U.S. AIR FORCE

ENVIRONMENTAL ASSESSMENT

United States Space Command Headquarters Basing and Construction

FINAL

October 2019

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FINAL ENVIRONMENTAL ASSESSMENT

UNITED STATES SPACE COMMAND HEADQUARTERS BASING AND CONSTRUCTION

October 2019

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COVER SHEET

ENVIRONMENTAL ASSESSMENT

UNITED STATES SPACE COMMAND HEADQUARTERS BASING AND CONSTRUCTION

a. Lead Agency: U.S. Air Force

b. Proposed Action: Establish U.S. Space Command (USSPACECOM) headquarters.

c. Written comments and inquiries regarding this document should be directed to:

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d. Designation: Final Environmental Assessment (EA)

Abstract: This EA evaluates the potential environmental impacts associated with establishing a headquarters for USSPACECOM at one of five Department of Defense installations in the United States (Proposed Action).

The Proposed Action would accommodate approximately 1,870 personnel in a typical headquarters setting providing 1,000,000 square feet (23 acres) of office/administrative space and privately owned vehicle (POV) parking. Temporary basing to conduct operations prior to the completion of the permanent facility (estimated to be 2025) would provide 595,000 square feet of interim facility space and POV parking. Existing, vacant facilities and/or temporary/modular facilities would be used at the selected installation in the interim until the permanent headquarters facility is operational. To maximize flexibility for siting USSPACECOM headquarters operations, the interim and permanent facilities would not necessarily be at the same installation. Seven interim site alternatives and 7 permanent site alternatives are evaluated in the EA.

Under the No Action Alternative, USSPACECOM headquarters would not be established.

All environmental resources were analyzed in this EA; however, only the environmental resources potentially affected by the Proposed Action and alternatives were analyzed in-depth, including transportation, hazardous materials and hazardous waste, socioeconomics and environmental justice, air quality, biological resources, cultural resources, geology and paleontological resources, and water resources. Based on the analysis of the Proposed Action and alternatives, the Air Force has determined that with incorporation of mitigation measures and best management practices, as outlined in the EA, no significant impacts would occur.

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Privacy Advisory

Your comments on this environmental assessment (EA) are requested. Letters or other written or oral comments provided may be published in the final EA. Any personal information provided will be used only to identify your desire to make a statement during the public comment period or to fulfill requests for copies of the final EA or associated documents. Private addresses will be compiled to develop a mailing list for those requesting copies of the final EA. However, only the names of the individuals making comments and specific comments will be disclosed. Personal home addresses and telephone numbers will not be published in the final EA.

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LIST OF ACRONYMS/ABBREVIATIONS

§	Section
AADT	Average Annual Daily Traffic
ACM	asbestos-containing material
ACP	access control point
AFB	Air Force Base
AFI	Air Force Instruction
AFS	Air Force Station
ALDOT	Alabama Department of Transportation
amsl	above mean sea level
BMP	Best Management Practice
CCR	Code of Colorado Regulations
CDOT	Colorado Department of Transportation
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CO	carbon monoxide
CO_2e	carbon dioxide equivalent
CRP	Compliance Restoration Program
CSOF	Consolidated Space Operations Facility
DepSecDef	U.S. Deputy Secretary of Defense
DoD	Department of Defense
EA	Environmental Assessment
EIS	Environmental Impact Statement
EISA	Energy Independence and Security Act
EJ	Environmental Justice
EO	Executive Order
EPA	United States Environmental Protection Agency
ERP	Environmental Restoration Program
ES&C	erosion and sediment control
EUL	enhanced use lease
FEMA	Federal Emergency Management Agency
FOC	full operational capability
FONSI	Finding of No Significant Impact
FY	fiscal year
GHG	greenhouse gas
HUC	hydrologic unit catalog
HWMP	Hazardous Waste Management Plan
I	Interstate
INRMP	Integrated Natural Resources Management Plan
IPAC	Information for Planning and Consultation
IRP	Installation Restoration Program
ICRMP	Integrated Cultural Resources Management Plan

