DRAFT ENVIRONMENTAL ASSESSMENT

Construction of the Energy and Minerals Research Facility on the Colorado School of Mines Campus

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Energy and Minerals Research Facility EA

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Acronyms and Glossary

ANSI – American National Standards Institute

BMP – Best Management Practice

CDPHE – Colorado Department of Public Health and Environment

CEQ – U.S. Council on Environmental Quality

CER – Central Energy Resources Science Center

CO_2 – Carbon Dioxide

dBA – A-weighted Decibels

DFC – Denver Federal Center

EA – Environmental Assessment

EHS – Environmental Health and Safety Department

EMRF – Energy and Minerals Research Facility

EO – Executive Order

EPA – U.S. Environmental Protection Agency

G3 – Geology, Geophysics, and Geochemistry Science Center

GHG – Greenhouse Gasses

GSA – General Services Administration

LEED – Leadership in Energy and Environmental Design

LOS – Level of Service

LUST – Leaking Underground Storage Tank

Mines – Colorado School of Mines

NAAQS – National Ambient Air Quality Standards

NEPA – National Environmental Policy Act of 1970

NO_x – Nitric Oxide and Nitrogen Dioxide

NZE – Net Zero Emissions

PM10 – Particulate Matter smaller than 10 microns in aerodynamic diameter

PM2.5 – Particulate Matter smaller than 2.5 microns in aerodynamic diameter

RCRA – Resource Conservation and Recovery Act of 1976

RMP – Risk Management Program

TPY – Tons Per Year

USGS – U.S. Geological Survey

WUI – Water Use Intensity

Energy and Minerals Research Facility EA

1. Introduction

1.1 Title and Type of Project

The U.S. Geological Survey (USGS) proposes the construction of the federally owned Energy and Minerals Research Facility (EMRF), which would be located on the Colorado School of Mines (Mines) campus in Golden, Colorado. Titled "*Construction of the Energy and Minerals Research Facility on the Colorado School of Mines Campus,"* this project is the result of 12 years of planning between Mines and USGS.

Originally, Mines planned to build the facility, formally referred to by Mines as the Subsurface Frontiers Building, on the west end of the 18th Street research corridor as laid out in the Mines Campus Master Plan. This building would have doubled on-campus laboratory space and provided open public space for students and faculty. A portion of this building space was reserved for colocation with the USGS Central Energy Resources Science Center (CER). Design for Subsurface Frontiers had reached 90% before COVID-19 halted further progress and rising costs made the project unaffordable.

On May 20, 2022, Federal funding from the Bipartisan Infrastructure Law provided the opportunity for USGS to take over the funding of the Subsurface Frontiers Building, switching it to a federally owned building renamed the EMRF. The EMRF will be the largest building on the Mines campus. Funding dictates that USGS house both the CER and the Geology, Geophysics, and Geochemistry (G3) Science Center in the new facility, resulting in much of the space being occupied by USGS.

For projects involving federal funding, the National Environmental Policy Act (NEPA) requires the completion of an Environmental Assessment (EA) prior to issuing a decision on the proposed project. Preliminary impact analyses and issues dismissed are discussed in Appendix A of this document. The EMRF Technical Report, included as Appendix B, contains the comprehensive analyses of issue statements, affected environments, project impacts, and mitigations. This EA summarizes these detailed analyses while providing an overview of the NEPA process to date.

1.2 Proposed Action

The USGS proposes to construct a new building on the Mines campus in Golden, Colorado, and to relocate two USGS Science Centers from the Denver Federal Center (DFC) to the new building (Figure 1). Specifically, the building would provide laboratory and office spaces for the CER Science Center and G3 Science Center that currently reside in a series of deteriorating buildings on the DFC campus, as well as laboratory and office spaces for Mines students and faculty. The new building would provide an

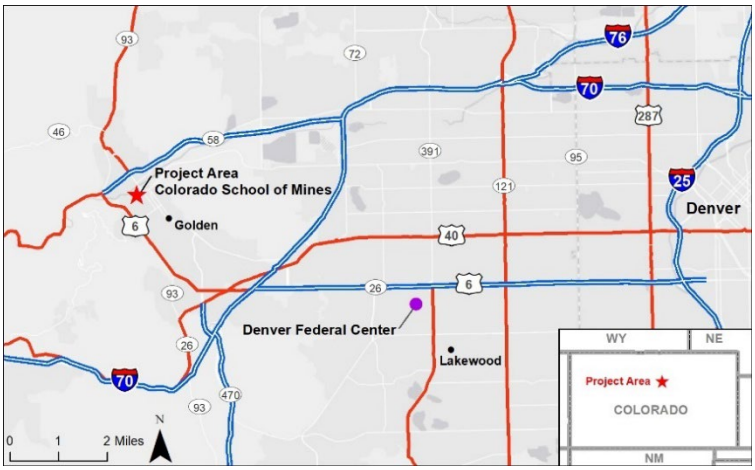

Figure 1 Proposed Project Area Vicinity Map

environment for collaborative research between USGS and Mines, and laboratory spaces capable of supporting precision equipment and cutting-edge research. Shown in Figure 2 below, the EMRF would be constructed on the southern edge of the Mines campus, directly east of the existing USGS Geologic Hazards Science Center building on 18th Street (shown in Figure 2 as USGS National Earthquake Information Center).

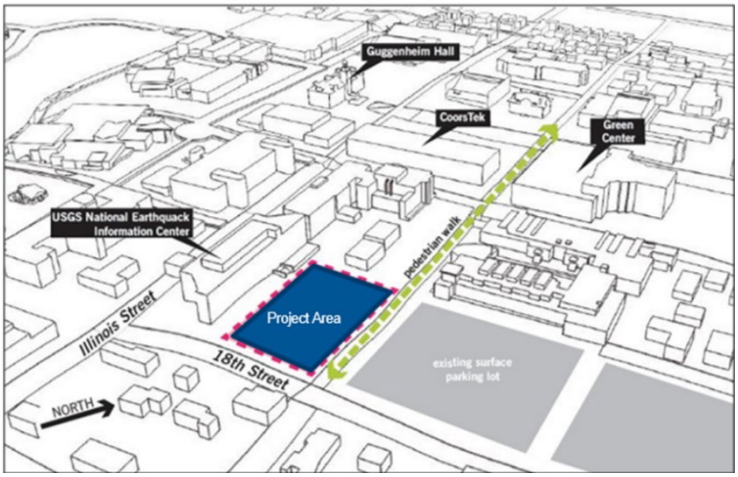

Figure 2 Proposed Project Area on Mines Campus

The EMRF is proposed to have a maximum building footprint of up to 50,000 square feet. At present, this proposed building site consists of landscaped greenspace and trees, a paved surface parking lot, and campus utilities infrastructure (Figure 3). The existing parking lot, greenspace, and mature pine trees would be removed during construction of the EMRF, while the campus utilities infrastructure would be relocated to a nearby site. The existing pedestrian walkway to the northeast of the project area would remain in place. Construction staging areas in the vicinity would include the use of the additional parking lot area directly east of the building site. Based on the preliminary designs previously prepared by Mines, the EMRF is proposed to include a full basement, split main floor, two floors above, and a rooftop penthouse for building utilities. Stylistically, the EMRF would feature a dynamic blend of glass, stone, wood, and steel to match other contemporary building designs on the Mines campus such as CoorsTek and Marquez Hall.

Figure 3 Landscaped greenspace and pine trees (left); and utilities infrastructure, existing USGS parking lot, and Geologic Hazards Science Center (right)

Related future developments include a multi-level parking garage at the corner of 18th Street and Washington Ave that will be completed prior to the estimated construction date of the proposed EMRF. Additionally, Mines has outlined plans for three additional research buildings to be constructed in the years following completion of the proposed EMRF. These facilities—much smaller than the EMRF—would be constructed along 18th Street between the EMRF and parking garage. As

such, these proposed future developments are considered in the cumulative impacts analyses of impacted resources.

1.3 Development of Proposed Action

The proposed EMRF is a federally funded project, and a cooperative agreement exists between USGS and Mines. This agreement facilitates a collaborative process that passes lead responsibility for development of building design and construction to Mines. USGS provides funding throughout this process and works in close partnership with Mines to ensure that the EMRF design meets USGS goals and regulatory requirements. This cooperative agreement allows USGS to oversee and guide the project, while allowing Mines the opportunity to design the building to fit with existing and proposed future campus developments.

1.4 Name and Location of Preparing Office

This document was prepared by DJ&A, P.C. for the U.S. Geological Survey, located at the DFC, W 6th Ave and Kipling Ste 810, Denver, Colorado, 80225.

1.5 Estimated Start Date of the Proposed Action

It is proposed that construction of the EMRF would begin in the spring of 2023, with move-in occurring as early as spring 2025.

2. Purpose and Need for Action

2.1 Purpose and Need for Proposal

The purpose of the project is to construct new facilities for the USGS CER and G3 Science Centers that support precision laboratory equipment, innovative science, and collaborative research with Mines. The need for new facilities is illustrated by the (1) deteriorating condition and (2) ineffective layout of existing USGS facilities at the DFC and (3) the need for increased collaboration with Mines staff and students. Supporting needs for this project include the benefits to Mines staff and students, such as increased on-campus laboratory space, exposure to cutting-edge research and technology, and opportunities to collaborate directly with USGS scientists.

1) Deteriorating condition of existing USGS laboratory facilities

The current Energy and Minerals Science Center facilities located in Buildings 20 and 95 of the DFC are deteriorating and pose numerous problems to USGS scientists and their work. Originally serving as a Remington munitions factory during World War II, Building 20 lacks the integrity to safely house the precision equipment used by USGS scientists. Leaks in the roof system allow water to enter the building during periods of rainfall or snowmelt. Prior roof repairs have failed, forcing USGS staff to install tarps, garden hoses, and barrels to collect leaking water and prevent contamination of samples and damage to equipment, as shown in Figure 4.

Figure 2 Tarps drain leaking rainwater into trash cans in Building 20 laboratories, trying to prevent damage to sensitive equipment.

Furthermore, Buildings 20 and 95 (built in 1941 and 1997, respectively) lack the environmental control necessary for the safe, effective functioning of lab equipment. In many instances, USGS staff run central heating and cooling systems simultaneously to achieve acceptable environmental conditions, and frequently stop to reboot or recalibrate their equipment in the middle of experiments. These conditions greatly limit the capacity of the CER and G3 Science Centers to perform their work and pose serious risks to costly lab equipment. Further reinforcing the need for new facilities, the U.S. General Services Administration (GSA) has determined Building 20 to be nearing the end of its service life.

2) Ineffective layout of existing USGS facilities

The layouts of Buildings 20 and 95 at DFC feature sprawling floorplans, with office spaces often located far from laboratories or in separate buildings entirely. Many research processes, however, require frequent trips between these spaces. Additionally, when the GSA deemed Building 21 too old for rehabilitation and G3 operations were forced to relocate into Building 95, storage facilities for field equipment were split between Buildings 45 and 810, further scattering USGS operations across the DFC campus. The existing USGS building layouts result in inefficiencies as researchers move back and forth between their offices, laboratories, and storage facilities for routine activities and have led to overall dissatisfaction of USGS staff with the work environment. Building programming in the proposed EMRF would bring corresponding labs and offices into closer proximity, resulting in a more effective work environment for USGS scientists.

3) Facilitation of collaborative research

USGS partners with universities across the nation, sharing facilities and/or research projects. Examples include Colorado State University in Fort Collins; the University of Colorado in Boulder, and the University of Tuscaloosa in Alabama, where USGS recently constructed a Hydrologic

Instrumentation Facility to support water resource monitoring efforts. The collaborative nature of these relationships offers benefits to both university and agency, including research and networking opportunities for students and university researchers and the recruitment of university students to USGS positions. Furthermore, socially collaborative environments such as those proposed by the EMRF present increased opportunity for the group problem-solving and open discussion demanded by high-level research. The current location of USGS labs on the DFC campus, however, makes this in-person collaboration with Mines difficult. Located approximately eight miles apart in Lakewood and Golden, Colorado, in-person meetings require substantial time and effort for travel, parking, and reservation of meeting rooms. Although videoconferencing has become commonplace in recent years, USGS and Mines staff emphasize that high-level research is best facilitated by in-person collaboration.

Even within the existing facilities on the DFC campus, USGS laboratories and offices are split between three separate buildings across campus and opportunities for colleague interaction are limited to working labs, offices, and conference rooms. In-person meetings often require a drive or lengthy walk across the DFC campus. Along with Mines, the proposed EMRF would bring the USGS Energy and Minerals operations together under one roof, allowing for the open exchange of ideas and problem solving, educational opportunities for students, and cutting-edge geological research.

2.2 Decisions to be Made

The Regional Director for the USGS Rocky Mountain Region must decide whether the proposed action adequately meets the purpose and need for the action. The Regional Director must also decide whether to enter into a long-term agreement with Mines for colocation of space within the EMRF. Finally, they must determine if the proposed action would or would not constitute a major Federal action, significantly affecting the quality of the human or natural environment.

2.3 Legal Mandates

Compliance with applicable regulations and policies includes the completion of procedural requirements, which include public notices; consultation, coordination, and cooperation with stakeholders and interested publics; and completion of the applicable level of NEPA review. These procedural requirements are dictated by the following acts, regulations, executive orders (EOs), directives, and local codes and ordinances:

- National Historic Preservation Act of 1966 as amended (54 USC § 306108) and its implementing regulations (36 CFR Part 800)
- NEPA of 1969 (42 U.S.C. § 4321 et seq.)
- NEPA Implementing Regulations (40 CFR § 1500 et seq.)
- NEPA Guidance on Consideration of Greenhouse Gas Emissions and Climate Change (88 FR 1196)
- Endangered Species Act of 1973 (16 U.S.C. § 1531 et seq.)
- Clean Water Act of 1972 (33 U.S.C. § 1251 et seq.)
    - Section 402 (Stormwater)
- Clean Water Act Regulations (40 CFR § 100 et seq.)
- Clean Air Act of 1977 (42 U.S.C. § 7401 et seq.)

- Clean Air Act Regulations, including National Ambient Air Quality Standards (40 CFR § 50 et seq.)
- Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986 SARA and the Community Environmental Response Facilitation Act of 1992.
- Pollution Prevention Act of 1990
- Toxic Substances Control Act of 1976, as amended
- Emergency Planning and Community Right-to-Know Act of 1986
- Resource Conservation and Recovery Act of 1976, as amended by the Superfund Amendments and Reauthorization Act of 1986 SARA and the Community Environmental Response Facilitation Act of 1992
- EO 14057 – *Catalyzing Clean Energy Industries and Jobs Through Federal Sustainability* (3 CFR 70935)
- EO 12191 – *Federal Facility Ridesharing Program* (45 FR 7997, 3 CFR, 1980 Comp., p.138)
- EO 12898 – *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* (59 CFR 7629)
- USGS NEPA Handbook (SM 516.1) (August 2016)
- Occupational Safety and Health Program Requirements Handbook (445-2-H)
- City of Golden Municipal Code
- Jefferson County Noise Abatement Policy (Part 3, Regulations Chapter 1, Noise Section 1)
- Colorado Department of Public Health and Environment Air Quality Control Commission (Regulation No. 3)
- Code of Colorado Regulations (5 CCR 1001-2)
- Public Protections from Toxic Air Contaminants (HB22-1244)
- Colorado Water Quality Control Act of 1974
- Colorado Groundwater Regulations (5 CCR 1002-41, -42)

2.4 List of Environmental Permits

The following list identifies environmental permits that are required for the project or for which applicability must be determined once operational conditions are known in detail.

- Hazardous Waste Generator Permit though the Colorado Department of Public Health and Environment's (CDPHE) Hazardous Materials and Waste Management Division.
- Resource Conservation and Recovery Act Hazardous Waste Permit (Form 8700-23 and required documentation)
- U.S. Environmental Protection (EPA) Agency ID # Registration (Form 8700-12), if required

- Risk Management Program ID # Registration
- Minor Source New Source Review requirements
    - Colorado Land Development Air Pollution Emission Notice
- Colorado Engines – Spark Ignition Air Pollution Emission Notice
- Colorado 5 CCR 1001-5 Stationary Source Permits

3. Agency and Public Process

3.1 News Release and Planning

On February 18, 2022, the Department of the Interior announced that the Bipartisan Infrastructure Law provided $167 million in funding for the construction of a new EMRF, meant to replace the existing USGS Energy and Minerals facilities at the DFC. This announcement, which was also posted to the USGS website, included a basic explanation of why the EMRF is needed, rationale for the project area on the Mines campus, and an estimated timeline for completion of five years.

USGS announced on May 20, 2022, that they had entered into a Cooperative Agreement with Mines for the design of the EMRF. This marked the beginning of the design phase for the building which was scheduled to last 16 weeks.

On August 15, 2022, USGS published a notice of study for an EA of the proposed EMRF project. According to CEQ guidance, this notice of study initiated a one-year period in which the assessment is to be completed, resulting in a final assessment deadline of August 15, 2023. A follow-up announcement was posted to the USGS website on August 24, 2022, which included links to webpages for the EMRF project and the EA, respectively. These webpages provided the public with information regarding the NEPA process, project details, and background information on the G3 and CER Science Centers.

3.2 Internal and External Scoping

Potential impacts, issue statements, design criteria, and potential alternatives were identified through internal and external scoping. Internal scoping included resources specialists, the USGS project team, and the Mines project team, and consisted of internal discussion meetings and a site visit to the project area and existing USGS facilities.

A notice of study was published on the USGS website on August 15, 2022, providing notice to the public, information about the project, and information on how to provide comments. Additionally, external scoping invitations were also extended to a USGS-provided list of relevant agencies, a Mines-provided list of community stakeholders from the surrounding neighborhood, and to tribal entities with connections to the project area. These invitations included USGS contact information and the proposed action and purpose and need. The following list includes all agencies contacted through this external scoping process:

- History Colorado
- U.S. Fish and Wildlife Service
- City of Golden
- Mines

- Tribal Entities
    - Apache Tribe of Oklahoma
    - Arapaho Tribe of the Wind River Reservation of Wyoming
    - Comanche Nation (Oklahoma)
    - Cheyenne and Arapaho Tribes (Oklahoma)
    - Fort Belknap Indian Community of the Fort Belknap Reservation of Montana
    - Northern Cheyenne Tribe of the Northern Cheyenne Indian Reservation of Montana
    - Southern Ute Indian Tribe (Colorado)
    - Ute Mountain Ute Tribe (Colorado)

Thus far, no correspondence has been received from tribal entities. Thirteen community stakeholders and agency representatives, however, provided a total of 41 unique comments and two consultation responses. From these comments, 11 new issue statements were developed which have been addressed throughout this EA and Technical Report. Additionally, a variety of design criteria and suggested alternatives for analysis were identified. The design criteria have been provided to the EMRF design team and suggested alternatives are addressed in the Alternatives Development section of this assessment. A summary of all substantive agency correspondences is provided below:

- A letter from History Colorado dated September 26, 2022, documented compliance with Section 106 consultation requirements of the National Historic Preservation Act of 1966 as amended (54 USC § 306108) and its implementing regulations (36 CFR Part 800).
- An email from the U.S. Fish and Wildlife Service dated October 7, 2022, documented the agency's concurrence with the finding of no project-related impacts to species listed as endangered, threatened, proposed, or candidate in the Endangered Species Act of 1973 (16 U.S.C. § 1531 et seq.)
- An email from a City of Golden representative dated September 7, 2022, expressed concerns and suggested design criteria regarding stormwater, transportation and parking, site selection, sustainability, and hazardous materials. These design criteria were provided to the project design team and concerns were addressed through the development and analysis of issue statements throughout this document and the associated Technical Report (Appendix B).

3.3 Issues Analyzed

Issue statements identified through internal and external scoping processes that were relevant to the proposed action and purpose and need were analyzed as part of the NEPA process. The Technical Report, included as Appendix B, contains the full detailed analyses of these issue statements and, for brevity, this EA summarizes these analyses. Issue statements are summarized below:

3.3.1 Transportation and Parking

- Would the building increase traffic and parking needs in the local area? If so, will the traffic and parking demands impact the local infrastructure, residential neighborhoods, and traffic patterns?

- Would the EMRF's trip generation and parking needs and characteristics adversely impact the local transportation system?
- What programs can be developed or enhanced to reduce the impacts on the local transportation system?
- Will EMRF construction create traffic impacts during the construction process, and, if so, how will they be mitigated?

3.3.2 Hazardous Materials (Hazardous Waste Substance and Disposal)

- Based on the environmental history and current status of the project area and surrounding area, would existing conditions, with respect to hazardous materials, hazardous substances, and petroleum products, be affected by the proposed action?
- Would hazardous materials used or generated in the EMRF labs impact current options for disposal?
- What type of hazardous materials would be used in the labs and do these operations pose any potential harm to members of the adjacent residential neighborhood?

3.3.3 Air Quality

- Would emission-generating equipment during construction and operations affect local and regional air quality?
- Would fugitive dust associated with construction and operations result in or contribute to degradation of air quality, haze, and reduced visibility in local and regional areas?
- Would building occupancy impact air quality in the local area?

3.3.4 Soundscapes

- Would noise generated by construction and operation of the project affect sensitive receptors?
- Would the proposed EMRF and buildings outlined in the Mines Campus Master Plan impact the soundscape of the adjacent residential neighborhood?

3.3.5 Light and Glare

- Would development of the project area alter lighting and glare in the project area?
- Would the project impact light pollution in the local neighborhood?

3.3.6 Viewsheds

- Would project implementation alter the views of residents and users in the project vicinity? Would the view of campus and the project area be fundamentally impacted? If so, to what extent?
- Would the building height impact local residential viewsheds?

3.3.7 Sustainability

- Would the proposed action meet the requirements of EO 14057 – *Catalyzing Clean Energy Industries and Jobs Through Federal Sustainability* (3 CFR 70935)?

- Would operations in the new building and labs impact energy sustainability and conservation?
- Would operations in the new building and labs impact water use or conservation practices?

3.3.8 Socioeconomic/Housing/Land Use/Zoning

- Would the proposed action affect social, economic, and private property resources of importance for populations living adjacent to the project area?

3.3.9 Environmental Justice

- Would the proposed action disproportionately affect minority, low-income, or marginalized communities? If so, what impacts are expected and how can these impacts be mitigated?
- Would the proposed action meet EO 12898 – *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* (59 CFR 7629)?

4. Alternatives Development

4.1 Alternative A – Proposed Action or Preferred Alternative

The Preferred Alternative is the construction of an EMRF on the Mines Campus in Golden, Colorado, to house the CER and G3 Science Centers. The project would be funded with Federal dollars designated by the Bipartisan Infrastructure Law. Building specifications include:

- A maximum building footprint of up to 50,000 square feet.
- Building layout featuring a full basement, split main floor, two floors above, and a rooftop penthouse for building utilities.
- Capacity for approximately 300 staff members, of which 250 would be from the current USGS CER and G3 Science Centers.
- Separate and shared laboratory spaces for USGS and Mines.
- Separate office areas for USGS and Mines.
- Common area for staff, students, and visitors which includes a food or coffee venue.
- Level 3 Security for portions of the building housing USGS operations.
- Fully sealed bathtub construction on lower levels to prevent the need to collect and remove groundwater from facilities.
- Utility connections supplied by Mines campus systems.
- Parking available in 18th Street parking garage, planned to be completed prior to construction of the EMRF.
- Integration of green space and natural elements in courtyard areas.
- Construction of the EMRF beginning in spring of 2023 with move-in occurring in 2025.

- Construction staging to occur in the existing parking areas directly northeast of the project area.

This alternative would fulfill the purpose and need for the project by modernizing USGS research facilities, creating effective office and laboratory spaces, and enhancing collaboration between USGS and Mines. The environmental impacts of this alternative have been analyzed in detail as part of the NEPA review process.

4.2 Alternative B – No Action Alternative

Under the No Action Alternative, the EMRF would not be constructed. The CER and G3 Science Centers would continue to operate within their existing facilities in Buildings 20 and 95 on the DFC campus and no substantial repairs would be made to these facilities. Existing issues with building maintenance, lack of environmental control, equipment recalibration and downtime, office-laboratory proximity, and operational inefficiency would continue to affect USGS research. Collaboration with Mines would continue to occur primarily through email and videoconferencing, with occasional in-person meetings at the DFC and Mines campuses. Impacts associated with the No Action Alternative are discussed in further detail in the Section 5.3 of this document and in the Technical Report (Appendix B).

4.3 Alternatives Considered but Eliminated from Detailed Analysis

4.3.1 Rehabilitating Existing Facilities on DFC Campus

Given the age and original intended use of the USGS buildings on the DFC campus, it is unlikely that facilities could be rehabilitated to achieve appropriate environmental control—even at great cost. Furthermore, this alternative would not meet the USGS needs for improved facility layout and collaboration with Mines students and staff. For these reasons, this alternative was eliminated from further study.

4.3.2 Building an EMRF on the DFC Campus

The cost of constructing an EMRF on the DFC campus greatly exceeded the $167 million in project funding allocated by the Bipartisan Infrastructure Law. GSA estimated that construction on the DFC campus would cost approximately $350 million total. Because of the DFC's history as ammunition manufacturing facilities and associated contamination, over $50 million of the total project cost would be spent on site soil remediation. Due to these prohibitive costs, this alternative was eliminated from further study.

4.3.3 Building an EMRF elsewhere in area

During scoping, community stakeholders suggested a variety of alternative building locations for the construction of an EMRF, including plots of undeveloped land and local business parks. These locations, however, do not fulfill the need for enhanced collaboration between USGS and Mines. Additionally, the building has been designed by Mines to increase on-campus laboratory space and provide students and staff with new facilities for research and study. If constructed off campus, the EMRF would be of limited use to Mines. For these reasons, these alternative building locations were eliminated from further study.

4.3.4 Leasing existing laboratory and office space elsewhere in area

The unique nature of the geologic research performed by USGS demands specialized requirements for research facilities. The needs for strict environmental control, isolation of vibrations, and integrated office spaces make it exceedingly difficult to lease laboratory space in the Lakewood/Golden,

Colorado area. Additionally, leased laboratory and office space would not adequately enhance the collaborative relationship between USGS and Mines students and staff. For these reasons, this alternative was eliminated from further study.

5. Affected Environment and Environmental Consequences

5.1 Direct, Indirect, and Cumulative Impacts

Regulations set by the U.S. Council on Environmental Quality (CEQ) require that NEPA analyses consider all relevant environmental impacts of a proposed federal action. This includes direct, indirect, and cumulative impacts, which are defined as follows:

- Direct Impacts: Caused by the action and occur at the same time and place.
- Indirect Impacts: Caused by the action and are later in time or farther removed in distance but are still reasonably foreseeable.
- Cumulative impacts: Result from the incremental effects of the action when added to the effects of other past, present, or reasonably foreseeable future actions, regardless of what agency (Federal or non-Federal) or person undertakes such other actions (85 CFR 43378 §1508.1, as amended by 87 CFR 23469).

The impact analyses of each affected resource will identify these types of impacts, as well as mitigations to reduce or eliminate the impact entirely.

5.2 Alternative A – Proposed Action

5.2.1 Transportation and Parking

For a complete discussion of transportation and parking, see section 3.1 of the Technical Report.

5.2.1.1 Affected Environment

The affected environment includes roadways adjacent to the planned EMRF, the future parking garage site, and other transportation related infrastructure. It also includes transportation conditions at the existing USGS facilities on the DFC campus and relevant policies. Namely, EO 12191 – *Federal Facility Ridesharing Program* (45 FR 7997, 3 CFR, 1980 Comp., p.138) and USGS incentives to encourage alternative modes of commute transportation.

The existing surface transportation system surrounding the proposed EMRF building site in Golden consists of two-lane, two-way streets with stop control at intersections. The street system is arranged in a grid pattern with multiple redundant access points and routes to the site. This system features adequate capacity for current levels of traffic.

The existing USGS site at the DFC, meanwhile, has a large amount of surface parking adjacent to the USGS buildings that provides a disincentive for alternate modes of transportation. The parking is included inside a secured perimeter with limited access control points. The secured perimeter also acts as a disincentive for transit-related trips and walking trips since transit users are required to disembark approximately ¾ of a mile from the USGS buildings.

Finally, it is assumed that Mines staff members that will be located in the EMRF are already on-site and, therefore, do not represent a new transportation burden. Transportation impacts are associated only with USGS staff relocating from existing facilities on the DFC campus.

5.2.1.2 Environmental Consequences

Accounting for continuation of USGS work policies, anticipated rates of telework among USGS staff, and displacement of existing parking spaces within the project area, detailed analysis identified a maximum daily parking need of 176 spaces. This need will be met by the construction of a new parking garage on the corner of 18th Street and Washington Avenue (not part of the proposed action) which will create a surplus of 584 new parking spaces that are available for new uses. In the event that USGS polices changed and all staff members were required to work in-person at the EMRF, this parking garage would still retain adequate capacity for the increased parking demand.

The streets surrounding campus were analyzed for traffic capacity to determine if the additional USGS traffic would cause any new congestion or delays. The 2019 traffic impact analysis performed by Kimley-Horn and Associates determined that all intersections within the EMRF analysis area would continue to meet the Level of Service (LOS) recommended by standard traffic engineering practices—LOS D—through a horizon year of 2040 (Kimley-Horn and Associates 2019). It was therefore determined that the operation of the proposed EMRF would have no significant impacts on local traffic conditions. Furthermore, the impact analysis found the street system surrounding the project area to have substantial spare traffic capacity. Coupled with the existing construction plan which provides off-street parking and working areas for all construction activities, there will be no need for long-term roadway closures. Therefore, there would be no significant impacts associated with the construction of the EMRF.

The construction activities and operational traffic demands associated with the development of the 18th Street research corridor are anticipated to be similar to those of the proposed EMRF. As such, no significant cumulative impacts are anticipated for the EMRF and related future developments.

5.2.1.3 Avoidance and/or Mitigation

Existing federal and USGS-specific policies on ridesharing, sustainable commuting, and remote work will continue to promote reductions in daily traffic to and from the EMRF. In addition to these measures, the incorporation of convenient on-site bike parking, shower/locker facilities, and elimination of distant security checkpoints will further reduce barriers to sustainable modes of commute transportation.

5.2.2 Hazardous Materials (Hazardous Waste Substance and Disposal)

For a complete discussion of hazardous materials, see section 3.2 of the Technical Report.

5.2.2.1 Affected Environment

The affected environment for hazardous materials consists of applicable regulations, environmental history of the project area, and hazardous waste disposal plans for the facilities. The regulatory environment for hazardous materials used and generated at the EMRF is extensive and includes a variety of laws, federal acts, and state permitting requirements.

The environmental history of the project area is consistent with an urban area with a long history of development. Past land uses include residential, parking lots, vacant land, and a baseball field. A variety of leaking underground storage tanks (LUSTs) have been identified within the surrounding community—including one within the project area—however, these LUSTs have been officially remediated and/or determined to be of no impact to the project area.

Facilities producing hazardous waste are required to register as a waste generator through the CDPHE. Mines is already registered as Large Quantity Generator and employs an Environmental

Health and Safety (EHS) Department to manage both hazardous and non-hazardous waste disposal on campus. At the time of analysis, it is anticipated that USGS and Mines will enter an agreement for disposal of USGS hazardous waste through Mines' existing disposal contract; however, no formal agreement has been signed at this time. If required, USGS will also register with CDPHE as a waste generator, with generator size to be determined at the time of registration, and USGS will likely coordinate with the Mines EHS department for storage and disposal of hazardous waste that may be generated by USGS operations.

5.2.2.2 Environmental Consequences

It is anticipated that hazardous materials will be used, and hazardous wastes will be generated in the EMRF, however, the timing and makeup of these substances will vary depending on the research being conducted at that time. Any negative impacts to the campus or community surrounding the EMRF would occur through the exhaust of hazardous fumes. Specifically, potential emissions sources at the EMRF include radioisotopes, perchloric acid, and hydrofluoric acid—which could cause hydrofluoric acid odors at the EMRF and Geologic Hazards Science Center building between 7-30 percent of the time. The EMRF laboratories will feature specialized fume hoods and exhaust systems that eliminate or limit the emission of hazardous fumes to published safety standards, as determined by the appropriate entity. These features will also help to mitigate hydrofluoric acid fumes.

At the time of analysis, USGS does not anticipate the use of any extremely hazardous substances or threshold quantities of regulated substances, which require the development and approval of a Risk Management Program (RMP) to prevent health impacts to the community. If this need were to be identified later, a separate risk analysis, emergency planning, and decision process would be conducted through consultation with the EPA.

By complying with the applicable regulations, maintaining safety technology, and implementing appropriate risk-mitigating work procedures, no safety impacts are expected to result from the normal operation of the EMRF, though USGS cannot completely eliminate the risks from hazardous materials.

No cumulative impacts are anticipated at this time. The impact of future developments in the 18th Street research corridor depends on the hazardous substances used or generated in these facilities. Assuming these facilities handle the same substances as the EMRF, similar risks can be expected. Like the EMRF, however, proper adherence to safety regulations, technology requirements, and work procedures would result in a finding of no anticipated impacts from the normal operation of these facilities.

5.2.2.3 Avoidance and/or Mitigation

Possible avoidance measures for potential hazardous materials in the existing environment include a complete ASTM International Phase I Environmental Site Assessment. This assessment would identify the presence or likely presence of hazardous substances in the project area resulting from past spills or releases. The assessment would also satisfy due diligence requirements to qualify for innocent landowner, contiguous property owner, or bono fide prospective purchaser limitations under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980.

Hazardous waste specialists also recommend performing a detailed hazard assessment of procedures and hazardous substances used in the EMRF once they have been identified. Clear quantification of the associated risks will allow USGS operations to further reduce these risks.

Risk reduction and response measures include a diverse set of regulatory, operational, and reporting procedures. These preemptive and responsive measures vary by substance and event. If EMRF emissions were discovered to be exceeding published standards, impacts could be mitigated by altering fume hood exhaust design to feature increased stack height or exit velocity, relocating exhaust stacks further from affected receptors, adding additional emissions technologies such as carbon filters and scrubbing systems, or revising work procedures to limit the quantity of potential laboratory spills. Scrubbing systems of 80-87 percent efficiency could be installed to completely eliminate hydrofluoric acid odors at the EMRF and nearby USGS Geologic Hazards Science Center building.

5.2.3 Air Quality

Air quality and emissions are highly regulated, including federal, state, and local regulations. For brevity, not all applicable regulations are represented in this EA. For a complete discussion of air quality, see section 3.3 of the Technical Report.

