in full-time employees would result in a payroll increase that would be a long-term, negligible, beneficial impact on the local economy and MHAFB. Additionally, MHAFB would no longer rely solely on Idaho Power for the power needed to maintain mission operations. As a result, long-term, beneficial, indirect impacts would be expected, as geothermal power generation would make MHAFB more energy independent, reduce energy costs, and enhance the economic impact of MHAFB as a contributor to the regional economy.

3.8.3.3 NO ACTION ALTERNATIVE

Under the No Action Alternative, the proposed geothermal power facility would not be constructed or operated on MHAFB and the existing conditions discussed in **Section 3.8.2** would remain unchanged. Impacts on socioeconomics would be long-term, negligible to minor under the No Action Alternative. Idaho Power would continue to supply power to MHAFB via the commercial power grid, and MHAFB would continue to be subject to fluctuating electricity rates and availability. Ultimately, this would potentially limit MHAFB's ability to provide reliable power to the installation and its personnel, which could adversely impact local and regional economic conditions, as the installation generates nearly $356 million in economic activity annually.

3.9 Transportation

3.9.1 Definition of the Resource

Transportation refers to roadway, street, rail, and air systems and the movement of vehicles on transportation networks. Transportation at MHAFB consists of vehicle, pedestrian/bicycle, air, rail, and public transportation infrastructure.

This analysis considers impacts beyond the physical project area where construction and operation would occur; the term ROI is used to describe the complete geographic scope of potential consequences for transportation. The ROI is identified as the installation, particularly the northwest and northeast corners of the installation, and the region surrounding the installation.

3.9.2 Existing Conditions

Vehicle Road Network. The regional road network surrounding MHAFB is made up of Interstate 84 (I-84), State Highway 67 (SH 67), State Highway 51 (SH 51, also known as Airbase Road), and State Highway 167 (SH 167, also known as Grand View Road), which can be used to access the installation (**Figure 3.6**).

I-84, approximately 12 miles northeast of the installation, is a major interstate that bisects the southwestern corner of the state. I-84 travels northwest towards Boise and passes just north of the city of Mountain Home, where it connects with SH 51. SH 51 travels southwest from the city of Mountain Home and turns into SH 67 at the city boundary. SH 67 turns south as Airbase Road and merges with Gunfighter Avenue at the MHAFB Main Gate at the northern perimeter of the installation. The second gate, Grand View Gate, located at the northwestern corner of the installation, can be accessed from SH 167, which also intersects SH 67 from the west.

The primary roads at MHAFB include Liberator Street, which turns into Bomber Street near the eastern portion of the installation; Alpine Street, Desert Street, and Falcon Street running in northwest-southeast directions; and Aardvark Avenue, Phantom Avenue, and Gunfighter Avenue running in northeast-southwest directions (**Figure 3.7**). The on-installation roadway network is divided into three classifications: major collectors, minor collectors, and local roads. Gunfighter Avenue, Aardvark Avenue, and Bomber Street are the major collectors; Phantom Avenue, Desert Street, Falcon Street, Hope Street, and Liberator Street are the minor collectors. The remaining roads are classified as local roads and connect to the major and minor collectors, which complete the transportation network. The installation road network has sufficient capacity to support current traffic and anticipated future traffic with congestion only occurring at peak travel times (MHAFB 2017c).

Figure 3.6. Regional Roadways

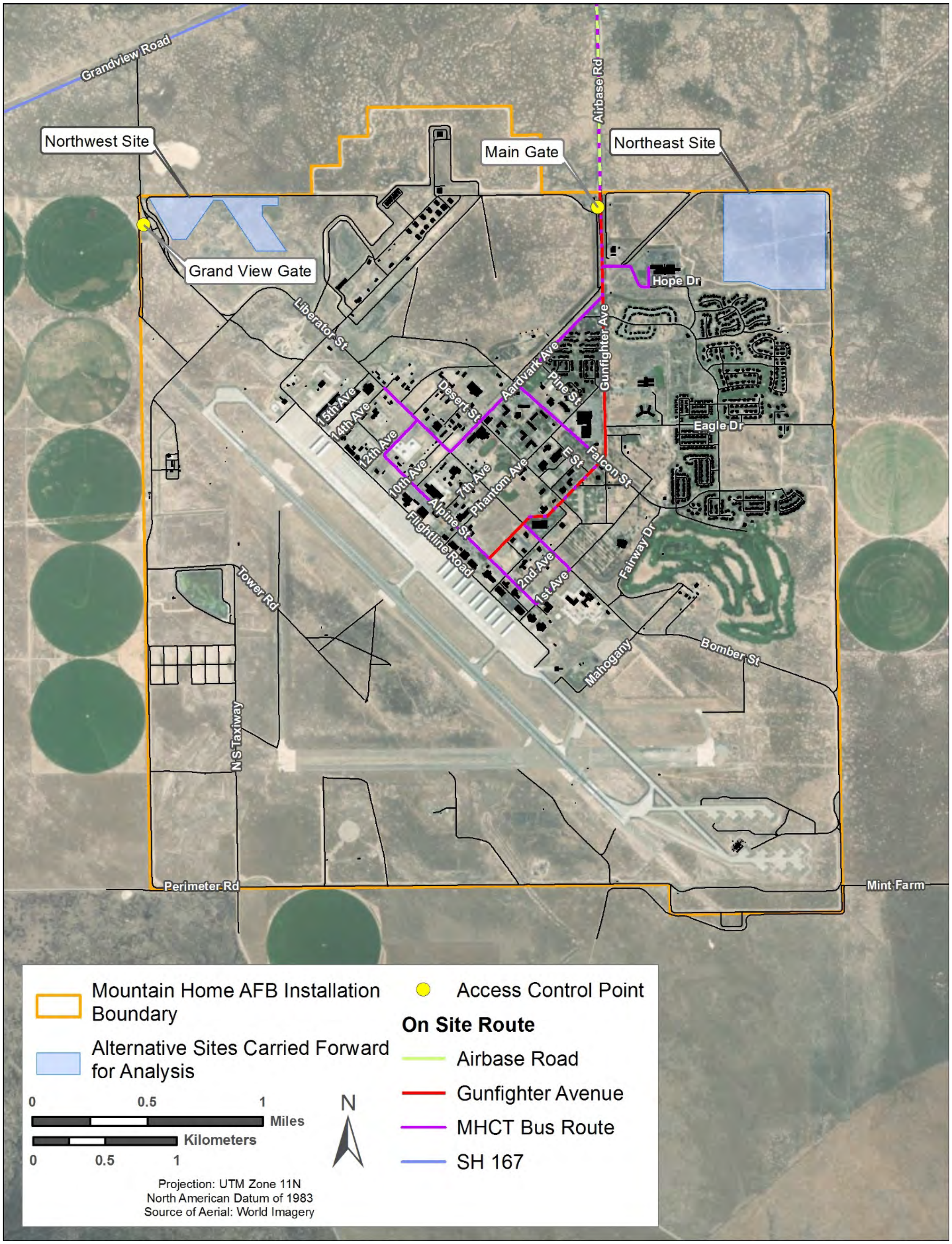

Figure 3.7. Installation Roadways

There are two primary access control points at the northern perimeter of the installation that are staffed, including the Main Gate and the Grand View Gate (**Figure 3.7**). Most traffic enters and exits the installation through the Main Gate, using Gunfighter Avenue as the primary road for access to secondary and tertiary roads, and installation facilities. The Main Gate operates 24 hours a day. Peak traffic volume at the Main Gate occurs from 7 a.m. to 8 a.m. for entering traffic and from 4 p.m. to 5 p.m. for exiting traffic. The Grand View Gate, located on Liberator Street in the northwest corner of the installation serves as the commercial vehicle inspection (CVI) gate and most commercial vehicles use this gate to access the installation. The Grand View Gate operates from 6 a.m. to 6 p.m., Monday through Saturday, and is currently in need of reconfiguration to support more efficient vehicle processing. There are no capacity issues at the Main Gate, but there can be moderate congestion during peak times at the Grand View Gate (MHAFB 2017c, MHAFB 2019c).

Public Transportation. The regional public transportation network consists of the Treasure Valley Transit (TVT) system, Mountain Home Community Transit (MHCT), Snake River Transit Idaho, and Mountain Community Transit. The TVT system is a private, non-profit company that services rural southern Idaho and the city of Mountain Home. The TVT system operates multiple bus route systems, which include MHCT, servicing the city of Mountain Home; Snake River Transit Idaho servicing Fruitland and Payette; and Mountain Community Transit servicing the city of McCall. The MHCT system runs on two different routes. The first route runs from the city of Mountain Home to the Mountain Home Municipal Airport and the second route runs from the city of Mountain Home to MHAFB, with several stops throughout the installation. On the installation, the MHCT runs through the Main Gate and makes a loop around the center of the installation using Aardvark Avenue, Alpine Street, Gunfighter Avenue, and Falcon Street (**Figure 3.7**). The MHAFB bus route operates on a limited schedule, from 6 a.m. to 9 a.m. and from 2 p.m. to 6 p.m., Monday through Friday, and does not operate on holidays (MHAFB 2017c, MHCT 2017, TVT 2015).

Pedestrian/Bicycle Facilities. Most facilities at MHAFB have sidewalks that connect to adjacent parking lots and additional sidewalks that connect to nearby facilities (**Figure 3.8**). Most roadways on the installation have adjacent sidewalks and MHAFB is currently in the process of connecting all existing sidewalks. The MHAFB installation development plan states that connectivity between pedestrian facilities is important and MHAFB continues to improve connectivity with planned construction for off-street jogging trails and paths, which will also connect dormitories and lodging facilities with other centrally located support facilities (MHAFB 2017c). There are no pedestrian or bicycle facilities that connect MHAFB with the city of Mountain Home.

Air Transportation. The airfield at MHAFB is oriented in a northwest-southeast direction and the total acreage of the airfield district is 2,440 acres. The airfield consists of a single runway, Runway 12/30, a main parking apron, transient ramps, a parallel taxiway with ladder taxiways, the live ordnance loading area, and two warm-up pads. MHAFB hosts a total of 6,460 flying mission per year and approximately 7,496 annual baseline operations are flown by based and transient air crews. The airspace extends from the airfield surface to 5,500 feet above ground level and within a 5-nautical-mile radius of the airfield (MHAFB 2017c).

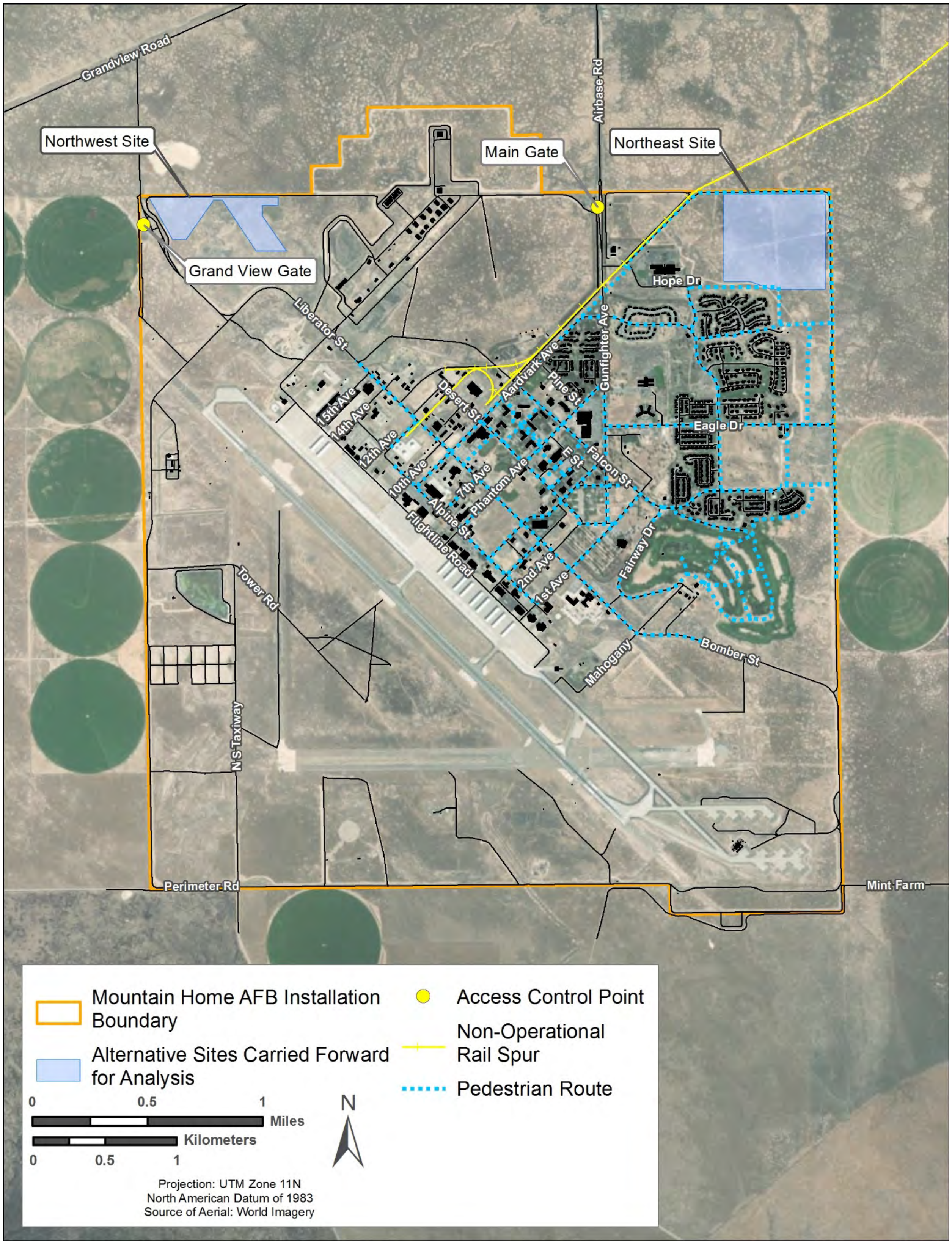

Figure 3.8. Installation Roadways and Pedestrian Facilities

3.9.3 Environmental Consequences

Transportation impacts would be considered significant if changes associated with the Proposed Action substantially and permanently affected transportation resources, or resulted in significant transportation impacts that compromises mission requirements.