LBP	lead-based paint
LID	low impact development
MMRP	Military Munitions Response Program
MS4	municipal separate storm sewer system
MT	million tons
NASA	National Aeronautics and Space Administration
NDAA	National Defense Authorization Act
NEPA	National Environmental Policy Act
NH_3	Ammonia
NHPA	National Historic Preservation Act
NORAD	North American Aerospace Defense Command
NOSC	Navy Operational Support Center
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
OSHA	Occupational Safety and Health Administration
POV	privately owned vehicles
pPA	project-specific Programmatic Agreement
RA	Restricted Area
ROI	Region of Influence
SBIRS	Space Based Infrared System
SCIF	sensitive compartmented information facility
SH	State Highway
SHPO	State Historic Preservation Officer
SPCC	Spill Prevention, Control, and Countermeasures
SR	State Route
SW	Space Wing
SWMP	Storm Water Management Plan
SWPPP	Stormwater Pollution Prevention Plan
T&E	Threatened and Endangered
TMP	Transportation Management Plan
TOY	time of year
tpy	tons per year
UFC	Unified Facilities Criteria
US	U.S. Highway
USACE	U.S. Army Corps of Engineers
USAF	United States Air Force
USC	United States Code
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
USSPACECOM	U.S. Space Command
WNWR	Wheeler National Wildlife Refuge

1.0 PURPOSE AND NEED

1.1 INTRODUCTION

This environmental assessment (EA) evaluates the potential environmental impacts associated with the establishment of a headquarters for the U.S. Space Command (USSPACECOM; Proposed Action). The Proposed Action would be implemented at one of five Department of Defense (DoD) installations in the U.S. Interim and permanent sites evaluated in this EA are at Buckley Air Force Base (AFB), Peterson AFB, and Schriever AFB in Colorado; Vandenberg AFB in California; and U.S. Army Garrison Redstone Arsenal (Redstone Arsenal) in Alabama (**Figure 1.1-1**).

This document has been prepared in compliance with the National Environmental Policy Act (NEPA) of 1969, as amended (42 United States Code [USC] 4321, et seq.); the Council on Environmental Quality (CEQ) regulations for implementing the procedural provisions of NEPA (40 Code of Federal Regulations [CFR] Parts 1500-1508); and the Air Force Environmental Impact Analysis Process (EIAP) (32 CFR Part 989).

In accordance with Air Force Instruction (AFI) 10-503, *Strategic Basing*, the Air Force would finalize a basing decision at the culmination of the EIAP for the Proposed Action. If the EIAP concludes with a Finding of No Significant Impact (FONSI), the Air Force would prepare a Basing Decision Memorandum that formalizes the basing decision for the Proposed Action. If the Air Force determines that an Environmental Impact Statement (EIS) is warranted for the Proposed Action, the basing decision would instead be finalized in the EIS Record of Decision.

1.2 PURPOSE AND NEED

Pursuant to Section 1601(c) of the National Defense Authorization Act (NDAA) for fiscal year (FY) 2018, the U.S. Deputy Secretary of Defense (DepSecDef) was directed to review national security space DoD components and recommend changes to Congress by August 1, 2018. The DepSecDef's final report to Congress recommended that the President of the United States modify the Unified Command Plan to standup a new combatant command for space (USSPACECOM). The U.S. Strategic Command's Joint Force Space Component Command was elevated to a combatant command and assumed these duties in 2019.

DoD combatant commands include forces from at least two military departments and are established to provide effective command and control of U.S. military forces, regardless of branch of service, in peace and war. They are organized either on a geographical basis (e.g., U.S. Northern Command), or on a functional basis (e.g., U.S. Cyber Command). USSPACECOM would be a DoD combatant command, distinct from U.S. Air Force Space Command established in 1982.

The purpose of the Proposed Action is to establish a permanent operational USSPACECOM headquarters as a functional combatant command.

The need for the proposed action is driven by the need for suitable permanent facilities to fulfill USSPACECOM required functions to enable achievement of full operational capability (FOC) by 2025.