5.2.3.1 Affected Environment

Any air quality impacts associated with the construction and operation of the EMRF would be limited primarily to the project area and—to a lesser extent—the surrounding campus and neighborhood. Because air quality data is only available at county scale, however, the analysis area for background air quality data encompasses the entirety of Jefferson County, CO.

Air quality within Jefferson County is measured in comparison to National Ambient Air Quality Standards (NAAQS) set by the EPA and Colorado-specific standards set by the State of Colorado. Areas are designated by the EPA according to attainment or non-attainment of air quality standards for each pollutant specified. Jefferson County is currently in non-attainment of ozone standards and attainment of all other air quality standards. Additionally, as a federal action, the project is subject to the General Conformity Rule, which dictates that federal actions may not inhibit local NAAQS attainment, worsen existing violations, or cause new violations of these standards.

The primary pollutants and air quality conditions potentially affected by the proposed action are ozone, fugitive dust (PM_{10} and $PM_{2.5}$), greenhouse gasses (GHGs), and haze. As a visual atmospheric phenomenon caused by sunlight encountering airborne pollutant particles, haze can be caused by a variety of emissions. The effect of the proposed action on these pollutants would differ between the construction and operational phases of the EMRF.

5.2.3.2 Environmental Consequences

Project impacts will vary from the construction phase to normal operation of the EMRF. Construction-related air quality impacts would result from soil disturbance, on-site vehicle and equipment operation, and increased traffic to and from the worksite. Fugitive dust would be generated by earthmoving activities, vegetation removal, and equipment operation on unpaved surfaces, but will be reduced by watering soils at the worksite. With construction expected to last two years, estimated fugitive dust emissions from earthwork are 0.16 Tons Per Year (TPY) of PM_{10} and 0.02 TPY of $PM_{2.5}$. GHGs from vehicle exhaust, meanwhile, were determined to be temporary, localized, and typical of other construction projects. It was therefore determined that no significant air quality impacts would result from the construction phase of the EMRF.

Operational emission sources include process sources (fume hood exhausts, specialty exhausts, emergency diesel generators, and on-site vehicle operation) and basic operational sources such as electricity consumption. At the time of analysis, there is not enough data to analyze criteria pollutant

emissions from the fume hoods, though section 5.2.2 of this document provides additional detail on hazardous fumes and fume hood exhaust. Similarly, emissions associated with the basic heating and electrical demand of the building are unknown at the time of analysis, but may include GHGs such as CO_2 and NO_x. Diesel generators would only be operated in case of emergency or regularly scheduled maintenance and readiness tests. On-site vehicle usage would be limited to occasion idling of passenger or delivery vehicles. The estimated emissions (and associated effects on haze) from these sources are negligible compared to existing levels in Jefferson County and will not cause an exceedance of any federal, state, or local air quality standards. No significant impacts will occur to air quality as a result of the proposed action.

Cumulative impacts resulting from future development of the 18th Street research corridor are expected to be similar to those of the construction and operation of the EMRF.

5.2.3.3 Avoidance and/or Mitigation

No significant air quality impacts are anticipated. Therefore, no mitigations will be necessary. However, design standards have been incorporated to prevent excess fugitive dust and vehicle exhaust. This includes best management practices (BMPs) such as site watering and reducing unnecessary equipment idling. All appropriate air quality permits will be obtained prior to construction and operation of the EMRF. In some cases, however, permit applicability will need to be determined once the building is complete and detailed emissions data is available. This process will also serve to identify any required emission control measures. BMPs such as site watering and reducing unnecessary equipment idling will be utilized to maintain favorable air quality during construction.

5.2.4 Soundscapes

For a complete discussion of soundscapes, see section 3.4 of the Technical Report.

5.2.4.1 Affected Environment

The soundscape of an environment includes all sound levels occurring throughout a 24-hour period. Noise is defined as unpleasant or unwanted sound that is unintentionally added to a desired soundscape or environment. The American National Standards Institute (ANSI) has determined acceptable day, night, and day-night averaged sound levels for varying land use categories, measured in A-weighted decibels (dBA). As a dense residential and commercial area with substantial traffic, the analysis area is best represented by the “noisy urban residential” category (ANSI, 1993); therefore, these noise levels were used as the baseline for impact threshold.

5.2.4.2 Environmental Consequences

Noise impacts were analyzed for the nearest residence, approximately 200 ft from the center of the project area. At this location, building construction would cause an estimated 11. 5 dBA increase to existing ambient noise levels, which the human ear would perceive as approximately twice as loud. These impacts would be temporary and intermittent in nature and would occur only during daylight hours. Noise from building operation would be limited to occasional, temporary use of emergency diesel generators. At the nearest residence, the noise level of these emergency generators would remain below the existing ambient noise level of the area, meaning that no noise impacts would occur from building operation.

As future developments occur along 18th Street, cumulative impacts could include the emergence of a “street canyon effect,” where noise is reflected off hard surfaces and travels greater distances. The details of this impact depend on the design of future buildings and associated noise-generating operational equipment.

5.2.4.3 Avoidance and/or Mitigation

Impact analysis accounted for typical construction equipment and hours. It did not, however, account for noise-reduction measures. Design standards include construction fencing and sound enclosures around emergency generators that would reduce the amount of noise transmitted to nearby receptors. Furthermore, design standards aimed at reducing the "street canyon effect" of future developments include landscaped, vegetated buffers that absorb unwanted noise and limit its travel. Incorporating these features into future developments would further reduce cumulative impacts.

5.2.5 Light and Glare

For a complete discussion of light and glare, see section 3.5 of the Technical Report.

5.2.5.1 Affected Environment

The affected environment includes the project area as well as users and residents of the 18th Street corridor. The existing conditions cause little glare to users and residents of the 18th Street corridor, however nighttime light pollution exists with the operation of the campus parking lots. Since light pollution concerns are addressed adequately by project design standards, the proposed action did not merit an in-depth light pollution impact analysis. The exterior design of the building and lack of glare in the existing environment, however, were analyzed to quantify impacts.

5.2.5.2 Environmental Consequences

The design of the proposed EMRF includes many specular materials with the potential to reflect large amounts of light. The glare impacts experienced by residents, staff, and visitors of the affected environment are highly variable and depend on season and sun angle, observation point, and rate of travel. In rare cases, the existing glare would be eliminated by the proposed building. Overall, however, the construction of the EMRF would increase glare impacts to the surrounding campus and neighborhood.

At certain observation points, the intensity of the glare could cause observers to experience negative visual effects such as afterimage. These impacts would be most pronounced for motorists, pedestrians, and residents along 18th Street between Cheyenne Street and Illinois Street. These instances of glare would occur in the early morning, mid-morning to early afternoon, and evening depending on the time of year. Portions of the USGS Geologic Hazards Science Center building would also experience glare, though this glare would be short-lived and would occur after typical working hours. Residents of 17th Street living northeast of the project area would experience substantial reductions to the intensity and duration of early morning glare during the spring, summer, and autumn months.

Cumulative impacts would occur as Mines develops the 18th Street research corridor. The addition of new buildings would reduce or eliminate glare to the northeast of the EMRF, depending on the size and height of the new developments. Continued changes to glare conditions resulting from building location, size, and materials, can be expected throughout these future developments.

5.2.5.3 Avoidance and/or Mitigation

Design standards specify vegetative buffers for reducing light and glare impacts. These trees would not exceed 25 ft in height and would continue to filter light and glare effectively when void of leaves. Exterior lighting BMPs—including automatic interior window shading systems that close each evening—will limit light exposure to nearby residences.

Recommended mitigations for light and glare impacts include:

- Replacement of mature trees on the project area through the proposal of a more substantial vegetative buffer along the 18th Street corridor. This could further reduce light and glare related impacts to observers and motorists.
- Utilizing pedestrian-scale lighting fixtures that direct light downward, away from off-site land uses.
- Utilizing exterior aluminum shading measures that direct interior light downward and away from off-site land uses. Similar measures could also be taken on 'bare' glass surfaces (primarily at the street level) to limit ambient light impact.

5.2.6 Viewsheds

For a complete discussion of viewsheds, see section 3.6 of the Technical Report.

5.2.6.1 Affected Environment

Visual resources, discussed here in terms of viewshed, consist of whatever natural or manmade features and landscapes are visible from a given location. The affected environment for this project includes nearby residences, Mines residence halls and educational buildings, and the existing USGS Geologic Hazards Science Center Building. Depending on factors such as location, setback, and height, these residences and facilities could lose views of the mountains, campus, or cityscape as the EMRF is constructed. These elements are referred to as visual resources.

5.2.6.2 Environmental Consequences

The analysis area was divided into a series of six zones, for which impacts were analyzed at a single representative location. Visual analysis determined that the viewsheds of all six zones would be impacted by the construction of the EMRF. Zone 3, which includes Spruce Hall and Maple Hall, would be impacted the least, experiencing only minor obstruction of a single visual resource. Zones 1, 2, 4, and 6, however, would experience total obstruction of at least one visual resource. Notable examples of visual obstruction include the total loss of foothill views to the northeast from the USGS Geologic Hazards Science Center building, total obstruction of Alderson Hall and/or Coors Tek building when viewed from residences along 18th Street, and an approximate 30% reduction in views of the southwest foothills when viewed from residences along 17th Street.

In consultation with the Colorado State Historic Preservation Office, the proposed EMRF was determined to have no impact on historic properties. The building height and number of levels are well within established impact thresholds.

Cumulative impacts associated with future development of the 18th Street research corridor include further viewshed impacts. Residents along 18th Street would experience significant reductions in viewshed as the Mines Campus is developed. Residents who currently have views of the foothills northeast of town would lose their views of the foothills and most residents would lose views into the interior of the Mines campus. Additionally, the few residents living on 17th Street would lose any views of the foothills to the southwest that remain following the construction of the EMRF.

5.2.6.3 Avoidance and/or Mitigation

Continued outreach and engagement with residents affected by construction impacts may help to ensure the adequacy and effectiveness of mitigations such as visual barrier fencing during construction. No mitigations exist for permanent visual impacts resulting from the EMRF building itself.

5.2.7 Sustainability

For a complete discussion of sustainability, see section 3.7 of the Technical Report.

5.2.7.1 Affected Environment

The affected environment consists of the sustainability of existing USGS Energy and Minerals operations, the sustainability of the agency's building portfolio, EO 14057, and all local and state requirements for sustainable buildings and sites. This order issues directives to federal agencies to increase the energy sustainability and water efficiency of their operations. Some of the foremost agency goals identified by the order include all agencies utilizing 100 percent carbon pollution-free electricity on a net annual basis by 2030 (Sec. 203) and achieving a net-zero emission (NZE) building portfolio by 2045, with a 50 percent reduction of GHGs (relative to 2008 baseline) in the existing building portfolio by 2032 (Sec. 205). The EO also requires the agency to identify targets for reducing net water use intensity (WUI) (Sec. 206).

Standards identified by EO 14057 that are directly related to the EMRF project include:

- Utilize 100 percent carbon pollution-free electricity on a net annual basis by 2030, including 50 percent 24/7 carbon pollution-free electricity.
- Achieving NZE by 2030 and, where feasible, net-zero water and waste for new federal construction projects over 25,000 gross square feet.
- Installation of Electric Vehicle Supply Equipment to support a fully electric vehicle fleet, where feasible.

USGS Energy and Minerals facilities, consisting of the G3 and CER Science Centers, are currently located in deteriorating buildings on the DFC campus. These facilities are extremely inefficient and, at times, require simultaneous heating and cooling to achieve proper environmental control for lab work. As such the GSA, who owns the buildings, has determined these facilities to be nearing the end of their service life.

USGS has achieved significant reductions in WUI across its operations in recent years. Exceeding the goals set by EO 13514 – *Federal Leadership in Environmental Energy and Economic Performance* (3 CFR 52118, Sec. 2 (d)), USGS reduced its net WUI by 45.6 percent relative to a 2007 baseline by fiscal year 2021. Following the directives of EO 14057, new net WUI targets are currently being developed. The details of these targets remain unknown at the time of analysis. WUI, however, is measured relative to square footage, rather than net consumption like the energy sustainability goals. This means that the EMRF would not have the same potential additive effects towards water sustainability goals that it would towards energy sustainability.

5.2.7.2 Environmental Consequences

Quantitative energy and water consumption data is not yet available for the EMRF. Building energy consumption will be modeled by an Energy Model upon the completion of the building design. Similarly, WUI will be modeled once all laboratory, office, and bathroom water fixtures have been determined. Considering the current lack of quantitative data for building sustainability, a qualitative analysis was performed that identifies and discloses potential impacts of the project. Additionally, in accordance with CEQ guidance, estimated GHG emissions and their associated costs were modeled for building construction and operation.

Design goals for the building include Gold-level Leadership in Energy and Environmental Design (LEED) v4 BD+C certification, with Silver being the minimum acceptable certification. It should be

noted that, though similar, the requirements for NZE buildings identified by EO 14057 are not directly equivalent to Silver-level LEED certification. Designing to LEED Silver or Gold standards (v4 BD+C), however, should result in a building requiring fewer future retrofits to achieve compliance with the EO.

Because the existing facilities at the DFC are owned and managed by the GSA, the energy and water consumption of these facilities is considered as part of the GSA building portfolio. The EMRF, however, represents a new, additional building in USGS's building portfolio. As such, any net energy consumption by the EMRF of non-renewable energy sources would negatively affect the agency's efforts to bring agency-wide energy consumption into accordance with EO 14057. It should be noted, however, that the project impacts may also include corresponding decreases to the overall energy consumption of the GSA building portfolio, depending on whether GSA decides to rehabilitate or replace the aging DFC buildings. If the DFC buildings are rehabilitated or replaced, the transition of USGS operations from inefficient facilities at DFC to new facilities in the EMRF will result in beneficial impacts to the overall sustainability of the federal government's operations.

Calculating the social cost of GHGs reflects the additive cost of damages caused by emissions as a dollar amount. Assuming a social cost of CO_2e of $0.02/lb, the estimated daily social costs of building construction and operation emissions are detailed in Table 1 below. Compliance with the future requirements of EO 14057 would further reduce or eliminate the social cost of building operation.

Table 1 Social Cost of EMRF Emissions

Year	GHG (CO_2e) lb/day	Social Cost $/day
2023	1265	$29.47
2024	1882	$43.85
2025	360	$8.39

(USGS 2023)

New WUI targets for federal facilities are currently in development and remain unavailable at the time of analysis. Furthermore, WUI cannot be determined until all building design elements and operational water uses have been determined. As a new facility with modern plumbing and water fixtures, however, the EMRF will feature greater system efficiency than existing facilities at the DFC. Given the modern design, sustainability goals equivalent to LEED Gold certification, and past reductions to USGS WUI ratings, it is unlikely that the EMRF will have significant negative impacts on the water sustainability of USGS operations.

Cumulative impacts include potential long-term reductions to the overall resource consumption and increased efficiency of USGS Energy and Minerals operations resulting from the transition to a modern facility. These cumulative impacts would help the federal government to meet the sustainability requirements outlined for federal buildings in EO 14057.

5.2.7.3 Avoidance and/or Mitigation

If the building does not meet the future sustainability goals identified by EO 14057 upon construction, USGS will identify and perform any necessary retrofits to bring the building into compliance. Such retrofits will utilize passive features and sustainable design processes to reduce building energy demand, such as daylighting and plug load reduction. Where feasible, renewable energy

technologies such as photovoltaic arrays and geothermal heating and cooling will be utilized. All retrofits should be subject to evaluation of life cycle costs.

5.2.8 Socioeconomics/Housing/Land Use/Zoning

For a complete discussion of socioeconomics, see section 3.8 of the Technical Report.

5.2.8.1 Affected Environment

The affected socioeconomic environment of the project centers on the community of Golden, the USGS workforce that would be relocated to the EMRF, and elements of the project that impact socioeconomic conditions of the area such as commuting and parking.

According to Mines, the neighborhoods surrounding campus are composed primarily of off-campus students, Mines faculty and staff, and recently retired individuals. This is reflected in 2020 U.S. Census Bureau data on age groups and occupations among Golden residents. As a result of the university presence, individuals between the ages of 20-24 represent the single largest age group in Golden, accounting for approximately 12 percent of the population. On the other hand, combined age groups over the age of 70 account for only a small portion of the population—approximately 6 percent. Occupation data, meanwhile, shows that most Golden residents work in management, business, science, and arts occupations (56 percent) or sales and office occupations (20.6 percent), such as at Mines or USGS (U.S. Census Bureau 2020). According to 2015-2019 American Community Survey data obtained from EJScreen, the unemployment rate in Golden reflects the state average of 4 percent (U.S. EPA 2022a). For a complete description of the existing socioeconomic conditions in Golden, CO, see section 3.8.2 of the Technical Report.

Socioeconomic conditions relevant to discernable project impacts include commuting and parking conditions and costs. The average commute time for the Golden workforce and prevalence of personal vehicle use suggests that most workers commute from a nearby city and that public transportation may be either unfeasible or undesirable for much of the workforce. The area is served by one bus route, with the nearest bus stop approximately four blocks from the proposed EMRF building site. Existing USGS facilities at the DFC, meanwhile, are served by multiple transit routes. However, the secured perimeter of the DFC requires commuters or visitors to disembark and walk the remaining distance to USGS facilities.

Additionally, USGS staff members currently working at the DFC in Lakewood have access to free parking. However, relocation to the Mines campus in Golden may require some staff to pay for parking. Though a new parking garage will be constructed near the EMRF, staff parking costs have yet to be negotiated between USGS and Mines.

5.2.8.2 Environmental Consequences

Commute mode and duration data suggests that most individuals working in Golden live in a nearby city. Though this daily influx of non-resident workers likely helps to support local business and industry, it also represents additional strain on community resources within Golden. Non-resident workers utilize public roadways and services (e.g., snowplowing) without contributing to the city's tax base which provides and maintains these resources. The EMRF will provide workspace for the relocation of approximately 250 USGS staff members from the DFC, approximately 90 of which are anticipated to commute to the EMRF daily. Assuming that most USGS staff members do not live in Golden and commute with a personal vehicle, the relocation of USGS operations to the EMRF would increase these impacts to the City of Golden and residents whose taxes fund these public resources.

It should be noted, however, that a detailed analysis of impacts to Golden traffic patterns found the new traffic associated with the EMRF to be within the capacity of the existing street systems.

USGS workers also face possible socioeconomic impacts. Although the staff parking plan has not yet been negotiated between USGS and Mines at the time of analysis, it is likely that USGS staff will be required to pay parking fees at the EMRF. Given that these staff members currently have access to free parking at the DFC, this represents a new financial burden for these staff members resulting from the proposed action. The extent of these impacts is assumed to be related directly to the parking prices. Overall, impacts to cost and duration of commute will vary for individual staff members, depending on home location. The details of these impacts cannot be quantified.

The Mines Campus Master Plan identifies future developments along the 18th Street research corridor. These developments are likely to have cumulative impacts similar to those of the proposed action and will contribute to these effects over the coming years.

5.2.8.3 Avoidance and/or Mitigation

To reduce transportation infrastructure and maintenance costs to the municipal tax base in Golden, USGS could provide EMRF staff with public transportation stipends or other incentives for alternative modes of transportation. This would also benefit the commute sustainability of the overall EMRF workforce.

5.2.9 Environmental Justice

For a complete discussion of environmental justice, see section 3.9 of the Technical Report.

5.2.9.1 Affected Environment

EO 12898 – *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* (59 CFR 7629) directs federal agencies to identify and address the disproportionately high and adverse human health or environmental effects of their actions on minority and low-income populations, to the greatest extent practicable and permitted by law. Within Colorado, the City of Golden ranks above the 50th percentile for percentage of low-income, unemployed, and linguistically isolated residents (U.S. EPA 2022b). As environmental justice populations, these groups are often subject to disproportionate environmental impacts of development and pollution. These environmental justice groups are currently subject to elevated levels of ozone, traffic proximity, hazardous waste proximity, and RMP facility proximity, all of which are potentially affected by the construction of the EMRF.

The affected environment also includes elements such as parking and transportation. Low-income and minority staff and visitors of the USGS facilities at the DFC in Lakewood have access to free parking. However, the relocation to the Mines campus in Golden may require these groups to pay for parking, public transit, or other transportation costs. Though a new parking garage will be constructed near the EMRF, parking costs have yet to be determined. Additionally, the Mines project area is only served by one public bus route which stops approximately four blocks away. By contrast, staff members and visitors of the existing facilities on the DFC campus are served by multiple public transit routes, though the walk required by perimeter security check points likely discourages travel by public transit.

Finally, with the median value of owner-occupied housing units with a mortgage of $581,000, home property value can be assumed to be an important financial resource for the many residents of Golden who own a home (U.S. Census Bureau 2020). This value is shaped by university presence, proximity to the Denver metropolitan area, access to public lands, and many other factors. However,

no data is available for rates of home ownership among environmental justice populations in Golden; therefore, these impacts were not analyzed in detail.

5.2.9.2 Environmental Consequences

Low-income staff members and visitors of the EMRF would be impacted by the required costs and payment methods present at the new facilities. Parking near the EMRF—including the new parking garage—will require payment, representing a new cost for visitors and staff. Additionally, the parking meters specified in the current design do not accept cash. For low-income individuals who may not own a credit or debit card, this presents an additional barrier to visiting the facility.

Building programming of the EMRF includes a communal area and food and drink venue which will be open to the public. Given that the current building design does not include multi-lingual signage, linguistically isolated populations within Golden who wish to use these portions of the building may encounter language barriers and reduced opportunity to utilize these public spaces.

Based on the materials and research expected to occur within the EMRF, the need for an RMP is not anticipated at this time. If this need is determined at a later date, an RMP would be developed for the materials or research procedures of concern. EMRF operations will, however, involve the handling and disposal of hazardous materials and waste products. Since Mines is already registered as a waste generator with the CDPHE, the EMRF would add to the total amount of hazardous materials and waste on campus. It should be noted that this represents an increase in the total amount of hazardous material within the community. However, as an addition to an existing source, environmental justice populations in Golden would not experience impacts to hazardous waste proximity.

Detailed analysis determined that no significant impacts would occur to local air quality as a result of the proposed EMRF. Construction impacts from equipment exhaust and fugitive dust would be temporary, highly localized, and typical of other construction projects. Operational emissions would be maintained according to air quality standards and would not cause significant impacts. For the complete air quality impact analysis, see section 3.3 of the Technical Report.

A detailed traffic analysis of the proposed action found no significant impacts to the community as a result of the proposed action. The timing and quantities of construction-related traffic and daily commute traffic are within the capacity of the existing street systems and parking demands. Therefore, there will be no significant impacts to environmental justice populations. For the complete traffic impact analysis, see section 3.1 of the Technical Report.

Cumulative impacts related to future development of the 18th Street research corridor are expected to be similar to those of the proposed EMRF. Together with the EMRF, a fully developed research corridor could cause a greater suite of impacts to environmental justice populations than the EMRF alone.

5.2.9.3 Avoidance and/or Mitigation

The EMRF does not incorporate any design standards specific to minimizing impacts to environmental justice populations. However, a complete discussion of EMRF design standards and applicable air regulations for air quality impacts is included in the section 3.3 of the Technical Report.

Possible mitigations include incorporation of multi-lingual signage in public areas to lessen language barriers for linguistically isolated populations wishing to use the public portions of the building.

Additionally, installation of parking meters that accept cash could lessen potential impacts for low-income individuals who may not have equal access to credit cards for payment.

5.3 Alternative B – No Action

Under the No Action Alternative, the EMRF would not be constructed. The CER and G3 Science Centers would continue to operate within their existing facilities in Buildings 20 and 95 on the DFC campus and no substantial repairs would be made to these facilities. Existing issues with building maintenance, lack of environmental control, equipment recalibration and downtime, office-laboratory proximity, and operational inefficiency would continue to affect USGS research. Collaboration with Mines would continue to occur primarily through email and videoconferencing, with occasional in-person meetings at the DFC and Mines campuses.

Cumulative effects include continued inefficiencies of time, money, materials, and electricity—which is sourced primarily from coal and gas. As the existing facilities continue to age, high maintenance costs would provide diminishing returns. USGS workers would spend increasing amounts of time tending to improvise repairs, attempting to maintain environmental conditions, and recalibrating equipment. Quality of research would continue to suffer.

Appropriate mitigations for the No Action Alternative include building repairs and upgrades. Extensive roof repairs would help to mitigate environmental concerns of water damage to lab equipment and office spaces. Current mitigations include makeshift arrangements of tarps, hoses, and rain barrels which require maintenance, inhibit productivity, and fail to provide adequate equipment protection. HVAC system upgrades would also be needed to achieve acceptable environmental control for laboratory equipment. These mitigations would be costly and, given the age and deteriorated condition of the facilities, may still fail to achieve proper function. Installation of solar panel arrays could help to offset the energy inefficiency of the existing facilities, but this would require expensive upgrades to old electrical systems. No mitigations exist for the issues of operational layout and need for enhanced internal and external collaboration.

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Appendices

Appendix A—Preliminary Impact Analysis Summary Table
Appendix B—Technical Report: Construction of the Energy and Minerals Research Center on the Colorado School of Mines Campus

Appendix A—Preliminary Impact Analysis Summary Table

Resource	Status (NP, PN, PI)*	Current Condition / Preliminary Analysis
Physical Resources		
Site Physical Characteristics and Land Formations	PN	The approximately 1.6-acre project area consists primarily of a flat, paved parking lot with gently to moderately sloping landscaped areas along the northeast edge and southwest corner of the lot. The site is bordered to the southeast by 18th Street, the southwest by the existing USGS Geologic Hazards Science Center, the northwest by the Colorado School of Mines (Mines) campus, and the northeast by an extended-width walkway which serves as an emergency vehicle access corridor. Vegetation in landscaped areas consists of grassy lawn, low-lying shrubs, and conifer and deciduous trees approximately 40 feet tall. The site generally slopes down from southwest to northeast, with surface runoff directed to a concrete-lined swale that parallels the extended-width walkway. Other existing elements of the built environment within the proposed building footprint include: • A large generator in a brick enclosure in the northeast portion of the parking lot that is associated with the Data Center Building to the northeast, • A backup generator (not enclosed) located near the parking lot entrance adjacent to 18th Street, • A parking lot lighting system, and • Underground utilities exist within the planned Energy and Minerals Research Facility (EMRF) building footprint. All of these features will need to be removed and relocated prior to construction of the EMRF. These are standard construction activities that can be completed using common BMPs to limit environmental impacts; detailed analysis for this resource is not required.
Geology and Soils	PN	Near-surface soil at the site consists of fill material from past disturbance and weathered claystone. The claystone grades to relatively unweathered claystone bedrock at depths ranging from about 16 to 32 feet below the existing ground surface (CTL Thompson 2019). The Natural Resources Conservation Service (NRCS) maps near-surface soil across the entirety of the project area as “Ascalon fine sandy loam, 5 to 9 percent slopes,” which has a moderate erosion rating (NRCS 2022). Because the site will be fully developed and landscaped with stormwater management features in place, soil erosion during construction will be the primary concern. Standard erosion control BMPs will likely be sufficient to mitigate this hazard and detailed analysis is not required for this resource.

Resource	Status (NP, PN, PI)*	Current Condition / Preliminary Analysis
Water Resources: Floodplains	NP	No floodplains present (FEMA 2020). No further analysis needed.
Water Resources: Groundwater and Surface Water	PN	The proposed action has potential to impact groundwater and surface water resources within the project area. The project area is located within the Jackson Street stormwater drainage basin (J1 subbasin) which drains to Clear Creek. Stormwater management operations are currently located on the Mines campus. Substantial groundwater presence and strict Colorado groundwater laws have influenced building design. Planned design features include a watertight design on basement levels that will eliminate the need for collection, discharge, and treatment of groundwater. During construction, groundwater will likely need to be pumped from excavations extending below the water table to provide for construction access and worker safety. Landscaped areas will be consumed by the building footprint causing a loss in greenspace and likely increases to stormwater runoff. However, BMPs are in place to minimize impacts during construction and existing stormwater capture does exist that currently captures runoff sufficiently from the surrounding areas, therefore a detailed analysis is not required for this resource. Suggested design standards or monitoring: • Updated stormwater analysis of the site should be completed once design is finalized. Manage surface water per future stormwater analysis and in accordance with BMPs for stormwater management and applicable codes and regulations • A dewatering plan should be developed to address ground and surface water present during excavation and construction. • Onsite infiltration facilities/galleries should be considered (if appropriate/reasonable)
Water Resources: Wetlands	NP	No wetlands present (U.S. Fish and Wildlife Service 2022b). No further analysis needed.
Biological Resources		

Resource	Status (NP, PN, PI)*	Current Condition / Preliminary Analysis
Vegetation and Landscaping	PN	Although the project area consists primarily of man-made features, a grassy knoll and row of mature pine trees bordering the existing USGS Geologic Hazards Science Center parking lot would be removed during construction of the proposed EMRF. These trees and green space represent potential nesting, breeding, and foraging habitat for various wildlife species that may be found in the urban environment, natural buffers for shade and aesthetics for humans, and buffers to dissipate runoff. However, while loss of vegetation would occur at this site because of the building placement, replanting of similar types of vegetation has been accounted for in the building design landscape plans, resulting in slightly reduced but similar benefits to urban wildlife, humans, and runoff dissipation. The Mines Campus Master Plan outlines plans for future development of the 18th Street research corridor. These developments include potential cumulative impacts to vegetative habitat from further loss or addition of landscaped vegetation. The beneficial or detrimental effects of these impacts depend on the details of these future developments, which are unknown at this time. Design standards or mitigations should be incorporated either onsite or on-campus as appropriate. Revegetation efforts will follow goals identified in the Mines Campus Master Plan. This includes utilization of native plants which consume less water, lend natural character to the campus, and provide a shady overstory where feasible. No further analysis is required.
Wildlife Resources	PN	Observations of urban wildlife species such as deer and small mammals are common on the Mines Campus, with occasional sightings of mountain lions in the residential areas surrounding campus. No wildlife, however, was observed within the project area during the site visit. Since potentially present species are capable of easily selecting similar, nearby habitats in response to construction disturbance, there will be no impacts to wildlife as a result of the proposed action, and these impacts will not be analyzed further.

Resource	Status (NP, PN, PI)*	Current Condition / Preliminary Analysis
Migratory Birds	PN	The Information for Planning and Consultation (IPaC) report identifies nine bird species of concern (U.S. Fish and Wildlife Service 2022a). Of these species, eight are identified by the U.S. Fish and Wildlife Service as Birds of Conservation Concern and nine species are migratory: • Bald Eagle (*Haliaeetus leucocephalus*) • Chimney Swift (*Chaetura pelagica*) • Clark's Grebe (*Aechmophorus clarkii*) • Ferruginous Hawk (*Buteo regalis*) • Lesser Yellowlegs (*Tringa flavipes*) • Lewis's Woodpecker (*Melanerpes lewis*) • Long-billed Curlew (*Numenius americanus*) • Long-eared Owl (*Asio otus*) • Red-headed Woodpecker (*Melanerpes erythrocephalus*) Removal of vegetation occurring prior to the migratory bird nesting season would not have an appreciable impact to migratory birds because of the amount of surrounding comparable vegetation. Any phases of project activities continuing through the breeding/nesting season would generate noise, dust, vibrations, and general disturbance to birds. These disturbances would function as a baseline condition to migrating birds while they select nesting and breeding sites and would deter migratory birds from selecting nest sites in the project area. The proposed action does, however, have potential to impact existing migratory bird nests in the project area as trees are removed. To offset this impact, pre-construction surveys should be conducted to identify any active migratory bird nests. If present, nest relocation or changes to construction timing and activities may be appropriate. There is also an increased potential for migratory bird mortality due to impacts with glass and reflective surfaces greater than six feet. Light and glare from the proposed action will be discussed in detail within the EA (see below), but impacts related to migratory bird collisions specifically can be reduced with implementation of appropriate design standards including: • Minimizing the reflectively of glass and mirrors on buildings with use of options such as decals, netting, screens, or shutters; fritted and patterned glass; UV-patterned glass, window films; translucent and opaque glass; or alternative surface coatings; and use of uneven surfaces where possible • Turn off or block lights illuminated from the building at night. Alongside with minimizing the reflectivity of glass, bird collisions can also be decreased by turning off lights or blocking lights in buildings at night, especially during spring and autumn migrations. Therefore, with the design standards above, no further analysis is needed related to migratory birds.

Resource	Status (NP, PN, PI)*	Current Condition / Preliminary Analysis
Federal Threatened and Endangered Species and Critical Habitat	NP	No federally Threatened or Endangered Species present. No Critical Habitat present (U.S. Fish and Wildlife Service 2022a). No further analysis needed.
State-Specific Species and Communities of Conservation Concern	NP	No state-specific species or communities of conservation concern present (Colorado Parks and Wildlife 2022). No further analysis needed.
Invasive Species	PN	Limited extent of greenspace within the project area and regular landscape maintenance activities on the Mines campus result in few opportunities for growth of invasive species. Construction of the proposed EMRF would reduce the amount of existing greenspace susceptible to growth and inhabitance of invasive species. The areas immediately adjacent to the project footprint are similarly developed and regularly maintained by landscape staff, meaning that any introduction of invasive plant species during construction activities are unlikely to have a substantial impact. Impacts related to invasive species are, therefore, expected to be minimal and have been eliminated from detailed analysis.
Man-made Resources		
Hazardous Materials (Hazardous Waste Substance and Disposal)	PI	If residual contamination is present from a former onsite leaking underground diesel fuel storage tank, the proposed action could expose construction workers to hazardous vapors. It could also result in encountering petroleum-contaminated soil that would need to be removed from the site for proper disposal. If that contaminated soil were allowed to remain in place, contaminated soil vapor could permeate the foundation of the planned structure and expose indoor workers. Additionally, the storage, handling, and emission of hazardous substances from exhaust fumes may have potential to impact the EMRF workers, individuals on campus, and nearby residences. These potential impacts are analyzed in detail in the EA.