3.9.3.1 ALTERNATIVE 1 – NORTHWEST

Short-term, minor, adverse impacts on the MHAFB transportation system would be expected from constructing and operating the geothermal power facility at the Northwest Alternative site. Temporary impacts on road transportation would occur during the construction period; impacts on air transportation and pedestrian/bicycle facilities would not occur.

It is assumed that construction workers in personal vehicles and construction vehicles would use the Grand View Gate and Liberator Street to access the project area. Short-term, adverse impacts on the gate and road network at MHAFB would occur at the Grand View Gate and on the northwest section of Liberator Street due to construction personnel commuting to and from the site, construction vehicles and equipment accessing the site, and delivery of construction materials.

To limit adverse impacts on transportation and avoid added congestion at the Grand View Gate, construction and delivery vehicles could use the gate outside of peak hours, construction workers could park at the construction site, and construction vehicles and equipment could be kept on site for the duration of the construction period. Because the Grand View Gate is the primary gate used for commercial vehicles and most MHAFB personnel use the Main Gate, traffic impacts at and near the Main Gate, which is approximately 2 miles east of Grand View Gate, would be avoided. New access roads would be constructed in the project area for anticipated construction vehicle use, which would further avoid possible traffic congestion on the road network throughout the installation. Efforts to avoid traffic congestion and use of existing roadways would be maximized. Additionally, MHAFB would minimize interference with public traffic on off-installation roads selected for hauling materials to and from the project area and would implement BMPs such as flaggers, notifications, and temporary detours to reduce short-term adverse impacts.

Long-term impacts on transportation at MHAFB would not be expected from operating the geothermal power facility at the Northwest Alternative site. Because the geothermal power facility would be accessed using new access roads and a negligible number of personnel would be required during operation, long-term adverse impacts on transportation would not be anticipated.

3.9.3.2 ALTERNATIVE 2 – NORTHEAST

Short-term, minor, adverse impacts on the MHAFB transportation system would be expected from constructing and operating the geothermal power facility at the Northeast Alternative site. Temporary impacts on transportation would occur during the construction period; impacts on air transportation would not.

Because of the proximity of the Main Gate to the project area, construction workers in personal vehicles may use the Main Gate for installation access. However, all construction equipment and construction vehicles would access the installation from the Grand View Gate at the northwest corner of the installation. Short-term, adverse impacts on transportation in the immediate vicinity of the project area would result from the construction and associated traffic. Personal and construction vehicles accessing the installation from the Main Gate or the Grand View Gate would use the existing road network, particularly Liberator Street, Falcon Street, Aardvark Avenue, and/or Gunfighter Avenue to access the project area, which could cause a temporary increase in traffic volume throughout the installation. Construction vehicle use of the Grand View Gate would result in impacts to transportation because of the travel distance and existing peak time congestion at the Grand View Gate. Implementing BMPs, such as accessing the installation outside of peak traffic times or avoiding heavily trafficked roads, could help alleviate a potential increases in adverse impacts.

New access roads could alleviate some construction-related traffic congestion near the project area but would not be sufficient to prevent construction traffic from using existing roadways to travel from the access gates to the project area. MHAFB would minimize interference of construction traffic with public traffic on roads and implement BMPs such as flaggers, notifications, and temporary detours to reduce any short-term adverse impacts.

Additionally, the northeast corner is located in the accompanied housing district, which contains many residential roads. Construction traffic may affect access to on-installation housing for personnel and their dependents, especially during peak traffic times. Further, the MHCT route that travels through the center of the installation could be temporarily impacted or delayed due to construction traffic, especially during peak traffic times.

There is a pedestrian trail that follows the northeast installation boundary that can be used by pedestrians to move through the installation and access the installation's main roadways and facilities. Because of potential trail closures for pedestrian safety during construction, there could be temporary impacts on the pedestrian facilities located in the northeast corner. Measures would be implemented to secure the integrity of, and avoid any damage to the trails near the Northeast Alternative site and could include keeping construction equipment and materials clear of trails. If the pedestrian trail along the northeast installation boundary were permanently closed due to the presence of the power facility, long-term, adverse impacts would occur.

Long-term impacts on transportation systems at MHAFB would not result from operating the geothermal power facility at the Northeast Alternative site. Because the geothermal power facility would be accessed using new access roads and a negligible number of personnel would be required during operation, long-term adverse impacts on traffic patterns would not be anticipated.

3.9.3.3 NO ACTION ALTERNATIVE

Under the No Action Alternative, the proposed geothermal power facility would not be constructed or operated on MHAFB and the existing conditions discussed in **Section 3.9.2** would remain unchanged. Established traffic patterns would continue in their current state. Implementation of the No Action Alternative would not result in any new or additional impacts on transportation.

3.10 Water Resources

3.10.1 Definition of the Resource

Water resources are natural and man-made sources of water that are available for use by and for the benefit of humans and the environment. Water resources relevant to MHAFB's location in Idaho include groundwater, surface water, floodplains, wetlands, and geothermal reservoir (part of the earth crust with hot water or steam). Evaluation of water resources examines the quantity and quality of the resource and its demand for various purposes.

Groundwater. Groundwater is water that exists in the saturated zone beneath the ground surface. It is an essential resource that functions to recharge surface water and can be used for drinking, irrigation, and industrial processes. Groundwater typically can be described in terms of depth from the surface, aquifer or well capacity, aquifer properties, water quality, recharge rate, and surrounding geologic formations.

Groundwater quality and quantity and geothermal resources are regulated under several different programs. Wells in Idaho with bottom-hole temperatures between 85 and 212 °F are regulated as a low temperature geothermal resource, and their use requires a water right from IDWR. Wells with a bottom hole temperature greater than 212 °F are considered geothermal resources and do not require a water right from IDWR, because geothermal resources are defined as "sui generis," neither water nor mineral. IDWR, under authority granted by the Idaho Geothermal Resources Act, Idaho Code § 42-4001 et seq., regulates drilling, operation, maintenance, and abandonment of all geothermal resource wells through the Idaho Underground Injection Control Program. Specific regulations apply to drilling geothermal wells to protect both the geothermal resource and any overlying cold water resources, and drilling a geothermal well requires a well construction permit. IDEQ is responsible for protecting the quality of groundwater in Idaho and relies on a combination of programs to protect groundwater from pollution, clean up degraded groundwater, and monitor and assess groundwater quality. MHAFB falls within the Elmore Ground Water Quality Improvement and Drinking Water Source Protection Plan, which outlines information for decision making associated with water quality-related activities and provides strategies for local land management entities to protect water supplies. In addition, MHAFB prepared and implements a Drinking Water Source Protection Plan that prevents potential contamination sources from being located over critical groundwater recharge areas and well head protection areas.

Surface Water and Stormwater. Surface water resources generally consist of lakes, rivers, streams, and wetlands. Surface water is important for its contribution to the economic, ecological, recreational, and human health of a community or locale. Waters of the United States are defined within the CWA, as amended, and jurisdiction is addressed by the USEPA and the U.S. Army Corp of Engineers (USACE). Jurisdictional waters of the United States are areas that convey water, exhibit an "ordinary high water mark," and do not meet the three parameter criteria for wetlands. USACE recognizes three distinct types of drainage features: ephemeral drainages, intermittent drainages, and perennial drainages. Section 404 of the CWA authorizes USACE to issue permits for the discharge of dredge or fill into waters of the United States, including wetlands. The CWA also mandated the NPDES program, which regulates the discharge of point (end of pipe) and nonpoint (stormwater) sources of water pollution and requires a permit under Section 402 for any discharge of pollutants into waters of the United States. Per Section 401 of the CWA, any applicant for a federal license or permit to conduct any activity, including but not limited to constructing or operating facilities that could result in any discharge into the navigable waters, shall provide the licensing or permitting agency a certification from the state in which the discharge originates or will originate.

Stormwater is an important component of surface water systems because of its potential to introduce sediment and other contaminates that could degrade surface waters. Proper management of stormwater flows, which can be intensified by high proportions of impervious surfaces associated with buildings, roads, and parking lots, is important to the management of surface water quality and natural flow characteristics. Prolonged increases in stormwater volume and velocity associated with development and increased impervious surfaces has potential to impact adjacent streams as a result of stream bank erosion and channel widening or down cutting associated with the adjustment of the stream to the change in flow characteristics.

All construction sites are required to meet NPDES stormwater permit non-numeric effluent limitations and design, install, and maintain effective erosion and sedimentation controls, including the following:

- Control stormwater volume and velocity to minimize erosion;
- Control stormwater discharges, including both peak flow rates and total stormwater volume;
- Provide and maintain natural buffers around surface waters, direct stormwater to vegetated areas to increase sediment removal, and maximize stormwater infiltration where feasible (e.g., silt fences);
- Minimize erosion at outlets and downstream channel and stream bank erosion;
- Minimize soil compaction and preserve topsoil where feasible.

In addition, construction site owners and operators that disturb 1 or more acres of land are required to use BMPs to ensure that soil disturbed during construction activities does not pollute nearby water bodies. Construction site owners and operators that disturb 10 or more acres of land are required to monitor discharges to ensure compliance with effluent limitations. Permittees can select management practices or technologies that are best suited for site-specific conditions. Construction activities disturbing a total of 20 or more acres at one time must comply with the numeric effluent limitation for turbidity in addition to the non-numeric effluent limitations. Construction or demolition activities that disturb 20 or more acres would need to comply with the maximum daily turbidity limitation of 280 nephelometric turbidity units (ntu) as outlined in the CWA Final Rule. Turbidity limitations and monitoring requirements could be avoided if construction or demolition activities are phased to reduce acreages disturbed simultaneously to less than 20 and 10 acres, respectively.

Management and oversight of the NPDES program in Idaho is in the process of being phased over from the USEPA to IDEQ. Beginning July 1, 2021, permits for stormwater discharges will be under the IPDES permit application process.

Construction activities such as clearing, grading, trenching, and excavating disturb soils and sediment. If not managed properly, disturbed soils and sediments can easily be washed into nearby water bodies during storm events, where water quality is reduced. Section 438 of the EISA established stormwater design requirements for federal construction projects that disturb a footprint of greater than 5,000 square feet of land. EISA Section 438 requirements are independent of stormwater requirements under the CWA. Under these requirements, predevelopment site hydrology must be maintained or restored to the maximum extent technically feasible with respect to temperature, rate, volume, and duration of flow. Predevelopment hydrology shall be modeled or calculated using recognized tools and must include site-specific factors such as soil type, ground cover, and ground slope. Site design shall incorporate stormwater retention and reuse technologies such as bioretention areas, permeable pavements, cisterns/recycling, and green roofs to the maximum extent technically feasible. Post-construction analyses shall be conducted to evaluate the effectiveness of the as-built stormwater reduction features. These regulations have been incorporated into applicable DOD United Facilities Criteria (UFC) in April 2010, which stated that low impact development features would need to be incorporated into new construction activities to comply with the restrictions on stormwater management promulgated by EISA Section 438. Additional guidance is provided in the USEPA's *Technical Guidance on Implementing the Stormwater Runoff Requirements for Federal Projects under Section 438 of the Energy Independence and Security Act* (USEPA 2009).