Resource	Status (NP, PN, PI)*	Current Condition / Preliminary Analysis
Air Quality	PI	The proposed action has potential to impact air quality resources within the project area. Jefferson County is currently designated as being in non-attainment for ozone according to the 2008 and 2015 8-hour standard. Jefferson County is currently designated as being in attainment for all other criteria pollutants for which there are National Ambient Air Quality Standards (NAAQS). Since the project is in an ozone non-attainment area, the General Conformity Rule is applicable. Construction equipment, vehicles, and venting from lab operations would be potential sources of criteria pollutants, hazardous air pollutants (HAPs), greenhouse gases, and fugitive dust. Appropriate air quality permits will need to be obtained from the Colorado Department of Public Health and Environment (CDPHE) for the project facilities and land disturbance. Appropriate emission control equipment would need to be installed and operated in accordance with the construction and operating air permits. Operational emissions are expected to be below de minimis levels since these are sporadic and low in magnitude. These potential impacts are analyzed in detail in the EA.
Noise and Soundscapes	PI	The proposed action has the potential to impact soundscape resources within the project area, both temporarily during construction and permanently following construction. Noise levels generated by construction equipment vary significantly and depend on several different parameters such as the type, model, size, and condition of the equipment; the operation schedule; and the condition of the area being worked. Permanent potential increases in noise could come from HVAC, emergency generators, traffic, and structural form. The level of impact would be dependent on distance. Changes in operational noise levels from many of these sources would likely not be perceptible given the distances to sensitive receptors. Construction of the proposed building and continued development of the research corridor by Mines would create a 'street canyon effect' on 18th Street. This effect could lead to increased noise pollution affecting existing residential communities along 18th Street. The design of a dense, preferably evergreen, vegetative buffer along 18th street will decrease the impact of the 'street canyon effect' in this corridor. These potential impacts are analyzed in detail in the EA.
Visual or Viewshed	PI	The height of the EMRF building would make it one of the tallest buildings on campus. While this would not change the overall views or viewshed of individuals standing next to the proposed EMRF because of the other campus buildings, it would change the views of the surrounding hillsides of those residing in the adjacent neighborhood. Furthermore, views of the foothills southwest of the Mines campus will be cumulatively eliminated by the continued development of the planned Mines research corridor. Residents of single-family homes across 18th Street will see most of these effects. Visual impacts are analyzed in detail in the EA.

Resource	Status (NP, PN, PI)*	Current Condition / Preliminary Analysis
Open Space	PN	The footprint of the proposed structure will replace multiple existing greenspaces. A proposed greenspace redesign directly north of the proposed structure will be bisected by an accessible ramp. The project has been determined to be in accordance with local land uses and, as such, no further analysis is needed.
Aesthetics	PN	Proposed hardscape elements such as ECO-PRIORIA permeable paving systems, poured in place gray concrete sidewalks (75% sandscape texture, 25% broom finish), sandstone wall caps, and sandscape textured concrete stairs are to be in character with other hardscape elements on the Mines campus. Curbs, gutters, driveway pans, and sidewalks at property lines shall meet the City of Golden's requirements for street standards and specifications available on the City's website. Lighting fixtures shall match CSM campus lighting and design standards. Site furnishings including benches, ground lighting, trash containers, and directional signage shall be approved by Mines (USGS 2018). No further analysis needed.
Light and Glare	PI	The introduction of large facades of glass and bright colored hardscapes would increase glare to users walking alongside the proposed building on sunny days. Drivers traveling southwest on 18th Street may experience morning glare from the glass façade of the proposed building on sunny days. These potential impacts are analyzed in detail in the EA. Suggested design standards: Glass glare can be reduced by architectural elements such as overhangs, extruded frames around windows, and decreased window size. This is a common theme in other glass façade buildings on Mines' campus. Design standards related to light and glare impacts to migratory birds should also be incorporated as recommended above.

Resource	Status (NP, PN, PI)*	Current Condition / Preliminary Analysis
Utilities and Energy Sources	PN	Mines has its own electrical primary distribution network which is fed by XCEL Energy. The campus substation is located at the northwest corner of the intersection of Elm Street and 19th Street. The Mines distribution system is a 13.2KVA system. A new underground electrical primary will need to be extended from the substation to the new building. The overhead power line running along the north side of 18th Street is owed by XCEL Energy and is proposed for conversion to an underground line. This line appears to be a transmission line from the size of the poles, conductors, and the insulators. However, the line was verified by XCEL to be a primary distribution line. Mines heating comes from a steam system that runs throughout campus in a system of tunnels. The steam system and tunnel system that supports it will be extended to the new building. Mines also has a separate "chilled" water system that runs throughout campus. The chilled water system will also be extended to the new building. New energy line installation and the relocation of existing lines would be completed in accordance with standard construction BMPs and all applicable codes to limit environmental impacts. No further analysis is needed.
Water Quality and Supply	PN	Water would be supplied by the City of Golden. The water distribution main along 18th Street will not need to be upsized to account for increase capacity due to the addition of the EMRF. The existing water main consists of 6" PVC with a static system pressure of about 100psi. Water quality is not anticipated to be affected by the new building. Impacts related to water quality and supply are, therefore, expected to be minimal and have been eliminated from detailed analysis.

Resource	Status (NP, PN, PI)*	Current Condition / Preliminary Analysis
Transportation and Parking	PI	Parking development specific for this building is not planned as part of the proposed project. Parking options are currently available directly adjacent to this structure and could be used by staff and building visitors. Long-term, a parking structure is planned two blocks away as part of the research block development proposed in the Mines Master Plan. This parking structure is planned as a separate project, not within the purview of this analysis. However, a portion of this structure is dedicated to accommodating EMRF parking demands and is sufficient to support the capacity of this building. Parking demand associated with the parking structure and the EMRF has already been analyzed in a Traffic Impact Study completed by Kimley-Horn and Associates, Inc. (2019) and is analyzed in further detail in the EA. Other transportation related issues include building access, single-occupancy vehicle use, multimodal use, and public transit. These elements will be mostly programmatic in nature and likely will not include infrastructure improvements. Regardless, these transportation related impacts will be analyzed in detail in the EA.
Delivery of Supplies and Disposal of Solid Waste	PN	The construction of a new building will require the need for increased capacity for deliveries and additional solid waste disposal, including lab waste. Currently, service deliveries and solid waste removal is occurring for existing buildings surrounding this location on the Mines campus. Additional delivery or removal needs would be coordinated with existing services on campus; sufficient capacity exists to accommodate additional needs. Specifically for delivery, the proposed EMRF would add additional needs for potential deliveries related to food service, office supplies, lab supplies, chemicals, and gases. The type and need for these supplies are present on campus and would not be new in relation to other office and laboratory spaces already in existence. Services such as gas cylinder delivery to the Alderson building would shift to a new curb cut on Illinois Street and would be replaced by a receiving bay on the new building of the USGS building. Service access to the building would need to be rerouted utilizing the 17th Street pedestrian corridor. Solid waste disposal requirements of the new building would not be anticipated to differ significantly compared to adject buildings and laboratory needs on campus, nor in the type or amounts of solids to dispose. USGS laboratories at Denver Federal Center (DFC) are currently very small and small quantity (VSQG and SQG) generators, which would not add appreciably to the current amounts generated on campus. USGS already has licenses with the state of Colorado for radiological work that would be used for any USGS-related radiological activities occurring within the building. Impacts related to service deliveries and solid waste disposal are, therefore, expected to be minimal and have been eliminated from detailed analysis.

Resource	Status (NP, PN, PI)*	Current Condition / Preliminary Analysis
Socioeconomic Resources		
Socioeconomic/Land Use/Zoning/Housing	PI	A variety of socioeconomic impacts could occur as a result of the proposed action and cumulatively with additional developments along the 18th Street research corridor as outlined in the Mines Campus Master Plan (Colorado School of Mines 2021). Due to increased traffic and visual impacts along 18th Street, residents of the adjacent neighborhood may experience temporary and/or long-term fluctuations in home values. Additionally, populations working within or visiting the EMRF may be subject to socioeconomic impacts arising from increased transportation and parking costs. These socioeconomic impacts are analyzed in detail in the EA.
Environmental Justice	PI	Executive Order (EO) 12898 – *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* (59 FR §7629) requires federal actions to identify and address disproportionate adverse human health or environmental effects on minority and low-income populations. With potential socioeconomic impacts associated with the proposed EMRF, it is possible that those impacts will disproportionately affect marginalized communities. Potential disproportionate impacts from this project could result from traffic increases, home value changes, and gentrification. The EO also stipulates that low-income and minority populations are to be provided with access to public information and the public participation process. Issues pertaining to environmental justice are analyzed in detail in the EA.

Resource	Status (NP, PN, PI)*	Current Condition / Preliminary Analysis
Cultural Resources		
Cultural and Historic	NP	No cultural resource identification surveys have been conducted of the project area, but there is no utility in undertaking such a study as no intact (potentially culture-bearing) sediment remains in the project area. If such deposits did exist, those deposits would not be visible due to previous development of the area to a parking lot with surrounding landscaping (grass and pavement). Historic records show that as early as 1886, the project area was used as a "public square" (based on 1886 Sanborn Fire Insurance Maps for Golden). The parcel remained a public square or park through at least 1938, per the last Sanborn map of Golden. In 1951 the 12-acre parcel was acquired by Mines and, by 1953, three-quarters of the park had been levelled for parking and structures (namely Alderson Hall, and the 1953 Jefferson County Courthouse). Photos from construction of the Jefferson County Courthouse clearly show the project area itself remained as the lone hilled area without development. However, it was certainly no longer a park-like setting in 1953. Formal development of the project area occurred between 1980 and 1983, when the building that houses the USGS Geologic Hazards Science Center was built. That development leveled the natural hill that was once part of a park for the early City of Golden. There will be no Direct Effects to cultural resources from the current project, as all impacts to the property pre-date 1983. Therefore, cultural and historic resources have been excluded from detailed analysis.

Resource	Status (NP, PN, PI)*	Current Condition / Preliminary Analysis
Cultural Landscape and Historic Buildings/Architecture	NP	The project area sits along the southeastern edge of the original town of Golden and the south-eastern corner of the Mines campus. There are no standing buildings or structures within the project area itself. The parcel is, however, on a campus that contains historic structures and across 18th Street from a residential area. In short, prior development of this portion of the Mines campus has already substantially altered the setting of the area. Construction of the current project will not change the current viewshed of historic buildings in the area because those impacts occurred between 1957 and 1980. From as early as 1886, houses built south of 18th Street and west of Illinois Avenue were built in a relatively isolated part of Golden, near a tree-covered park. That park remained in place and undeveloped until 1953. Residences built prior to 1953, when the park was mostly removed, no longer retain a setting similar to the historic setting. The small portion of the park that remained in the project area was levelled between 1980 (aerial showing it intact) and 1983. The project area is bordered by residential development to the south and west, and the Mines campus to the north and east. The surrounding structures, whether residential, business, or academic in nature, are highly eclectic. The area around the project reflects an evolving development with architecture dating from 1889 to present. There is no clear theme to the residential area, although it certainly reflects the general growth of Golden. Although the historic nature in the project vicinity might lend itself to concerns about affecting the landscape or setting of the neighborhood, modern buildings, parking lots, and businesses already impact the viewshed. Residential structures bordering the project area date from 1889 thru 1967, while business and academic structures range from 1957 to modern. Because this location was on the margin on Golden, with a public square (park) and growing campus nearby, the area was appealing for houses in the early part of Golden's settlement (1880-1924). By 1930, the Mines campus reached the residential area through southern expansion, with the Sigma Nu Fraternity House being built at the nearby corner of 18th Street and Illinois Avenue in 1928. By the 1950s, Mines was building larger academic buildings and parking areas as well as the new 1953 Jefferson County Courthouse (on what is now the Mines campus). Impacts to historic structures and the cultural landscape would be negligible and have been excluded from detailed analysis.

Resource	Status (NP, PN, PI)*	Current Condition / Preliminary Analysis
Other		
Climate and Greenhouse Gases	PN	Increased energy consumption and operation of gas and diesel-powered equipment and generators during construction will temporarily increase greenhouse gas contributions from the project area. However, once built, the building design is expected to have emissions reflective of increased energy efficiencies. Compared to the ongoing greenhouse gas production of transportation, development, and energy consumption within the greater Denver metropolitan area, the proposed action is not anticipated to have a substantial effect on local and global climate trends. Climate impacts related to production of greenhouse gasses during the construction and operation of the EMRF are, therefore, eliminated from detailed analysis. Guidance from the CEQ provides recommendations to agencies for properly analyzing the impacts of GHGs generated as a result of the proposed action. Although no appreciable emissions impacts are anticipated at a county, state, or national scale, project emissions and their effects were modeled in accordance with the CEQ guidance and disclosed in the analysis. In accordance with CEQ guidance, GHG emissions and their associated social costs will be discussed as part of the detailed analysis for Sustainability.
Sustainability	PI	Given Bipartisan Infrastructure Law funding and the size of the proposed EMRF, this project is subject to EO 14057 – *Catalyzing Clean Energy Industries and Jobs Through Federal Sustainability* (3 C.F.R. §70935), which outlines a suite of sustainability criteria for federal facilities. These include, but are not limited to: • Achieving net-zero emissions and, where possible, net-zero water and waste for new federal construction projects over 25,000 gross square feet. • Installation of EVSE infrastructure to support a fully electric vehicle fleet, where feasible. • Reduce contribution of construction waste and debris to landfill and other waste disposal facilities. • Location decisions that prioritize sustainable land use, reduced greenhouse gasses, efficient integration with existing infrastructure, public transportation access, and coordination with the development plans of state, Tribal, and local governments that advance these goals. Existing USGS facilities at the DFC are highly inefficient. By relocating these operations to a new building which adheres to the sustainability requirements identified in EO 14057 (3 C.F.R. §70935), the USGS will substantially increase the efficiency and sustainability of its operations. These long-term impacts will be analyzed in detail in the EA, along with GHG emissions and associated socials costs as recommended by CEQ.

Resource	Status (NP, PN, PI)*	Current Condition / Preliminary Analysis
Health and Human Safety (Construction and Employee Workspace)	PN	Potential impacts to health and human safety exist because of the proposed construction activities. These include airborne dust, excess construction noise, storage of large quantities of hazardous materials, and exhaust fumes from equipment and generators that may affect students, staff, and visitors on the Mines campus and residents of the surrounding neighborhood. In addition, construction activities will result in the need for a temporary closure of the Cheyenne Street pedestrian corridor, which is currently used as an active emergency vehicle access route. Impacts from construction that would impact health and human safety are currently already captured in other sections (see air quality section and noise and soundscapes section) that will be analyzed in detail in the EA. Design measures related to vehicle accessibility of the Cheyenne Street pedestrian corridor should be taken to address campus safety and offset this impact. Closure design measures could include narrowing the hardscape, meandering the path for speed reduction, introducing bollards, and adding vegetative buffers. Such a closure, even if temporary, would need to be accompanied by a safety analysis of campus emergency vehicle access and a new emergency vehicle route. Additionally, impacts will occur regarding the health and safety of the workspace for USGS staff. While security will be similar between buildings because of conformance with USGS Survey Manual 440.2 – Physical Security Program, conditions of workspaces would change. Existing workspaces on the DFC campus are located in old buildings that have served various purposes throughout history, including ammunition manufacturing. These past uses and age of the buildings may contribute to existing concerns of staff health and safety with the facilities. By relocating USGS Energy and Minerals operations to new, modern facilities, workplace safety and health will be increased for these staff members. These benefits and impacts are known and meet the purpose and need. Further analysis is not needed.

Resource	Status (NP, PN, PI)*	Current Condition / Preliminary Analysis
Human and Working Environment (Effective Workspaces and Collaborative Environment)	PN	Impacts will occur to the layout and effectiveness of USGS workspaces because of the proposed action. Improvements will be made to environmental control and, as a result, efficiency of work involving high-sensitivity equipment. Associated offices and laboratories will be brought into close proximity, eliminating the need for routine, lengthy trips between buildings or across sprawling floor plans, which is common at the existing facilities on the DFC campus. These impacts are well-understood, fulfill the purpose and need for the proposed action, and do not merit detailed analysis as part of the EA. The proposed action will also have impacts on existing opportunities and goals for a collaboration between USGS and Mines. Together under one roof, the need for travel between the DFC and Mines campus would be eliminated and would provide additional opportunities for staff to work together on research and co-mingle in shared locations. While collaboration is still facilitated between USGS and Mines because of this shared space, USGS security requirements may cause barriers to the ease of access, particularly by Mines students and the public, to participate in the shared goal of a highly collaborative research environment. However, while this access would be restricted, it would not be eliminated. It is suggested that a review and identification of all options, including spaces outside of this building, which provide for collaborative space between USGS and Mines staff, students, and the public, be reviewed to help identify opportunities for meeting this purpose while still ensuring security according to USGS Survey Manual 440.2 – Physical Security Program. Additional analysis is not needed within the EA.
NP= Not Present PN=Present but Not Impacted PI=Present and Potentially Impacted		

APPENDIX B: TECHNICAL REPORT

Construction of the Energy and Minerals Research Center on the Colorado School of Mines Campus

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February 3, 2023

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Technical Report – Energy and Minerals Research Facility

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Acronyms and Glossary

AASHE – Advancement of Sustainability in Higher Education

ACGIH – American Conference of Governmental Industrial Hygienists

APEN – Air Pollutant Emission Notice

ASHRAE – American Society of Heating Refrigeration, and Air Conditioning Engineers

ASTM – ASTM International

CAA – Clean Air Act

CDPHE – Colorado Department of Public Health and Environment

CER – Central Energy Research Science Center

CERCLA – Comprehensive Environmental Response, Compensation, and Liability Act 1980

CERFA – Community Environmental Response Facilitation Act 1992

CFE – Carbon Pollution-free Electricity

CI – Compressed Ignition

CO – Carbon Monoxide

CO_2 – Carbon Dioxide

CO_2e – Carbon Dioxide Equivalent

CPP – CPP, Inc.

CTLM – Center for Technology and Learning Media

DFC – Denver Federal Center

Dv - Deciviews

EHS – Environmental Health and Safety Department

EMRF – Energy and Minerals Research Facility

EPA – Environmental Protection Agency

EPCRA – Emergency Planning and Community Right-to-Know Act of 1986

ESA – Environmental Site Assessment

EWS – Exterior Wall Surface

G3 – Geology, Geophysics, and Geochemistry Science Center

GHGs – Greenhouse Gases Emissions

GSA – General Services Administration

HAPs – Hazardous Air Pollutants

HMWMD – Hazardous Materials and Waste Management Division

HVAC – Heating, Ventilation, and Air Conditioning

Hz – Hertz

IMPROVE – Interagency Monitoring of Protected Visual Environments

L_d – Daytime Equivalent Sound Levels

L_{dn} – Day-night Average Sound Levels

LEED – Leadership in Energy and Environmental Design

L_{eq} – Energy-averaged Sound Levels

L_{max} – Maximum Sound Level

L_n – Nighttime Equivalent Sound Level

LOS – Level of Service

LUST – Leaking Underground Storage Tank

Mines – Colorado School of Mines

NAAQS – National Ambient Air Quality Standard

NEI – National Emissions Inventory

NEPA – National Environmental Policy Act

NESHAP – National Emission Standards for Hazardous Air Pollutants

NO_2 – Nitrogen Dioxide

NO_x – Nitric Oxide and Nitrogen Dioxide

NPS – National Park Service

NSA – Noise Sensitive Area

NSPS – New Source Performance Standards

NSR – New Source Review

NZE – Net-zero Emissions

O_3 – Ozone

OPS – Colorado Division of Oil and Public Safety

Pb – Lead

PM_{10} – Particulate Matter smaller than 10 microns in aerodynamic diameter

$PM_{2.5}$ – Particulate Matter smaller than 2.5 microns in aerodynamic diameter

PSD – Prevention of Significant Deterioration

RCNM – Roadway Noise Construction Model

RCRA – Resource Conservation and Recovery Act of 1976

RMP – Risk Management Program

SAA – Satellite Accumulation Area

SARA – Superfund Amendments and Reauthorization Act 1986

SGHAT – Solar Glare Hazard Assessment Tool

SO_2 – Sulfur Dioxide

SO_x – Sulfur Oxide and Sulfur Dioxide

STARS – Sustainability Tracking, Assessment, and Rating System

TPY – Tons Per Year

USGS – United States Geological Survey

UST – Underground Storage Tank

WUI – Water Use Intensity

1. Introduction

The United States Geological Survey (USGS), in collaboration with the Colorado School of Mines (Mines), has proposed to construct an Energy and Minerals Research Facility (EMRF) on the Mines campus in Golden, Colorado (proposed action; see the Environmental Assessment for a full description). This building will provide laboratory and office spaces for the staff of the Geology, Geophysics, and Geochemistry (G3) Science Center and Central Energy Resources (CER) Science Center who are currently located at the Denver Federal Center (DFC) in Lakewood, Colorado. In addition, the building will provide office and laboratory spaces for Mines staff and students. This building is part of the Mines' proposed developments of the 18th Street research corridor. As shown in Figure 1 below, the project area is located along the southern edge of the Mines campus, directly northeast of the existing USGS building on 18th Street.

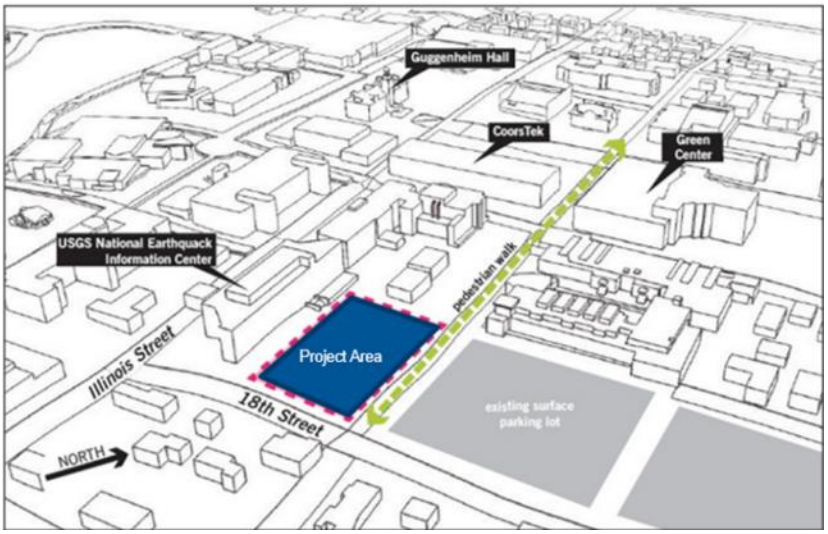

Figure 1 Proposed Project Area on Mines Campus

This technical report provides detailed analyses of the affected environment and discloses potential impacts to resources analyzed. Resources determined not to be present in the project area or not impacted via preliminary analysis are summarized and discussed in the Preliminary Impact Analysis Summary Table, which is included as Appendix A in the EMRF Environmental Assessment. The findings of this technical report will be summarized and discussed in an Environmental Assessment.

2. Analysis Methodology

2.1 Assumptions for Analysis

The analyses herein are based on the following assumptions:

- Unless otherwise stated, the analysis area includes the proposed building location on the Mines campus, adjacent staging area to the northeast of the proposed building location, and the residential neighborhood adjacent to the 18th Street.
- No major changes to rights-of-way will be required.

- The building will have a maximum footprint of 50,000 square feet and an anticipated capacity of up to 300 staff, of which it is assumed that up to 250 will be USGS staff relocating from the DFC.
- The Mines Campus Master Plan accurately represents the reasonably foreseeable developments along the 18th Street research corridor.
- Socioeconomic data available through online tools provided by the federal government accurately represent existing conditions.
- The traffic impact study completed for the proposed parking garage is approved and currently valid.
- The USGS or Mines will develop and provide a plan for construction that includes laydown areas and contractor parking areas.
- Construction equipment will be typical of a large building construction project.
- Emission estimates prepared to support any permit applications for disclosing operational emissions impacts are accurate and well-referenced.

2.2 Analysis Process and Focus

The analysis process and focus vary by resource. Specifics relevant to each resource are described in Sections 3.1–3.9 of this document. The general process used for all analyses was to identify direct, indirect, and cumulative impacts associated with the proposed action and recommend design standards to limit or offset negative impacts for each of these. Where applicable, mitigation measures to further lessen or compensate for anticipated impacts are recommended.

Direct impacts are caused by the proposed action and occur at the same time and place as the action. Indirect impacts are also caused by the proposed action but occur later in time or are further removed in distance. Cumulative impacts are those impacts resulting from the incremental impact of an action when added to other past, present, and reasonably foreseeable actions, regardless of what agency or person undertakes such other actions. Most cumulative impacts for this project relate to the proposed future developments of the 18th Street research corridor outlined in the Mines Campus Master Plan (2021). These developments would have very similar impacts to the proposed action and would take place over several years.

Design standards are features of the design that reduce or eliminate anticipated negative impacts. Design standards for the various resources are recommended where applicable. Mitigation measures are responsive actions used to decrease the negative impacts of the proposed action that cannot be managed through the implementation of design standards. Where applicable and within reason, mitigation measures have been identified for negative impacts stemming from the proposed action.

2.3 Legal

Compliance with applicable regulations and policies includes the completion of procedural requirements, which include public notices; consultation, coordination, and cooperation with stakeholders and interested publics; and completion of the applicable level of National Environmental Policy Act (NEPA) review. These procedural requirements are dictated by the following acts, regulations, executive orders, directives, and local codes and ordinances:

- National Historic Preservation Act of 1966 as amended (54 USC § 306108) and its implementing regulations (36 CFR Part 800)
- NEPA of 1969 (42 U.S.C. § 4321 et seq.)
- NEPA Implementing Regulations (40 CFR § 1500 et seq.)
- NEPA Guidance on Consideration of Greenhouse Gas Emissions and Climate Change (88 FR 1196)
- Endangered Species Act of 1973 (16 U.S.C. § 1531 et seq.)
- Clean Water Act of 1972 (33 U.S.C. § 1251 et seq.)
- Section 402 (Stormwater)
- Clean Water Act Regulations (40 CFR § 100 et seq.)
- Clean Air Act of 1977 (42 U.S.C. § 7401 et seq.)
- Clean Air Act Regulations, including National Ambient Air Quality Standards (40 CFR § 50 et seq.)
- Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986 SARA and the Community Environmental Response Facilitation Act of 1992.
- Pollution Prevention Act of 1990
- Toxic Substances Control Act of 1976, as amended
- Emergency Planning and Community Right-to-Know Act of 1986
- Resource Conservation and Recovery Act of 1976, as amended by the Superfund Amendments and Reauthorization Act of 1986 SARA and the Community Environmental Response Facilitation Act of 1992
- EO 14057 – Catalyzing Clean Energy Industries and Jobs Through Federal Sustainability (3 CFR 70935)
- EO 12191 – Federal Facility Ridesharing Program (45 FR 7997, 3 CFR, 1980 Comp., p.138)
- EO 12898 – Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (59 CFR 7629)
- USGS NEPA Handbook (SM 516.1) (August 2016)
- Occupational Safety and Health Program Requirements Handbook (445-2-H)
- City of Golden Municipal Code
- Jefferson County Noise Abatement Policy (Part 3, Regulations Chapter 1, Noise Section 1)
- Colorado Department of Public Health and Environment Air Quality Control Commission (Regulation No. 3)
- Code of Colorado Regulations (5 CCR 1001-2)

- Public Protections from Toxic Air Contaminants (HB22-1244)
- Colorado Water Quality Control Act of 1974

  Colorado Groundwater Regulations (5 CCR 1002-41, -42)

3. Detailed Analysis of Potentially Impacted Resources

The following is the analysis of potentially impacted resources. Issue statements were created to help focus the analysis from both internal and external scoping.

3.1 Transportation and Parking

3.1.1 Issue Statements

- Would the building increase traffic and parking needs in the local area? If so, will the traffic and parking demands impact the local infrastructure, residential neighborhoods, and traffic patterns?
- Would the EMRF's trip generation and parking needs and characteristics adversely impact the local transportation system?
- What programs can be developed or enhanced to reduce the impacts on the local transportation system?
- Will EMRF construction create traffic impacts during the construction process, and, if so, how will they be mitigated?

3.1.2 Affected Environment

Within the project area, the affected environment includes roadways adjacent to the planned EMRF, the future parking garage site, and other transportation related infrastructure.

Policies relevant include EO 12191 – *Federal Facility Ridesharing Program* (45 FR 7997, 3 CFR, 1980 Comp., p.138) and the USGS incentives for alternate modes of commuting. These incentives provide a cash stipend to staff who utilize modes of transportation other than single occupant vehicles. The existing USGS site at the DFC has a large amount of surface parking adjacent to the USGS buildings that provides a disincentive for alternate modes of transportation. The parking is included inside a secured perimeter with limited access control points. The secured perimeter also acts as a disincentive for transit related trips and walking trips since transit users are required to disembark approximately ¾ of a mile from the USGS buildings.

The existing surface transportation system surrounding the proposed EMRF building site in Golden consists of two-lane, two-way streets with stop control at intersections. The street system is arranged in a grid pattern with multiple redundant access points and routes to the site. This system features adequate capacity for current levels of traffic.

3.1.3 Direct and Indirect Impacts

3.1.3.1 Alternative A – Proposed Action

3.1.3.1.1 Parking

The proposed EMRF building footprint will displace 86 parking spaces located in the parking lot of the USGS Geologic Hazards Science Center. In addition, the proposed EMRF building is anticipated to

house a maximum of 250 USGS staff members that currently work at the DFC. To determine the daily average parking demand associated with the ERMF, the following factors were considered:

- Mines staff members that will be present in the EMRF are already located on-site and, therefore, do not represent a new transportation burden.
- Up to 75 percent of USGS staff members currently utilize the maximum remote work allowance of working remotely 8 out of 10 days.
- Of the 250 USGS staff members relocating from the DFC to the EMRF, approximately 50 are lab personnel that are on-site each day. The other 200 staff members are not on-site every day and utilize the remote work policy.
- USGS is currently experiencing approximately 20 percent of the non-lab staff members being on-site on an average day yielding approximately 40 non-lab staff members on-site each day.
- Forty non-lab staff members and 50 lab staff members on-site each day yields a total of 90 staff members on-site each day.
- The EMRF building will be designed to Leadership in Energy and Environmental Design (LEED) Silver or Gold standards and will include bicycle parking directly outside the building and showers inside the building to facilitate bicycle commuting.
- The building site is changing from an isolated location with a secured perimeter to being located directly in a college campus surrounded by housing, sidewalks, bicycle infrastructure, transit service and rideshare opportunities that will encourage transportation options other than single occupant auto.
- The USGS has an incentive program that provides a monthly stipend for staff members choosing to commute by public transit, bicycle, or walking.
- The existing facilities at the DFC have plentiful, free, and adjacent surface parking while the new site will have paid parking in a parking structure which will act to diminish demand for parking.

Based on these factors, if the anticipated number of daily staff members all drove private automobiles to the EMRF, a maximum of 90 parking spaces are expected to be needed each day for the staff members relocating to the EMRF. Including the existing 86 displaced parking spaces in the Geologic Hazards Science Center lot yields a maximum parking need of 176 parking spaces.

If the remote work policy were modified and more of the 250 USGS staff members commuted to the ERMF on a daily basis, the following factors would apply to parking demand:

- Of the 250 expected daily USGS staff members, a portion would not drive their own private automobile to the ERMF.
- Five-year estimates from the American Community Survey estimate that, from 2016 to 2020, 65.5 percent of the Golden workforce commuted alone via private automobile (U.S. Census Bureau 2020).
- A conservative assumption is that only 25 percent of ERMF staff would choose an alternate mode of transportation or would work remotely on any given day. This would result in 75

percent of the ERMF staff or 188 staff members commuting to the EMRF alone via private automobile on an average day.

- Adding the 86 displaced parking spaces to the 188 new staff parking spaces yields a maximum demand of 274 parking spaces needed.

Mines is currently constructing a 934-space parking structure a few hundred feet from the proposed EMRF building site. The traffic impact analysis for the structure indicates that this will result in 584 net new parking spaces that are available for new uses (Kimley-Horn and Associates 2019). The estimated current parking demand for the new ERMF facility of 176 spaces can easily be accommodated in the new parking structure. If the remote work policy changed and more staff members commuted to the EMRF each day, a maximum of 274 parking spaces would need to be accommodated in the new parking structure. This conservative maximum potential parking demand is also within the capacity of the new parking structure. Mines and USGS are in negotiations regarding the details of the use of this new parking structure. There are no parking impacts associated with the proposed design of the EMRF building.

3.1.3.1.2 Traffic

The Traffic Impact Analysis for the new Mines parking structure analyzed the traffic impacts of up to 600 new parking spaces which inherently includes the EMRF parking needs. Traffic capacity analysis results are identified in terms of Level of Service (LOS). LOS is a qualitative term describing operating conditions a driver will experience while traveling on a particular street or highway during a specific time interval. It ranges from A (very little delay) to F (long delays and congestion). For intersections and roadways in this analysis area, typical standard traffic engineering practice recommends intersection LOS D as the minimum threshold for acceptable operations for overall intersections and LOS E for movements and approaches. The Traffic Impact Analysis found no intersections in the analysis area that would operate worse than LOS D upon completion of the parking structure nor in a horizon year of 2040 (Kimley-Horn and Associates 2019). Therefore, there are no traffic impacts associated with the proposed EMRF building.

3.1.3.1.3 EMRF Construction Activities

Potential temporary impacts associated with the construction of the EMRF building were considered. Mines has developed a construction plan that accommodates all contractor laydown needs and parking needs off-street in current Mines facilities. Additionally, construction-related traffic activity traditionally occurs prior to the morning peak hour and before the afternoon peak hour. The Traffic Impact Study for the parking structure identified significant spare traffic capacity on the surrounding street system and no long-term roadway closures are anticipated to be needed for construction activities (Kimley-Horn and Associates 2019). Therefore, no construction-related parking or traffic impacts are anticipated for this project.

An assessment of potential indirect impacts from additional trips to/from the area based on research synergies and collaboration was considered. During conversations with USGS staff, it was discovered that most of these potential trips are assumed to be from within the Mines campus itself and not from outside the area. Those trips would not be auto related and would not impact parking or transportation systems. For those trips that would originate outside the area, given the additional capacity available in the new parking structure and the additional traffic capacity available on the roadway system, no indirect impacts are expected.

During discussions with USGS staff, it was identified that two loading bays able to accommodate a heavy-duty pick-up truck with a 25 ft attached trailer would be required. This need is being incorporated into the design of the proposed EMRF building.

3.1.3.2 Alternative B – No Action

The No Action alternative will not impact transportation or parking.

3.1.4 Cumulative Impacts

Cumulative impacts include Mines' plans for future development of the 18th Street research corridor identified in the Mines Campus Master Plan. There is also a possibility of attracting other government or private sector development in the analysis area that generates additional vehicle trips and transportation system demands. The planned excess capacity in the new parking structure and the spare capacity in the surrounding transportation system will be able to accommodate the needs of these planned and potential developments in the area.

3.1.5 Design Standards

USGS has incorporated travel demand management programs into the project design. These include:

- Ride sharing policies (per EO 12191),
- Continuation of USGS remote work policies,
- Convenient bike parking located adjacent to the EMRF, and
- Inclusion of shower/locker facilities in the building design.

3.1.6 Mitigation Measures

There are no foreseeable mitigation measures required for this resource. Although not required, recommendations for minimizing single occupant vehicle use related to the new building include:

- Signage on building promoting bike friendliness.
- Kiosk with information on alternate modes of transportation. Also incorporate this information into USGS website and Google maps, etc.
- Modify building access to make the first floor accessible without security clearance.

3.2 Hazardous Materials (Hazardous Waste Substance and Disposal)

Project-related actions may affect human health and safety via potential exposure to hazardous waste substances generated by operations and disposal of hazardous materials. Additionally, existing environmental concerns in the project area and surrounding area could be affected by the proposed action. This analysis describes the existing environmental conditions and the potential hazardous materials impacts resulting from operation of the proposed action.

3.2.1 Issue Statements

- Based on the environmental history and current status of the project area and surrounding area, would existing conditions, with respect to hazardous materials, hazardous substances, and petroleum products, be affected by the proposed action?

- Would hazardous materials used or generated in the EMRF labs impact current options for disposal?
- What type of hazardous materials would be used in the labs and do these operations pose any potential harm to members of the adjacent residential neighborhood?

3.2.2 Affected Environment

3.2.2.1 Regulatory Applicability

The potential impacts resulting from hazardous materials collection, control, and disposal are assessed under five primary laws that govern the handling and disposal of hazardous materials, chemicals, substances, and wastes:

- Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, (as amended by the Superfund Amendments and Reauthorization Act of 1986 [SARA] and the Community Environmental Response Facilitation Act of 1992 [CERFA]),
- Pollution Prevention Act of 1990,
- Toxic Substances Control Act of 1976, as amended,
- Emergency Planning and Community Right-to-Know Act (EPCRA) of 1986, and
- Resource Conservation and Recovery Act (RCRA) of 1976, (as amended by SARA and CERFA).89.

The statute that is the most pertinent to USGS actions to construct and operate a research laboratory facility is the RCRA. The RCRA governs the generation, treatment, storage, and disposal of hazardous wastes.

Section 112(r) of the Clean Air Act (CAA) Amendments requires the U.S. Environmental Protection Agency (EPA) to publish regulations and guidance for chemical accident prevention at facilities that use certain hazardous substances. These regulations and guidance are contained in the Risk Management Program (RMP) rule. The RMP rule requires facilities that use extremely hazardous substances to develop a Risk Management Plan which:

- Identifies the potential effects of a chemical accident,
- identifies steps the facility is taking to prevent an accident, and
- spells out emergency response procedures should an accident occur.

These plans provide valuable information to local fire, police, and emergency response personnel to prepare for and respond to chemical emergencies in their community. Making RMPs available to the public also fosters communication and awareness to improve accident prevention and emergency response practices at the local level.

The EPA has established accidental release prevention and risk management plan requirements as part of 40 CFR Part 68 (Chemical Accident Prevention Provisions). Part 68 lists regulated substances along with thresholds for determining the applicability of the associated requirements. If a regulated substance is handled, stored, or processed in greater than threshold quantities at a stationary source, then a risk management plan must be prepared.

Even if a facility is not required to prepare a risk management plan, the General Duty Clause in the CAA requires owners of any facility that produces, processes, handles, or stores regulated substances or other extremely hazardous substances on-site be continuously vigilant about potential hazards and methods of minimizing the consequences of accidental releases.

The EPCRA was created to help communities plan for chemical emergencies and requires industries to report on the storage, use and releases of hazardous substances to federal, state, and local governments. The EPCRA requires state and local governments, and Indian tribes to use this information to prepare for and protect their communities from potential risks. Sections 301 through 303 require that any facility that maintains extremely hazardous substances on-site in quantities greater than corresponding threshold planning quantities must cooperate in emergency plan preparation, while Section 304 requires that facilities must immediately report accidental releases of extremely hazardous substances and hazardous substances defined under CERCLA. Any releases of these substances in quantities greater than their corresponding reportable quantities must be reported to state and local officials.

Additionally, Colorado Department of Public Health and Environment (CDPHE) has its own hazardous waste regulations under 6 CCR 1007-3 Part 262. The regulations in this part establish standards for generators of hazardous waste as defined in § 260.10 of these regulations. A facility that generates a hazardous waste must comply with all the applicable independent requirements depending on the generator category. These requirements generally include annual fees, hazardous waste determination and recordkeeping, additional reporting, generator category determination, and notifications. A generator must use § 262.13 to determine which provisions of this part are applicable based on the quantity of hazardous waste generated per calendar month.

3.2.2.2 Environmental History

A limited Phase I Environmental Site Assessment (ESA) was completed to satisfy one of the due diligence requirements to qualify for the innocent landowner, contiguous property owner, or bona fide prospective purchaser limitations on CERCLA liability, prior to acquisition of the subject property.

The project area consists primarily of man-made features such as paved surfaces, utilities infrastructure, and landscaped greenspace. The past uses of the project area include residential use, parking lot, vacant land, and a baseball field. Two buildings were constructed within or partially within the project area in the 1960s. One building was within the northeastern portion of the project area and the other was along the northwest edge of the project area. One of these was the Jefferson County Hall of Justice, at what was then 1701 Arapahoe Street. The buildings were demolished in the 2000s and replaced with parking lots (Nationwide Environmental Title Research, LLC 2022, USGS 2022, Google Earth 2022).

A leaking underground storage tank (LUST) was identified near the middle of the project area at the former location of the Jefferson County Hall of Justice, at what was 1701 Arapahoe Street. A diesel fuel tank was installed in 1965 for fleet fueling, which later leaked. This case is closed, and the state approved no further action status for the site (CDPHE 2022a–c, Colorado Department of Labor and Employment [CDLE] 2022, Environmental Data Resources, Inc. [EDR] 2022). No further documentation is readily available.

Several LUST sites were identified within 0.5 mile of the project area (CDPHE 2022a–c, CDLE 2022, EDR 2022). These LUST cases have been remediated and closed except for the following:

- An unnamed former gas station located 0.28 mile east of and cross gradient to the project area at 2120 Ford Street. A release was discovered in 2018 and remediation is being led by the state.
- Jackson Street Station located 350 feet east of and cross gradient to the project area at 1820 Jackson Street. A release was discovered in 2011 and remediation is being led by the state.

Assuming that groundwater generally mimics surface contours and slopes to the north-northeast, both of the above open LUST case locations are outside of the identified area of concern for soil vapor encroachment conditions (EDR 2022).

Reconnaissance of the subject property on July 13, 2022, found the subject property to be paved parking lots, a series of sidewalks, and green areas. There are two generators on the southwest side of the property near the Unit Operations Lab and the existing USGS building. The generators may have fuel tanks, but they were not evident during the site visit.

3.2.2.3 State Hazardous Waste Permitting and Compliance

The CDPHE Hazardous Materials and Waste Management Division (HMWMD) regulates the state's solid and hazardous waste. The HMWMD reviews and issues hazardous waste permits at facilities to ensure hazardous wastes are managed appropriately. This division provides technical and regulatory assistance in unusual or time-critical projects and incorporates pollution prevention into permitting, compliance and enforcement activities of the division. The HMWMD regulates hazardous waste generators, treatment, storage, and disposal facilities and monitors the cleanup remedies of facilities found to be out of compliance with emissions or disposal regulations. The HMWMD also regulates facilities that process, use, store, transport, or dispose of radioactive materials to ensure that the materials are managed appropriately. The HMWMD inspects research facilities, tracks all devices that contain sealed sources, and acts as a first responder if there is any release of radioactive materials (CDPHE 2022d).

3.2.2.4 Hazardous Waste Program

The proposed project is intended to support both the USGS and Mines energy and mineral science operations. The CDPHE hazardous waste facility database shows that Mines is currently registered as a Large Quantity Generator. According to the Mines website (Mines 2022a), the Environmental Health and Safety (EHS) Department of Mines manages the collection, classification, consolidation, packaging, and shipping for disposal or recycle of all the waste streams generated on campus. The EHS developed a training program which is required for all faculty, staff, and students who generate regulated waste and use or dispose of chemical wastes. The training covers required procedures for waste labeling, packaging, handling, mixing, documentation, and regulatory compliance (Mines 2022a). The EHS team states that it participates in a wastewater-monitoring program with the City of Golden to ensure that wastewater generated by its facilities meets stringent EPA limits. The EHS team also participates in the local EPCRA emergency response plan programs.

The Sustainability Tracking, Assessment and Rating System (STARS) implemented by the Association for the Advancement of Sustainability in Higher Education (AASHE) has a report detailing how hazardous waste is handled at Mines. According to the STARS report (AASHE 2021), Mines operates a chemical storage and distribution facility. This facility is an important asset used to minimize hazardous and non-hazardous chemical wastes. Additionally, Mines has a Hazardous Materials Management Facility that allows the EHS team to handle and properly dispose of the diverse hazardous, universal, and chemical waste streams generated from campus research. Mines

employs a “green chemistry” program. Green chemistry is the design of chemical products and processes that reduce or eliminate the use and generation of hazardous substances. Green chemistry relies on a set of 12 principals that can be used to design or re-design molecules, materials, and chemical transformations to be safer for human health and the environment.

Mines policy requires all campus personnel who require chemical procurement services to receive Waste Generator Training. Annual refresher training is required to remain eligible. This training identifies the requirements for using the chemical procurement program, searching the chemical inventory, and the strategies outlined in the Waste Minimization Plan.

Waste Generators submit individual waste containers for pick up from campus labs using the Mines web-based submittal program. Each waste container is evaluated for proper waste disposal and moved to a centralized waste storage facility. Unused/unwanted chemicals that satisfy age and safety requirements are reintroduced to the chemical inventory system. Chemical hazardous waste that needs to be managed for off campus disposal is sent to preselected treatment storage and disposal facilities. This ensures all wastes are managed in a legal and responsible manner. Flammable and organic wastes are shipped to a fuel blending facility.

It is likely that the USGS will coordinate with the EHS team at Mines to manage any hazardous waste from the EMRF through the existing Mines disposal contract; however, no official agreement exists between USGS and Mines at the time of analysis. The USGS will also register as a waste quantity generator with the CDPHE. There are three hazardous waste generator categories recognized by the CDPHE which include: very small quantity generator, small quantity generator and large quantity generator. These categories are based on the cumulative amount of hazardous waste a facility generates per calendar month, measured in kilograms or pounds. The waste generator category for the proposed project will be determined after operation of the project commences. Additionally, as waste generating USGS operations are brought together under one roof, USGS will either need to obtain a new EPA identification number or update and transfer an existing EPA identification number to the new location. These details have not been determined at the time of analysis.

3.2.3 Direct and Indirect Impacts

3.2.3.1 Alternative A – Proposed Action

3.2.3.1.1 Environmental History

A Phase I ESA site investigation for the project area property was conducted on July 13, 2022. The property was observed by walking throughout the site and an environmental consultant met with the planners, architects, and engineers related to the project. A checklist of the presence or absence of the features, activities, uses, and conditions identified in Section 9.4 of the ASTM standard was provided in Table 3 of the Phase I ESA. Photographs taken during the property reconnaissance were also included in the Phase I ESA. The property was verified to consist of paved parking lots, sidewalks, and green areas. There are two generators on the southwest side of the property near the Unit Operations Lab and existing USGS building. No evidence of past or present stored chemicals or petroleum products was noted during the site reconnaissance. No evidence of spills, significant staining, unusual odors, potential contamination, or potential sources of contamination was observed on or adjacent to the subject property during the site reconnaissance. The existing environmental conditions are not expected to be affected by the proposed action. The scope of work for the Phase I ESA conducted did not include the collection of soil samples at the project site. A review of Soil Survey Geographic Database (SSURGO) data from the Natural Resources Conservation Service

(NRCS) indicates that soils on the subject property are mapped as the Ascalon-Critchell soil complex. The Ascalon series consists of very deep, well drained soils that formed in moderate coarse textured calcareous material. These soils are on upland hillslopes and tableland plains. The Critchell series consists of deep, well drained soils that formed in mixed, stratified alluvium derived from reddish brown sedimentary rocks. These soils are on fans, terraces, and valley side slopes.

3.2.3.1.2 Hazardous Materials Used and Generated

According to the Draft Air Quality Report conducted by CPP, Inc. (CPP), toxic and hazardous substances may be used at some point during the lifetime of the laboratory facility, however it was assumed that chemical utilization will change over time and specifying design criteria on current chemical utilization may not be appropriate.

CPP based their evaluation of laboratory chemical fume hood exhaust on the American National Standard Method of Testing Performance of Laboratory Fume Hoods and the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) Handbook; specifically, the heating, ventilation, and air conditioning (HVAC) applications. The report conducted by CPP stated that there was no proposed chemical inventory provided for this project in regard to the chemicals released by the general laboratory fume hood exhausts, therefore design criteria were set to correspond to the ASHRAE example criterion discussed in Chapter 16 of the 2015 ASHRAE Handbook HVAC Applications (ASHRAE, 2015). This criterion assumes a chemical emission rate similar to that of a small liquid spill or lecture bottle fracture. The ASHRAE Handbook states that laboratories using extremely hazardous substances should conduct a chemical specific analysis based on published health limits. A more moderate limit may be justified for laboratories with low levels of chemical usage. Project specific requirements must be developed in consultation with the safety officer. If a problem seems likely due to certain chemicals being used, then mitigation measures may be required for some chemicals. Additionally, a detailed hazard assessment should be carried out.

The CPP Draft Air Quality Report also discussed the operation of radioisotope exhausts. The National Council on Radiation Protection (1996a) specifies a three-level screening procedure to determine compliance with exposure limits. This procedure was used to estimate amounts of radioisotopes. Since no isotope information was provided for this study, a generic criterion was used, based on the American National Standards Institute (ANSI)/American Industrial Hygiene Association (AIHA) Z9.5 (2012) “as installed” chemical fume hood containment criterion. Allowable “Annual Usage” quantities were then calculated as described above for each isotope, assuming only one isotope will be used. The normalized concentration design criterion is listed in Table 3 of the report. Computations showing the maximum allowable usage are presented in Table 8 of the report. The final locations of the specialty exhausts were not known at the time this testing was conducted, so representative exhaust locations were tested to cover the designated roof area. The report stated that the probability of exceeding the recommended criterion is typically considered acceptable when the probability of a spill is considered. For the radioisotope exhaust, the criterion assumes that the carbon bag is adequate to contain the radioisotopes being used. If radioisotopes in excess of the maximum allowable amounts are being exhausted through the stack, a more stringent criterion may be appropriate (CPP n.d.).

Perchloric acid was identified as another potential emission source. According to the Draft Air Quality Report, there are currently no published health limits for perchloric acid, however, there is extensive qualitative information describing its toxic effects. It is anticipated that very limited quantities, in the range of milliliters, will be used (CPP n.d.).

The Draft Air Quality Report by CPP stated that the facility is also planned to be equipped with hydrofluoric acid. The normalized health limit (HL/m) and normalized odor threshold (OT/m) design criteria for the hydrofluoric acid exhaust stacks were calculated based on published occupational exposure values (American Conference of Governmental Industrial Hygienists [ACGIH], 2018) and odor thresholds (Ruth, 1986; ACGIH, 2018). Based on previous work at Mines (Ritter et. al., 2015), aqueous hydrofluoric acid solution (52 percent hydrogen fluoride) was evaluated for use in the fume hoods. In addition, the Draft Air Quality Report stated that the largest container of the hydrofluoric acid solution is expected to be 500 mL. The normalized health limit and normalized odor threshold design criteria were calculated based on 52 percent concentration of hydrogen fluoride in liquid phase and a spill size of 500 mL was used as an accidental release scenario (as opposed to 1L as is often assumed for other chemicals used in fume hoods) (CPP n.d.).

Hydrofluoric acid odors are likely at the EMRF, but the health criterion was met for all stack heights tested. The receptor locations analyzed for the hydrofluoric exhausts in the draft air quality report were at the EMRF and nearby Geologic Hazards Science Center building. Odors from the hydrofluoric exhausts are likely to reach the entrances of the EMRF and USGS building, as well as the roofs and areas between the two buildings, between 7-30 percent of the time. The closest residence halls and homes are farther away than the EMRF and USGS building, therefore odors are expected to be much lower or non-existent at these locations, depending on the distance from each exhaust. A modeling analysis would have to be performed for the residence halls and nearby homes to provide an accurate determination of the probability of occurrence of odors at these locations. The intensity of the odors will depend on the quantity of hydrofluoric acid being handled, whether odor mitigation measures are taken, and meteorological factors such as wind direction and speed. Increasing the stack height of the hydrofluoric exhausts would reduce the maximum concentrations and probability of occurrence of odors. In order to eliminate odors completely, scrubbing systems with efficiencies of 80-87 percent may need to be added to the hydrofluoric exhaust streams (CPP n.d.).

The storage, use, transportation, and disposal of hazardous materials and other regulated substances would continue to be governed by federal, state, and local regulations. These regulations, combined with existing technologies and work practices developed to properly manage these substances, substantially reduce but do not eliminate the risks of causing environmental contamination from the operation.

Per 40 CFR 262.15(a), a satellite accumulation area (SAA) is where waste is contained at or near any point of generation where hazardous wastes initially accumulate, which is under the control of the operator of the process generating the waste. The federal regulatory requirements for SAAs specify that up to 55 gallons of non-acute hazardous waste and/or one quart of liquid acute hazardous waste or 1 kilogram of solid acute hazardous waste may accumulate and be stored in a SAA. These wastes may be stored in SAAs indefinitely without a permit or interim status, provided that all of the conditions for exemption in this section are met. According to 40 CFR 262.15(a), the wastes must be placed in containers that are in good condition. If a container holding waste is not in good condition, or if it begins to leak, the generator must immediately transfer the hazardous waste from this container to a container that is in good condition and does not leak, or immediately transfer and manage the waste in a central accumulation area operated in compliance with 40 CFR §262.16(b) or 40 CFR §262.17(a). The generator must use a container made of or lined with materials that will not react with, and are otherwise compatible with, the hazardous waste to be accumulated, so that the ability of the container to contain the waste is not impaired. Incompatible wastes, or incompatible wastes and materials, must not be placed in the same container. Hazardous waste must not be placed in an unwashed container that previously held an incompatible waste or material. A container

holding a hazardous waste that is incompatible with any waste or other materials accumulated nearby in other containers must be separated from the other materials or protected from them by any practical means. A container holding hazardous waste must be closed at all times during accumulation, except when adding, removing, or consolidating waste; or when temporary venting of a container is necessary for the proper operation of equipment, or to prevent dangerous situations, such as build-up of extreme pressure. A generator must mark or label its container with the words "Hazardous Waste" and an indication of the hazards of the contents. All satellite accumulation areas operated by a small quantity generator must meet the preparedness and prevention regulations of 40 CFR §262.16(b)(8) and emergency procedures at 40 CFR §262.16(b)(9). All satellite accumulation areas operated by a large quantity generator must meet the Preparedness, Prevention and Emergency Procedures in 40 CFR Part 262 Subpart M.

The proposed action has the potential to pose risks to the public as well as the environment if chemicals used in the laboratory are mishandled, misused, or equipment is not constructed or operated according to proper design criterion. At the time that the Draft Air Quality Report by CPP was conducted, not enough information was available to assess all possible chemicals that would be used in the laboratory facilities aside from perchloric acid and hydrofluoric acid, therefore a new or updated analysis will need to be completed once more specifics are known. As previously stated, a detailed hazard assessment should be carried out to provide a full understanding of the potential risks related to hazardous materials used for the project. Chemicals, substances, and all hazardous materials associated with the proposed action are expected to be used and handled within acceptable health limits and odor thresholds. If appropriate construction and operation of equipment handling hazardous materials is achieved in combination with proper personnel training and compliance with regulations related to hazardous materials, it is expected that there will be no impacts to human or environmental health.

3.2.3.2 Alternative B – No Action

Under the No Action Alternative, the proposed action would not be developed and there would be no project-related hazardous materials used or generated. No physical changes to the Mines campus would occur under this alternative. Therefore, there would be no change to hazardous materials described in Section 3.2.2 for the No Action Alternative. The existing environment would be undisturbed.

3.2.4 Cumulative Impacts

No cumulative impacts are anticipated. For environmental resources where construction and implementation of the proposed action would have no environmental impact, there is no potential for an adverse cumulative environmental impact to occur. Mines plans to develop additional buildings with facilities that may handle chemicals and hazardous materials. If the chemicals and associated equipment within these facilities are constructed and operated according to acceptable design criterion, it would be expected that there would be no impacts from these actions.

3.2.5 Design Standards

- The proposed action is subject to requirements set forth by the Colorado Division of Oil and Public Safety (OPS). The OPS will be notified in the event any material contaminated with petroleum is encountered, a petroleum spill of significant quantity takes place, an "orphaned" underground storage tank (UST) is discovered during any excavation, and regarding the use of any proposed or on-site petroleum USTs or above ground storage tanks.

- The report by CPP stated that the occupational exposure limits discussed in regard to the chemicals at the facility are based on a mixture of guidelines, recommendations, and regulatory limits from the ACGIH or National Institute for Occupational Safety and Health and were developed as guidelines to assist in the control of health hazards and are not intended for use as legal standards. Additional design standards for hazardous materials are to be determined upon further analysis.

3.2.6 Mitigation Measures

Mitigation would entail conducting a complete ASTM International (ASTM) Phase I ESA pursuant to ASTM Standard Practice E1527-21, Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process (ASTM 2021). A Phase I ESA would identify and document the presence or likely presence of hazardous substances or petroleum products in, on, or at the project area due to a past release to the environment. A Phase I ESA would also satisfy one of the due diligence requirements to qualify for the innocent landowner, contiguous property owner, or bona fide prospective purchaser limitations under CERCLA.

As part of the Phase I ESA, a request would be made to the state for further information related to the former on-site LUST. The Phase I ESA could include recommendations for testing soil, soil vapor, and/or groundwater prior to ground-disturbing activities.

If an exceedance occurs in relation to the fume hood exhausts, there are several mitigations measures that can be taken to reduce the emissions of problem chemicals. One option would be physically altering the initial exhaust/intake design. This is often the simplest alternative available to mitigate excessive concentrations at sensitive locations. Alternate exhaust designs such as increased stack height, increased volume flow, and/or increased exit velocity may mitigate exhaust emissions. Alternate exhaust or intake locations may also mitigate exhaust impacts. Activated carbon filters, which may adsorb a significant amount of odor, may also be installed in the fume hood exhausts. To eliminate all hydrofluoric acid odors, scrubbing systems with 80-87 percent efficiency could be added to the appropriate exhaust systems.

Additionally, there could be a limitation applied to the maximum quantity that may potentially be spilled within the fume hood. To achieve a normalized health limit design criterion for a specific chemical, the maximum storage quantity (and thus, maximum volume available to be spilled) may need to be limited. Emission controls for gaseous emissions can be obtained through emergency shut-off valves and in-line restrictor orifices.

Hydrofluoric acid is on the List of Regulated Substances under section 112(r) of the CAA and will potentially need a RMP depending on the quantity being handled by the facility. If additional chemicals regulated under the RMP are used in the facility, they may be subject to the requirements of the RMP. If the facility is holding more than a threshold quantity of a regulated substance in a process, USGS will comply with EPA's RMP regulations and implement a risk management program which will be submitted to the EPA.

3.3 Air Quality

Air quality is determined by the quantity and chemistry of atmospheric pollutants in consideration of meteorological factors (i.e., weather patterns) and topography, both of which influence the dispersion and concentration of those pollutants. This section describes the impacts to ambient air quality caused by the construction and operational elements of this project. Because air quality related

emission data is generally available at a county scale, the analysis area for background air quality data encompasses the entirety of Jefferson County.

Sources of emissions include construction equipment, on/off-road vehicles, and fugitive dust emissions resulting from earth disturbing activities. Operational emissions will occur as a result of equipment associated with the proposed action. Appropriate air quality permits will be obtained from the CDPHE for project facilities and land disturbance. Appropriate emission control equipment will be installed and operated in accordance with the construction and operating air permits.

This section and its subsections describe the air emissions and associated impacts related to construction and operation of the project, and the existing climatological and air quality conditions of the project area. Items discussed include applicable federal and state permitting and regulatory requirements, ambient air quality, new air emissions associated with construction and operation, anticipated air quality impacts, and potential mitigation measures. The provisions of the CAA and state-level regulations that are potentially relevant to the project are summarized throughout this section. Construction (temporary) and operation (long-term) impacts associated with the project are discussed in Section 6.3.3.

3.3.1 Issue Statements

- Would emission-generating equipment during construction and operations affect local and regional air quality?
- Would fugitive dust associated with construction and operations result in or contribute to degradation of air quality, haze, and reduced visibility in local and regional areas?
- Would building occupancy impact air quality in the local area?

3.3.2 Affected Environment

3.3.2.1 Climate

The project area borders between a cold semi-arid (steppe) climate and a hot summer continental climate environment characterized by semi-arid to semi-humid conditions with an average of 242 cloud-free days, modest annual rainfall, high annual snowfall, and moderately high diurnal variability in temperatures. The climate is controlled primarily by mountainous terrain of the Rockies to the west. Prevailing westerly winds move air over the western slopes of the Rockies where the air cools as it is being forced upwards due to topographic lift, condensation takes place, and much of the moisture falls as precipitation. As the air descends the eastern slopes leeward of the Mountain Range, convectional warming takes place, resulting in less rain.

An analysis of regional climate impacts prepared by the Fourth National Climate Assessment (U.S. Global Change Research Project 2018) recognizes that the Southwest Region encompasses diverse ecosystems, cultures, and economies, reflecting a broad range of climate conditions, including the hottest and driest climate in the United States. Water for people and nature in the region has declined during droughts, due in part to human-caused climate change. The reduction of water volume in various lakes increases the risk of water shortages across much of the region. Local water utilities and governments have voluntarily developed and implemented solutions to minimize the possibility of water shortages for cities, farms, and ecosystems. Mortality risk during a heat wave is amplified on days with high levels of ground-level ozone or particulate air pollution. Analyses estimated that the area burned by wildfire across the western United States from 1984 to 2015 was twice what would

have burned had climate change not occurred. Colorado has passed renewable portfolio standards to reduce fossil fuel dependence and greenhouse gas emissions.

3.3.2.2 Local and Regional Air Quality

Air quality within a region can be measured in comparison to the National Ambient Air Quality Standard (NAAQS), which are set by the EPA Office of Air Quality Planning and Standards. The EPA has established NAAQS to limit the amount of air pollutant emissions considered harmful to public health and the environment. There are two sets of NAAQS (EPA 2022c). The "primary" standards are designed to provide an adequate margin of safety essential to protecting public health. The "secondary" standards are intended to protect public welfare from any known or anticipated adverse effects associated with the presence of a criteria pollutant in the ambient air. The EPA has set air quality standards for the following criteria pollutants: nitrogen dioxide (NO_2), sulfur dioxide (SO_2), carbon monoxide (CO), particulate matter smaller than 10 microns in aerodynamic diameter (PM_{10}), particulate matter smaller than 2.5 microns in aerodynamic diameter ($PM_{2.5}$), ozone (O_3), and lead (Pb). The State of Colorado has incorporated the NAAQS by reference; however, it does have its own additional ambient air quality standards for sulfur dioxide. The NAAQS and Colorado Ambient Air Quality Standards are provided in Table 1.

Table 1 Ambient Air Quality Standards

Pollutant	Averaging Time	Colorado Standards	NAAQS Primary Standards	NAAQS Secondary Standards
CO	1-hour [a] 8-hour [a]	- -	35 ppm 9 ppm	- -
Pb	3 months (rolling) [b] Quarterly [k]	- -	0.15 µg/m^3 -	Same as primary -
NO_2	Annual [c] 1-hour [d]	- -	0.053 ppm 0.100 ppm	Same as primary -
O_3	1-hour [a] 8-hour [e]	- -	- 0.07 ppm	- Same as primary
PM_{10}	24-hour [f] Annual	- -	150 µg/m^3 -	Same as primary -
$PM_{2.5}$	24-hour [g] Annual [h]	- -	35 µg/m^3 12 µg/m^3	Same as primary 15 µg/m^3
SO_2	1-hour [i] 3-hour [j] 24 hours Annual	- 0.267 ppm [l] - -	0.075 ppm - - -	- 0.5 ppm - -
Hydrogen Sulfide	1-hour	0.08 ppm	-	-

Source: EPA 2022, Code of Colorado Regulations 2022
Notes: µg/m^3: micrograms per cubic meter. ppm: parts per million. ppb: parts per billion.
[a] Not to be exceeded more than once per year.
[b] Not to be exceeded.
[c] Annual mean.
[d] The 3-year average of the 98th percentile of the daily maximum 1-hour average must not exceed this standard.
[e] The 3-year average of the 4th highest daily maximum 8-hour average O_3 concentration measured at each monitor within an area over each year must not exceed this standard.
[f] Not to be exceeded more than once per year on average over 3 years.
[g] The 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed this standard.
[h] The 3-year average of the annual arithmetic mean $PM_{2.5}$ concentrations from single or multiple community-oriented monitors must not exceed this standard.
[i] The 3-year average of the annual 99th percentile of the 1-hour daily maximum must not exceed this standard.
[j] Not to be exceeded more than once per year.

[k] Quarterly mean.
[l] The actual concentration of sulfur dioxide at any given receptor site (no greater than five meters above ground level) in the State of Colorado not to be exceeded more than once in any twelve-month period.

The EPA assigns classifications to geographic areas based on monitored ambient air quality. Attainment is achieved when the existing background concentrations for criteria air pollutants are less than the NAAQS. Jefferson County is currently designated as being in non-attainment for ozone according to the 2008 and 2015 8-hour standard. Jefferson County is currently designated as being in attainment for all other criteria pollutants for which there are NAAQS. Since the project is located in an ozone non-attainment area, the General Conformity Rule is applicable.

The National Emissions Inventory (NEI) is a detailed annual estimate of criterial pollutants and hazardous air pollutants (HAPs) from air emission sources maintained by the EPA. Emission inventories provide an overview of the types of pollution sources in the area, as well as the amount of pollution being emitted on an annual basis. Emission inventories are useful in comparing emission source categories (agriculture, biogenic, dust, fire, fuel combustion, industrial process, and mobile) to determine which industries or practices are contributing to the general level of pollution in an area. Table 2 summarizes the emission inventory data for Jefferson County from most recent NEI, which was conducted in 2017.

Table 2 2017 Emissions Inventory in Tons Per Year for Jefferson County

Source	CO	NO_X	SO_X	PM_{10}	$PM_{2.5}$	VOC	HAPs	CO_2e[3]
Agriculture	No Data	No Data	No Data	568	114	5	0.26	No Data
Biogenics[1]	738	211	No Data	No Data	No Data	5,574	540	No Data
Dust	No Data	No Data	No Data	8,061	925	No Data	No Data	No Data
Fires	357	5	2	36	31	84	21	4116.02
Fuel Combustion	4,582	1,312	37	657	653	758	116	No Data
Industrial Processes	483	825	484	336	188	554	43	445,875
Miscellaneous[2]	470	31	15	309	273	4,488	477	No Data
Mobile	57,083	6,028	38	495	309	4,548	1,342	2,898,210
Total	**63,713**	**8,412**	**576**	**10,463**	**2,493**	**16,012**	**2,539**	**3,348,201**

Source: EPA 2017
Note: CO_2e is listed in metric tons. SO_X = sulfur oxides; VOC = volatile organic compound
[1] Biogenic includes those emissions derived from natural processes (such as vegetation and soil).
[2] Miscellaneous categories include bulk gasoline terminals, waste disposal, commercial cooking, gas stations, miscellaneous non-industrial (not elsewhere classified), and solvent use.
[3] CO_2e = carbon dioxide equivalent. Emissions are reported in metric tons.

Dust sources are the biggest contributors to PM_{10} (making up 77 percent of emissions) and $PM_{2.5}$ (making up 37 percent of emissions). Mobile sources are the biggest contributors to Colorado (making up 90 percent of emissions), NO_x (making up 72 percent of emissions), HAPs (making up 53 percent of emissions), and carbon dioxide equivalent, or CO_2e (making up 87 percent of emissions). Biogenic sources are the biggest contributors to VOCs (making up 35 percent of emissions).

Monitored pollutant concentrations (also known as background concentrations) represent prevailing air pollution from existing sources in the region. Table 3 provides the background concentrations (in units of parts per billion [ppb] and/or µg/m^3) representative of the project area. These background concentrations were measured at the nearest EPA monitoring location containing data for all pollutants in 2021.

Table 3 Representative Background Concentrations for the Project

Pollutant	Averaging Time	Background Concentration (ppb)	Background Concentration (µg/m^3)	Data Source
CO	8-hour 1-hour	8.469 8.487	- -	Denver- Camp (AQS Data Mart) Denver- Camp (AQS Data Mart)
NO_2	Annual 1-hour	7,820 7,820	- -	Denver- Camp (AQS Data Mart) Denver- Camp (AQS Data Mart)
PM_{10}	24-hour	-	60	Denver- Camp (AQS Data Mart)
$PM_{2.5}$	Annual 24-hour	- -	54 365	Denver- Camp (AQS Data Mart) Denver- Camp (AQS Data Mart)
SO_2	3-hour 1-hour	2,740 8,408	- -	Denver- Camp (AQS Data Mart) Denver- Camp (AQS Data Mart))

3.3.2.3 Federal Air Quality Programs

Construction and operation of the project will emit air pollutants regulated under the CAA. During construction of the project, activities such as equipment delivery and operation of non-stationary construction equipment and on- and off-road vehicles will generate emissions. In addition, installation and operation of the new stationary source equipment at the proposed building will result in an increase in the station's potential to emit. The provisions of the CAA that are potentially relevant to the project are summarized in the following sections.

3.3.2.3.1 New Source Review

New Source Review (NSR) permitting regulations at Title 40 of the CFR Part 51 (40 CFR 51) are designed to protect air quality when certain new air emissions sources are constructed, or existing air emissions sources are modified. NSR also ensures that advances in pollution control occur concurrently with industrial expansion. There are three types of NSR: (1) Prevention of Significant Deterioration (PSD); (2) Nonattainment NSR; and (3) Minor Source NSR, all of which are discussed below.

3.3.2.3.2 Prevention of Significant Deterioration

PSD federal permitting requirements at 40 CFR Part 52.21 apply to new major stationary sources and major modifications to existing major stationary sources located in an area designated as in attainment or unclassifiable with the NAAQS. For this project, the applicable PSD major stationary source threshold is the potential to emit 250 tons per year (TPY) of a criteria pollutant. In addition, for all greenhouse gas emissions (GHGs), facility emissions that are greater than or equal to 100,000 TPY are classified as major sources under PSD regulations. However, a facility cannot become a major source based solely on GHGs emissions and must first be classified as a major PSD source for one or more criteria pollutants for this threshold to apply.