Floodplains. Floodplains are areas of low-level ground present along rivers, stream channels, or coastal waters. The living and nonliving parts of natural floodplains interact with each other to create dynamic systems in which each component helps to maintain the characteristics of the environment that support it. Floodplain ecosystem functions include natural moderation of floods, flood storage and conveyance, groundwater recharge, nutrient cycling, water quality maintenance, and diversification of plants and animals. Floodplains provide a broad area to spread out and temporarily store floodwaters. This reduces flood peaks and velocities and the potential for erosion. In their natural vegetated state, floodplains slow the rate at which the incoming overland flow reaches the main water body (FEMA 1986).

***Wetlands*.** Wetlands perform several hydrologic functions, including water quality improvement, groundwater recharge and discharge, pollution mitigation, nutrient cycling, stormwater attenuation and storage, sediment detention, and erosion protection. Wetlands are protected as a subset of the waters of the United States under Section 404 of the CWA. USACE defines wetlands as "areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas" (USACE 1987).

3.10.2 Existing Conditions

Groundwater. MHAFB has seven wells that draw water from the Idaho Group; three wells produce potable water. MHAFB is planning for one of the existing wells, Well 14, to also draw from the Idaho Group to produce potable water. The wells draw from an unconfined aquifer that is approximately 400 feet bgs and is composed of coarse sands. This unconfined aquifer is not designated as a sole-source aquifer (USEPA 2019c) and also provides water to the City of Mountain Home and surrounding areas.

Recharge of the aquifer occurs through subsurface flow, although the water usage exceeds the recharge rates. Despite the water table at MHAFB dropping an average of 2 feet per year, the combined capacity of the seven wells is 9.3 million gallons per day (MHAFB 2017c). Well yields from the unconfined aquifer range from 10 to 3,500 gallons per minute, with water use at 800,000 gallons per day during the fall through spring, and 6 million gallons per day in the summer. Eighty to 90 percent of the summer water usage is for irrigation purposes (MHAFB 2011).

MHAFB falls within the Mountain Home Groundwater Management Area. Groundwater management area designations are for a groundwater basin that does not have sufficient groundwater to provide a reasonably-safe supply for irrigation or other uses at the current or projected rates of withdrawal. Designation as a groundwater management area resulted in development of a committee to mediate water-related issues involving water users and to serve as a forum for communication of water-related issues.

There are approximately 130 monitoring and production (municipal and public water supply) wells on the MHAFB (IDWR 2019a). They are all owned by MHAFB, DoD, USAF, or similar owner.

Surface Water and Stormwater. MHAFB is within the C.J. Strike Dam Recreation Annex Watershed, which has a drainage area of approximately 55 square miles (USGS 2019). Annual precipitation in the vicinity of MHAFB averages 10 inches, and there are no perennial streams or signification natural drainages crossing the installation. All stormwater runoff from the installation is discharged to a ditch system that flows to Canyon Creek, and then to Snake River. This single discharge point is on the western portion of the installation and meets the USEPA definition of a point source. For construction sites equal to or greater than 1 acre, a USEPA Construction General Permit must be obtained, and a site-specific SWPPP must be developed.

Because of the semi-arid climate, stormwater management is conducted through a mixture of basins, retention/detention ponds, and ditches. MHAFB implements BMPs and the stormwater drainage system requires routine cleaning, repair, and preventative maintenance. The system consists of more than 600 inlets and 196,660 linear feet of conveyance pipes and ditches. The only stormwater management issues on the installation occur in the family housing area on the northeast corner of the installation. The stormwater management system in this area can be overtaxed during air inversions, resulting in rapid snow melt while the ground is still frozen. Additionally, rain events during inversions, although rare, enhance the issue. An EA outlining possible projects for stormwater management in the family housing area was recently completed. No stormwater infrastructure is within the project areas (MHAFB 2017c).

The only open bodies of water at MHAFB are several rapid infiltration basins and a treated effluent lagoon situated along the western installation boundary. However, nine small playas adjacent to the installation serve as low-point collection areas for surface water runoff that does not reach Canyon Creek. These playas are small basins that have no outlets and, as a result, any water they collect is lost to infiltration or evaporation. USACE determined that the playas are not jurisdictional. In addition, there is a lagoon on the golf course that stores clean water for irrigation purposes. The 2008 public health assessment concluded that there are no public health hazards associated with surface water exposure at MHAFB (MHAFB 2011).

Topographic maps show no cold water springs or thermal springs within the vicinity of the geothermal operations area (USGS 1992).

Geothermal Resources. The Snake River volcanic province overlies a thermal anomaly that extends deep into the mantle and represents one of the highest heat flow provinces in North America. Geothermal power has been used in southern Idaho, primarily as direct use applications such as space heating and aquaculture, as with Boise's heating system that supplies heat to many businesses and municipal buildings. There is one site where geothermal resources are used for power generation, the Raft River Valley site 150 miles southeast of MHAFB.

Data collected from Mountain Home geothermal field indicates the existence of a large, moderate temperature geothermal resource. Geothermal exploration occurred at MHAFB in 1986 on the eastern side of the installation at test well MH-1, and in 2012 in the northwest corner of the installation at test well MH-2 (Armstrong et al. undated; Nielson and Shervais 2014). Maximum temperatures vary between 200 to 302°F at depths between 3,960 feet in MH-1 to 5,882 feet in MH-2 (Lewis and Stone, 1988, Armstrong et al. undated). The hydrothermal system is hosted by a fault zone containing hydrothermal breccias. Analysis of fracturing suggests that the fault is steeply dipping (~80º) and has a strike of about 300º, and temperatures decrease after drilling deeper into the footwall block; thus the fault confines the geothermal system on the south (Nielson et al. 2018). The resource reservoir geothermal gradient is confirmed in two wells and regional in extent; however, the resource permeability has not been evaluated. The actual extent of the geothermal reservoir remains undefined.

According to IDWR's Geothermal Resources Interactive Map, the closest geothermal springs to MHAFB are over 17 miles away and the closest geothermal well is located more than 7 miles away, and appears to be low temperature, pumped for irrigation, and approximately 800 feet deep (IDWR 2019b).

Floodplains. There are no designated 100-year floodplains contained within the boundaries of MHAFB or the immediate surrounding area (FEMA 2019). Therefore, floodplains are not discussed further.

Wetlands. There are no jurisdictional wetlands or waters of the United States on MHAFB, based on a jurisdictional determination on June 27, 2008 (MHAFB 2011). Therefore, wetlands are not discussed further.

3.10.3 Environmental Consequences

Factors considered in determining whether a proposed action would have a significant impact on water resources include the extent or degree to which its implementation would result in one or more of the following situations:

- Degrade groundwater, surface, or coastal water quality in a manner that would reduce the existing or potential beneficial uses of the water.
- Reduce the availability of, or accessibility to, one or more of the beneficial uses of a water resource.
- Alter the existing pattern of groundwater or surface water flow or drainage in a manner that would affect the uses of the water within or downgradient from the project area.
- Be out of compliance with existing or proposed water quality standards or with other regulatory requirements related to protecting or managing water resources.
- Substantially increase risks associated with human health or environmental hazards.
- Increase the hazard of flooding or the amount of damage that could result from flooding, including from runoff or from severe weather events.

3.10.3.1 ALTERNATIVE 1 – NORTHWEST

Groundwater. Short- and long-term, negligible, adverse impacts on groundwater would be expected from constructing and operating the geothermal power facility at the Northwest Alternative site. Geothermal production and injection wells would be drilled using nontoxic drilling mud to prevent the loss of drilling fluids into the rock and the risk of contamination to any aquifers from the drilling fluid. Reserve pits would be constructed at each well site to contain and temporarily store drilling mud, drill cuttings, geothermal fluid and stormwater runoff from each well pad. The pits would be lined with synthetic liner to protect against infiltration into groundwater. Therefore, contamination of the local groundwater aquifer as a result of the temporary discharges into the reserve pits is unlikely. The proposed geothermal well construction would follow the IDWR stringent construction standards that require casing and sealing through the shallower groundwater aquifers to prevent mixing that could impact the quality of potable water sources and damage the geothermal reservoir (IDAPA 37.03.04). During construction at the Northwest Alternative site, USAF would avoid disturbing or restricting access to existing monitoring wells within the site perimeter.

During construction, approximately 150 acre-feet (49 million gallons) of groundwater would be consumed over approximately 18 months, principally for geothermal well drilling and dust control. This small quantity of water, obtained from existing MHAFB water wells, would have little potential for affecting the quantity of groundwater in or adjacent to the project area.

Land disturbance, compaction produced by vehicular traffic, material storage, waste disposal, and inadvertent chemical or hazardous liquid spills during construction could also impact the local aquifer and groundwater quality. USAF would implement BMPs, as described in **Section 3.3** and **Section 3.10**, to contain soil and stormwater runoff on site, and reduce the potential for adverse effects associated with erosion and sedimentation and transport of sediments in runoff. Additionally, USAF would implement BMPs, described in **Section 3.4,** to minimize the potential for spills or hazardous materials releases. Hazardous and petroleum wastes generated would be handled, stored, and disposed of in accordance with the MHAFB hazardous waste management plan and federal, state, and local regulations.

As noted in **Section 2.1.1**, the proposed geothermal power facility could potentially use a sealed, closed-loop system (e.g., EAVOR LOOP), rather than a binary cycle system. In a sealed, close-loop system, geothermal production and reinjection wells would not need to be drilled. However, a sealed, closed-loop system would require horizontal drilling within the geothermal rock formation, and two wells to complete the U-loop piping system for the thermal fluid. It is estimated that the diameter of thermal fluid wells would be similar to geothermal production wells. Construction of thermal fluid wells would include similar BMPs as described for the construction of geothermal production and injection wells to prevent contamination of groundwater. Well construction would follow IDWR construction standards that require casing and sealing through the shallower groundwater aquifers to prevent mixing that could impact the quality of potable water sources and damage the geothermal reservoir (IDAPA 37.03.04).

The proposed geothermal plant would use dry-type cooling condensers, which do not require water. Therefore, there is no proposed long-term consumptive use of groundwater proposed. Over the operational life of the project, accidental discharges of geothermal fluids from a binary cycle system, or discharges of thermal fluid from a sealed, closed-loop system (e.g., EAVOR LOOP), could contaminate groundwater. These are unlikely because the geothermal facilities would be operated in compliance with IDWR requirements, and frequent inspections and ultrasonic testing of all system pipelines would be conducted, the pipeline flow and pressure would be monitored, pumps and pipeline valves would be equipped with shutdown features, and groundwater monitoring would be conducted. Contamination groundwater from spills of petroleum products (such as diesel fuel or lubricants) could also occur. However, this is also unlikely because the well pads would be bermed to contain and control any spills. Further, the containment structures would be lined with an approved liner to prevent any groundwater contamination.

Surface Water and Stormwater. Short- and long-term, minor, adverse impacts on surface water and stormwater would be expected from constructing and operating the geothermal power facility at the Northwest Alternative site. Construction and long-term facility operation could affect the quality of stormwater runoff by increasing erosion or sedimentation, or contaminating surface water due to materials and/or practices used.

Vegetation removal and periodic disturbance during site maintenance would potentially increase sedimentation, decrease infiltration, and result in disruption of the natural drainage patterns, contamination of stormwater discharge, and heavy sediment loading. Under the NPDES stormwater program, construction sites that disturb greater than 1 acre would require a Construction General Permit and development of a construction site-specific SWPPP and BMPs. As noted in **Section 3.10.1**, beginning July 1, 2021, permits for stormwater discharges will be under the IPDES permit application process. Depending on construction date of the geothermal power facility, USAF would comply with the requirements of the IPDES program, and also develop a construction SWPPP and implement BMP as under the NPDES program. Adhering to the SWPPP and implementing BMPs would reduce the potential for impacts. To minimize erosion, grading or clearing the surface for construction would occur only as needed, and only within the approved construction corridors. Further, water and/or aggregate would be applied on disturbed areas to control dust and stabilize erosive soils, which would reduce the potential for erosion. Disturbed areas that would not be used after construction would be revegetated with an approved seed mixture and planting procedures. Any topsoil enriched in organic material stockpiled on previously-disturbed areas would be applied to enhance the opportunity for successful revegetation. Erosion and sediment control techniques could include erosion control mats, silt fences, straw bales, diversion ditches, riprap channels, water bars, water spreaders, and sediment basins, and would be used as appropriate. Access roads would also be constructed and maintained consistent with the BMPs for road construction applicable to the intended use (temporary or permanent) of the road.