Emissions resulting from the operation of the project will be below the PSD thresholds and therefore not subject to PSD rules.

3.3.2.3.3 Nonattainment New Source Review

Nonattainment NSR applies to new major sources of air emissions or major modifications at existing sources that are located within a nonattainment area. Because this project is expected to be a minor source, Nonattainment NSR is not applicable.

3.3.2.3.4 Minor Source New Source Review

Sources of air emissions that do not fall under PSD or Nonattainment NSR permit programs will be subject to applicable state-level permit requirements under a Minor Source NSR permit program. In these instances, permitting limits and thresholds are established and implemented by the state. This project will be authorized under an Air Pollutant Emission Notice (APEN) and potentially a construction permit. The APENs applicable to the project include the Land Development APEN and the Engines – Spark Ignition APEN. Uncontrolled annual emissions will need to be quantified for criteria pollutants, lead, and non-criteria pollutants for all emission sources to determine permit applicability.

3.3.2.4 New Source Performance Standards

The EPA has promulgated New Source Performance Standards (NSPS) for specific categories of stationary sources of air pollution at 40 CFR 60, Subparts A through UUUU. NSPS are developed by the EPA and delegated to the states for implementation, although the EPA retains implementation and enforcement authority. NSPS includes testing, monitoring and recordkeeping requirements, as well as emissions limits. Subparts that are applicable to the project are summarized below.

3.3.2.4.1 40 CFR 60 Subpart A – General Provisions

Certain provisions of 40 CFR 60, Subpart A, apply to the owner or operator of any stationary source subject to a NSPS. The project will be subject to this subpart since the stationary compressed ignition (CI) diesel emergency generators are subject to NSPS Subpart IIII.

3.3.2.4.2 40 CFR 60 Subpart IIII – Standards of Performance for Stationary Spark Ignition Internal Combustion Engines

The stationary CI internal combustion engines at the Site are emergency, are assumed to have a displacement of less than 30 liters per cylinder, and be a model year of 2007 or later, or manufactured after April 1, 2006; therefore, the engines are subject per 60.4205(b). Compliance with the applicable testing, reporting, monitoring, and recordkeeping requirements of this subpart will be maintained.

3.3.2.5 National Emission Standards for Hazardous Air Pollutants

The National Emission Standards for Hazardous Air Pollutants (NESHAP) regulations established in 40 CFR 61 and 63 regulate emission of air toxics. NESHAP standards primarily apply to major sources of HAPs, though some Subparts of Part 63 have been revised to include area (non-major) sources. The NESHAP regulations under 40 CFR 61 establish emission standards on a pollutant basis, whereas 40 CFR 63 establishes the standards on a source category basis. NESHAP Subparts that are applicable to the emissions sources associated with the project are summarized below.

3.3.2.5.1 40 CFR 63 Subpart ZZZZ – National Emission Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines

Stationary reciprocating IC engines (RICE) located at area and major sources of HAPs that are new, existing, or reconstructed are subject to this Subpart, depending on power rating and unit type. The emergency generators will have an engine rating large enough to be subject to Subpart ZZZZ as a new stationary RICE.

3.3.2.6 Greenhouse Gas Reporting

40 CFR Part 98 requires covered sources with annual GHG emissions equal to or greater than 25,000 metric tons of CO_2e to report GHGs from various processes within the facility. These emissions are reported directly to the EPA for all covered facilities. A complete analysis of construction and operations emissions will need to be performed to determine if the proposed action will need to comply with applicable 40 CFR Part 98 requirements.

3.3.2.7 General Conformity

According to the EPA, the goal of General Conformity is to ensure that actions conducted or sponsored by federal agencies are consistent with state air quality goals. The purpose of General Conformity is to ensure that:

- Federal activities do not cause or contribute to new violations of the NAAQS,
- Actions do not worsen existing violations of the NAAQS, and
- Attainment of the NAAQS is not delayed.

Under 40 CFR Part 93, a General Conformity determination is required for any project that requires federal action where: (1) the total direct and indirect emissions of a criteria pollutant or its precursors would equal or exceed specific thresholds set forth at 40 CFR Part 93.153(b)(1) in nonattainment or maintenance areas, and (2) such emissions are not already covered by an air permit. Emissions from construction activities, for example, are not typically subject to air permitting and are often subject to General Conformity. Because Jefferson County is currently designated as being in non-attainment for ozone according to the 2008 and 2015 8-hour standard, the project is subject to General Conformity.

Jefferson County is classified as serious non-attainment for the 2008 8-hour ozone standard and marginal for the 2015 8-hour ozone standard. De minimis levels within a serious ozone non-attainment area are 50 TPY for VOC and NO_x. If a project's net emissions are less than the de minimis levels, then the federal action is considered to be too small to adversely affect the air quality status of the area and is automatically considered to conform with the applicable state and federal implementation plans, therefore the general conformity requirements have been complied with and the process is complete. An analysis of the proposed project's annual VOC and NO_x emissions will need to be performed to determine if the project complies with the general conformity requirements.

3.3.2.8 State and Local Air Quality Requirements

Under the provisions of the CAA, any state can have requirements that are more stringent than those of the national program. This section discusses state and local regulations that may be applicable to the proposed project.

In addition to federal air regulations, the project may be subject to state air quality requirements administered by the CDPHE Air Quality Control Commission pursuant to Code of Colorado Regulations (CCR) 5 CCR 1001. 5 CCR 1001 codifies rules and regulations for stationary sources of

emissions within the State of Colorado. The project is subject to 5 CCR 1001-5 Stationary Source Permitting and APEN Requirements. Additionally, Common Provisions Regulations of 5 CCR 1001-2 will apply. A brief summary of applicable Colorado requirements, and how USGS will comply, are listed in Table 4.

Table 4 Code of Colorado Regulations Applicability Determination

State Regulation Citation	Title	Applicability	Justification
5 CCR 1001-2	Common Provisions Regulations	Does Apply	Emission control regulations adopted by the Air Quality Control Commission apply throughout Colorado unless otherwise stipulated. The Statement of Intent, Definitions, and General Provisions of this regulation apply to all emission control regulations adopted by the Commission unless otherwise stipulated. The site will comply with all applicable general air quality rules and regulations.
5 CCR 1001-5	Stationary Source Permitting and APEN Requirements	Does Apply	This regulation identifies the requirements for projects that are authorized under construction and operating permits in regard to permit general conditions, fees, and registration requirements. This site will comply with all applicable permit rules and regulations.

The Public Protections from Toxic Air Contaminants Act (HB22-1244) was signed into law in Colorado in June 2022. The act creates a new program to regulate air pollutants that the air quality control commission designates as toxic air contaminants. The CDPHE published an initial list of toxic air contaminants in October 2022 which will be reviewed at least every five years, beginning no later than September 30, 2030. Per HB22-1244, on or before June 30 of each year, beginning on June 30, 2024, owners and operators required to have an operating permit pursuant to section 25-7-114.3 and synthetic minor sources submit an annual toxic emissions report to the CDPHE that reports the levels of toxic air contaminants that were emitted by the source in the preceding calendar year, beginning with January 1, 2023, to December 31, 2023. The CDPHE will also conduct a study and prepare a report for the commission on the types of information reported to the division regarding toxic air contaminants, and, no later than April 30, 2025, the commission may require additional types of information to be included in annual toxic emissions reports submitted for calendar year 2025 and each calendar year thereafter. It is not expected that these requirements will be applicable to the proposed project based on the anticipated annual emissions of pollutants related to operation of the project, but this may be re-evaluated in 2024.

3.3.2.9 Fugitive Dust

An estimate of PM_{10} and $PM_{2.5}$ emissions from fugitive dust generated by earthmoving activities from construction were calculated for this project. The most recent NEI data from 2017 indicated that emissions from unpaved road dust, construction dust, and paved road dust accounted for approximately 4,915 tons of combined $PM_{2.5}$ and PM_{10} in Jefferson County, with the majority of the emissions (64 percent) coming from unpaved road dust.

3.3.2.10 Haze

An Air Quality Related Value (AQRV) is defined as a resource "for one or more federal areas that may be adversely affected by a change in air quality. The resource may include visibility or a specific scenic, cultural, physical, biological, ecological, or recreational resource identified by the federal land manager for a particular area" (U.S. Forest Service et al. 2010). The Federal Land Managers' AQRV Workgroup (FLAG) guidance was developed by the United States Forest Service, the National Park Service (NPS), and the United States Fish and Wildlife Service "to achieve greater consistency in the procedures each agency uses in identifying and evaluating AQRVs" (NPS 2010). Per this guidance: "the Agencies will consider a source located greater than 50 km from a Class I area[1] to have negligible impacts with respect to Class I AQRVs if its total SO_2, NO_x, PM_{10}, and H_2SO_4 (sulfuric acid) annual emissions (in TPY, based on 24-hour maximum allowable emissions), divided by the distance (in km) from the Class I area (Q/D) is 10 or less. The Agencies would not request any further Class I AQRV impact analyses from such sources."

Section 169A of the CAA established a national visibility goal to prevent future visibility impairment and remedy any existing impairment in Class I areas. Visibility refers to the clarity with which scenic vistas and landscape features are perceived at great distances. Impairment refers to human-caused air pollution. In 1999, the EPA promulgated the Regional Haze Rule to address regional haze, which refers to haze that impairs visibility in all directions over a large area. Haze forms when sunlight encounters particle pollution in the air. The Regional Haze Rule calls for state and federal agencies to work together to establish goals and emission reduction strategies to improve visibility in Class I areas (EPA 2001). States are required to address visibility in their state implementation plans.

The Interagency Monitoring of Protected Visual Environments (IMPROVE) program was initiated in 1985 to establish current visibility conditions and trends in national parks and wilderness areas. Average visual range in many Class I areas in the western United States is 60 to 90 miles (100 to 150 kilometers), equivalent to 13.6 to 9.6 deciviews (dv), or about 50 percent to 70 percent of the visual range that would exist without anthropogenic air pollution from stationary and mobile sources (64 Federal Regulation 35714).

The closest Class I area to the project is the Eagles Nest Wilderness, approximately 80 km to the west. The Eagles Nest Wilderness IMPROVE station was used for characterization of the baseline regional haze level in the indirect effects analysis area using data for the period from 2000-2004 (84 FR 84083). Over that time period, the clearest 20 percent days in the Eagles Nest Wilderness have seen an average visibility range of 0.73 dv. The 20 percent most impaired days had an average visibility range of 9.60 dv (Federal Register 2019). Recently measured visual ranges at the Eagles

[1] Class I areas include lands retaining natural character such as designated wilderness areas and national parks.

Nest Wilderness showed that the clearest 20 percent days have seen an average visibility range of -0.10 dv. The 20 percent most impaired days had an average visibility range of 8.48 dv.

3.3.2.11 Local and Regional Greenhouse Gas Emissions

GHGs trap heat from solar radiation in the atmosphere. Adverse health effects and other impacts caused by elevated atmospheric concentrations of GHGs occur via climate change. Climate impacts are not attributable to any single action but are exacerbated by diverse individual sources of emissions that each make relatively small additions to GHG concentrations.

GHGs absorb heat and slow the rate at which energy escapes to space. Some GHGs are more effective at absorbing energy and stay in the atmosphere longer than others. Equivalent carbon dioxide (CO_2e) is the amount of CO_2 that would cause the same level of warming as a unit of one of the other GHGs. For example, 1 ton of CH_4 has a CO_2e of 25 tons; therefore, 25 tons of CO_2 would cause the same level of warming as 1 ton of CH_4. N_2O has a CO_2e value of 298 (40 CFR 98).

The 2014 Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report states that the atmospheric concentrations of well-mixed, long-lived GHGs, including CO_2, CH_4, and N_2O, have increased to levels unprecedented in at least the last 800,000 years. Further human influence has been detected in warming of the atmosphere and the ocean, changes in the global water cycle, reductions in snow and ice, global mean sea level rise, and changes in some climate extremes. It is extremely likely (95-100 percent probability) that human influence has been the dominant cause of the warming observed since the mid-twentieth century (IPCC 2014).

Global mean surface temperatures have already increased 1.5°F from 1880 to 2012. Additional near-term warming is inevitable because of the thermal inertia of the oceans and ongoing GHG emissions. However, climate change will impact regions differently and warming will not be equally distributed. Both observations and computer model predictions indicate that increases in temperature are likely to be greater at higher latitudes, where the temperature increase may be more than double the global average. Models also predict increases in duration, intensity, and extent of extreme weather events. Warming of surface air temperature will very likely be greater over land than over oceans (IPCC 2013).

The final Council on Environmental Quality (CEQ) GHG guidance states that agencies should consider the potential effects of a proposed action on climate change by assessing GHG emissions. Agencies should also consider the effects of climate change on the proposed action and its environmental impacts (CEQ 2016).

No national standards have been established regarding GHGs. In addition, the tools necessary to quantify incremental climatic impacts of specific projects or activities are presently unavailable. However, CEQ draft guidance states that NEPA documents for proposed federal actions resulting in direct GHG emissions of 25,000 metric tons (MT) per year should include a GHG emissions analysis of alternatives. The reference point of 25,000 MT of direct GHG emissions is not an indicator of a level of GHG emissions that may significantly affect the quality of the human environment but serves as a minimum for conducting a quantitative analysis (CEQ 2014). The EPA's Mandatory Greenhouse Gas Reporting rule requires industrial facilities and suppliers of fossil fuels or industrial gases that result in greater than 25,000 MT of carbon dioxide equivalent (CO_2e) of GHG emissions per year to report their emissions (EPA 2009). A comparison of the project's GHG emissions with the state, national, and global level emissions is provided in the direct and indirect impacts section.

3.3.3 Direct and Indirect Impacts

3.3.3.1 Alternative A – Proposed Action

3.3.3.1.1 Construction

Construction will be performed by contractors over a two-year period. The construction schedule is expected to follow a seven-day work schedule. During the construction period, the project would create short-term air pollutant emissions from off-road vehicle and equipment exhaust, construction worker and material delivery on-road vehicle exhaust from travel to and from the project area, and fugitive dust from soil disturbance and travel on paved and unpaved roads. Much of the workforce is expected to commute from Golden, Colorado, or other nearby cities such as Denver. There are several construction actions that are expected to impact all of the air quality issues previously discussed. Ground disturbance and vegetation removal (grading, excavation, compacting, etc.) associated with temporary and permanent structures/facilities (parking lots, buildings, utilities) will contribute to an increase in fugitive dust, haze, and other air pollutant emissions. Water will be used during construction to help with dust abatement.

PM_{10} and $PM_{2.5}$ emissions from fugitive dust generated by earthmoving activities were estimated using the Western Regional Air Partnership's Fugitive Dust Handbook (2006). The tons of each pollutant for the duration of construction were calculated by multiplying the applicable emission factor (in ton/acre-month) by the number of acres affected, number of months of construction for the project, and the assumed control efficiency. Detailed calculations can be found in Appendix A of this document. The fugitive dust emission estimates due to earthwork were estimated to be 0.16 TPY of PM_{10} and 0.02 TPY of $PM_{2.5}$ over the two-year construction duration.

Although project construction would generate emissions of criteria pollutants, given the temporary nature of emissions and scope of construction activities, it is unlikely that emissions would exceed NAAQS or expose sensitive receptors to substantial pollutants. Fugitive dust emissions would be adequately controlled by the water application of haul roads and other disturbed areas, chemical dust suppressant application (such as magnesium chloride) where appropriate, and other dust control measures would be applied as per accepted as reasonable industry practice. As a result, construction impacts to air quality would be less than significant. Construction of the project would also result in the emissions of GHGs. Internal combustion engines associated with project construction vehicles and equipment would emit GHGs. Construction activities and corresponding GHG emissions would be temporary, localized, and typical of other construction projects. Because a detailed list of construction equipment is not available at the time of analysis, detailed quantities of GHG emissions and corresponding social costs of carbon, methane, and nitrous oxide cannot be calculated.

3.3.3.1.2 Operational Emissions

The air emission sources for operation include the process sources (fume hood exhausts, specialty exhausts, one 275 kW emergency diesel generator, one 600 kW emergency diesel generator, one 750 kW emergency diesel generator, idling diesel vehicles at the loading dock, and an electricity e-grid) and operational sources (HVAC, lighting, etc.). There is currently not enough data to calculate the criteria pollutant emissions associated with operational sources, fume hood exhausts, specialty exhausts, diesel vehicles, or the electricity e-grid. However, these sources may produce GHGs such as CO_2 and CO_2e; criteria pollutants including NO_x, SO_x, $PM_{2.5}$, and PM_{10}; and/or volatile organic compounds. Emissions for the three emergency diesel generators was estimated using EPA Tier 2 standards and AP-42 Chapter 3 Section 3.3 to be conservative because the make, model, and

manufacturer year and specifications are currently unknown for all generators. In accordance with the CDPHE's emission calculation methods for generators, it was assumed that each emergency generator would operate for up to 500 hours per year . Table 5 presents the estimated maximum total generator operation emissions that would be emitted annually.

Table 5 Emissions from Operation of the Project

Unit Description	**Total Project Emissions (TPY)**							
	CO	**NO_X**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**	**VOC**	**HAPS**	**CO_2e[a]**
275 kW Diesel Emergency Generator	0.53	0.97	0.19	0.03	0.03	0.97	0.00	106.55
600 kW Diesel Emergency Generator	1.16	2.12	0.41	0.07	0.07	2.12	0.01	231.82
750 kW Diesel Emergency Generator	1.45	2.64	0.51	0.08	0.08	2.64	0.01	289.42
TOTAL	**3.14**	**5.73**	**1.11**	**0.18**	**0.18**	**5.73**	**0.02**	**627.79**
Jefferson County Emissions Inventory Total	63,713	8,412	576	10,463	2,493	16,012	2,539	3,348,201
Operations Emissions Increase as Percent of Jefferson County's Emissions Inventory Total (%)	<0.01	0.07	0.19	<0.01	<0.01	0.04	<0.01	0.02

Emissions from operations would increase Jefferson County's annual emissions inventory by 0.50 percent or less for each pollutant and would be less than de minimis levels, which are 50 TPY for VOC and NO_x. Impact on air quality from operation of the generators would be negligible and would not cause an exceedance of the NAAQs. Table 5 shows that the maximum annual potential emissions from the project's process and ancillary sources are lower than the applicable major source thresholds for both criteria (250 TPY per pollutant) and HAP (25 TPY aggregate and 10 TPY per single HAP). Therefore, the project is expected to be designated a minor source for NSR and an area source for NESHAP applicability. Additionally, based on the values in Table 5, the proposed action is expected to be in conformity due to the fact that emissions will below the de minimis threshold. No further analysis will be necessary. Appropriate emission control equipment will be installed and operated in accordance with the construction and operating air permits. Where required, pollution control devices installed by equipment manufacturers will control combustion emissions.

Pollution control equipment will be installed, operated, and maintained in good working order to minimize emissions.

Haze

The closest Class I area to the EMRF project is the Eagles Nest Wilderness, approximately 80 km to the west in northwestern Colorado. The screening Q/D analysis for the project emissions and the Eagles Nest Wilderness Class I area is provided in Table 6. This table provides the maximum daily emissions of AQRV pollutants (SO_2, NO_x, PM_{10}, and H_2SO_4) in pounds per day (lb/day) in the first column. These maximum daily emissions are converted to annual emissions in TPY using 365 days per year, which are provided in the second column.

Table 6 Q/D Analysis for Eagles Nest Wilderness Class I Area

AQRV Pollutant Emissions (Q) (lb/day)	AQRV Pollutant Emissions (Q) (TPY)	Eagles Nest Distance (D) (km)	Q/D (TPY-km)	Q/D <10
7.46	1.36	80	0.02	Yes

As shown in Table 6, Q/D is less than 10 for the Eagles Nest Wilderness Class I area. Therefore, the project emissions are considered to have "negligible impacts" on AQRV (visibility and nitrogen and sulfur deposition) per the FLAG guidance and should not cause any excessive haze.

Greenhouse Gas Emissions

The project's maximum annual GHG emissions are 151 TPY as CO_2e. These CO_2e emissions are calculated based on the 100-year global warming potential consistent with reporting under the United Nations Framework Convention on Climate Change (UNCC n.d.) and IPCC (IPCC 2007).

A comparison of the project's GHG emission with the state, national, and global level emissions is provided in Table 7. The last column in this table shows the project's GHG emissions as a percentage of the state, national, and global emissions.

Table 7 Estimated Maximum Proposed Action GHG Emissions Comparison

Source	CO_2 (million TPY)	Project (%)
Proposed EMRF	0.0001	100
State (Colorado)	82	<0.001
National (USA)	5,222	<0.001
Global	54,013	<0.001

The state and national CO_2e emissions shown in Table 7 reflect the 2020 emissions reported in the EPA's Greenhouse Gas Reporting Program. The global emissions presented in Table 7 were taken

from the IPCC's 2014 Climate Change report. The operational impacts to GHGs would be less than significant compared to the state, national, and global emissions. Detailed emission calculations for the criteria pollutants, HAP, and GHG are provided in Appendix A.

3.3.3.2 Alternative B – No Action

Under the No Action Alternative, the proposed action would not be developed and there would be no project-related emissions; therefore, there would be no impacts to air quality in the analysis area.

3.3.4 Cumulative Impacts

Construction of the project will result in a short period of minor impacts to local ambient air quality, mainly due to fugitive particulates from earth moving activities. These impacts are typically small and localized, as these emissions will be very near to or at ground level. Additionally, these impacts will only occur for a temporary period. The emissions of criteria pollutants resulting from operations of the project are not expected to be significant, however a complete analysis of uncontrolled hourly and annual emissions must be conducted for all emission sources to determine cumulative impacts and permit applicability. Mines plans to construct additional facilities that may have potential to emit criteria pollutants as a result of construction and operation. It would be expected that the impacts from these actions would be comparable to the proposed action.

3.3.5 Design Standards

- Appropriate air quality permits will be obtained from the CDPHE for project facilities and land disturbance.
- The proposed action will incorporate construction best management practices (BMPs) which include limiting dust by keeping exposed soil damp and reducing vehicle and equipment idling.
- The emission control requirements are to be determined based on the permitting process applicable to the project.
- Once detailed operational emissions information is available, an analysis of construction and operations emissions will be performed to determine if the proposed action is subject to 40 CFR Part 98 requirements.
- Once detailed operational emissions information is available, an analysis of the proposed project's annual VOC and NO_x emissions will be performed to determine if the project complies with general conformity requirements.

3.3.6 Mitigation Measures

No significant impacts have been identified related to project construction or operation. Therefore, no mitigation measures are required.

3.4 Soundscapes

Sound is defined as a form of energy that is transmitted by pressure variations, which the animal or human ear can detect. Noise can be defined as any unpleasant or unwanted sound that is unintentionally added to a desired sound or environment. Noise effects in humans include interference with communication, learning, rest, sleep, and physiological health effects. There are two main properties of sound: the amplitude and the frequency. Amplitude refers to the level of energy that reaches the ear (how loud we perceive the sound), while frequency is the number of cycles or

oscillations per unit of time completed by the source (the perceived pitch of the sound). Frequency is normally expressed in hertz (Hz).

Sound power is defined as the measurement of a source's ability to make sound. It is independent of the acoustic environment in which is located. The sound power level of a source is the amount of energy it produces relative to a reference value and is normally expressed in decibels (dB). The decibel is a logarithmic scale to describe the sound pressure ratio.

Humans perceive a frequency range of about 20 Hz to about 20,000 Hz. An internationally standardized frequency weighting, the A-weighting scale, was designed to approximate the audible range of frequencies of a healthy human ear. The A-weighting scale corresponds to the fact that the human ear is not as sensitive to sound at the lower frequencies as it is at the higher frequencies.

The general human response to changes in noise levels that are similar in frequency content (such as comparing increases in continuous [L_{EQ}] traffic noise levels) are summarized as follows (Cowan 1993):

- A 3-dBA change in sound level is considered a barely noticeable difference.
- A 5-dBA change in sound level typically is noticeable.
- A 10-dBA increase is considered a doubling in loudness.

3.4.1 Issue Statements

- Would noise generated by construction and operation of the project affect sensitive receptors?
- Would the proposed EMRF and buildings outlined in the Mines Campus Master Plan impact the soundscape of the adjacent residential neighborhood?

3.4.2 Affected Environment

Ambient sound levels can be highly variable and are influenced by the sound sources in the immediate area. As described above, land uses within the project are dominated by cultivated crops. Existing noise levels in the vicinity of the project would be largely influenced by levels of traffic on roads, industrial activity, and suburban sounds such as barking dogs and lawn mowers or natural sounds from insects, animals, or wind. ANSI published a standard (Acoustical Society of America S12.9 1993 Part 3) with estimates of energy-averaged sound levels (L_{EQ}) and day-night average sound levels (L_{dn}) based on detailed descriptions of six land use categories. Daytime equivalent sound level (L_d) is the time-average frequency-weighted sound level between the hours of 7:00 a.m. and 10:00 p.m. and nighttime equivalent sound level (Ln) is the time-average frequency-weighted sound level between the hours of 10:00 p.m. and 7:00 a.m. Typical estimated ambient L_{dn} for each of these categories are listed in Table 8.

Table 8 A-Weighted Day, Night, and Day-Night Average Sound Levels

Land Use Category	Typical L_{dn} (dBA)	Day Level, L_d (dBA)	Night Level, L_n (dBA)
1. Very noisy urban residential	67	66	58
2. Noisy urban residential	**62**	**61**	**54**

Land Use Category	Typical L_{dn} (dBA)	Day Level, L_d (dBA)	Night Level, L_n (dBA)
3. Urban and noisy suburban residential	57	55	49
4. Quiet urban and normal suburban residential	52	50	44
5. Quiet suburban residential	47	45	39
6. Very quiet suburban and rural residential	42	40	34

Source: ANSI S12.9-2013/Part 3

Note: L_d = daytime average level, L_{dn} = day-night level, L_n = nighttime average level.

The project area can be defined as a dense residential and commercial area with heavy traffic; therefore, background sound levels are conservatively represented by those of Category 2: noisy urban residential. No background noise level measurements were collected at the nearest noise-sensitive area (NSA; a residence). There are several residences near the project area. For the purposes of this analysis, NSA #1 is a residence located south of the property boundary at 39.749620° N, -105.218004° W and is approximately 200 feet from the center of the property boundary and 55 feet from the edge of the property boundary. Assumed ambient noise levels selected for the study were estimated based on the dominant land usage in the vicinity of the project. Thus, in lieu of background noise level measurements at the NSA, the L_{EQ} day and night noise levels (L_d and L_n) can be assumed to be 61 and 54 A-weighted decibels (dBA), respectively (ANSI/ASA S12.9).

3.4.2.1 Federal Noise Regulations

In 1974, the EPA published Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety. This publication (EPA 1974) evaluated the effects of environmental noise with respect to human health and safety. The EPA identified an L_{dn} of 55 dBA as a threshold for outdoor noise in residential areas. This noise level is often used by federal and state agencies to establish noise limitations for cumulative noise exposure. The Commission limits the noise attributable to stationary energy facilities (such as compressor stations) to 55 dBA L_{dn} at pre-existing NSAs such as schools, hospitals, or residences.

3.4.2.2 State, County, and Local Noise Regulations

Project construction and operation will occur in Golden, Colorado. The city of Golden currently has a noise ordinance.

> Ordinance No. 2173 of the City of Golden Municipal Code specifies excessive sound levels. Producing noise over set decibel sound levels is a violation depending on the time of day and property zoning, and it is measured at the edge of the property line. Per 5.15.020:
>
> (1) No person shall operate any type of vehicle, machine, or device; carry on any activity; or promote or facilitate the carrying on of any activity in excess of the levels specified, in this section.
>
> (2) Sound from any source, other than a moving vehicular source located within the public right-of-way, shall not exceed any of the following limits for its appropriate zone, as measured at or inside the property line other than that on which the sound originates:

Daytime = 7:00 a.m. to 10:00 p.m. of the same day (Mountain Time Zone)

Nighttime = 10:00 p.m. to 7:00 a.m. of the following day (Mountain Time Zone)

City of Golden Noise Limits

Residential		**Commercial**		**Industrial**	
Daytime	Nighttime	Daytime	Nighttime	Daytime	Nighttime
55 dBA	50 dBA	65 dBA	60 dBA	80 dBA	75 dBA

The prohibitions set forth in subsection 5.15.020 shall not apply to sound from:

(a) Any bell or chime from any building clock, school, or church;

(b) Any siren, whistle, or bell lawfully used by emergency vehicles, or any other alarm system used in case of fire, collision, civil defense, police activity or other imminent danger; provided however, that burglar alarms not terminated within 20 minutes after being activated shall not be excepted;

(c) Aircraft which are operated in accordance with federal laws or regulations;

(d) City authorized or sponsored events including, but not limited to, parades and fireworks displays;

(e) Any domestic power equipment, except as provided within this subsection, operated upon any residential, commercial, industrial, or public place between 7:00 a.m. and 9:00 p.m.;

(f) Any temporary construction, maintenance, or repair activities between 7:00 a.m. and 9:00 p.m.;

(g) Activities directly connected with the abatement of an emergency;

(h) Noise from snow blowers, snow throwers, and snow plows when operated with a muffler for the purpose of snow removal; or

(i) Noise generated from golf course maintenance equipment.

The State of Colorado has implemented Noise Statute 25-12-103. Every activity to which this article is applicable shall be conducted in a manner so that any noise produced is not objectionable due to intermittence, beat frequency, or shrillness. Sound levels of noise radiating from a property line at a distance of twenty-five feet or more therefrom in excess of the dBA established for the following time periods and zones shall constitute prima facie evidence that such noise is a public nuisance:

Daytime = 7:00 a.m. to 7:00 p.m. of the same day (Mountain Time Zone)

Nighttime = 7:00 p.m. to 7:00 a.m. of the following day (Mountain Time Zone)

State of Colorado Noise Limits

Residential		Commercial		Light Industrial		Industrial	
Daytime	Nighttime	Daytime	Nighttime	Daytime	Nighttime	Daytime	Nighttime
55 dBA	50 dBA	60 dBA	55 dBA	70 dBA	65 dBA	80 dBA	75 dBA

In the hours between 7:00 a.m. and the next 7:00 p.m., the noise levels permitted in the table above may be increased by ten dBA for a period of not to exceed fifteen minutes in any one-hour period. Construction projects shall be subject to the maximum permissible noise levels specified for industrial zones for the period within which construction is to be completed pursuant to any applicable construction permit issued by proper authority or, if no time limitation is imposed, for a reasonable period of time for completion of project. To evaluate compliance with applicable federal and county regulations, specialists assessed potential increases in ambient noise levels associated with planned operational activities in the immediate vicinity of the project in relation to existing baseline noise levels, as defined above.

3.4.3 Direct and Indirect Impacts

3.4.3.1 Alternative A – Proposed Action

Worker commutes and material delivery vehicles would be expected to generate a short-term increase in noise with little effect on the hourly average noise level. In comparison to the other construction equipment noise during construction and existing heavy traffic conditions at the project area, the increased frequency of brief noise from vehicles passing would not be noticed. Therefore, this traffic was not included in the project construction noise analysis.

The noise levels generated by construction equipment vary significantly and depend on several different parameters, such as the type, model, size, and condition of the equipment; the operation schedule; and the condition of the area being worked. Additionally, construction projects are accomplished in several different stages. Each stage has a specific equipment mix, depending on the work to be completed.

Construction is expected to occur in phases starting in 2023 and being completed in 2025. These phases are expected to include initial sitework and mobilization, material deliveries, earthwork and underground utilities, foundation work, equipment and mechanical work, electrical work, startup/commissioning, operational testing, and final grading/paving. During these construction phases, different equipment will be required on-site that will result in varying emission rates due to construction activities. Noise levels for typical construction equipment that would likely be used at the project range from approximately 70-90 dBA at 50 feet, as shown in Table 9.

Table 9 Noise Levels for Common Construction Equipment

Equipment Type	Typical Maximum Noise Levels at 50 Feet (dBA)
Backhoe	80
Belly Dump	76
Compactor	83

Equipment Type	Typical Maximum Noise Levels at 50 Feet (dBA)
Concrete Telebelt	81
Crane	81
Drill Rig	79
Dozer	82
Excavator	81
Forklift	85
Flatbed	74
Grader	85
Generator	81
Loader	79
Scraper	84
Tractor	84
Trencher	80
Truck	75

Source: RCNM Software Version 1.1 (FHWA 2006). Table based on EPA report and measured data.

Estimates of noise from the construction of the project are based on a roster of the maximum amount of construction equipment used on a given day. Table 9 shows a list of typical construction equipment and the noise level at 50 feet. The Roadway Construction Noise Model (RCNM) has noise levels for various types of equipment preprogrammed into the software; therefore, the noise level associated with the equipment is typical for the equipment type and not based on any specific make or model.

The RCNM assumes that the maximum sound level for the project (L_{max}) is the maximum sound level for the loudest piece of equipment. The approximate noise generated by the construction equipment used at the facility has been conservatively calculated based on an estimated project construction equipment roster projected to be used at the construction site, and not considering further attenuation due to atmospheric interference or intervening structures.

The equipment and activities on-site would vary throughout the project, depending on various stages of construction. The predicted noise from construction activity is presented as a worst case (highest noise level) scenario, where it is assumed, all equipment is present and operating simultaneously on-site for each stage of construction. Results of the RCNM construction noise calculations are presented in Table 10.

Table 10 Calculated Noise Levels at Nearest Sensitive Receptor Due to Project Construction

	Calculated L_{MAX} (dBA)	Calculated L_{EQ} TOTAL (dBA)	Noise Level, Ambient and Construction (dBA)
			L_{EQ}
Ambient baseline noise level*	-	-	61.0
Noise level at nearest residence (200 feet from the center of the EMRF property boundary)	73.0	74.1	72.5

* Baseline noise level obtained based on estimated local land use.

Estimated noise levels from construction activities at the closest NSA were estimated to be approximately 72.5 dBA L_{EQ}. Construction is transient in nature and noise levels vary depending on the activity in progress. The outdoor noise level at the nearest sensitive receptor would increase by approximately 11.5 dBA, which the human ear would interpret as being almost twice as loud as the outdoor ambient baseline noise level. This cumulative noise level is approximately equivalent to the sound level of hearing a residential air conditioning unit located 50 feet away. Noise impacts to residents due to the construction of the project would be temporary and intermittent. Construction is assumed to be limited to daytime hours and any exceedance of the City of Golden's Noise Ordinance will be exempt under Chapter 5.15.050.