Construction or demolition activities that disturb 20 or more acres would need to comply with the maximum daily turbidity limitation of 280 ntu as outlined in the CWA Final Rule. Construction or demolition activities that disturb 10 or more acres of land would need to monitor discharges to ensure compliance with effluent limitations as specified by the permitting authority. Turbidity limitations and monitoring requirements could be avoided if construction or demolition activities are phased to reduce acreages disturbed simultaneously to less than 20 and 10 acres, respectively.

A long-term increase in impervious surfaces associated with the geothermal facility would be expected to increase volume and velocity of stormwater runoff and associated potential erosion and off-site transport of sediments. Section 438 of the EISA would be adhered to, to the extent technically feasible to maintain pre-development hydrology. An erosion and sediment control plan would be developed and implemented both during and following site development to contain soil and stormwater runoff on site, and would reduce the potential for adverse effects associated with erosion and sedimentation and transport of sediment in runoff. Stormwater runoff would be in compliance with Section 438 of the EISA and the CWA Final Rule regarding non-numeric effluent limitations. Short-term, adverse effects would be minimized with implementation of BMPs, including wetting soils. Wetting soils would occur on a daily basis, as needed, to prevent erosion and dust generation (see discussion on air quality in **Section 3.1**).

Material storage, waste disposal, and inadvertent chemical or hazardous liquid spills could also impact surface water quality during construction. USAF would implement BMPs described in **Section 3.4** to minimize the potential for spills or hazardous materials release. Hazardous and petroleum wastes generated would be handled, stored, and disposed of in accordance with the MHAFB hazardous waste management plan and federal, state, and local regulations. If during the construction planning process USAF identified that project construction activities could alter the hydrology of surface runoff such that erosion carries sediment to surface waters and pollutants to local drainages and the underlying aquifer, USAF would coordinate with IDEQ and all potentially affected tribes to assure that state and tribal water resources are protected from impacts.

Over the operational life of the project, accidental discharges of geothermal fluids from a binary cycle system, or discharges of thermal fluid from a sealed, closed-loop system (e.g., EAVOR LOOP), could contaminate surface water. These are unlikely because the geothermal facilities would be operated in compliance with IDWR requirements, and frequent inspections and ultrasonic testing of system pipelines would be conducted, the pipeline flow and pressure would be monitored, pumps and pipeline valves would be equipped with shutdown features, and monitoring would be conducted. Contamination of surface water from petroleum product spills (such as diesel fuel or lubricants) could also occur. However, this is also unlikely because the well pads would be bermed to contain and control any spills.

Given these practices, degraded water quality due to increased erosion or sedimentation and increased impervious surfaces is unlikely.

Geothermal Resources. Long-term, negligible, adverse impacts on geothermal resources would be expected from constructing and operating the geothermal power facility at the Northwest Alternative site. Fluid from the geothermal reservoir is not expected to be impacted by the MHAFB geothermal power facility because that fluid would be injected back into the aquifer following use of the heat from the fluid. The proposed facility would use a binary system, a closed-loop system that transfers heat from the geothermal fluid to a motive fluid, pentane or equivalent fluid, without the geothermal fluid coming into contact with the motive fluid or the atmosphere. The heat is transferred to the motive fluid through a heat exchanger and then injected back into the geothermal aquifer zone. Thus, the same volume of fluid pumped from the geothermal aquifer is returned to the geothermal aquifer. Therefore, with proper design of the production and injection wells and adequate spacing between production and injection wells, reservoir pressures can be sustained. To inform well siting and distances, USAF could conduct a hydraulic gradient assessment, to include temperature profiles, known and inferred faults, fluid pathways, and geologic deposits within the geothermal aquifer.

There is a potential for the hot fluid in the geothermal reservoir to cool over the life of the operation of the power facility because using fluid for power generation cools it by approximately 180 degrees before it is reinjected. Cooling the geothermal resource has the potential to shorten the life of the geothermal power production capabilities. Distance between production wells as well as distance between production wells and injection wells is dependent upon reservoir structure, extents of the reservoir, the system enthalpy, and pumping rates. The reservoir data required to design the well field has not been completed to date; therefore it is assumed the well field design would account for these factors to sustain the reservoir and allow the production wells and injection wells to be located within the project area.

The geothermal wells would be cased with steel to a depth below the shallow groundwater reservoirs. The casing would be cemented into the ground to prevent the loss of any geothermal resource into, and prevent the contamination or mixing of, any shallow groundwater by the geothermal production or injection fluid.

As noted in **Section 2.1.1**, the proposed geothermal power facility could potentially use a sealed, closed-loop system (e.g., EAVOR LOOP), rather than a binary cycle system. In a sealed, close-loop system, the thermal fluid (similar to the binary fluid) is pumped below the surface in a U-loop piping system to the geothermal formation for heating, and then returned to the surface to the heat exchanger at the power plant. Therefore, in a sealed, closed-loop system, the geothermal fluid is not extracted from the geothermal formation and the system would not alter the composition or pressures of the geothermal reservoir. Accidental discharges of thermal fluid from the sealed, closed-loop system (e.g., EAVOR LOOP) could occur into the geothermal reservoir; however, these are unlikely because the geothermal facilities would be operated in compliance with IDWR requirements, frequent inspections and ultrasonic testing of system pipelines would be conducted, the pipeline flow and pressure would be monitored, pumps and pipeline valves would be equipped with shutdown features, and monitoring would be conducted.

3.10.3.2 ALTERNATIVE 2 – NORTHEAST

Impacts on water resources from construction and operation of the geothermal power facility at the Northeast Alternative site would be similar to those described in **Section 3.10.3.1** for the Northwest Alternative site. However, additional design considerations would be required to prevent additional impacts on stormwater.

Design of the geothermal power facility at the Northeast Alternative site would need to consider proximity to family housing as the stormwater management system in this area can be overtaxed. Additionally, as described in **Sections 3.6** and **3.10.3.1**, geothermal resources within and adjacent to the project area may be limited due to a steeply dipping fault. Therefore, while not the preferred option, MHAFB would potentially need to use the geothermal reservoir in the northwest corner of the base for the Northeast Alternative site facility. Under this option, longer pipelines would be required to carry geothermal fluid from the well field to and from the power plant, resulting in potential for additional erosion and sedimentation, and long-term increase in impervious surfaces. Implementation of BMPs and compliance with requirements described in **Section 3.10.3.1** would reduce the potential for impacts.

3.10.3.3 NO ACTION ALTERNATIVE

Under the No Action Alternative, the proposed geothermal power facility would not be constructed or operated on MHAFB and the existing conditions discussed in **Section 3.10.2** would remain unchanged. Implementation of the No Action Alternative would not result in any new or additional impacts on water resources.

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4. Cumulative Impacts

The CEQ regulations for implementing NEPA require that the cumulative impacts of a proposed action be assessed (40 CFR §§ 1500–1508). CEQ defines cumulative impacts as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions" (40 CFR § 1508.7). Cumulative impacts are most likely to arise when a relationship exists between a proposed action and other actions expected to occur in a similar location or during a similar time period. Actions overlapping with, or in proximity to, a proposed action would be expected to have more potential for a relationship than more geographically-separated actions.

CEQ's guidance for considering cumulative impacts states that NEPA documents "should compare the cumulative effects or multiple actions with appropriate national, regional, state, or community goals to determine whether the total effect is significant." The first step in assessing cumulative impacts involves identifying and defining the scope of other actions and their interrelationship with a proposed action or alternatives. The scope must consider other projects that coincide with the location and timeline of a proposed action and other actions.

This section briefly summarizes past, present, and reasonably foreseeable future projects within the same general geographic scope as the Proposed Action. The geographic scope of the analysis varies by resource area. For example, the geographic scope of the cumulative impacts on noise, geological resources, and safety is narrow and focused on the location of the resource. The geographic scope of air quality, infrastructure, and socioeconomics is broader and considers more county- or region-wide activities.

The past, present, and reasonably foreseeable future projects, identified below, make up the cumulative impact scenario for the Proposed Action. The Proposed Action's impacts on the individual resource areas analyzed in **Sections 3.1** through **3.10** are added to the cumulative impact scenario to determine the cumulative impacts of the Proposed Action. In accordance with CEQ guidance, the impacts of past actions are considered in aggregate as appropriate for each resource area without delving into the historical details of individual past actions.

4.1 Projects Considered for Potential Cumulative Impacts

This section provides decision makers with the cumulative effects of the Proposed Action at MHAFB by determining the incremental contribution of the Proposed Action together with past, present, and reasonably foreseeable future actions. **Sections 4.1.1** and **4.1.2** summarize past, present, and reasonably foreseeable future actions within the region that could interact with implementation of the Proposed Action at MHAFB. The sections briefly describe each action, present the proponent and the timeframe (e.g., past, present/ongoing, future) of the action, and indicate which actions have the potential to cumulatively interact with the Proposed Action.

4.1.1 Past Actions

Past activities are those actions that occurred within the geographic scope of cumulative effects that have shaped the current environmental conditions of the project area. No substantial projects have been completed within the recent past that warrant consideration regarding cumulative impacts. Most construction activities to establish airfield pavements, interior roads, and installation infrastructure were completed approximately 70 years ago. The installation infrastructure has expanded since that time to accommodate changes in the installation's mission and fluctuations in population. Facility improvements and demolition actions continue, as needed, to maintain space-use efficiency and optimized operations. Therefore, the impacts of past actions are now considered part of the existing environment and are incorporated in the description of the affected environment in **Section 3**.

4.1.2 Present and Reasonably Foreseeable Future Actions

4.1.2.1 ON-INSTALLATION PROJECTS

MHAFB regularly takes into consideration the long-term needs of the installation and identifies projects that would help maintain efficient and optimized installation operations. Multiple construction projects are currently being considered by MHAFB; however, they have not been programmed or funded, and therefore, are not ripe for consideration as present or reasonably foreseeable projects for this cumulative effects analysis. One reasonably foreseeable action on MHAFB with the potential to have cumulative effects with the Proposed Action is discussed below.

Sustainable Water Supply. The proposed project consists of establishing a new sustainable water supply conveyed via predominantly linear underground infrastructure to a proposed water treatment facility that would be established within the installation boundary. The project would install or develop a dedicated vertical turbine pump station and intake structure at the C.J. Strike Reservoir; a pressurized conveyance feature (pipe) extending from the C.J. Strike Reservoir to MHAFB, predominantly through land administered by BLM, although some smaller parcels of private (non-federal land) may be crossed by the system; a water treatment facility with ancillary elements, including: 1) a 30-acre-foot raw water reservoir; 2) water treatment processing equipment; 3) sludge drying beds; and 4) disinfection processing equipment; two-track roadways requiring temporary and permanent easements; and a connection to the existing water storage and distribution system within the installation. The FONSI and Decision Record for this project were signed and completed in December 2017. The footprint of the geothermal facility at either alternative site and the footprint of the sustainable water supply project would not overlap.

4.1.2.2 OFF-INSTALLATION PROJECTS

Idaho Power 2019 Integrated Resource Plan. The Idaho Power 2019 Integrated Resource Plan action plan identifies milestones to successfully position Idaho Power to provide reliable, economic, and environmentally sound service to their customers into the future. The action plan considers the current regional electric market, regulatory environment, pace of technological change, and Idaho Power's goal of 100 percent clean energy by 2045. The action plan is driven by core resource actions through the mid-2020s, which include 220 MW of added solar photovoltaic capacity (2022–2023); exit from three coal-fired generating units by year-end 2022, and from five coal-fired generating units (total) by year-end 2026; and the Boardman to Hemingway transmission line on-line in 2026. The Boardman to Hemingway transmission line is a proposed 500-kilovolt transmission line that will run approximately 290 miles across eastern

Oregon and southwestern Idaho and is considered a top-performing resource alternative providing Idaho Power access to clean and low-cost energy in the Pacific Northwest wholesale electric market (Idaho Power 2019).

Cat Creek Energy and Water Storage Renewable Power Station. Cat Creek Energy tentatively proposes to construct a pump storage electricity generation project that would include a large dam and reservoir above the existing Anderson Ranch Dam Reservoir on the South Fork of Boise River; this project is currently in the planning stages and is subject to change. The proposed energy project would include a new hydropower reservoir above Anderson Ranch Dam Reservoir, which would receive water from the existing reservoir through large pumps and release the water back downstream during times of heavy electricity use to generate additional power through existing generation units at Anderson; a 40 MW solar farm consisting of approximately 171,000 solar panels; a 110 MW wind farm consisting of approximately 39 large wind turbines; and a 3.4-mile earthen dam to impound a 50,000 acre-foot upper reservoir above Anderson Ranch. In February 2018, Cat Creek Energy, LLC, entered into a Development Agreement with Elmore County to develop, construct, install, and operate the electrical generating facility. The agreement states the developer will obtain building permits and comply with all ordinances, including the building code under the agricultural zoning designation and FAA regulations (Snake River Alliance 2016, Elmore County 2018).

4.2 Cumulative Effects Analysis

The analysis in **Sections 4.2.1** through **4.2.10** examines the cumulative effects on the environment that would result from the incremental impacts of the Proposed Action, in addition to other past, present, and reasonably foreseeable future actions. This analysis assesses the potential for an overlap of impacts with respect to project schedules or affected areas. This section presents a qualitative analysis of the cumulative effects. There is a negligible difference in the impacts associated with Alternative 1 and Alternative 2; this difference would be indistinguishable and, therefore, the cumulative impacts would be expected to be similar and are presented for the Proposed Action.

4.2.1 Air Quality

Construction and maintenance activities under the Proposed Action would be expected to result in low levels of air emissions, well below the *de minimis* threshold limits, would not be regionally significant, and would be intermittent, short-term, and temporary in nature. BMPs outlined in **Section 3.1.3**, including wetting the ground surface for dust suppression, maintaining work vehicles, and using diesel particulate filters to reduce particulate matter air emissions, are also consistent with those adhered to within Elmore County and would minimize impacts. These BMPs are typical measures used for fugitive dust control. Emissions are not anticipated from the geothermal plant once operational; however, potential for emissions would be dependent upon final plant design. MHAFB would comply with applicable IDEQ air quality requirements and permitting requirements. The use of geothermal and other RE sources in the region, coupled with the exit from coal-fired generating units, would have a long-term, beneficial impact on regional air quality. In addition, the use of geothermal and other RE sources in the region and exit from coal-fired generating units would have a long-term, beneficial impact on global climate change by potentially reducing GHG emissions produced from the use of nonrenewable energy.

Therefore, the Proposed Action, when combined with other past, present, and reasonably foreseeable future actions, would not result in significant cumulative impacts on air quality at MHAFB or regionally.

4.2.2 Biological Resources

Construction and maintenance activities under the Proposed Action and present and reasonably foreseeable future actions on the installation and within the region would result in impacts from permanent removal of otherwise undisturbed vegetation and soil compaction during ground-disturbing activities, which could result in encroachment of noxious weeds and other invasive species. The increase in activity and soil disturbance from operating crews would increase the risk of spreading and encroachment of noxious weeds and other invasive species. Adverse impacts on vegetation would be minimized through the use of appropriate BMPs, such as avoiding infested areas, cleaning construction equipment prior to entering project areas, restricting travel to areas within the designated construction footprint and designated roads and pathways would be implemented to help prevent and control dissemination of noxious weeds and invasive plant species during construction and operation. Revegetation of disturbed areas with native species would prevent soil erosion and overall site deterioration.

Removing vegetation and operating heavy equipment could cause loss of foraging habitat for various birds, reptiles, and small mammals. Smaller species that are less mobile or have smaller home ranges may be permanently displaced or killed during ground disturbing activities associated with construction. Individuals not habituated to human presence would likely be displaced to adjacent undeveloped areas. Wildlife that is more mobile would temporarily avoid the area or alter their behavior during construction due to the increased noise and activity. These disturbances are expected to be minor and it is assumed that wildlife would gradually acclimate and use open space in adjacent areas following construction. Because there is comparable habitat in the region, these impacts would affect individuals and would not impact local or regional wildlife populations. Impacts associated with increased vehicular traffic, during construction and operation, would be minimized by implementing speed restrictions.

Permanent features associated with the Proposed Action and reasonably foreseeable future actions would be both adverse and beneficial for wildlife. Wildlife may avoid habitat affected by the long-term noise continually generated by injection wells or other aspects of the RE facilities. Although these actions would be adverse for small prey species, they would provide increased perches for raptors to hunt. Therefore, the Proposed Action, when combined with other past, present, and reasonably foreseeable future actions, would not result in a significant cumulative impact on biological resources.

4.2.3 Geology and Soils

The Proposed Action would neither reduce prime farmland soils or agricultural production nor would it significantly affect the local or regional geology. Ground-disturbing activities associated with the Proposed Action and present and reasonably foreseeable future projects would expose soils and increase their susceptibility to water and wind erosion. The use of heavy equipment or vehicles could result in soil compaction, altering their normal function relative to water storage, infiltration, or filtration; however, construction activities associated with the Proposed Action and present and reasonably foreseeable future actions would take the attributes of the topography and underlying soil types within a project area into consideration in the design of each potential project.

BMPs outlined in **Section 3.3.3**, which are standard construction BMPs, would be implemented during and after construction to control erosion during ground-disturbing activities, which would minimize impacts. For actions like the Proposed Action and other present and reasonably foreseeable actions, Section 438 of EISA would be adhered to so that pre- and post-development hydrology would be equal. Additionally, approved erosion and sediment control plans and SWPPPs would be adhered to during and after site development to contain soil and stormwater runoff and reduce the potential for adverse effects associated with erosion, sedimentation, and transport of sediments in runoff.

The Proposed Action also would be designed to balance geothermal reservoir pressures and not increase pressure or induce rock fracture. Therefore, the Proposed Action is not expected to induce seismic events and there is no potential for cumulative impacts when combined with other past, present, and reasonably foreseeable future actions.

The Proposed Action, when combined with other past, present, and reasonably foreseeable future actions, would not result in significant cumulative impacts on geology and soils.

4.2.4 Hazardous Materials and Wastes

The Proposed Action and present and reasonably foreseeable future actions on MHAFB and within the region would result in short-term, temporary increases in the use of hazardous materials and petroleum products and generation of waste. BMPs outlined in **Section 3.4.3**, including proper vehicle maintenance, proper procurement of hazardous materials, and proper disposal of hazardous wastes would minimize impacts. Hazardous materials that could be used during construction and operation of RE facilities include paints, welding gases, solvents, biodegradable liquid descalers, hydrochloric acid, glycol, preservatives, and sealants. The Proposed Action, as well as present and reasonably foreseeable future actions at MHAFB and within the region, would incorporate measures to limit or control hazardous materials and waste into their design and operation plans. Radon would be managed in new construction by incorporating passive features into the design that would limit the ability of radon to enter buildings. Periodic radon testing would occur as needed and post-construction radon management measures would be installed in buildings that test higher than 4 pCi/L. Therefore, the Proposed Action, when combined with other past, present, and reasonably foreseeable future actions, would not result in a significant cumulative impact on hazardous materials and wastes.

4.2.5 Health and Safety

The Proposed Action and present and reasonably foreseeable future actions on MHAFB and within the region would result in short-term, minor, adverse cumulative impacts to the health and safety of construction personnel directly involved in the construction. Long-term, negligible to minor, adverse cumulative impacts would occur to the health and safety of operations and maintenance personnel of the proposed facilities on MHAFB.

The Proposed Action and present and reasonably foreseeable future actions include using heavy equipment for construction and exposure to situations that are inherently dangerous. Compliance with OSHA standards and use of appropriate PPE would minimize health and safety risks.

Facilities operation and infrastructure under the Proposed Action and present and reasonably foreseeable future actions on MHAFB could introduce operational personnel to health and safety risks. Personnel would be prevented from conducting ground-disturbing activities within the boundaries of IRP sites and would remain outside of ESQDs. All applicable safety guidelines and regulations would be adhered to in order to avoid all health and safety risks, such as exposures to hazardous chemicals or falls risks, to the greatest extent.

The Proposed Action, when combined with other past, present, and reasonably foreseeable future actions, would not result in a significant cumulative impact on health and safety.

4.2.6 Infrastructure and Utilities

The Proposed Action has the potential to adversely impact the following infrastructure: electrical system, and solid waste management. Short-term adverse impacts could include service interruptions experienced when extending or rerouting existing utility lines to the project area. Construction and maintenance of the Proposed Action and other present and reasonably foreseeable future actions would require minimal amounts of water, primarily for dust suppression. Implementation of BMPs outlined in **Section 3.6.3**, and diverting materials that could be recycled or reused from landfills to the greatest extent possible, would further reduce any impacts. These BMPs are typical measures adhered to for construction projects. Upgrading and constructing RE sources on and off the installation would result in beneficial impacts from improved energy efficiency; any excess power sold to Idaho Power from the geothermal power facility would support Idaho Power's goal of 100 percent clean energy by 2045. Therefore, the Proposed Action, when combined with other past, present, and reasonably foreseeable future actions, would not result in a significant cumulative impact on infrastructure.

4.2.7 Noise

Noise generated by construction and maintenance activities of the Proposed Action and present and reasonably foreseeable future actions would be short-term, and temporary in nature. By adhering to the BMPs outlined in **Section 3.7.3**, noise impacts generated by the Proposed Action and present and reasonably foreseeable future actions would result in only temporary increases in ambient noise levels during construction activities. Noise associated with operation of the geothermal facility and other present and reasonably foreseeable future actions, would only be perceptible in close proximity to the facility. Therefore, the Proposed Action, when combined with other past, present, and reasonably foreseeable future actions, would not result in significant cumulative impacts on sensitive noise receptors or the noise environment at MHAFB or regionally.

4.2.8 Socioeconomics

The Proposed Action, when combined with other past, present, and reasonably foreseeable future actions on MHAFB and within the region, would result in short-term, beneficial impacts on the region's economy through the purchase of construction materials and providing employment for construction personnel during project activities. The slight increase of personnel on MHAFB and within the region necessary to operate the geothermal and RE facilities would result in long-term, negligible, beneficial impacts on the local socioeconomic environment. Operation of the geothermal power facility could also eliminate MHAFB's dependence on Idaho Power and potentially generate excess power for sale back to Idaho Power. Any excess power sold to Idaho Power from the geothermal power facility would support Idaho Power's goal of 100 percent clean energy by 2045. Therefore, the Proposed Action, when combined with other past, present, and reasonably foreseeable future actions, would not result in a significant cumulative impact on socioeconomics.

4.2.9 Transportation

Transportation impacts from construction vehicles associated with the Proposed Action and other present and reasonably foreseeable future actions would be localized, short-term, and temporary in nature. Therefore, the Proposed Action, when combined with other past, present, and reasonably foreseeable future actions, would not result in a significant cumulative impact on transportation.

4.2.10 Water Resources

The Proposed Action, and other present and reasonably foreseeable future actions would result in short-term impacts on local and regional water resources. Adverse impacts would result from ground-disturbing activities associated with the Proposed Action and present and reasonably foreseeable future actions; however, these impacts would be short-term, and temporary in nature. Construction activities would involve removing vegetation, which could potentially increase sedimentation and decrease infiltration and groundwater recharge. To minimize erosion, grading and clearing would occur only as needed and only within approved construction corridors. Adherence to the construction site-specific SWPPP, and BMPs outlined in **Section 3.10.3** for equipment use and emergency equipment repair, such as containment of fuels and other potentially hazardous materials, secondary containment, and keeping spill kits on site during construction and operation, would reduce the potential for adverse impacts. Revegetation of disturbed areas with native species would prevent soil erosion and overall site deterioration. Therefore, degraded water quality due to increased erosion and sedimentation is unlikely.

Geothermal production and injection wells would be drilled using nontoxic drilling mud to prevent the risk of contamination to any aquifers from drilling fluids and the pits would be lined to protect against infiltration into groundwater. Over the operational life of the geothermal facility, accidental discharges of geothermal fluid could contaminate surface water or groundwater. However, accidental discharges would be unlikely because of routine inspections and ultrasonic testing as well as groundwater monitoring. Therefore, the Proposed Action, when combined with other past, present, and reasonably foreseeable future actions, would not result in a significant cumulative impact on water resources.

4.3 Unavoidable Adverse Impacts

Unavoidable adverse impacts would result from the Proposed Action. None of these impacts would be significant.

Energy. The Proposed Action would require the use of fossil fuels, a non-renewable natural resource, during construction (i.e., oil, fuel) and facility operation (i.e., natural gas). The use of non-renewable resources is an unavoidable occurrence, although not considered significant.

Geological Resources. Construction activities associated with the Proposed Action would result in temporary soil disturbance; however, implementation of BMPs and erosion- and sedimentation-control measures would limit environmental impacts. Although soil disturbance would be unavoidable, the impact on geological resources would be negligible.