Operation

The project's operations-related noise would consist of occasional use of the emergency diesel generators. There are three emergency generators proposed for the project, but it is assumed that only one will operate at any given time and that operation of the emergency generator would only occur during the day. The project's operations-related noise from the generators would have minor, short-term impacts on the nearest sensitive receptor (NSA #1). Operational impacts based on noise attenuation at increasing distances for equipment is captured in Table 11. Noise levels from the generator were analyzed from the center of the project area to NSA #1 (approximately 200 feet) as the exact locations of the generators are currently unknown.

Table 11 Summary of Predicted Noise Generation from the Proposed Operation Equipment by Distance

Generator at 88 dBA	
Distance in Feet from NSA #1	**Noise Level (dBA)**
0	88
10	82
20	76
30	72
40	70
50	68

Generator at 88 dBA	
Distance in Feet from NSA #1	**Noise Level (dBA)**
60	66
70	65
80	64
90	63
100	62
150	58
200	56

Table 11 shows that the noise levels generated by the generators would be below the existing ambient daytime noise level at NSA #1. Additionally, all three generators will be in enclosures which means that the expected noise levels generated by the units will be lower than what was estimated in the table above. The estimated noise levels for the operation of the EMRF are not expected to be significant.

3.4.3.2 Alternative B – No Action

Under the No Action Alternative, the proposed action would not be developed and there would be no project-related emissions; therefore, there would be no impacts to soundscapes in the analysis area.

3.4.4 Cumulative Impacts

There would be cumulative minor noise impacts within the analysis area, but these impacts would be temporary. Based on the relatively minimal nature of operational noise, ongoing cumulative effects would only occur for a short time during construction and during occasional operation of the emergency generators; there would be no long-term cumulative noise impacts. Mines plans to construct additional developments similar to the proposed action that will also have the potential to increase noise levels as a result of construction and operation. It is expected that the impacts from these actions would be comparable to the proposed action.

3.4.5 Design Standards

- The operation of the proposed action and continued development of the 18th Street research corridor by Mines would create a 'street canyon effect' on 18th Street. This effect could lead to increased noise pollution affecting existing residential communities along 18th Street. The design of a dense, preferably evergreen, vegetative buffer along 18th Street will decrease the impact of the 'street canyon effect' in this corridor.

- The proposed action will also incorporate construction work hours that minimize noise during times when adjacent residents are most likely to be impacted. Additional design standards will be determined upon review of finished plans.

3.4.6 Mitigation Measures

Measures to minimize or eliminate impacts to ambient noise levels include maintaining equipment to proper manufacturer's specifications and limiting certain activities to daytime hours only and the excessive use loud signals on the project area.

3.5 Light and Glare

3.5.1 Issue Statements

- Would development of the project area alter lighting and glare in the project area?
- Would the project impact light pollution in the local neighborhood?

3.5.2 Affected Environment

The affected environment includes the project area as well as users and residents of the 18th Street corridor. The existing environment has little glare to users and residents on the 18th Street corridor, however nighttime light pollution exists with the operation of the campus parking lots. The proposed action does not call for an in-depth analysis of the impact of light pollution, as the project design standards for this resource adequately reduce the impact of light pollution (see Section 3.5.5 Design Standards). The existing condition, and lack of glare within, will have an increased glare impact with the proposed action and calls for an in-depth analysis.

3.5.3 Direct and Indirect Impacts

3.5.3.1 Alternative A – Proposed Action

3.5.3.1.1 Sources of Light and Glare

Glare is perceived by observers within the cone-of-influence[2]. Based on the height of the proposed building relative to the context of the site, an increase in glare would be noticeable. The proposed building is made of many specular[3] materials including aluminum sunshades, corrugated metal, steel beams, and glass. These materials reflect most of the solar rays they receive, 75-90 percent (Marsh-2010.), and are perceived by observers primarily on the 18th Street corridor. The same qualitative assessment graphic used to determine observation points for the visual analysis was used to define observation points for the glare analysis (Appendix B).

Total hours of nighttime ambient light would increase with the proposed action. However, the intensity and duration of light pollution would be minimal to any space that would be negatively impacted. The 18th Street corridor, adjacent pedestrian corridors on campus, and open spaces would be affected. These spaces would benefit from a security and safety standpoint from the impact of ambient nighttime light. In addition, light pollution from vehicle headlights and existing parking lot light poles affecting adjacent residential properties would be eventually eliminated by Mines' development of the 18th Street research corridor. Light pollution from night-time construction will be limited with temporary fencing detailed in the construction staging plan.

3.5.3.1.2 Glare Impact Assessment Framework

The Solar Glare Hazard Assessment Tool (SGHAT) was used for the glare impact assessment. First, an average albedo[4] was defined for each exterior wall surface (EWS) specified in the EMRF building 80 percent schematic drawings. The square footage of each EWS material was calculated in

[2] The cone-of-influence is defined as the viewing area within 20 degrees of the horizontal that points in the direction of the observer's line of site and, typically, direction of travel. This represents the most impactful area for observers. Glare impacts are less critical outside the cone-of-influence.
[3] Refers to the highly reflective materials specified.
[4] Albedo is defined as the proportion of radiation reflected by a horizontal surface. (ScienceDirect)

reference to each architectural elevation (N-E-S-W). A percentage was then found of each material's make-up of each elevation. This was applied as a weight multiplier to define a weighted average albedo for each architectural elevation of the proposed EMRF building. See Appendix B for detailed calculations.

The weighted average albedo was applied as the reflective value for vertical surfaces created in the SGHAT model. No-impact vertical surfaces were created to model the existing buildings and vegetative screens (existing pine tree screens) contributing to glare conditions as the site exists. Observation points and a vehicle travel lane along the 18th Street corridor were modeled and the analysis was run once with the impact (model of proposed EMRF building) and no-impact model. Reference Appendix C for the layout of the SGHAT analysis model.

3.5.3.1.3 Glare Impact Assessment Summary

After running the SGHAT assessment, all impact for each receptor (observation points and route 1) was overlaid for analysis. Because of the precise location/activity of the observer, glare duration and intensity are variable among each tested observation point and vehicle route. A stationary observer may experience several minutes of direct glare, while a vehicular observer on 18th Street will experience substantially less due to travel speed. Additionally, the intensity of glare is measured and expressed as a 'green', 'yellow', and/or 'red' level glare intensity derived from the retinal irradiance[5] experienced by an observer. Each level of intensity can be characterized by the potential for afterimage[6] to occur in the eyes of the observer. Each written assessment of the glare impact graphs was done considering the average impact of all vertical surfaces defined in the model in Appendix E.

Route 1: 18th Street Two-Way Vehicular Travel

The proposed alternative would increase glare intensity from the 'green' to 'yellow' level in August to mid-May. The duration of glare throughout the day increases from approximately 20 to 60 minutes of glare during this period. Most glare occurs in the mornings and late afternoon in both the proposed action and no-action alternatives. Daily duration of glare in the summer is reduced from 120 minutes to about 50 minutes.

Observation Point 1

The proposed alternative would increase glare intensity in the mornings from mid-February to November. A short period of glare in the afternoons in April and October would become slightly more intense. 'Green' level glare is eliminated by the proposed alternative from November to March.

Observation Point 2

There is no existing glare at this point. 'Yellow' level glare is introduced in the mornings in October to March.

Observation Point 3

The proposed alternative would increase glare intensity and occurrence in the early mornings and late afternoons from April to October.

Observation Point 4

[5] Retinal Irriadiance = Watts per Square Centimeter.

[6] An afterimage is an image that continues to appear in the eyes after a period of exposure to the original image. In this case, a physiological response (afterimage) is likely to occur with 'yellow' glare levels, unlikely with 'green' levels, and potentially harmful with 'red' glare levels.

No glare impact predicted.

Observation Point 5
No glare impact predicted.

Observation Point 6
There is no existing glare at this point. Short occurrences of glare appear in the early mornings and late afternoons from February to November.

3.5.3.2 Alternative B – No Action

The No Action alternative will not impact lighting or glare.

3.5.4 Cumulative Impacts

The ambient light and solar glare impact of the EMRF building will be mitigated by the continual development of the 18th Street research corridor. Impacts to observers looking southwest towards the project area will be nearly eliminated by new campus buildings of similar height built in front of it. However, the construction of additional buildings along the 18th Street corridor would amplify the glare impact in general, primarily for motor vehicle operators.

Ambient light generated by the EMRF building is mitigated and directed downward on many of the glass facades by aluminum shading systems detailed in the 80 percent schematic designs (Mines 2022b).

The daily duration of glare for observation points along the 18th Street corridor would be increased (Appendix C). Drivers along 18th Street in peak glare hours will experience an increased potential for after-image ('yellow' level glare intensity).

3.5.5 Design Standards

- Vegetative buffers of trees growing no taller than 25 feet (to not interfere with power utilities) will minimize glare for observation points 1-4 (Appendix C). A vegetative buffer would also decrease the amount of nighttime light exposure to adjacent residences. Even when deciduous trees drop their leaves, they are efficient at filtering and minimizing light impact.
- Exterior lighting BMPs that limit nighttime light exposure to adjacent residences.
- Regularly closing automated window shade systems in the evening will limit nighttime ambient light.

3.5.6 Mitigation Measures

- Replacement of mature trees on the project area through the proposal of a more substantial vegetative buffer along the 18th Street corridor would minimize light and glare related impacts to observers and motorists.
- Pedestrian-scale lighting elements would include fixtures that direct light upward or downward, away from off-site land uses.
- Exterior surfaces on the EMRF building utilize aluminum shading measures that direct interior light downward and away from off-site land uses, therefore minimizing the ambient light impact of the building. Similar measures (such as interior shades) should

be taken on 'bare' glass surfaces, primarily at the street level) to limit ambient light impact.

3.6 Viewsheds

3.6.1 Issue Statements

- Would project implementation alter the views of residents and users in the project vicinity? Would the view of campus and the project area be fundamentally impacted? If so, to what extent?
- Would the building height impact the local residential viewshed?

3.6.2 Affected Environment

The affected environment consists of six adjacent 'zones' defined as 'impacted' through the viewshed analysis.

Impact Zones (Refer to Appendix F-K):

Zone 1: Includes residential properties along 18th Street from Jackson to Arapahoe street within 1000 feet of the project area.

Zone 2: Includes residential properties along 18th Street one block southwest of Arapahoe street to Illinois street within 500 feet of the project area.

Zone 3: Includes the top two floor units of the Spruce and Maple residence halls facing northeast towards the project area. Both halls are within 500 feet of the project area.

Zone 4: Includes the northeast facing windows of the existing USGS Geologic Hazards Science Center building directly next to the project area.

Zone 5: Includes the east and northeast facing windows of Alderson Hall directly next to the project area.

Zone 6: Includes residential properties along 19th street from Jackson Street and within 1000 feet of the project area to the southeast facing windows of the CTLM (Center for Technology and Learning Media) building directly next to the project area.

Affected Visual Resources (Refer to Appendix F-K):

Visual Resource A: Views of the foothills southwest of the project area including Mount Galbraith, Lookout Mountain, and the Windy Saddle.

Visual Resource B: Views to the interior of campus - Façade of the USGS Geologic Hazards Science Center Building.

Visual Resource C: The existing parking lot (and associated vegetation) and service roadways from 18th Street to the Alderson Hall service alley.

Visual Resource D: Views to the interior of campus - Façade of Alderson Hall.

Visual Resource E: Views to the interior of campus - Façade of the CTLM building.

Visual Resource F: Views of the foothills northeast of the project area including the North and South Table Mountains.

Proposed Visual Resources (Refer to Appendix F-K):

Visual Resource G: The proposed façade of the EMRF building.

Visual Resource H: The proposed courtyard open space of the EMRF building.

3.6.3 Direct and Indirect Impacts

3.6.3.1 Alternative A – Proposed Action

Impact Assessment Methodology:

The visual impact assessment was begun by defining potentially impacted views from observation points in the context of the site. These points were then distilled to six observation points through a qualitative analysis of a 3-D Google Earth model with a massing model of the proposed EMRF building placed on the project area (Appendix F-K). The six observation points were then defined to be used as the point of analysis for each impact zone (zones 1-6). A visual resource inventory and forecast was created using this qualitative analysis. Observation points were then analyzed using Google Earth's 'viewshed tool' that uses geographical data to generate a 360-degree visual analysis of what can be seen by a user at the defined location (shown in green). The viewshed tool was used with the proposed building turned off and then turned on (Appendix F-K). The green pixels of the 'impact' analysis were then divided by the pixels of those in the 'no-impact' analysis using an overlay operation in Adobe Photoshop. (Appendix F-K) Shown in pink is the impacted view. This analysis was then taken further for zones 1, 2, and 6 which were photographed at the site visit (Appendices G, H, and L). A 3-D massing model is placed in each photo to work in conjunction with the Google Earth visual analysis to better communicate the impact of the proposed building on the defined visual resources.

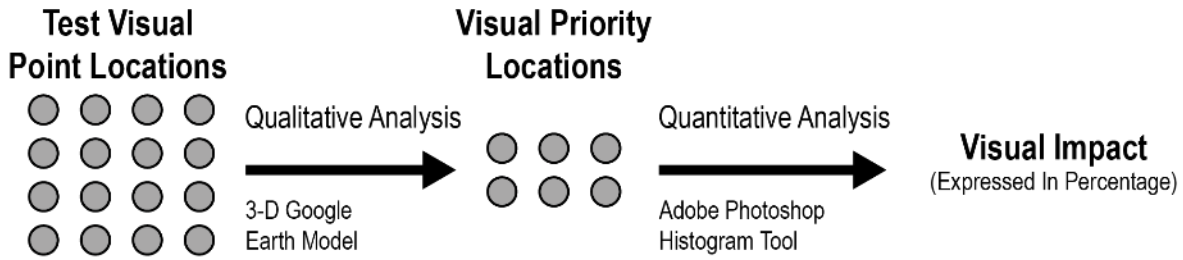

Figure 2 Visual Impact Assessment Methodology Flowchart

Quantifying visual impact within this framework is an estimate of viewshed loss not considering any unexpected changes in environment such as future Mines building development (discussed as part of cumulative impacts), changes in existing vegetation, or temporary obstructions such as traffic on 18th Street.

Impact Assessment Framework:

A quantified value of impact is defined for each visual resource in each zone. These values are defined as a percentage of green pixels lost by the proposed action (shown in pink). Values are rounded to the nearest 10 percent (i.e., 10, 20, 30) as each viewshed impact is calculated in relation to its visible context. For example:

Zone 1 Assessment (Refer to Appendix F)

Visual Resource [A]: Rounded to **10%** Existing Viewshed: (Green + Pink) 343,513 pixels
24,608 / 343,513 = .07 = 7%
Impacted Viewshed: (Pink) 24,608 pixels

Each visual resource of concern viewable from each observation point is analyzed within this assessment framework. An average impact percentage is then found for each associated impact zone.

Impact Assessment Summary:

Views for residents across 18th Street of the surrounding foothills will be reduced. Views of the foothills are unaffected by users at the intersection of Washington Avenue and 18th Street looking west. As users travel west along 18th Street and approach closer to the EMRF building, the views are reduced cumulatively. Residents directly across 18th Street from the project location will lose views to the interior of the Mines campus and will see the biggest loss of foothill views when looking north. Additionally, Maple Residence Hall tenants to the southwest of the project location will experience reduced views to the interior of campus. The degree of viewshed impact to each apartment resident is dependent on what floor they are living on (higher floors = less viewshed impact). The interior portion of campus adjacent to the project area will see an impact in viewshed to users in Alderson Hall and the existing USGS Geologic Hazards Science Center building. Windows in these buildings facing the project location will have greatly reduced viewsheds to the southeast and northeast, respectively. The introduction of new visual resources part of the proposed EMRF building, such as the proposed courtyard open space or the façade of the building itself, is called out in the appendices.

Visual Impact Assessment Table:

Table 12 provides a summary of the visual assessment findings. Values can vary slightly based upon cumulative impacts (such as the continued development of the 18th Street research corridor), precise location within each defined impact zone, changes to viewshed influencing vegetation, or a combination of these factors. Calculations can be found in Appendix L.

Table 12 Visual Impact Assessment Summary

Visual Resource	**Zone**					
	Zone 1	**Zone 2**	**Zone 3**	**Zone 4**	**Zone 5**	**Zone 6**
Visual Resource [A]	10%	NI	NI	NI	NI	30%
Visual Resource [B]	100%	NI	NI	NI	NI	100%
Visual Resource [C]	NI	NI	NI	70%	50%	NI

Visual Resource	Zone					
Visual Resource [D]	80%	100%	NI	NI	NI	NI
Visual Resource [E]	NI	100%	NI	100%	NI	NI
Visual Resource [F]	NI	NI	5%	100%	NI	NI
Average Impact	63%	100%	5%	90%	50%	65%

3.6.3.2 Alternative B – No Action

The No Action Alternative will not impact visual resources within the analysis area.

3.6.4 Cumulative Impacts

Zone 1 (Appendix F)

Due to the proposed building being at a closer proximity to residents and users in this zone, views of buildings on the interior of campus (visual resources B and D) are greatly impacted. There is a low impact to the views of foothills southwest of the project area (visual resource A). Observers will see a higher level of visual impact to views north, beyond 18th Street, that will cumulatively be eliminated by the continued development of the 18th Street research corridor.

Zone 2 (Appendix G)

Residential properties within 500 feet of the project area will see significant visual impacts to views into the interior of campus. The visual impact to users/property owners within this zone is variable. Observers southwest of the project area will see lessened visual impact as there is less existing viewshed due to the height of the existing USGS and Mines campus buildings. Observers southeast of the site will see a higher level of visual impact to views north, beyond 18th Street, that will cumulatively be eliminated by the continued development of the 18th Street research corridor.

Zone 3 (Appendix H)

Views of the South Table Mountain from the upper floors of Mines campus housing directly south of the project area will be minimally impacted. The analysis does not suggest any cumulative impacts with the continued development of the 18th Street research corridor.

Zone 4 (Appendix I)

Views from all east-facing windows of the existing USGS Geologic Hazards Science Center building of the South and North Table Mountains, surrounding neighborhoods, and existing parking lot and associated vegetation are eliminated. Cumulative impacts include any visual changes to the EMRF courtyard as the community begins to use it.

Zone 5 (Appendix J)

Views from all east and south facing windows of Alderson Hall of the existing parking lot and associated vegetation are mostly eliminated and replaced with the views of the EMRF courtyard. Cumulative impacts include any visual changes to the EMRF courtyard as the community begins to use it, and any changes to the service alley accessible through the 17th street pedestrian corridor.

Zone 6 (Appendix K)

Views of the foothills to the southwest of the site are impacted by the proposed EMRF building and views to the south are cumulatively affected by the continued development of the 18th Street research corridor. The views of the campus buildings adjacent to the project area are eliminated.

3.6.5 Design Standards

- EMRF Building height is set to be 78'4" measured from the proposed grade of the Cheyenne Street pedestrian corridor. This is in character with the adjacent buildings on the Mines campus (Mines 2022b).

3.6.6 Mitigating Measures

- Continued engagement and outreach with directly impacted residences regarding construction-related impacts and mitigation measures, such as the effectiveness of visual barrier fencing.

3.7 Sustainability

3.7.1 Issue Statements

- Would the proposed action meet EO 14057 – *Catalyzing Clean Energy Industries and Jobs Through Federal Sustainability* (3 CFR 70935)?
- Would operations in the new building and labs impact water use or conservation practices?
- Would operations in the new building and labs impact energy sustainability and conservation?

3.7.2 Affected Environment

The affected environment consists of the sustainability of existing USGS Energy and Minerals operations, the sustainability of the agency's building portfolio, and requirements of Executive Order 14057. This executive order issues directives to federal agencies to increase the energy sustainability and water efficiency of their operations. Some of the foremost agency goals identified by the order include utilizing 100 percent carbon pollution-free energy (CFE) on a net annual basis by 2030 (Sec. 203) and achieving a net-zero emission (NZE) building portfolio by 2045, with a 50 percent reduction of GHGs (relative to 2008 baseline) in existing building portfolio by 2032 (Sec. 205). The executive order also requires the agency to identify targets for reducing net water use intensity (WUI) (Sec. 206).

USGS Energy and Minerals facilities, consisting of the G3 and CER Science Centers, are currently located in deteriorating buildings on the DFC campus (Figure 3). These facilities are extremely inefficient and, at times, require simultaneous heating and cooling to achieve proper environmental control for lab work. As such, the General Services Administration (GSA), who owns the buildings, has determined these facilities to be at the end of their service life.

Figure 3 Tarps drain leaking rainwater into trash cans in Building 20 laboratories, trying to prevent damage to sensitive equipment

The DFC and the EMRF project area both use electricity from the same regional power grid, which includes Colorado and substantial portions of Wyoming and South Dakota. At the time of analysis, approximately 35 percent of the total electricity supplied to consumers in this area is produced by carbon pollution-free production methods (e.g., solar, wind, and hydro) (Kallus 2023).

USGS has achieved significant reductions in WUI across its operations in recent years. Exceeding the goals set by EO 13514 – *Federal Leadership in Environmental Energy and Economic Performance* (3 CFR 52118, Sec. 2 (d)), USGS reduced its net WUI by 45.6 percent relative to a 2007 baseline by fiscal year 2021 (Richard Isensee 2022). Following the directives of EO 14057, new net WUI targets are currently being developed; the details of these targets remain unknown at the time of analysis. WUI, however, is measured relative to square footage, rather than net consumption like the energy sustainability goals. This means that the EMRF would not have the same potential additive effects towards water sustainability goals that it would towards energy sustainability.

3.7.3 Direct and Indirect Impacts

3.7.3.1 Alternative A – Proposed Action

Quantitative energy and water consumption data is not yet available for the EMRF. Building energy consumption will be modeled by an Energy Model upon the completion of the building design. Similarly, WUI will be modeled once all laboratory, office, and bathroom water fixtures have been determined. Considering the current lack of quantitative data for building sustainability, a qualitative analysis was performed that identifies and discloses potential impacts of the project.

In addition to this qualitative analysis, estimated GHGs and their associated social costs were modeled using CalEEMod Software. This modeling was performed in response to CEQ guidance that provides recommendations for analyzing and presenting the emissions impacts of proposed actions in easily understood terms. This modeling used widely accepted emissions estimation

methodologies and, where project-specific data on construction and operational emissions was unavailable, default values. Emissions were modeled for short-term construction activities and future operation of the EMRF, as well as the effect of project-related vegetation removal on GHGs (USGS 2023). The full details of this model are included as part of the project record.

By relocating the G3 and CER Science Centers to the EMRF, the proposed action would impact the energy consumption and overall sustainability of these operations. Because the existing facilities at the DFC are owned and managed by GSA, the EMRF represents a new, additional building in USGS's building portfolio. Depending on the energy requirements of the building, this could affect the agency's ability to achieve the goals and requirements set by EO 14057 for agency-wide energy sustainability. It should be noted, however, that the project impacts would also include decreases to the overall energy consumption of both USGS science centers as they relocate to modern facilities.

Potential operational emissions include GHGs such as CO_2 and CO_2e; criteria pollutants including NO_x, SO_x, $PM_{2.5}$, and PM_{10}; and/or volatile organic compounds. All modeled emission levels for construction and operation of the EMRF are within their respective thresholds, identified by Table 1 in section 3.3.2.2 of this document (USGS 2023). These emissions are also discussed in the Air Quality section of this report.

Calculating the social cost of GHGs reflects the additive cost of damages caused by emissions as a dollar amount. Assuming a social cost of CO_2e of $0.02/lb, the estimated daily social costs of building construction and operation emissions are presented in Table 13 below. Compliance with the future requirements of EO 14057 would further reduce or eliminate the social cost of building operation.

Table 13 Social Cost of EMRF Emissions

Year	GHG (CO_2e) lb/day	Social Cost $/day
2023	1265	$29.47
2024	1882	$43.85
2025	360	$8.39

(USGS 2023)

In accordance with EO 14057, new WUI targets for federal facilities are currently in development. The details of these targets remain unavailable at the time of analysis. Additionally, WUI is measured relative to the square footage of a building. As such, WUI cannot be determined until all building design elements and operational water uses have been determined. As a modern facility with up-to-date plumbing and water fixtures, however, the EMRF will feature greater system efficiency than existing facilities at the DFC. Furthermore, given the modern design, sustainability goals equivalent to LEED Gold certification, and past reductions to USGS WUI ratings, it is unlikely that the EMRF will have significant negative impacts on the water sustainability of USGS operations.

3.7.3.2 Alternative B – No Action

Under the No Action Alternative, USGS Energy and Minerals operations would continue to operate in the existing facilities at the DFC. These deteriorating facilities would continue to have a detrimental impact on the sustainability of both USGS Energy and Minerals operations and the agency as a

whole. No actions would be taken to ensure compliance with EO 14057 and electricity—sourced primarily from coal and gas—would be wasted as the facilities continue to operate despite inefficiencies.

3.7.4 Cumulative Impacts

Cumulative impacts include potential long-term reductions to the overall resource consumption and increased efficiency of USGS Energy and Minerals operations resulting from the transition to a modern facility. These cumulative impacts relate directly to the sustainability requirements outlined for federal buildings in EO 14057.

3.7.5 Design Standards

The EMRF will be subject to NZE building goals outlined by EO 14057. Stated design goals for the building include Gold-level LEED certification, with Silver being the minimum acceptable certification. It should be noted that, though similar, the requirements for NZE buildings identified by EO 14057 are not directly equivalent to Silver-level LEED certification. Designing to LEED Silver or Gold standards, however, should result in a building requiring fewer future retrofits to achieve compliance with the executive order.

Relevant standards identified by EO 14057 that will need to be met by the project in the coming years include:

- Utilize 100 percent CFE on a net annual basis by 2030, including 50 percent 24/7 CFE.
- Achieving NZE by 2030 and, where feasible, net-zero water and waste for new federal construction projects over 25,000 gross square feet.
- Installation of Electric Vehicle Supply Equipment to support a fully electric vehicle fleet, where feasible.
- Reducing construction waste and debris sent to landfills and other waste disposal facilities.

3.7.6 Mitigating Measures

At the time of analysis, no project-specific mitigations have been identified for the potential negative sustainability impacts of the EMRF. If the building does not meet the future sustainability goals identified by EO 14057 upon construction, USGS will identify and perform any necessary retrofits to bring the building into compliance, specifically as they relate to energy infrastructure, decentralization of energy production, and enhanced building envelope efficiency. Such retrofits will also utilize passive features and sustainable design processes to reduce building energy demand, such as daylighting and plug load reduction. Where feasible, renewable energy technologies such as photovoltaic arrays and geothermal heating and cooling will be utilized. All retrofits should be subject to evaluation of life cycle costs.

3.8 Socioeconomic/Housing/Land Use/Zoning

3.8.1 Issue Statement

- Would the proposed action affect social, economic, and private property resources of importance for populations living adjacent to the project area?

3.8.2 Affected Environment

Socioeconomics and Housing
As homeowners, community members, and members of the workforce, the affected socioeconomic environment of the project centers on the community of Golden and the USGS workforce that will be relocated to the EMRF. Including thousands of Mines students, Golden has a population of approximately 20,000 residents (U.S. Census Bureau 2020), which represents an approximate 8 percent increase in population from 2010-2020 (U.S. Census Bureau 2010). The university presence helps to support local business and provides numerous jobs, with many faculty and staff living in the neighborhoods surrounding campus.

As a result of the university presence, individuals between the ages of 20-24 represent the single largest age group in Golden, accounting for approximately 12 percent of the population. On the other hand, combined age groups over the age of 70 account for only a small portion of the population—approximately 6 percent (U.S. Census Bureau 2020). According to Mines, the neighborhoods surrounding campus are composed primarily of off-campus students, Mines faculty and staff, and recently retired individuals.

Golden's median household income of $80,338 is approximately 7 percent higher than the state median. Furthermore, with median value of owner-occupied housing units with a mortgage of $581,000, median home values in Golden exceed the state median value by over $200,000 (U.S. Census Bureau 2020).Given that 58 percent of the housing units are owner-occupied in Golden, property value is an important financial resource for residents of Golden (U.S. EPA 2022). This value is shaped by university presence, proximity to the Denver metropolitan area, access to public lands, and many other factors.

Table 14 summarizes occupational data from the 2016-2020 American Community Survey showing that 56 percent of Golden residents work in management, business, science, and arts occupations. An additional 20.6 percent work in sales and office occupations (U.S. Census Bureau 2020). According to 2015-2019 American Community Survey data obtained from EJScreen, the unemployment rate in Golden reflects the state average of 4 percent (U.S. EPA 2022).

Table 14 Golden, Colorado Workforce Estimates by Occupation

Total Workforce	Management, business, science, and arts occupations	Service occupations	Sales and office occupations	Natural resources, construction, and maintenance occupations	Production transportation, and material moving occupations
10,234 workers	56%	13.3%	20.6%	3.6%	6.5%

(U.S. Census Bureau 2020)

The affected socioeconomic environment also includes elements such as commuter flow patterns, transportation, and parking. Most people working in Golden (65.5 percent) commute alone via personal vehicle, with an average commute time of 25.6 minutes (U.S. Census Bureau 2020).This suggests that most individuals working in Golden live in a nearby city and that public transportation may be either unfeasible or undesirable for the majority of the Golden workforce. The Mines project area is only served by one public bus route which stops approximately four blocks away. However, visitors and staff members of the existing facilities on the DFC campus are required to pass through security check points on the perimeter of the campus, meaning that public transit users are required to disembark and walk approximately ¾ miles when coming and going from USGS buildings. This makes commuting to existing USGS facilities by public transportation highly undesirable.

Finally, the USGS staff members currently working at the DFC in Lakewood have access to free parking. However, the relocation to the Mines campus in Golden may require some staff to pay for parking. Though a new parking garage will be constructed near the EMRF, parking costs for staff members have yet to be negotiated between USGS and Mines.

Land Use and Zoning

The Mines campus is centrally located in Golden. The campus is bordered by local businesses to the northeast, Hwy 6 to the southwest, and residential neighborhoods to the northwest and southeast. Most developments in these areas are subject to the Golden Municipal Code, which specifies allowable land uses throughout city limits. Being owned by the State of Colorado, however, the land within the project area and 18th Street research corridor are not subject to municipal zoning regulations.

There are no state zoning regulations in place. However, permitting regulations require that self-issued state building permits be reviewed by an authorized third-party professional prior to approval. The preliminary review process is currently in process and will be completed following the completion and submission of the project construction documents.

3.8.3 Direct and Indirect Impacts

3.8.3.1 Alternative A – Proposed Action

Commute mode and duration data suggests that most individuals working in Golden live in a nearby city. Though this daily influx of non-resident workers likely helps to support local business and industry, it also represents additional strain on community resources within Golden. Non-resident workers utilize public roadways and services (e.g., snowplowing) without contributing to the city's tax base which provides and maintains these resources. The EMRF will provide workspace for

approximately 300 total staff members, of which 250 will USGS staff members relocating from the DFC. Roughly 90 of which will commute to the EMRF daily. Assuming that most current USGS staff members do not live in Golden and commute with a personal vehicle, the relocation of USGS operations to the EMRF would increase these impacts to the City of Golden and residents whose taxes fund these public resources. It should be noted, however, that a detailed analysis of impacts to Golden traffic patterns found the new traffic associated with the EMRF to be within the capacity of the existing street systems.

USGS workers also face possible socioeconomic impacts. Although the staff parking plan has not yet been negotiated between USGS and Mines at the time of analysis, it is likely that USGS staff will be required to pay parking fees at the EMRF. Given that these staff members currently have access to free parking at the DFC, this represents a new financial burden for these staff members resulting from the proposed action. The extent of these impacts is assumed to be related directly to the parking prices.

3.8.3.2 Alternative B – No Action

No direct or indirect impacts are associated with the No Action Alternative. However, future Mines developments along the 18th Street research corridor would likely have cumulative impacts similar to those associated with the proposed action.

3.8.4 Cumulative Impacts

The Mines Campus Master Plan identifies future developments along 18th Street. These developments are likely to have impacts similar to the proposed action and will contribute to these effects over the coming years.

3.8.5 Design Standards

The proposed action does not include any design standards pertaining to socioeconomic impacts identified in this analysis.

3.8.6 Mitigating Measures

To reduce transportation infrastructure and maintenance costs to the municipal tax base in Golden, USGS could provide EMRF staff with public transportation stipends or other incentives for alternative modes of transportation. This would also benefit the commute sustainability of the overall EMRF workforce.

3.9 Environmental Justice

3.9.1 Issue Statement

- Would the proposed action disproportionately affect minority, low-income, or marginalized communities? If so, what impacts are expected and how can these impacts be mitigated?
- Would the proposed action meet EO 12898 – *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* (59 CFR 7629)?

3.9.2 Affected Environment

Executive Order 12898 directs federal agencies to identify and address the disproportionately high and adverse human health or environmental effects of their actions on minority and low-income populations, to the greatest extent practicable and permitted by law. The order also directs each

agency to develop a strategy for implementing environmental justice. The order is also intended to promote nondiscrimination in federal programs that affect human health and the environment, as well as provide minority and low-income communities access to public information and public participation.

According to guidance from the Council on Environmental Quality (CEQ), minority and low-income communities can be identified where (a) the minority/low-income population of the affected area exceeds 50 percent or (b) the minority/low income population percentage in the affected area is meaningfully greater than the minority/low income population percentages in the general population or other appropriate unit of the geographic analysis (U.S. CEQ 1997). Information obtained from the EPA EJScreen website shows that the community of Golden, CO ranks in the 62nd percentile for low-income population, 59th percentile for unemployment, and 65th percentile for linguistically isolated populations compared to state averages (U.S. EPA 2022). Golden's unemployment rate of 28 percent is 3 percent higher than the state average (Table 15).

Table 15 Environmental Justice Populations of Golden, CO

Variable	Value	State Avg.	Percentile in State
Demographic Index	23%	29%	47
People of Color	15%	32%	25
Low Income	28%	25%	62
Unemployment Rate	4%	4%	59
Linguistically Isolated	2%	3%	65
Less than High School Education	5%	8%	51
Under Age 5	4%	6%	27
Over Age 64	11%	14%	46

(U.S. EPA 2022)

Within Golden, these populations are currently subject to several forms of pollution and existing sources of environmental justice impacts, summarized in Table 16 below. Of these, the EMRF could impact RMP facility proximity, ozone concentrations, hazardous waste proximity, and traffic proximity for environmental justice populations, which will be analyzed in detail.