Hazardous Materials and Wastes. The use and generation of hazardous materials and wastes during construction and maintenance activities would be unavoidable; however, the materials and wastes would be handled in accordance with federal, state, and local policies and would not be expected to result in significant impacts.

4.4 Compatibility of Proposed Action with the Objectives of Federal, Regional, State, and Local Land Use Plans, Policies, and Controls

The Proposed Action would occur entirely within MHAFB. Construction and maintenance activities would not be incompatible with any current land uses on or adjacent to the installation. The Proposed Action would not conflict with any applicable off-installation land use ordinances and would follow all applicable permitting, building, and safety requirements.

4.5 Relationship between Short-Term Uses of the Human Environment and Maintenance and Enhancement of Long-Term Productivity

The relationship between short-term uses and enhancement of long-term productivity from implementation of the Proposed Action is evaluated from the standpoint of short-term effects and long-term effects. Short-term uses of the biophysical components of the human environment include direct construction-related disturbances and direct impacts associated with an increase in population and activity that occurs over a period of less than 5 years. Long-term uses of the human environment include those impacts occurring over a period of more than 5 years, including permanent resource loss.

The Proposed Action would not require short-term resource uses that would result in long-term productivity compromises. The Proposed Action would not intensify land use at MHAFB or within the surrounding area. The negative effects of short-term operational changes during construction activities would be minor when compared to the positive benefits from independent RE. Immediate and long-term benefits would be realized for operation and maintenance after completion of the Proposed Action.

4.6 Irreversible and Irretrievable Commitment of Resources

Irreversible and irretrievable resource commitments are related to the use of non-renewable resources and the impacts that the use of these resources would have on future generations. Irreversible impacts primarily result from using or destroying a specific resource that cannot be replaced within a reasonable timeframe (e.g., energy and minerals). The irreversible and irretrievable commitment of resources that would result from the Proposed Action involve the consumption of material resources used for construction, energy resources, biological resources, and human labor resources. The use of these resources is considered to be permanent.

Material Resources. Material resources used for the Proposed Action would potentially include concrete and various construction materials and supplies. The materials that would be consumed are not in short supply, would not limit other unrelated construction activities, and would not be considered significant.

Energy Resources. Energy resources used for the Proposed Action would be irretrievably lost. This includes petroleum-based products (e.g., gasoline and diesel). During construction and maintenance activities, gasoline and diesel would be used to operate vehicles and construction equipment. Consumption of these energy resources would not place a significant demand on their availability in the region; therefore, less than significant impacts would be expected.

Biological Resources. The Proposed Action would result in a negligible loss of vegetation and wildlife habitat. Direct effects on vegetation from vegetation removal and crushing and indirect effects from soil compaction and potential for establishment of invasive species would occur; however, revegetation of disturbed sites with native species would support a native plant community in the long-term. Minimal loss of wildlife would occur because of the Proposed Action; however, this would not constitute a significant adverse impact on biological resources.

Human Resources. The use of human resources for construction and maintenance activities is considered an irretrievable loss only in that it would preclude such personnel from engaging in other work activities. However, the use of human resources for the Proposed Action represents employment opportunities and is considered beneficial.

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5. List of Preparers

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A

Public and Stakeholder Coordination List

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Appendix A: Public and Stakeholder Coordination List

Federal Agency Contacts

Environmental Protection Agency, Region 10

Federal Political Representatives

Idaho Senators

Idaho Representative, 2nd District

State Agency Contacts

Idaho Department of Environmental Quality

Idaho Department of Water Resources

Idaho State Historic Preservation Office

Special Assistant for Military Affairs

State Political Representatives

Governor of Idaho

Idaho House of Representatives, District 23

Idaho Senate, District 23

Local Agencies and Officials

Elmore County Commission

Mountain Home Chamber of Commerce

Mountain Home City Council

Mayor of Mountain Home

Non-Governmental Organizations

Idaho Conservation League

Idaho Rivers United

Idaho Wildlife Federation

Libraries

Mountain Home Air Force Base Library

Mountain Home Public Library

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B

Air Quality Analysis
Supporting Documentation

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AIR CONFORMITY APPLICABILITY MODEL REPORT
RECORD OF AIR ANALYSIS (ROAA)

1. General Information: The Air Force's Air Conformity Applicability Model (ACAM) was used to perform an analysis to assess the potential air quality impact/s associated with the action in accordance with the Air Force Manual 32-7002, Environmental Compliance and Pollution Prevention; the Environmental Impact Analysis Process (EIAP, 32 CFR 989); and the General Conformity Rule (GCR, 40 CFR 93 Subpart B). This report provides a summary of the ACAM analysis.

a. Action Location:
Base: MOUNTAIN HOME AFB
State: Idaho
County(s): Elmore
Regulatory Area(s): NOT IN A REGULATORY AREA

b. Action Title: Construct Notional Geothermal Facility

c. Project Number/s (if applicable):

d. Projected Action Start Date: 1 / 2021

e. Action Description:

See Section 2.0 of EA.

f. Point of Contact:

Name:	Timothy Didlake
Title:	Contractor
Organization:	HDR
Email:	timothy.didlake@hdrinc.com
Phone Number:	484-612-1124

2. Air Impact Analysis: Based on the attainment status at the action location, the requirements of the General Conformity Rule are:

_____ applicable
__X__ not applicable

Total combined direct and indirect emissions associated with the action were estimated through ACAM on a calendar-year basis for the "worst-case" and "steady state" (net gain/loss upon action fully implemented) emissions.

"Air Quality Indicators" were used to provide an indication of the significance of potential impacts to air quality. These air quality indicators are EPA General Conformity Rule (GCR) thresholds (de minimis levels) that are applied out of context to their intended use. Therefore, these indicators do not trigger a regulatory requirement; however, they provide a warning that the action is potentially significant. It is important to note that these indicators only provide a clue to the potential impacts to air quality.

Given the GCR de minimis threshold values are the maximum net change an action can acceptably emit in non-attainment and maintenance areas, these threshold values would also conservatively indicate an actions emissions within an attainment would also be acceptable. An air quality indicator value of 100 tons/yr is used based on the GCR de minimis threshold for the least severe non-attainment classification for all criteria pollutants (see 40 CFR 93.153). Therefore, the worst-case year emissions were compared against the GCR Indicator and are summarized below.

Analysis Summary:

AIR CONFORMITY APPLICABILITY MODEL REPORT
RECORD OF AIR ANALYSIS (ROAA)

2021

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	5.679	100	No
NOx	21.592	100	No
CO	8.046	100	No
SOx	0.020	100	No
PM 10	31.586	100	No
PM 2.5	0.705	100	No
Pb	0.000	25	No
NH3	0.012	100	No
CO2e	2057.3		

2022

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.034	100	No
NOx	0.031	100	No
CO	0.381	100	No
SOx	0.000	100	No
PM 10	0.001	100	No
PM 2.5	0.001	100	No
Pb	0.000	25	No
NH3	0.002	100	No
CO2e	32.4		

2023 - (Steady State)

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.034	100	No
NOx	0.031	100	No
CO	0.381	100	No
SOx	0.000	100	No
PM 10	0.001	100	No
PM 2.5	0.001	100	No
Pb	0.000	25	No
NH3	0.002	100	No
CO2e	32.4		

None of estimated emissions associated with this action are above the GCR indicators, indicating no significant impact to air quality; therefore, no further air assessment is needed.

Timothy T. Didlake

02 October 2019

Timothy Didlake, Contractor DATE

DETAIL AIR CONFORMITY APPLICABILITY MODEL REPORT

1. General Information

- Action Location
Base: MOUNTAIN HOME AFB
State: Idaho
County(s): Elmore
Regulatory Area(s): NOT IN A REGULATORY AREA

- Action Title: Construct Notional Geothermal Facility

- Project Number/s (if applicable):

- Projected Action Start Date: 1 / 2021

- Action Purpose and Need:
See Section 1.4 of EA.

- Action Description:
See Section 2.0 of EA.

- Point of Contact
Name: Timothy Didlake
Title: Contractor
Organization: HDR
Email: timothy.didlake@hdrinc.com
Phone Number: 484-612-1124

- Activity List:

Activity Type		Activity Title
2.	Construction / Demolition	Construct Notional Geothermal Facility
3.	Personnel	Add Six Personnel to Operate Power Plant
4.	Emergency Generator	Emissons from Geothermal Production and Injection Well Drilling

Emission factors and air emission estimating methods come from the United States Air Force's Air Emissions Guide for Air Force Stationary Sources, Air Emissions Guide for Air Force Mobile Sources, and Air Emissions Guide for Air Force Transitory Sources.

2. Construction / Demolition

2.1 General Information & Timeline Assumptions

- Activity Location
County: Elmore
Regulatory Area(s): NOT IN A REGULATORY AREA

- Activity Title: Construct Notional Geothermal Facility

- Activity Description:
Assumptions:

No demoliton is necessary.
Site Grading = 35 acres. Entire site would be graded.
Trenching = 2 acres for utility connections. No fill would be hauled on- or off-site.

DETAIL AIR CONFORMITY APPLICABILITY MODEL REPORT

Building Construction and Architectural Coatings = 6 acres for power plant and 2 acres for reclamation and maintenance area. 8 acres total. Buildings would be 50 feet tall on average.
Paving = 2 acres for access roads and 4 acres for storage yard. 6 acres total.

- Activity Start Date
Start Month: 1
Start Month: 2021

- Activity End Date
Indefinite: False
End Month: 12
End Month: 2021

- Activity Emissions:

Pollutant	Total Emissions (TONs)
VOC	5.214904
SO_x	0.011510
NO_x	4.809104
CO	3.588143
PM 10	31.061430

Pollutant	Total Emissions (TONs)
PM 2.5	0.180300
Pb	0.000000
NH_3	0.011527
CO_2e	1195.4

2.1 Site Grading Phase

2.1.1 Site Grading Phase Timeline Assumptions

- Phase Start Date
Start Month: 1
Start Quarter: 1
Start Year: 2021

- Phase Duration
Number of Month: 2
Number of Days: 0

2.1.2 Site Grading Phase Assumptions

- General Site Grading Information
Area of Site to be Graded (ft^2): 1524600
Amount of Material to be Hauled On-Site (yd^3): 0
Amount of Material to be Hauled Off-Site (yd^3): 0

- Site Grading Default Settings
Default Settings Used: Yes
Average Day(s) worked per week: 5 (default)

- Construction Exhaust (default)

Equipment Name	Number Of Equipment	Hours Per Day
Excavators Composite	1	8
Graders Composite	1	8
Other Construction Equipment Composite	1	8
Rubber Tired Dozers Composite	1	8
Scrapers Composite	3	8
Tractors/Loaders/Backhoes Composite	3	8

- Vehicle Exhaust
Average Hauling Truck Capacity (yd^3): 20 (default)
Average Hauling Truck Round Trip Commute (mile): 20 (default)

- Vehicle Exhaust Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	0	0	0	0	0	100.00	0

- Worker Trips
Average Worker Round Trip Commute (mile): 20 (default)

- Worker Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	50.00	50.00	0	0	0	0	0

2.1.3 Site Grading Phase Emission Factor(s)

- Construction Exhaust Emission Factors (lb/hour) (default)

Excavators Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2e
Emission Factors	0.0687	0.0013	0.3576	0.5112	0.0158	0.0158	0.0062	119.73
Graders Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2e
Emission Factors	0.0860	0.0014	0.5212	0.5747	0.0247	0.0247	0.0077	132.93
Other Construction Equipment Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2e
Emission Factors	0.0533	0.0012	0.3119	0.3497	0.0121	0.0121	0.0048	122.61
Rubber Tired Dozers Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2e
Emission Factors	0.2015	0.0024	1.4660	0.7661	0.0581	0.0581	0.0181	239.53
Scrapers Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2e
Emission Factors	0.1814	0.0026	1.2262	0.7745	0.0491	0.0491	0.0163	262.89
Tractors/Loaders/Backhoes Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2e
Emission Factors	0.0407	0.0007	0.2505	0.3606	0.0112	0.0112	0.0036	66.890

- Vehicle Exhaust & Worker Trips Emission Factors (grams/mile)

	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	Pb	NH_3	CO_2e
LDGV	000.316	000.002	000.241	003.506	000.009	000.008		000.023	00320.042
LDGT	000.378	000.003	000.413	004.709	000.011	000.010		000.024	00411.658
HDGV	000.691	000.005	001.080	015.443	000.024	000.021		000.044	00752.986
LDDV	000.131	000.003	000.136	002.381	000.004	000.004		000.008	00308.501
LDDT	000.266	000.004	000.387	004.046	000.007	000.006		000.008	00437.634
HDDV	000.538	000.013	005.426	001.822	000.169	000.155		000.029	01481.841
MC	002.411	000.003	000.857	013.650	000.027	000.024		000.054	00397.874

2.1.4 Site Grading Phase Formula(s)

- Fugitive Dust Emissions per Phase
$PM10_{FD} = (20 * ACRE * WD) / 2000$

$PM10_{FD}$: Fugitive Dust PM 10 Emissions (TONs)

20: Conversion Factor Acre Day to pounds (20 lb / 1 Acre Day)
ACRE: Total acres (acres)
WD: Number of Total Work Days (days)
2000: Conversion Factor pounds to tons

- Construction Exhaust Emissions per Phase
$CEE_{POL} = (NE * WD * H * EF_{POL}) / 2000$

CEE_{POL}: Construction Exhaust Emissions (TONs)
NE: Number of Equipment
WD: Number of Total Work Days (days)
H: Hours Worked per Day (hours)
EF_{POL}: Emission Factor for Pollutant (lb/hour)
2000: Conversion Factor pounds to tons

- Vehicle Exhaust Emissions per Phase
$VMT_{VE} = (HA_{OnSite} + HA_{OffSite}) * (1 / HC) * HT$

VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
HA_{OnSite}: Amount of Material to be Hauled On-Site (yd^3)
$HA_{OffSite}$: Amount of Material to be Hauled Off-Site (yd^3)
HC: Average Hauling Truck Capacity (yd^3)
(1 / HC): Conversion Factor cubic yards to trips (1 trip / HC yd^3)
HT: Average Hauling Truck Round Trip Commute (mile/trip)

$V_{POL} = (VMT_{VE} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Vehicle Exhaust On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

- Worker Trips Emissions per Phase
$VMT_{WT} = WD * WT * 1.25 * NE$

VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
WD: Number of Total Work Days (days)
WT: Average Worker Round Trip Commute (mile)
1.25: Conversion Factor Number of Construction Equipment to Number of Works
NE: Number of Construction Equipment

$V_{POL} = (VMT_{WT} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

2.2 Trenching/Excavating Phase

2.2.1 Trenching / Excavating Phase Timeline Assumptions

- Phase Start Date
Start Month: 1
Start Quarter: 3
Start Year: 2021

- Phase Duration
Number of Month: 0
Number of Days: 19

2.2.2 Trenching / Excavating Phase Assumptions

- General Trenching/Excavating Information
Area of Site to be Trenched/Excavated (ft^2): 87120
Amount of Material to be Hauled On-Site (yd^3): 0
Amount of Material to be Hauled Off-Site (yd^3): 0

- Trenching Default Settings
Default Settings Used: Yes
Average Day(s) worked per week: 5 (default)

- Construction Exhaust (default)

Equipment Name	Number Of Equipment	Hours Per Day
Excavators Composite	2	8
Other General Industrial Equipmen Composite	1	8
Tractors/Loaders/Backhoes Composite	1	8

- Vehicle Exhaust
Average Hauling Truck Capacity (yd^3): 20 (default)
Average Hauling Truck Round Trip Commute (mile): 20 (default)

- Vehicle Exhaust Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	0	0	0	0	0	100.00	0

- Worker Trips
Average Worker Round Trip Commute (mile): 20 (default)

- Worker Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	50.00	50.00	0	0	0	0	0

2.2.3 Trenching / Excavating Phase Emission Factor(s)

- Construction Exhaust Emission Factors (lb/hour) (default)

Excavators Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2e
Emission Factors	0.0687	0.0013	0.3576	0.5112	0.0158	0.0158	0.0062	119.73
Graders Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2e
Emission Factors	0.0860	0.0014	0.5212	0.5747	0.0247	0.0247	0.0077	132.93
Other Construction Equipment Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2e
Emission Factors	0.0533	0.0012	0.3119	0.3497	0.0121	0.0121	0.0048	122.61

Rubber Tired Dozers Composite								
	VOC	**SO_x**	**NO_x**	**CO**	**PM 10**	**PM 2.5**	**CH_4**	**CO_2e**
Emission Factors	0.2015	0.0024	1.4660	0.7661	0.0581	0.0581	0.0181	239.53
Scrapers Composite								
	VOC	**SO_x**	**NO_x**	**CO**	**PM 10**	**PM 2.5**	**CH_4**	**CO_2e**
Emission Factors	0.1814	0.0026	1.2262	0.7745	0.0491	0.0491	0.0163	262.89
Tractors/Loaders/Backhoes Composite								
	VOC	**SO_x**	**NO_x**	**CO**	**PM 10**	**PM 2.5**	**CH_4**	**CO_2e**
Emission Factors	0.0407	0.0007	0.2505	0.3606	0.0112	0.0112	0.0036	66.890

- Vehicle Exhaust & Worker Trips Emission Factors (grams/mile)

	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	Pb	NH_3	CO_2e
LDGV	000.316	000.002	000.241	003.506	000.009	000.008		000.023	00320.042
LDGT	000.378	000.003	000.413	004.709	000.011	000.010		000.024	00411.658
HDGV	000.691	000.005	001.080	015.443	000.024	000.021		000.044	00752.986
LDDV	000.131	000.003	000.136	002.381	000.004	000.004		000.008	00308.501
LDDT	000.266	000.004	000.387	004.046	000.007	000.006		000.008	00437.634
HDDV	000.538	000.013	005.426	001.822	000.169	000.155		000.029	01481.841
MC	002.411	000.003	000.857	013.650	000.027	000.024		000.054	00397.874

2.2.4 Trenching / Excavating Phase Formula(s)

- Fugitive Dust Emissions per Phase

$PM10_{FD}$ = (20 * ACRE * WD) / 2000

$PM10_{FD}$: Fugitive Dust PM 10 Emissions (TONs)
20: Conversion Factor Acre Day to pounds (20 lb / 1 Acre Day)
ACRE: Total acres (acres)
WD: Number of Total Work Days (days)
2000: Conversion Factor pounds to tons

- Construction Exhaust Emissions per Phase

CEE_{POL} = (NE * WD * H * EF_{POL}) / 2000

CEE_{POL}: Construction Exhaust Emissions (TONs)
NE: Number of Equipment
WD: Number of Total Work Days (days)
H: Hours Worked per Day (hours)
EF_{POL}: Emission Factor for Pollutant (lb/hour)
2000: Conversion Factor pounds to tons

- Vehicle Exhaust Emissions per Phase

VMT_{VE} = (HA_{OnSite} + $HA_{OffSite}$) * (1 / HC) * HT

VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
HA_{OnSite}: Amount of Material to be Hauled On-Site (yd^3)
$HA_{OffSite}$: Amount of Material to be Hauled Off-Site (yd^3)
HC: Average Hauling Truck Capacity (yd^3)
(1 / HC): Conversion Factor cubic yards to trips (1 trip / HC yd^3)
HT: Average Hauling Truck Round Trip Commute (mile/trip)

V_{POL} = (VMT_{VE} * 0.002205 * EF_{POL} * VM) / 2000

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)

0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Vehicle Exhaust On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

- Worker Trips Emissions per Phase
VMT_{WT} = WD * WT * 1.25 * NE

VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
WD: Number of Total Work Days (days)
WT: Average Worker Round Trip Commute (mile)
1.25: Conversion Factor Number of Construction Equipment to Number of Works
NE: Number of Construction Equipment

V_{POL} = (VMT_{WT} * 0.002205 * EF_{POL} * VM) / 2000

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Worker Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

2.3 Building Construction Phase

2.3.1 Building Construction Phase Timeline Assumptions

- Phase Start Date
Start Month: 2
Start Quarter: 2
Start Year: 2021

- Phase Duration
Number of Month: 9
Number of Days: 14

2.3.2 Building Construction Phase Assumptions

- General Building Construction Information
Building Category: Office or Industrial
Area of Building (ft^2): 392040
Height of Building (ft): 50
Number of Units: N/A

- Building Construction Default Settings
Default Settings Used: Yes
Average Day(s) worked per week: 5 (default)

- Construction Exhaust (default)

Equipment Name	Number Of Equipment	Hours Per Day
Cranes Composite	1	7
Forklifts Composite	2	7
Generator Sets Composite	1	8
Tractors/Loaders/Backhoes Composite	1	8

Welders Composite	3	8

- Vehicle Exhaust
Average Hauling Truck Round Trip Commute (mile): 20 (default)

- Vehicle Exhaust Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	0	0	0	0	0	100.00	0

- Worker Trips
Average Worker Round Trip Commute (mile): 20 (default)

- Worker Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	50.00	50.00	0	0	0	0	0

- Vendor Trips
Average Vendor Round Trip Commute (mile): 40 (default)

- Vendor Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	0	0	0	0	0	100.00	0

2.3.3 Building Construction Phase Emission Factor(s)

- Construction Exhaust Emission Factors (lb/hour) (default)

Cranes Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2e
Emission Factors	0.0845	0.0013	0.6033	0.3865	0.0228	0.0228	0.0076	128.82
Forklifts Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2e
Emission Factors	0.0293	0.0006	0.1458	0.2148	0.0056	0.0056	0.0026	54.462
Generator Sets Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2e
Emission Factors	0.0362	0.0006	0.2977	0.2707	0.0130	0.0130	0.0032	61.074
Tractors/Loaders/Backhoes Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2e
Emission Factors	0.0407	0.0007	0.2505	0.3606	0.0112	0.0112	0.0036	66.890
Welders Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2e
Emission Factors	0.0280	0.0003	0.1634	0.1787	0.0088	0.0088	0.0025	25.665

- Vehicle Exhaust & Worker Trips Emission Factors (grams/mile)

	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	Pb	NH_3	CO_2e
LDGV	000.316	000.002	000.241	003.506	000.009	000.008		000.023	00320.042
LDGT	000.378	000.003	000.413	004.709	000.011	000.010		000.024	00411.658
HDGV	000.691	000.005	001.080	015.443	000.024	000.021		000.044	00752.986
LDDV	000.131	000.003	000.136	002.381	000.004	000.004		000.008	00308.501
LDDT	000.266	000.004	000.387	004.046	000.007	000.006		000.008	00437.634
HDDV	000.538	000.013	005.426	001.822	000.169	000.155		000.029	01481.841
MC	002.411	000.003	000.857	013.650	000.027	000.024		000.054	00397.874

2.3.4 Building Construction Phase Formula(s)

DETAIL AIR CONFORMITY APPLICABILITY MODEL REPORT

- Construction Exhaust Emissions per Phase
CEE_{POL} = (NE * WD * H * EF_{POL}) / 2000

CEE_{POL}: Construction Exhaust Emissions (TONs)
NE: Number of Equipment
WD: Number of Total Work Days (days)
H: Hours Worked per Day (hours)
EF_{POL}: Emission Factor for Pollutant (lb/hour)
2000: Conversion Factor pounds to tons

- Vehicle Exhaust Emissions per Phase
VMT_{VE} = BA * BH * (0.42 / 1000) * HT

VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
BA: Area of Building (ft^2)
BH: Height of Building (ft)
(0.42 / 1000): Conversion Factor ft^3 to trips (0.42 trip / 1000 ft^3)
HT: Average Hauling Truck Round Trip Commute (mile/trip)

V_{POL} = (VMT_{VE} * 0.002205 * EF_{POL} * VM) / 2000

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

- Worker Trips Emissions per Phase
VMT_{WT} = WD * WT * 1.25 * NE

VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
WD: Number of Total Work Days (days)
WT: Average Worker Round Trip Commute (mile)
1.25: Conversion Factor Number of Construction Equipment to Number of Works
NE: Number of Construction Equipment

V_{POL} = (VMT_{WT} * 0.002205 * EF_{POL} * VM) / 2000

V_{POL}: Vehicle Emissions (TONs)
VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

- Vender Trips Emissions per Phase
VMT_{VT} = BA * BH * (0.38 / 1000) * HT

VMT_{VT}: Vender Trips Vehicle Miles Travel (miles)
BA: Area of Building (ft^2)
BH: Height of Building (ft)
(0.38 / 1000): Conversion Factor ft^3 to trips (0.38 trip / 1000 ft^3)
HT: Average Hauling Truck Round Trip Commute (mile/trip)

$V_{POL} = (VMT_{VT} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VT}: Vender Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