Table 16 Pollution Sources and Levels of Golden, CO

Variable	Value	State Avg.	Percentile in State
Particulate Matter 2.5 (ug/m^3)	6.99	7.3	38
Ozone (ppb)	58	55.5	95
2017 Diesel Particulate Matter (ug/m^3)	0.147	0.253	31

Variable	Value	State Avg.	Percentile in State
2017 Air Toxics Cancer Risk (lifetime risk per million)	20	25	50
2017 Air Toxics Respiratory HI	0.21	0.34	38
Traffic Proximity (daily traffic count/distance to road)	580	590	69
RMP Facility Proximity (facility count/km distance)	1.8	0.66	90
Hazardous Waste Proximity (facility count/km distance)	1.6	0.85	81
Wastewater Discharge (toxicity-weighted concentration/m distance)	0.033	0.36	64

(U.S. EPA 2022)

The affected environment also includes elements such as parking and transportation. Low-income and minority staff members and visitors of the USGS facilities at the DFC in Lakewood have access to free parking. However, the relocation to the Mines campus in Golden may require these groups to pay for parking, public transit, or other transportation costs. Though a new parking garage will be constructed near the EMRF, parking costs have yet to be determined. Additionally, the Mines project area is only served by one public bus route which stops approximately four blocks away. By contrast, staff members and visitors of the existing facilities on the DFC campus are served by multiple public transit routes.

Finally, with the median value of owner-occupied housing units with a mortgage of $581,000, home property value can be assumed to be an important financial resource for the many residents of Golden who own a home (U.S. Census Bureau 2020). This value is shaped by university presence, proximity to the Denver metropolitan area, access to public lands, and many other factors. No data is available for rates of home ownership among environmental justice populations in Golden, therefore, these impacts will not be analyzed in detail.

3.9.3 Direct and Indirect Impacts

3.9.3.1 Alternative A – Proposed Action

Under the proposed action, the EMRF would be constructed on the Mines campus and USGS would relocate the CER and G3 Science Centers to the new facilities. Low-income individuals within the USGS workforce, visitors to the buildings, and Golden residents hoping to use the common areas of the building would be impacted by required costs and payment methods. Though parking is currently

free at USGS facilities on the DFC campus, the EMRF would feature paid parking which may place financial burden on low-income individuals. The details of these parking costs are unknown at the time of analysis. Additionally, the current design features parking meters that do not accept cash payment, presenting further challenges to low-income populations for whom credit cards may not be available.

The new location would also impact daily commutes and transportation routes to USGS facilities. At the time of analysis, the project area is not directly served by public transportation, with the nearest transit terminal being a bus stop at Washington Ave and 19th Street– approximately four blocks away. Low-income USGS staff members and visitors who currently rely on public transportation would be required to walk between this stop and the EMRF, though positive and negative impacts to individual overall travel times and costs vary by starting location.

Building programming of the EMRF includes a communal area and food and drink venue which will be open to the public. Given that the current building design does not include multi-lingual signage, linguistically isolated populations within Golden who wish to use these portions of the building may encounter language barriers and reduced opportunity to utilize these public spaces.

At this time, the need for a risk management plan has not been identified for the EMRF. The materials and research occurring at the existing facilities on the DFC do not require a risk management plan, and these operations are likely to be representative of the work conducted in the EMRF. If the need for a risk management plan were to be identified in the future, the plan would be developed and approved prior to initiation of risk-associated actions.

Detailed air quality analyses determined that no significant impacts would result from the proposed action. Construction impacts to air quality—including equipment exhaust, greenhouse gases, and fugitive dust—would be temporary, localized, and typical of other construction projects. Operational emissions would be minimized by building design criteria and adherence to air quality standards and were not found to result in significant impact. Therefore, no significant air quality impacts are anticipated to environmental justice populations.

USGS operations within the EMRF will include handling and disposal of hazardous materials and waste products. However, Mines is already registered as a waste generator with the CDPHE, meaning that any hazardous material proximity impacts associated with the EMRF would be additive in nature, rather than a new impact to the community. Waste generated by Mines is disposed of through approved protocols, and it is likely that USGS would coordinate with the Mines EHS team to dispose of their waste. Though there is low risk for community health effects from USGS operations at the EMRF, the proposed action does increase the total amount of hazardous materials within the proximity of environmental justice populations.

A detailed traffic analysis of the proposed action found no significant impacts to the community as a result of the proposed action. The timing and quantities of construction-related traffic and daily commute traffic are within the capacity of the existing street systems and parking demands. Therefore, there will be no significant impacts to environmental justice populations.

3.9.3.2 Alternative B – No Action

Under the No Action Alternative, the EMRF would not be constructed. The CER and G3 Science Centers would continue to operate within their existing facilities on the DFC campus. As a result, no direct or indirect impacts would occur to the residential neighborhood adjacent to the Mines Campus.

The USGS facilities and workforce would continue to be served by a variety of public transportation options, including rail and bus routes. The DFC campus would continue to offer ample parking availability at no cost to USGS staff members or visitors. Mines would continue to develop the 18th Street research corridor according to the Campus Master Plan.

3.9.4 Cumulative Impacts

The Mines Campus Master Plan identifies future developments along the 18th Street research corridor that would have similar impacts to the proposed action. Together with the EMRF, a fully developed research corridor could present intensified impacts to environmental justice populations, though similar mitigations to those identified for this project would help to reduce these cumulative impacts.

3.9.5 Design Standards

The EMRF does not incorporate any design standards specific to minimizing impacts to environmental justice populations. However, a discussion of EMRF design standards and applicable air regulations for minimizing air quality impacts is included in the Air Quality portion of this report.

3.9.6 Mitigating Measures

Several mitigations could reduce impacts to environmental justice populations. Incorporation of multi-lingual signage in public areas would lessen language barriers for linguistically isolated populations wishing to use the public portions of the building. Additionally, installation of parking meters that accept cash could lessen potential impacts for low-income individuals who may not have equal access to credit cards for payment.

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Appendix A – Detailed Emissions Calculations

Energy and Minerals Research Facility
Air Quality
Emission Calculations
Construction Emissions Summary

Annual Construction Emissions Summary

Construction Emission Source	Emissions, TPY							Emissions, MTPY
	CO	NO_X	SO_X	PM_{10}	$PM_{2.5}$	VOC	HAPs	CO_2e
Fugitive Dust From Construction Operations	-	-	-	0.08	0.01	-	-	-
Total:	**0.00**	**0.00**	**0.00**	**0.08**	**0.01**	**0.00**	**0.00**	**0**

Energy and Minerals Research Facility
Air Quality
Emission Calculations
County Emission Inventory Comparison to Proposed Action Emissions

Construction Emissions - Percent of County Inventory

Emissions Source	Emissions, tpy						
	CO	NO_X	SO_X	PM_{10}	$PM_{2.5}$	VOC	HAPs
Construction Emissions	0.00	0.00	0.00	0.08	0.01	0.00	0.00
Jefferson County Emissions Inventory Total	63,713	8,412	576	10,463	2,493	16,012	21,612
Percent of County EI Total	**< 0.01%**	**< 0.01%**	**< 0.01%**	**< 0.01%**	**< 0.01%**	**< 0.01%**	**< 0.01%**

Note: Emission inventory data from the National Emissions Inventory, 2017.

Energy and Minerals Research Facility
Air Quality
Emission Calculations
Construction Emissions: Earthmoving Activities

Fugitive Dust From Construction Operations: General Construction and Cut/Fill

Parameter	Value	Source / Notes
Total Acres Affected During Construction	1.60	*Tech memo assumptions*
Total Months of Construction	24	*Tech memo assumptions*
General Construction PM_{10} Emission Factor, ton/acre-month	0.011	*WRAP Fugitive Dust Handbook, Table 3-2, "Level 2"*
Assumed Control Efficiency, %	61%	*WRAP Fugitive Dust Handbook, Table 3-6, for applying water at various intervals (3.2hr watering interval).*

Note: No off-site haulage indicated or assumed.

Source: Based on WRAP Fugitive Dust Handbook, Table 3-2, "Recommended PM_{10} Emission Factors for Construction Operations," Level 2. http://www.wrapair.org/forums/dejf/fdh/content/final-handbook.pdf

Annual Fugitive Dust Emissions From Construction Operations, in Tons

Source	CO	NO_X	SO_X	PM_{10}	$PM_{2.5}$	VOC	HAPs	CH_4	CO_2	CO_2e
General Construction	-	-	-	0.16	0.02	-	-	-	-	-
Total Fugitive Emissions, tons	-	-	-	**0.16**	**0.02**	-	-	-	-	-

Note: $PM_{2.5}/PM_{10}$ ratio of 0.10 used from the WRAP Fugitive Dust Handbook, Section 3.3.1. On-site cut-fill emissions do not assume controls.

Example Calculation, General Construction: [Emission Factor, ton/acre-month] * [# of acres affected] * [# of months of construction/project] * [1 - Control Efficiency] = Tons of pollutant for duration of project

Example Calculation, On-Site Cut/Fill: [Emission Factor, ton/1,000 cu yds] * [total cu yds of material/1,000] = Tons of pollutant for duration of project

USGS and CSM
Energy and Minerals Research Facility
Emissions Summary

Table PTE.1 - Summary of Potential-to-Emit in Tons per Year

Unit ID	Description	Potential to Emit (tpy)											
		PM	PM_{10}	$PM_{2.5}$	NO_X	SO_2	CO	VOC	Total HAP	CO_2e [2]	CO_2	CH_4	N_2O
GEN 1	275 kW Diesel Emergency Generator	0.03	0.03	0.03	0.97	0.19	0.53	0.97	0.00	106.55	106.19	0.00	0.00
GEN 2	600 kW Diesel Emergency Generator	0.07	0.07	0.07	2.12	0.41	1.16	2.12	0.01	231.82	231.04	0.01	0.00
GEN 3	750 kW Diesel Emergency Generator	0.08	0.08	0.08	2.64	0.51	1.45	2.64	0.01	289.42	288.44	0.01	0.00
Sitewide Total		**0.18**	**0.18**	**0.18**	**5.73**	**1.11**	**3.14**	**5.73**	**0.02**	**627.79**	**625.66**	**0.03**	**0.01**
Title V Major Source Thresholds		-	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**25.00**	-	-	-	-
Title V Major Source Totals [1]		-	**0.18**	**0.18**	**5.73**	**1.11**	**3.14**	**5.73**	**0.02**	-	-	-	-
Title V Applicable?		-	**No**	**No**	**No**	**No**	**No**	**No**	**No**	-	-	-	-

[1] The Title V major source totals include fugitive emissions since a named source category (i.e., petroleum storage capacity exceeding 300,000 barrels) per 40 CFR Part 51.166(b)(1)(iii).

[2] Global warming potentials obtained from Table A-1 to Subpart 98 - Global Warming Potentials for the conversion to CO_2e. GWPi = Global warming potential for each GHG (1 for CO_2, 25 for CH_4, 298 for N_2O).

Table PTE.2 - Summary of Potential-to-Emit in Pounds per Hour

Unit ID	Description	Potential to Emit (lb/hr)											
		PM	PM_{10}	$PM_{2.5}$	NO_X	SO_2	CO	VOC	Total HAP	CO_2e [1]	CO_2	CH_4	N_2O
GEN 1	275 kW Diesel Emergency Generator	0.12	0.12	0.12	3.89	0.75	2.13	3.89	0.02	426.21	424.76	0.02	3.43E-03
GEN 2	600 kW Diesel Emergency Generator	0.26	0.26	0.26	8.47	1.63	4.63	8.47	0.04	927.29	924.14	0.04	7.45E-03
GEN 3	750 kW Diesel Emergency Generator	0.33	0.33	0.33	10.57	2.04	5.78	10.57	0.04	1,157.68	1,153.74	0.05	0.01
Total		**0.72**	**0.72**	**0.72**	**22.94**	**4.43**	**12.54**	**22.94**	**0.10**	**2,511.18**	**2,502.64**	**0.10**	**0.02**

[1] Global warming potentials obtained from Table A-1 to Subpart 98 - Global Warming Potentials for the conversion to CO_2e. GWPi = Global warming potential for each GHG (1 for CO_2, 25 for CH_4, 298 for N_2O).

USGS and CSM
Energy and Minerals Research Facility
Emissions Summary
275 kW Emergency Diesel Generator

Table GEN-1-2.1 - Emergency Generator Emissions

Assumptions	Value	Units
Number of Generators	1	engines
Power Output [1]	370	hp
Annual Hours of Operation [2]	500	hrs/yr
Fuel Heat Rating [3]	7,000	BTU/hp-hr
Heat Input [3]	2.59	MMBTU/hr

Pollutant	Emission Factor		Emission Rates, Single Engine		Emission Rates, All Engines	
	g/bhp-hr	(lb/MMBtu)	(lb/hr) [7]	(tpy) [8]	(lb/hr) [7]	(tpy) [8]
NO_x [4]	4.77	-	3.89	0.97	3.89	0.97
CO [4]	2.61	-	2.13	0.53	2.13	0.53
VOC [4]	4.77	-	3.89	0.97	3.89	0.97
$PM/PM_{10}/PM_{2.5}$ [4]	0.15	-	0.12	0.03	0.12	0.03
SO_2 [4]	-	0.29	0.75	0.19	0.75	0.19
CO_2 [5]	-	164	424.76	106.19	424.76	106.19
CH_4 [5]	-	0.01	0.02	0.00	0.02	0.00
N_2O [5]	-	0.001	3.43E-03	8.56E-04	3.43E-03	8.56E-04
HAP Pollutant [6]	**Emission Factor**		**Emission Rates, Single Engine**		**Emission Rates, All Engines**	
	(g/hp-hr)	(lb/MMBtu)	(lb/hr) [7]	(tpy) [8]	(lb/hr) [7]	(tpy) [8]
Benzene	-	9.33E-04	2.42E-03	6.04E-04	2.42E-03	6.04E-04
Toluene	-	4.09E-04	1.06E-03	2.65E-04	1.06E-03	2.65E-04
Xylenes	-	2.85E-04	7.38E-04	1.85E-04	7.38E-04	1.85E-04
Propylene	-	2.58E-03	6.68E-03	1.67E-03	6.68E-03	1.67E-03
1,3-Butadiene	-	3.91E-05	1.01E-04	2.53E-05	1.01E-04	2.53E-05
Formaldehyde	-	1.18E-03	3.06E-03	7.64E-04	3.06E-03	7.64E-04
Acetaldehyde	-	7.67E-04	1.99E-03	4.97E-04	1.99E-03	4.97E-04
Acrolein	-	9.25E-05	2.40E-04	5.99E-05	2.40E-04	5.99E-05
Naphthalene	-	8.48E-05	2.20E-04	5.49E-05	2.20E-04	5.49E-05
TOTAL HAP			**1.65E-02**	**4.12E-03**	**1.65E-02**	**4.12E-03**

[1] The exact make and model of this generator is unknown, however the USGS indicated that there is one 275 kW engine, one 600 kW engine, and one 750 kW engine at the facility.

[2] Per 40 CFR §60.4243(d)(1)-(2), there is no time limit on the use of emergency stationary internal combustion engines in emergency situations; operation for non-emergency uses is limited to 100 hours per calendar year. The CDPHE calculates emissions for emergency engines assuming a maximum of 500 hours of operation annually.

[3] Heat input calculated assuming a brake-specific fuel capacity of 7,000 Btu/hp-hr, based on U.S. EPA AP-42 Chapter 3 Section 3.4 - Large Stationary Diesel And All Stationary Dual-fuel Engines, Table 3.3-1.
Estimated Heat Input (MMBtu/hr) = Average Brake-Specific Fuel Consumption (BSFC) (Btu/hp-hr) * Maximum Power Output (hp) * (1 MMBtu/1,000,000 Btu)

[4] The emission factors for NMHC+NOx, CO, and PM were obtained EPA Tier 2 Emission Standards (Table 4 to 40 CFR Part 60, Subpart IIII). To be conservative, the entire NOx +NMHC emission standard is used as the emission factor for NOx and for VOC.

[5] From U.S. EPA AP-42 Chapter 3 Section 3.3, Table 3.3-1. CH4 and N2O emission factor not available from AP-42 so the Default emission factor for petroleum products from 40 CFR Part 98, Subpart C Table C-2 is used. Value listed in the table above is converted from kg/mmBtu.

[6] From U.S. EPA AP-42 Chapter 3 Section 3.3, Table 3.3-2

[7] Hourly Potential Emissions (lb/hr) = Estimated Heat Input (mmBtu/hr) x Emission Factor (lb/mmBtu)

[8] Annual Potential Emissions (tpy) = Hourly Potential Emissions (lb/hr) x Annual Hours of Operation (hr/yr)

USGS and CSM
Energy and Minerals Research Facility
Emissions Summary
600 kW Emergency Diesel Generators

Table GEN-1-2.1 - Emergency Generator Emissions

Assumptions	Value	Units
Number of Generators	1	engines
Power Output [1]	805	hp
Annual Hours of Operation [2]	500	hrs/yr
Fuel Heat Rating [3]	7,000	BTU/hp-hr
Heat Input [3]	5.64	MMBTU/hr

Pollutant	Emission Factor		Emission Rates, Single Engine		Emission Rates, All Engines	
	g/bhp-hr	(lb/MMBtu)	(lb/hr) [7]	(tpy) [8]	(lb/hr) [7]	(tpy) [8]
NO_x [4]	4.77	-	8.47	2.12	8.47	2.12
CO [4]	2.61	-	4.63	1.16	4.63	1.16
VOC [4]	4.77	-	8.47	2.12	8.47	2.12
$PM/PM_{10}/PM_{2.5}$ [4]	0.15	-	0.26	0.07	0.26	0.07
SO_2 [4]	-	0.29	1.63	0.41	1.63	0.41
CO_2 [5]	-	164	924.14	231.04	924.14	231.04
CH_4 [5]	-	0.01	0.04	0.01	0.04	0.01
N_2O [5]	-	0.001	7.45E-03	1.86E-03	7.45E-03	1.86E-03
HAP Pollutant [6]	**Emission Factor**		**Emission Rates, Single Engine**		**Emission Rates, All Engines**	
	(g/hp-hr)	(lb/MMBtu)	(lb/hr) [7]	(tpy) [8]	(lb/hr) [7]	(tpy) [8]
Benzene	-	9.33E-04	5.26E-03	1.31E-03	5.26E-03	1.31E-03
Toluene	-	4.09E-04	2.30E-03	5.76E-04	2.30E-03	5.76E-04
Xylenes	-	2.85E-04	1.61E-03	4.01E-04	1.61E-03	4.01E-04
Propylene	-	2.58E-03	1.45E-02	3.63E-03	1.45E-02	3.63E-03
1,3-Butadiene	-	3.91E-05	2.20E-04	5.51E-05	2.20E-04	5.51E-05
Formaldehyde	-	1.18E-03	6.65E-03	1.66E-03	6.65E-03	1.66E-03
Acetaldehyde	-	7.67E-04	4.32E-03	1.08E-03	4.32E-03	1.08E-03
Acrolein	-	9.25E-05	5.21E-04	1.30E-04	5.21E-04	1.30E-04
Naphthalene	-	8.48E-05	4.78E-04	1.19E-04	4.78E-04	1.19E-04
TOTAL HAP			**3.59E-02**	**8.97E-03**	**3.59E-02**	**8.97E-03**

[1] The exact make and model of this generator is unknown, however the USGS indicated that there is one 275 kW engine, one 600 kW engine, and one 750 kW engine at the facility.

[2] Per 40 CFR §60.4243(d)(1)-(2), there is no time limit on the use of emergency stationary internal combustion engines in emergency situations; operation for non-emergency uses is limited to 100 hours per calendar year. The CDPHE calculates emissions for emergency engines assuming a maximum of 500 hours of operation annually.

[3] Heat input calculated assuming a brake-specific fuel capacity of 7,000 Btu/hp-hr, based on U.S. EPA AP-42 Chapter 3 Section 3.4 - Large Stationary Diesel And All Stationary Dual-fuel Engines, Table 3.3-1.
Estimated Heat Input (MMBtu/hr) = Average Brake-Specific Fuel Consumption (BSFC) (Btu/hp-hr) * Maximum Power Output (hp) * (1 MMBtu/1,000,000 Btu)

[4] The emission factors for NMHC+NOx, CO, and PM were obtained EPA Tier 3 Emission Standards (Table 4 to 40 CFR Part 60, Subpart IIII). To be conservative, the entire NOx +NMHC emission standard is used as the emission factor for NOx and for VOC.

[5] From U.S. EPA AP-42 Chapter 3 Section 3.3, Table 3.3-1. CH4 and N2O emission factor not available from AP-42 so the Default emission factor for petroleum products from 40 CFR Part 98, Subpart C Table C-2 is used. Value listed in the table above is converted from kg/mmBtu.

[6] From U.S. EPA AP-42 Chapter 3 Section 3.3, Table 3.3-2

[7] Hourly Potential Emissions (lb/hr) = Estimated Heat Input (mmBtu/hr) x Emission Factor (lb/mmBtu)

[8] Annual Potential Emissions (tpy) = Hourly Potential Emissions (lb/hr) x Annual Hours of Operation (hr/yr)

USGS and CSM
Energy and Minerals Research Facility
Emissions Summary
750 kW Emergency Diesel Generator

Table GEN-3.1 - Emergency Generator Emissions

Assumptions	Value	Units
Number of Generators	1	engines
Power Output [1]	1,005	hp
Annual Hours of Operation [2]	500	hrs/yr
Fuel Heat Rating [3]	7,000	BTU/hp-hr
Heat Input [3]	7.04	MMBTU/hr

Pollutant	Emission Factor		Emission Rates, Single Engine		Emission Rates, All Engines	
	g/bhp-hr	(lb/MMBtu)	(lb/hr) [7]	(tpy) [8]	(lb/hr) [7]	(tpy) [8]
NO_x [4]	4.77	-	10.57	2.64	10.57	2.64
CO [4]	2.61	-	5.78	1.45	5.78	1.45
VOC [4]	4.77	-	10.57	2.64	10.57	2.64
$PM/PM_{10}/PM_{2.5}$ [4]	0.15	-	0.33	0.08	0.33	0.08
SO_2 [4]	-	0.29	2.04	0.51	2.04	0.51
CO_2 [5]	-	164	1,153.74	288.44	1,153.74	288.44
CH_4 [5]	-	0.01	0.05	0.01	0.05	0.01
N_2O [5]	-	0.001	9.31E-03	2.33E-03	9.31E-03	2.33E-03
HAP Pollutant [6]	**Emission Factor**		**Emission Rates, Single Engine**		**Emission Rates, All Engines**	
	(g/hp-hr)	(lb/MMBtu)	(lb/hr) [7]	(tpy) [8]	(lb/hr) [7]	(tpy) [8]
Benzene	-	9.33E-04	6.56E-03	1.64E-03	6.56E-03	1.64E-03
Toluene	-	4.09E-04	2.88E-03	7.19E-04	2.88E-03	7.19E-04
Xylenes	-	2.85E-04	2.00E-03	5.01E-04	2.00E-03	5.01E-04
Propylene	-	2.58E-03	1.82E-02	4.54E-03	1.82E-02	4.54E-03
1,3-Butadiene	-	3.91E-05	2.75E-04	6.88E-05	2.75E-04	6.88E-05
Formaldehyde	-	1.18E-03	8.30E-03	2.08E-03	8.30E-03	2.08E-03
Acetaldehyde	-	7.67E-04	5.40E-03	1.35E-03	5.40E-03	1.35E-03
Acrolein	-	9.25E-05	6.51E-04	1.63E-04	6.51E-04	1.63E-04
Naphthalene	-	8.48E-05	5.97E-04	1.49E-04	5.97E-04	1.49E-04
TOTAL HAP			**4.48E-02**	**1.12E-02**	**4.48E-02**	**1.12E-02**

[1] The exact make and model of this generator is unknown, however the USGS indicated that there is one 275 kW engine, one 600 kW engine, and one 750 kW engine at the facility.

[2] Per 40 CFR §60.4243(d)(1)-(2), there is no time limit on the use of emergency stationary internal combustion engines in emergency situations; operation for non-emergency uses is limited to 100 hours per calendar year. The CDPHE calculates emissions for emergency engines assuming a maximum of 500 hours of operation annually.

[3] Heat input calculated assuming a brake-specific fuel capacity of 7,000 Btu/hp-hr, based on U.S. EPA AP-42 Chapter 3 Section 3.4 - Large Stationary Diesel And All Stationary Dual-fuel Engines, Table 3.3-1.
Estimated Heat Input (MMBtu/hr) = Average Brake-Specific Fuel Consumption (BSFC) (Btu/hp-hr) * Maximum Power Output (hp) * (1 MMBtu/1,000,000 Btu)

[4] The emission factors for NMHC+NOx, CO, and PM were obtained EPA Tier 3 Emission Standards (Table 4 to 40 CFR Part 60, Subpart IIII). To be conservative, the entire NOx +NMHC emission standard is used as the emission factor for NOx and for VOC.

[5] From U.S. EPA AP-42 Chapter 3 Section 3.3, Table 3.3-1. CH4 and N2O emission factor not available from AP-42 so the Default emission factor for petroleum products from 40 CFR Part 98, Subpart C Table C-2 is used. Value listed in the table above is converted from kg/mmBtu.

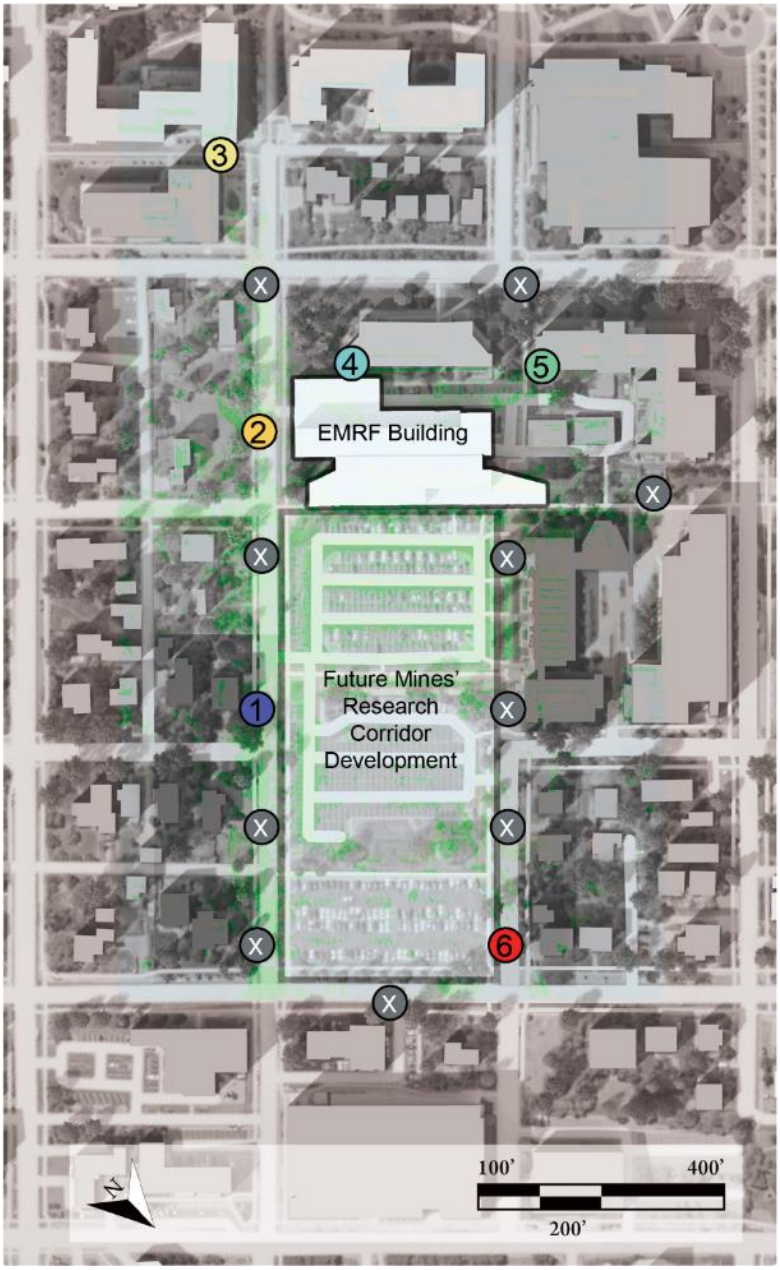
[6] From U.S. EPA AP-42 Chapter 3 Section 3.3, Table 3.3-2

[7] Hourly Potential Emissions (lb/hr) = Estimated Heat Input (mmBtu/hr) x Emission Factor (lb/mmBtu)

[8] Annual Potential Emissions (tpy) = Hourly Potential Emissions (lb/hr) x Annual Hours of Operation (hr/yr)

Appendix B – Qualitative Visual Impact Assessment

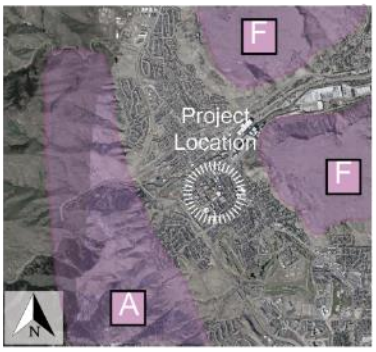
Observation Points Key



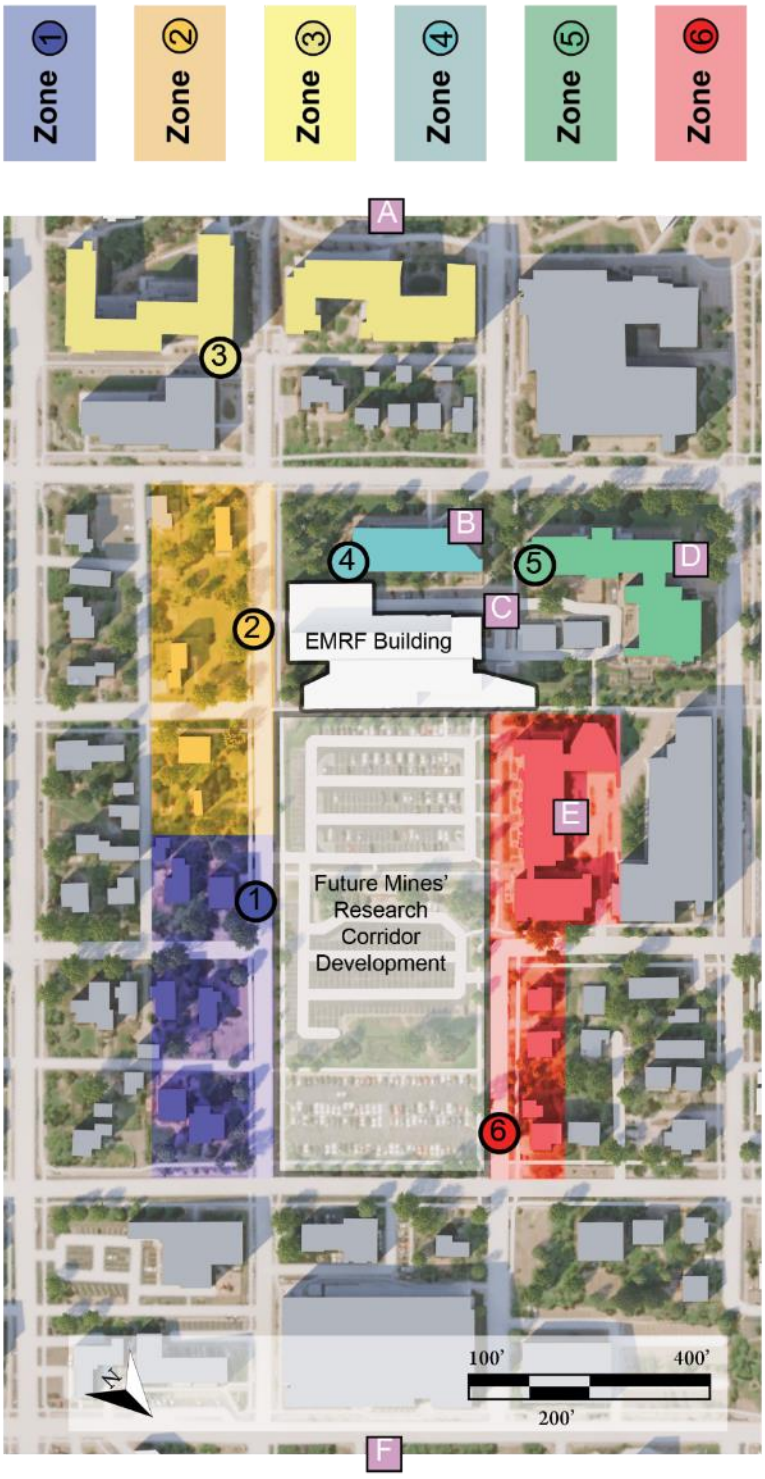
Visual Resources Key

- A Foothills Southwest of Project Site
- B USGS Earthquake Building
- C Existing Parking Lot
- D Alderson Hall
- E CTLM Building
- F Foothills Northeast of Project Site
- G Proposed EMRF Building
- H Proposed EMRF Courtyard
- Impacted Viewshed
- Proposed/Remaining Viewshed
- Proposed EMRF Building Shell

Visual Resource Locations Key Map



Impacted Observation Points & Zones Key



Appendix C – Glare Impact Assessment (Weighted Average Albedo Calculations)

Material Code (80% SD-A00-02)	Albedo Value
EWS-01	90%
EWS-02	90%
EWS-03	90%
EWS-04	90%
EWS-05	90%
EWS-06	30%
EWS-07	35%
EWS-09A	95%
EWS-09C	95%
Totals/Averages:	**78%**