2.4 Architectural Coatings Phase

2.4.1 Architectural Coatings Phase Timeline Assumptions

- Phase Start Date
Start Month: 11
Start Quarter: 3
Start Year: 2021

- Phase Duration
Number of Month: 0
Number of Days: 19

2.4.2 Architectural Coatings Phase Assumptions

- General Architectural Coatings Information
Building Category: Non-Residential
Total Square Footage (ft^2): 392040
Number of Units: N/A

- Architectural Coatings Default Settings
Default Settings Used: Yes
Average Day(s) worked per week: 5 (default)

- Worker Trips
Average Worker Round Trip Commute (mile): 20 (default)

- Worker Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	50.00	50.00	0	0	0	0	0

2.4.3 Architectural Coatings Phase Emission Factor(s)

- Worker Trips Emission Factors (grams/mile)

	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	Pb	NH_3	CO_2e
LDGV	000.316	000.002	000.241	003.506	000.009	000.008		000.023	00320.042
LDGT	000.378	000.003	000.413	004.709	000.011	000.010		000.024	00411.658
HDGV	000.691	000.005	001.080	015.443	000.024	000.021		000.044	00752.986
LDDV	000.131	000.003	000.136	002.381	000.004	000.004		000.008	00308.501
LDDT	000.266	000.004	000.387	004.046	000.007	000.006		000.008	00437.634
HDDV	000.538	000.013	005.426	001.822	000.169	000.155		000.029	01481.841
MC	002.411	000.003	000.857	013.650	000.027	000.024		000.054	00397.874

2.4.4 Architectural Coatings Phase Formula(s)

- Worker Trips Emissions per Phase
VMT_{WT} = (1 * WT * PA) / 800

VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
1: Conversion Factor man days to trips (1 trip / 1 man * day)
WT: Average Worker Round Trip Commute (mile)
PA: Paint Area (ft^2)
800: Conversion Factor square feet to man days (1 ft^2 / 1 man * day)

V_{POL} = (VMT_{WT} * 0.002205 * EF_{POL} * VM) / 2000

V_{POL}: Vehicle Emissions (TONs)
VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

- Off-Gassing Emissions per Phase
VOC_{AC} = (AB * 2.0 * 0.0116) / 2000.0

VOC_{AC}: Architectural Coating VOC Emissions (TONs)
BA: Area of Building (ft^2)
2.0: Conversion Factor total area to coated area (2.0 ft^2 coated area / total area)
0.0116: Emission Factor (lb/ft^2)
2000: Conversion Factor pounds to tons

2.5 Paving Phase

2.5.1 Paving Phase Timeline Assumptions

- Phase Start Date
Start Month: 12
Start Quarter: 2
Start Year: 2021

- Phase Duration
Number of Month: 0
Number of Days: 19

2.5.2 Paving Phase Assumptions

- General Paving Information
Paving Area (ft^2): 261360

- Paving Default Settings
Default Settings Used: Yes
Average Day(s) worked per week: 5 (default)

- Construction Exhaust (default)

Equipment Name	Number Of Equipment	Hours Per Day
Pavers Composite	1	8
Paving Equipment Composite	2	6
Rollers Composite	2	6

- Vehicle Exhaust
Average Hauling Truck Round Trip Commute (mile): 20 (default)

- Vehicle Exhaust Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	0	0	0	0	0	100.00	0

- Worker Trips
Average Worker Round Trip Commute (mile): 20 (default)

- Worker Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	50.00	50.00	0	0	0	0	0

2.5.3 Paving Phase Emission Factor(s)

- Construction Exhaust Emission Factors (lb/hour) (default)

Excavators Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2e
Emission Factors	0.0687	0.0013	0.3576	0.5112	0.0158	0.0158	0.0062	119.73
Graders Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2e
Emission Factors	0.0860	0.0014	0.5212	0.5747	0.0247	0.0247	0.0077	132.93
Other Construction Equipment Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2e
Emission Factors	0.0533	0.0012	0.3119	0.3497	0.0121	0.0121	0.0048	122.61
Rubber Tired Dozers Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2e
Emission Factors	0.2015	0.0024	1.4660	0.7661	0.0581	0.0581	0.0181	239.53
Scrapers Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2e
Emission Factors	0.1814	0.0026	1.2262	0.7745	0.0491	0.0491	0.0163	262.89
Tractors/Loaders/Backhoes Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2e
Emission Factors	0.0407	0.0007	0.2505	0.3606	0.0112	0.0112	0.0036	66.890

- Vehicle Exhaust & Worker Trips Emission Factors (grams/mile)

	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	Pb	NH_3	CO_2e
LDGV	000.316	000.002	000.241	003.506	000.009	000.008		000.023	00320.042
LDGT	000.378	000.003	000.413	004.709	000.011	000.010		000.024	00411.658
HDGV	000.691	000.005	001.080	015.443	000.024	000.021		000.044	00752.986
LDDV	000.131	000.003	000.136	002.381	000.004	000.004		000.008	00308.501
LDDT	000.266	000.004	000.387	004.046	000.007	000.006		000.008	00437.634
HDDV	000.538	000.013	005.426	001.822	000.169	000.155		000.029	01481.841
MC	002.411	000.003	000.857	013.650	000.027	000.024		000.054	00397.874

2.5.4 Paving Phase Formula(s)

- Construction Exhaust Emissions per Phase

$CEE_{POL} = (NE * WD * H * EF_{POL}) / 2000$

CEE_{POL}: Construction Exhaust Emissions (TONs)
NE: Number of Equipment

WD: Number of Total Work Days (days)
H: Hours Worked per Day (hours)
EF_{POL}: Emission Factor for Pollutant (lb/hour)
2000: Conversion Factor pounds to tons

- Vehicle Exhaust Emissions per Phase
$VMT_{VE} = PA * 0.25 * (1 / 27) * (1 / HC) * HT$

VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
PA: Paving Area (ft^2)
0.25: Thickness of Paving Area (ft)
(1 / 27): Conversion Factor cubic feet to cubic yards (1 yd^3 / 27 ft^3)
HC: Average Hauling Truck Capacity (yd^3)
(1 / HC): Conversion Factor cubic yards to trips (1 trip / HC yd^3)
HT: Average Hauling Truck Round Trip Commute (mile/trip)

$V_{POL} = (VMT_{VE} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Vehicle Exhaust On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

- Worker Trips Emissions per Phase
$VMT_{WT} = WD * WT * 1.25 * NE$

VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
WD: Number of Total Work Days (days)
WT: Average Worker Round Trip Commute (mile)
1.25: Conversion Factor Number of Construction Equipment to Number of Works
NE: Number of Construction Equipment

$V_{POL} = (VMT_{WT} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Worker Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

- Off-Gassing Emissions per Phase
$VOC_P = (2.62 * PA) / 43560$

VOC_P: Paving VOC Emissions (TONs)
2.62: Emission Factor (lb/acre)
PA: Paving Area (ft^2)
43560: Conversion Factor square feet to acre (43560 ft2 / acre)^2 / acre)

3. Personnel

3.1 General Information & Timeline Assumptions

DETAIL AIR CONFORMITY APPLICABILITY MODEL REPORT

- Add or Remove Activity from Baseline? Add

- Activity Location
County: Elmore
Regulatory Area(s): NOT IN A REGULATORY AREA

- Activity Title: Add Six Personnel to Operate Power Plant

- Activity Description:
6 new personnel would be added to Mountain Home AFB to operate the power plant.

- Activity Start Date
Start Month: 1
Start Year: 2022

- Activity End Date
Indefinite: Yes
End Month: N/A
End Year: N/A

- Activity Emissions:

Pollutant	Emissions Per Year (TONs)
VOC	0.033800
SO_x	0.000226
NO_x	0.030676
CO	0.380539
PM 10	0.000907

Pollutant	Emissions Per Year (TONs)
PM 2.5	0.000817
Pb	0.000000
NH_3	0.002077
CO_2e	32.4

3.2 Personnel Assumptions

- Number of Personnel
Active Duty Personnel: 6
Civilian Personnel: 0
Support Contractor Personnel: 0
Air National Guard (ANG) Personnel: 0
Reserve Personnel: 0

- Default Settings Used: No

- Average Personnel Round Trip Commute (mile): 50

- Personnel Work Schedule
Active Duty Personnel: 5 Days Per Week
Civilian Personnel: 5 Days Per Week
Support Contractor Personnel: 5 Days Per Week
Air National Guard (ANG) Personnel: 4 Days Per Week
Reserve Personnel: 4 Days Per Month

3.3 Personnel On Road Vehicle Mixture

- On Road Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	37.55	60.32	0	0.03	0.2	0	1.9
GOVs	54.49	37.73	4.67	0	0	3.11	0

3.4 Personnel Emission Factor(s)

- On Road Vehicle Emission Factors (grams/mile)

	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	Pb	NH_3	CO_2e
LDGV	000.316	000.002	000.241	003.506	000.009	000.008		000.023	00320.042
LDGT	000.378	000.003	000.413	004.709	000.011	000.010		000.024	00411.658
HDGV	000.691	000.005	001.080	015.443	000.024	000.021		000.044	00752.986
LDDV	000.131	000.003	000.136	002.381	000.004	000.004		000.008	00308.501
LDDT	000.266	000.004	000.387	004.046	000.007	000.006		000.008	00437.634
HDDV	000.538	000.013	005.426	001.822	000.169	000.155		000.029	01481.841
MC	002.411	000.003	000.857	013.650	000.027	000.024		000.054	00397.874

3.5 Personnel Formula(s)

- Personnel Vehicle Miles Travel for Work Days per Year

$VMT_P = NP * WD * AC$

VMT_P: Personnel Vehicle Miles Travel (miles/year)
NP: Number of Personnel
WD: Work Days per Year
AC: Average Commute (miles)

- Total Vehicle Miles Travel per Year

$VMT_{Total} = VMT_{AD} + VMT_C + VMT_{SC} + VMT_{ANG} + VMT_{AFRC}$

VMT_{Total}: Total Vehicle Miles Travel (miles)
VMT_{AD}: Active Duty Personnel Vehicle Miles Travel (miles)
VMT_C: Civilian Personnel Vehicle Miles Travel (miles)
VMT_{SC}: Support Contractor Personnel Vehicle Miles Travel (miles)
VMT_{ANG}: Air National Guard Personnel Vehicle Miles Travel (miles)
VMT_{AFRC}: Reserve Personnel Vehicle Miles Travel (miles)

- Vehicle Emissions per Year

$V_{POL} = (VMT_{Total} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{Total}: Total Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Personnel On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

4. Emergency Generator

4.1 General Information & Timeline Assumptions

- Add or Remove Activity from Baseline? Add

- Activity Location
County: Elmore
Regulatory Area(s): NOT IN A REGULATORY AREA

DETAIL AIR CONFORMITY APPLICABILITY MODEL REPORT

- Activity Title: Emissons from Geothermal Production and Injection Well Drilling

- Activity Description:
The ACAM does not have the ability to estimate air emissions from well drilling. So, to estimate the air emissions from drilling the four geothermal production wells and five injection wells, the engine of a 900 horsepower, diesel-fueled emergency generator was used as a surrogate. Well drilling was assumed to take 20 days each with the engine operating 8 hours per day. Total drilling time for all of the wells was assumed to be 1,440 hours during 2021.

- Activity Start Date
Start Month: 1
Start Year: 2021

- Activity End Date
Indefinite: No
End Month: 12
End Year: 2021

- Activity Emissions:

Pollutant	Total Emissions (TONs)
VOC	0.463968
SO_x	0.008100
NO_x	16.783200
CO	4.458240
PM 10	0.524232

Pollutant	Total Emissions (TONs)
PM 2.5	0.524232
Pb	0.000000
NH_3	0.000000
CO_2e	861.8

4.2 Emergency Generator Assumptions

- Emergency Generator
Type of Fuel used in Emergency Generator: Diesel
Number of Emergency Generators: 1

- Default Settings Used: No

- Emergency Generators Consumption
Emergency Generator's Horsepower: 900
Average Operating Hours Per Year (hours): 1440

4.3 Emergency Generator Emission Factor(s)

- Emergency Generators Emission Factor (lb/hp-hr)

VOC	SO_x	NO_x	CO	PM 10	PM 2.5	Pb	NH_3	CO_2e
0.000716	0.0000125	0.0259	0.00688	0.000809	0.000809			1.33

4.4 Emergency Generator Formula(s)

- Emergency Generator Emissions per Year
AE_{POL}= (NGEN * HP * OT * EF_{POL}) / 2000
AE_{POL}: Activity Emissions (TONs per Year)
NGEN: Number of Emergency Generators
HP: Emergency Generator's Horsepower (hp)
OT: Average Operating Hours Per Year (hours)
EF_{POL}: Emission Factor for Pollutant (lb/hp-hr)