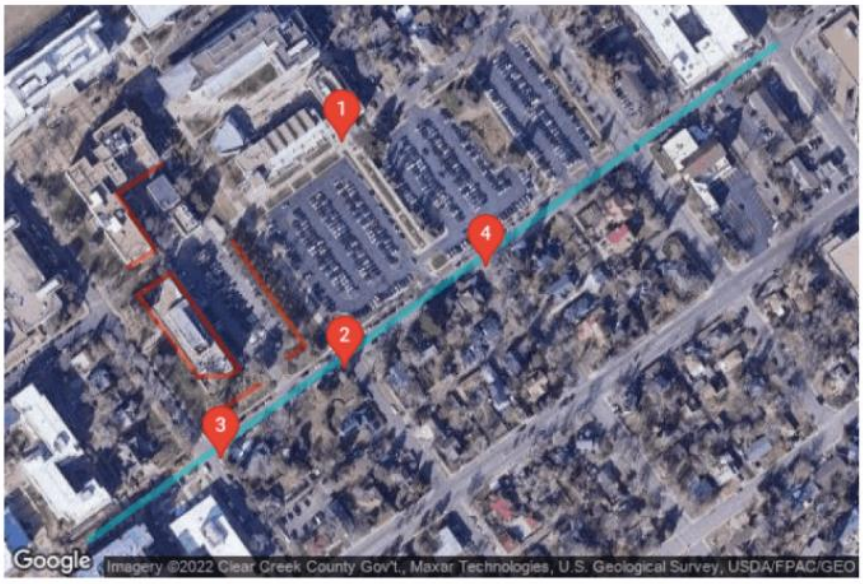
East Elevation	Albedo Weight (E)	South Elevation	Albedo Weight (S)
	-		-
	4,552	21%	1,737
	6,200	28%	4,128
	357	2%	150
	1,883	9%	1,600
	5,546	25%	2,451
	-		1,918
	3,500	16%	1,163
	-		275
	22,038		**13,422**

West Elevation	Albedo Weight (W)	North Elevation	Albedo Weight (N)
2,493	15%	1,376	13%
2,379	14%	337	3%
-	0%	2,201	21%
538	3%		
-	0%	3,911	38%
7,599	46%	1,144	11%
-	0%		
3,655	22%	834	8%
-		593	6%
16,664		**10,396**	

Weighted Average (E)	Weighted Average (S)	Weighted Average (W)	Weighted Average (N)
76%	72%	64%	84%

Appendix D – Glare Impact Assessment – Observation Points

No-Impact
Solar Glare Hazard Analysis Tool (SGHAT) Key



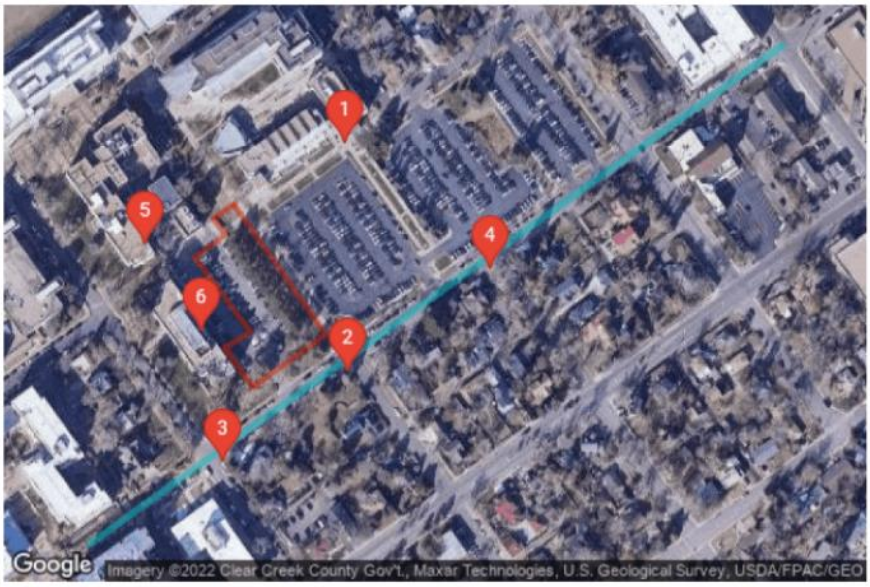
SGHAT Model Key

Observation Points

18th Street Route
(Two-way Vehicular Travel)

Vertical Surfaces
(Sources of Glare)

Impact
Solar Glare Hazard Analysis Tool (SGHAT) Key

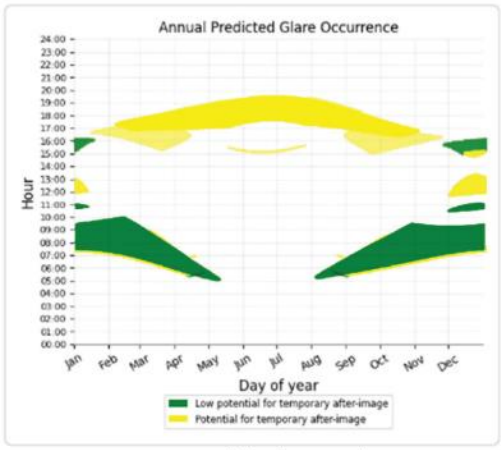


Appendix E – Glare Impact Assessment – 18th Street Corridor

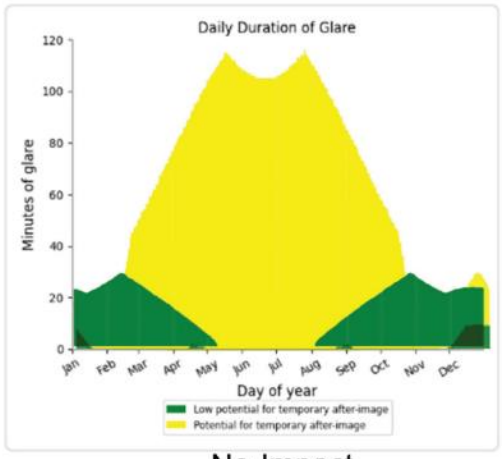
Route: (Route 1)

Vertical Surface face is expected to produce the following glare for receptors at this location:

- 32,242 minutes of "green" glare with low potential to cause temporary after-image.
- 0 minutes of "yellow" glare with potential to cause temporary after-image.



No-Impact

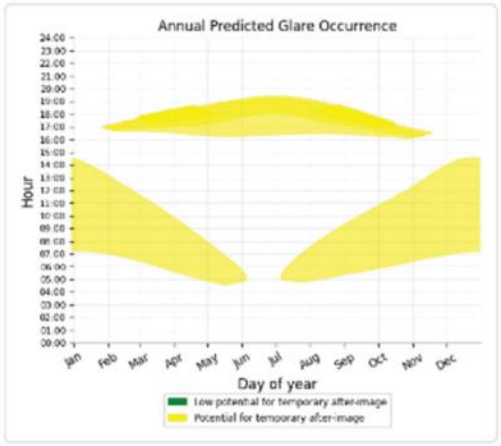


No-Impact

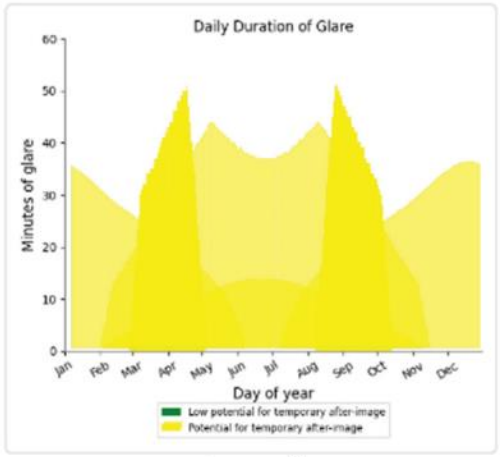
Route: (Route 1)

Vertical Surface face is expected to produce the following glare for receptors at this location:

- 0 minutes of "green" glare with low potential to cause temporary after-image.
- 4,476 minutes of "yellow" glare with potential to cause temporary after-image.

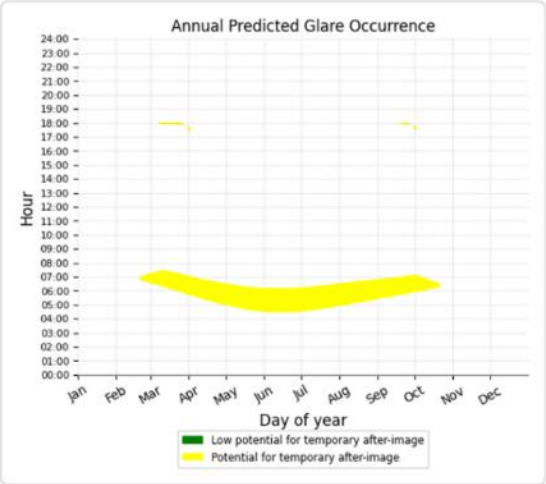


Impact

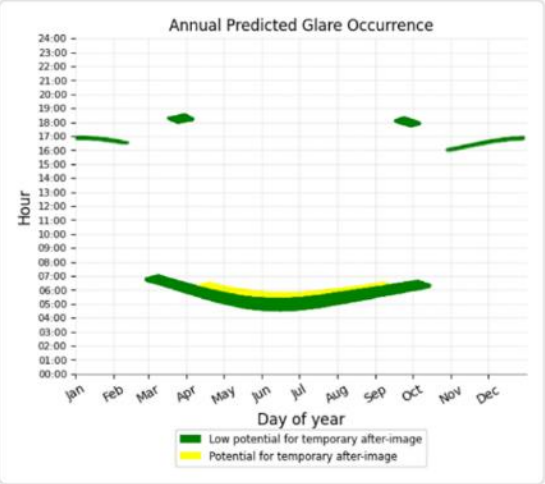


Impact

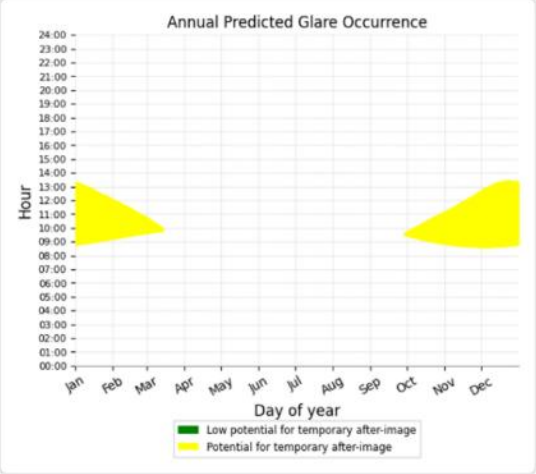
Observation point: OP 1 **Impact**



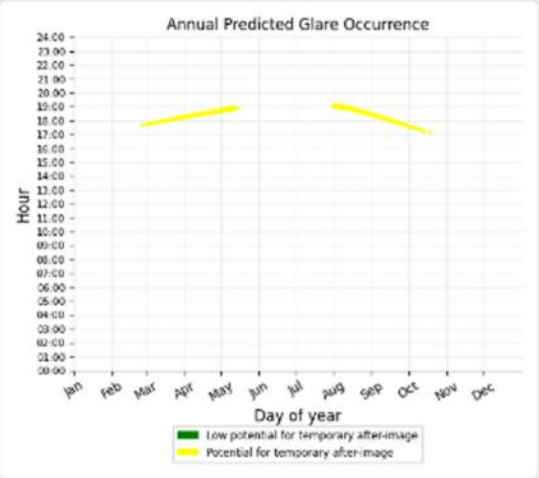
Observation point: OP 1 **No-Impact**



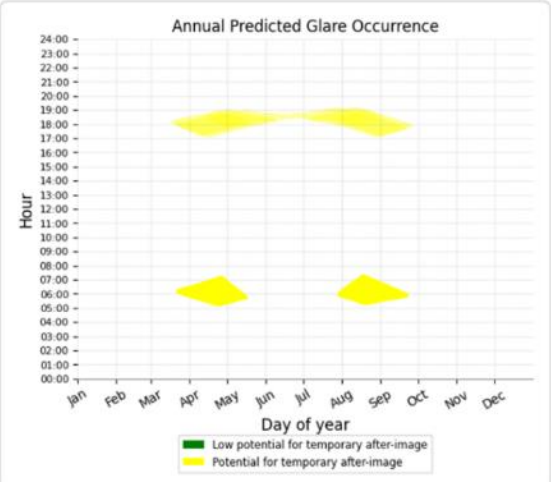
Observation point: OP 2 **Impact**



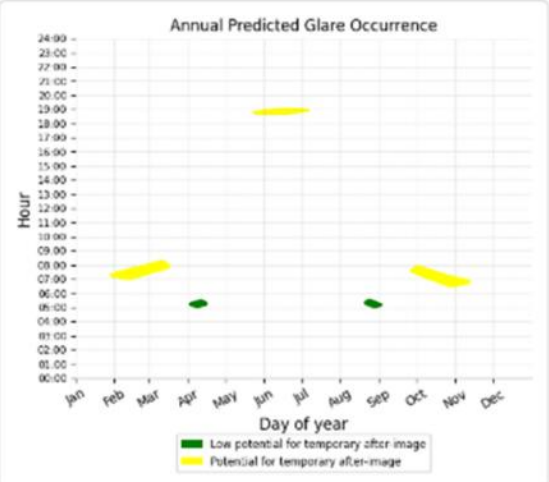
Observation point: OP 6 **Impact**



Observation point: OP 3 **Impact**



Observation point: OP 3 **No-Impact**



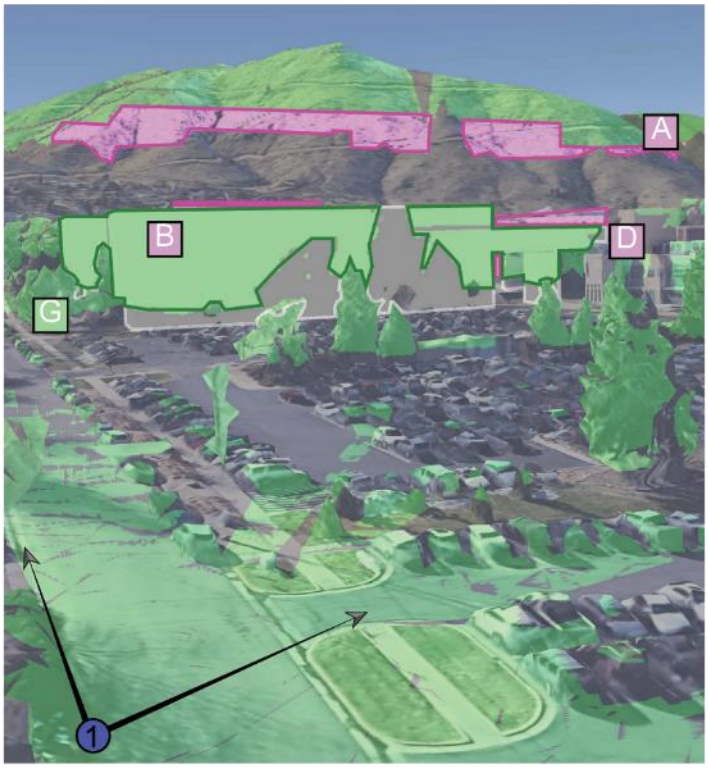
Appendix F – Qualitative Visual Impact Assessment – Zone 1

1

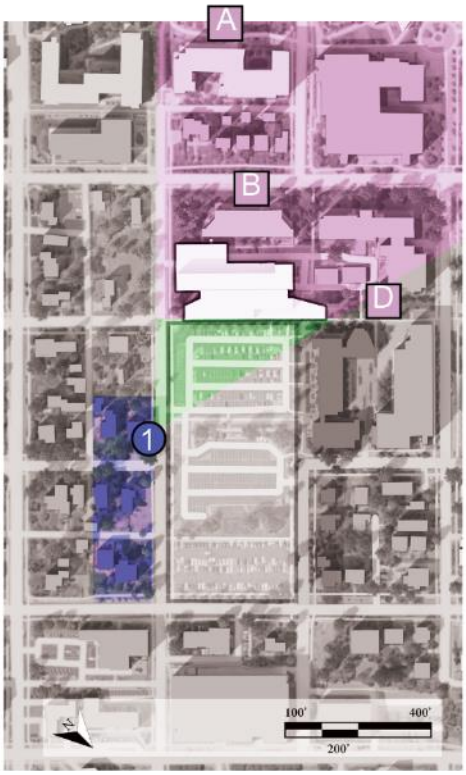
Visual Observation Point Key
Distance to Project Site: 500'-1,000'
18th Street - Looking Southwest

- A Foothills Southwest of Project Site
- B USGS Earthquake Building
- D Alderson Hall
- G Proposed EMRF Building
- Impacted Viewshed
- Proposed/Remaining Viewshed

Impact
18th Street - Looking Southwest



Key Map
18th Street - Looking Southwest



Impact
18th Street - Looking Southwest

Visual Resources Key

- A Foothills Southwest of Project Site
- B USGS Earthquake Building
- C Existing Parking Lot
- D Alderson Hall
- G Proposed EMRF Building
- Impacted Viewshed
- Proposed/Remaining Viewshed

No-Impact
18th Street - Looking Southwest

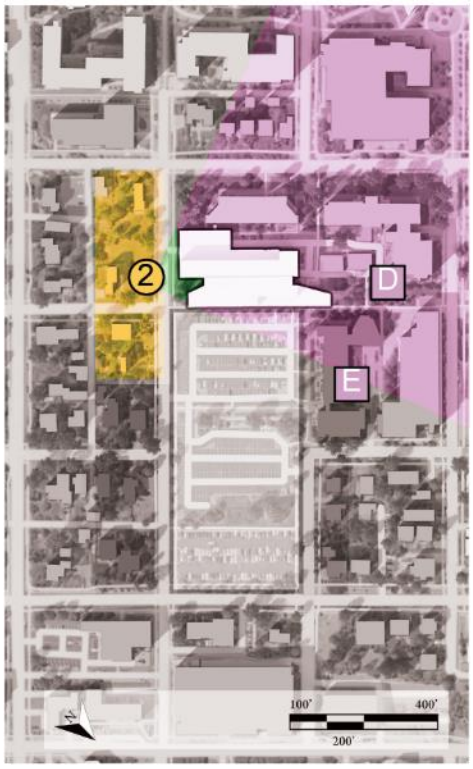
Appendix G – Qualitative Visual Impact Assessment – Zone 2

2 Visual Observation Point Key
Distance to Project Site: <500'
18th Street - Looking Southwest

- D Alderson Hall
- E CTLM Building
- G Proposed EMRF Building
- H Proposed EMRF Courtyard
- Impacted Viewshed
- Proposed/Remaining Viewshed

Impact
18th Street - Looking Southwest

Key Map
18th Street - Looking Southwest

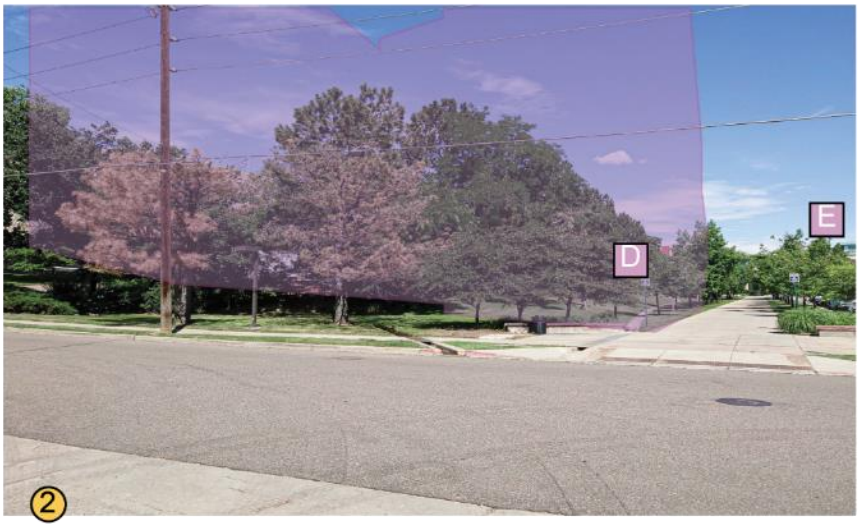


Impact
18th Street - Looking West

Visual Resources Key

- D Alderson Hall
- E CTLM Building
- G Proposed EMRF Building
- Impacted Viewshed
- Proposed/Remaining Viewshed

No-Impact
18th Street - Looking West

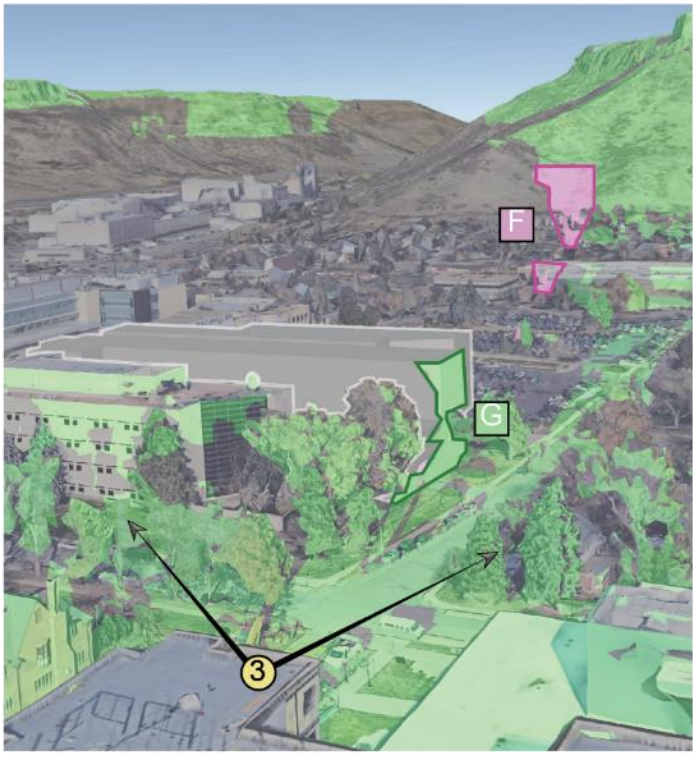


Appendix H – Qualitative Visual Impact Assessment – Zone 3

3 Visual Observation Point Key
Distance to Project Site: <500'
18th Street - Looking Southwest

C Existing Parking Lot
F Foothills Northeast of Project Site
G Proposed EMRF Building
Impacted Viewshed
Proposed/Remaining Viewshed

Impact
Residence Halls - Looking Northeast



Key Map
Residence Halls - Looking Northeast

Appendix I – Qualitative Visual Impact Assessment – Zone 4

Visual Observation Point Key

Distance to Project Site: <500'
18th Street - Looking Southwest

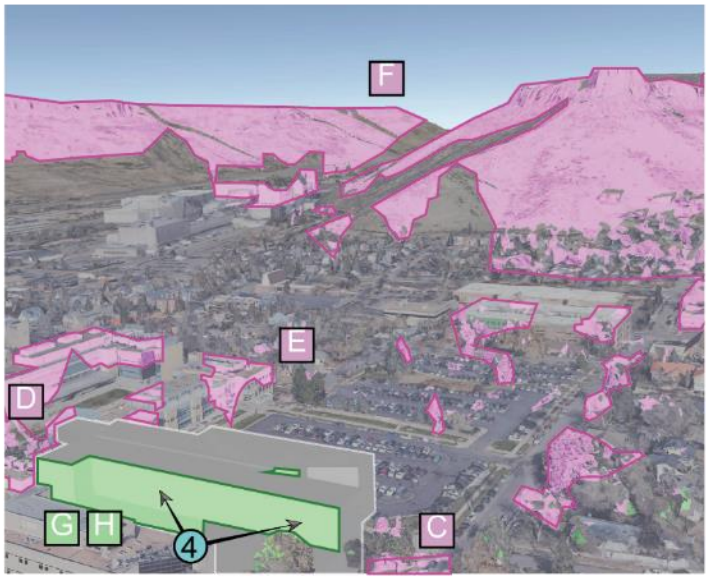
- C Existing Parking Lot
- D Alderson Hall
- E CTLM Building
- F Foothills Northeast of Project Site
- G Proposed EMRF Building
- H Proposed EMRF Courtyard

Impacted Viewshed

Proposed/Remaining Viewshed

Impact

USGS Building - Looking Northeast



Key Map

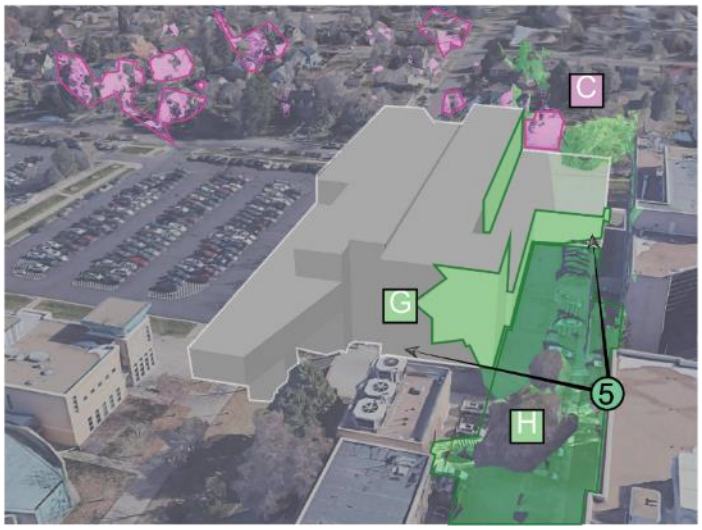
USGS Building - Looking Northeast

Appendix J – Qualitative Visual Impact Assessment – Zone 5

5 Visual Observation Point Key
Distance to Project Site: <500'
18th Street - Looking Southwest

C Existing Parking Lot
G Proposed EMRF Building
H Proposed EMRF Courtyard
Impacted Viewshed
Proposed/Remaining Viewshed

Impact
Alderson Hall - Looking East



Key Map
Alderson Hall - Looking East

Appendix K – Qualitative Visual Impact Assessment – Zone 6

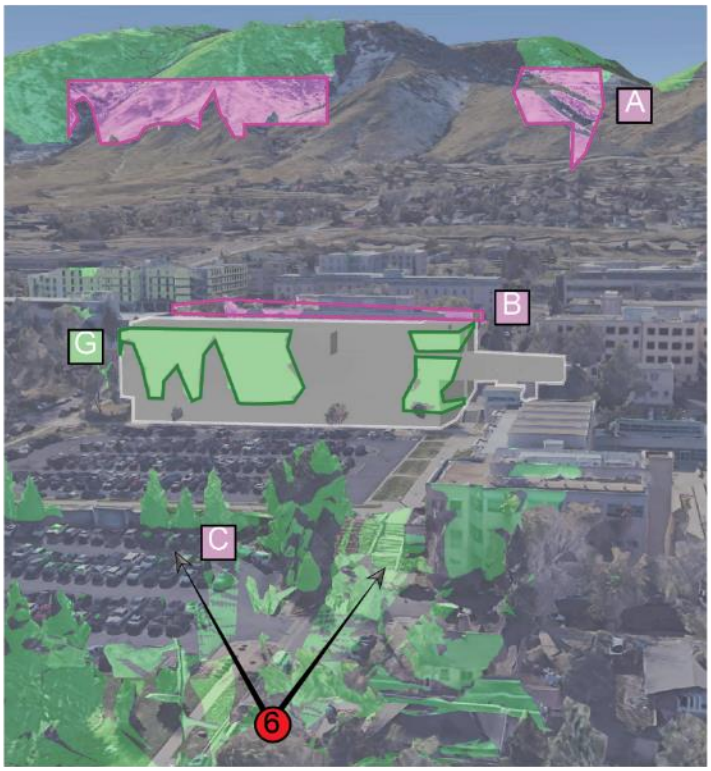
6

Visual Observation Point Key
Distance to Project Site: <500'
18th Street - Looking Southwest

A Foothills Southwest of Project Site
B USGS Earthquake Building
C Existing Parking Lot
G Proposed EMRF Building

Impacted Viewshed
Proposed/Remaining Viewshed

Impact
16th Street - Looking Southwest



Key Map
16th Street - Looking Southwest

Impact
16th Street - Looking Southwest

No-Impact
16th Street - Looking Southwest

Visual Resources Key

- A — Foothills Southwest of Project Site
- B — USGS Earthquake Building
- C — Existing Parking Lot
- G — Proposed EMRF Building
- Impacted Viewshed
- Proposed/Remaining Viewshed

Appendix L – Quantitative Visual Impact Assessment (Calculations)

Zone 1 Assessment (Appendix 18)

Visual Resource [A]: Rounded to 10%

Existing Viewshed:
(Green + Pink)
343,513 pixels
24,608 / 343,513 = .07 = 7%
Impacted Viewshed:
(Pink)
24,608 pixels

Visual Resource [B]: Rounded to 100%

Existing Viewshed:
(Green + Pink)
38,820
38,820 / 38,820 = 1.0 = 100%
Impacted Viewshed:
(Pink)
38,820

Visual Resource [D]: Rounded to 80%

Existing Viewshed:
(Green + Pink)
48,437
40,099 / 48,437 = .83 = 83%
Impacted Viewshed:
(Pink)
40,099 pixels

Zone 2 Assessment (Appendix 18)

Visual Resource [D]: Rounded to 100%

Existing Viewshed:
(Green + Pink)
70,988
70,988 / 70,988 = 1.0 =100%
Impacted Viewshed:
(Pink)
70,988

Visual Resource [E]: Rounded to 100%

Existing Viewshed:
(Green + Pink)
7,091
7,091 / 7,091 = 1.0 = 100%
Impacted Viewshed:
(Pink)
7,091

Zone 3 Assessment (Appendix 18)

Visual Resource [F]: Rounded to 5%

Existing Viewshed:
(Green + Pink)
129,600
129,600 / 9,242 = .07 =7%
Impacted Viewshed:
(Pink)
9,242

Zone 4 Assessment (Appendix 18)

Visual Resource [C]: Rounded to 70%

Existing Viewshed:
(Green + Pink)
132,819 pixels
97,118 / 132,819 = .73 =73%
Impacted Viewshed:
(Pink)
97,118 pixels

Visual Resource [D]: Rounded to 100%

Existing Viewshed:
(Green + Pink)
32,199 pixels
32,199 / 32,199 = 1.0 =100%
Impacted Viewshed:
(Pink)
32,199 pixels

Visual Resource [E]: Rounded to 100%

Existing Viewshed:
(Green + Pink)
619,034 pixels
619, 034 / 619,034 = 1.0 =100%
Impacted Viewshed:
(Pink)
619,034 pixels

Zone 5 Assessment (Refer to Appendix 18)

Visual Resource [C]: Rounded to 50%

Existing Viewshed:
(Green + Pink)
223,888 pixels
121,907 / 223,888 = .54 =54%
Impacted Viewshed:
(Pink)
121,907 pixels

Zone 6 Assessment (Refer to Appendix 18)

Visual Resource [B]: Rounded to 100%

Existing Viewshed:
(Green + Pink)
47,406 pixels
47,406 / 47,406 = 1.0 =100%
Impacted Viewshed:
(Pink)
47,406 pixels

Visual Resource [C]: Rounded to 30%

Existing Viewshed:
(Green + Pink)
103,107 pixels
29,819 / 103,107 = .29 =29%
Impacted Viewshed:
(Pink)
29,819 pixels

Appendix M – Quantitative Visual Impact Assessment (Calculation Pixel Samples)

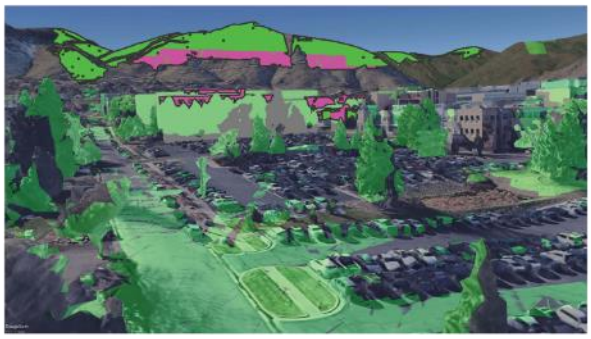
Impacted Viewshed (Not Sampled)

Impacted Visual Resource Pixel Sample

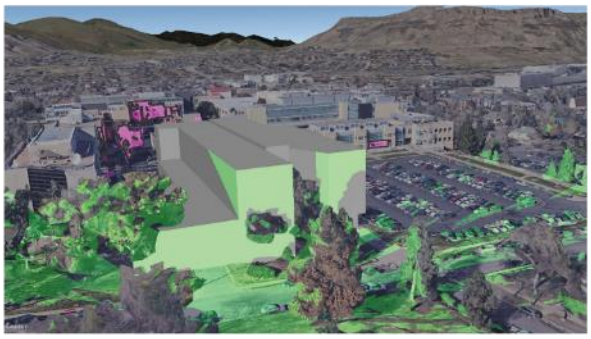
Proposed/Remaining Viewshed (Not Sampled)

Remaining Visual Resource Pixel Sample

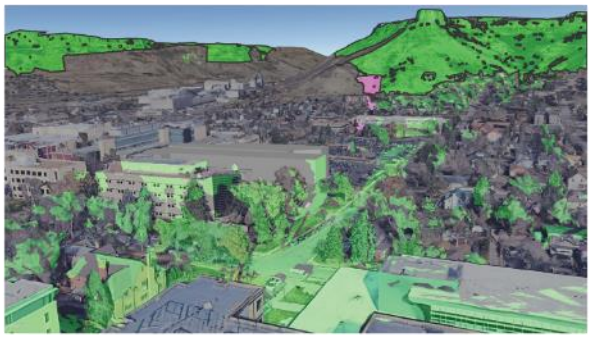
Pixel Sample
Appendix 16 - Zone 1 Assessment



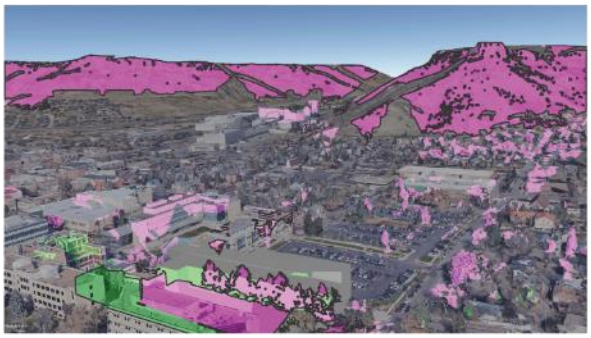
Pixel Sample
Appendix 16 - Zone 2 Assessment



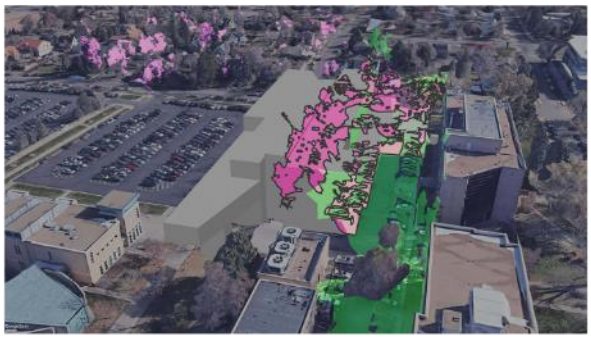
Pixel Sample
Appendix 16 - Zone 3 Assessment



Pixel Sample
Appendix 16-17 - Zone 4 Assessment



Pixel Sample
Appendix 17 - Zone 5 Assessment



Pixel Sample
Appendix 17 - Zone 6 Assessment