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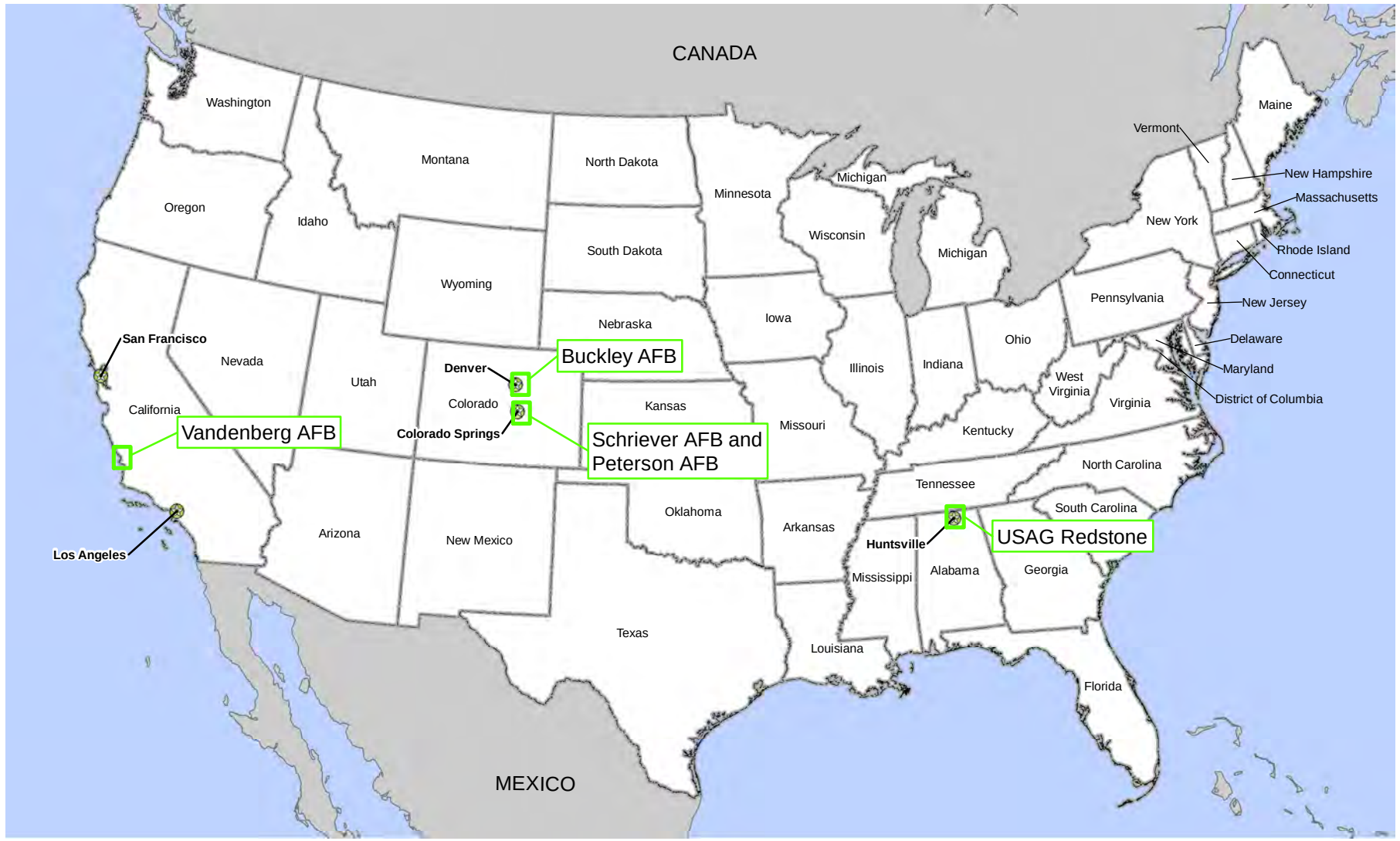

Alternative DoD Installation

N

0 250 500 1,000 Miles

USSPACECOM

Figure 1.1-1
DoD Installation Alternatives

1.3 SCOPE OF THE ENVIRONMENTAL ASSESSMENT

Consistent with the CEQ regulations, the scope of analysis presented in this EA is defined by the potential range of environmental impacts that would result from implementation of the Proposed Action or alternatives. This document is issue-driven, in that it concentrates on those resources that may be affected by implementation of the Proposed Action or alternatives.

Resources that have a potential for impact were considered in detail to determine if implementing the Proposed Action or alternatives would have a significant impact on them. The resources analyzed in detail in this EA include air quality, biological resources, cultural resources, geological and paleontological resources, hazardous materials and hazardous waste, transportation, water resources, and socioeconomics (not all resources may be analyzed in the EA for each site alternative, depending on existing development or other site-specific conditions). The affected environment and the potential environmental consequences for these resources are described in **Chapter 3.0**, Affected Environment and **Chapter 4.0**, Environmental Consequences, respectively. Thresholds of significance were developed for each resource analyzed in the EA and are further discussed in **Chapter 4.0**, Environmental Consequences. Cumulative impacts, the impacts of the Proposed Action when considered with those of other past, present, and reasonably foreseeable future actions (federal and non-federal), also are addressed in **Chapter 4.0**, Environmental Consequences.

1.4 INTERAGENCY/INTERGOVERNMENTAL COORDINATION AND CONSULTATION

Interagency Coordination and Consultation. Scoping is an early and open process for developing the breadth of issues to be addressed in the EA and for identifying significant concerns related to a proposed action. Federal, state, and local agencies with jurisdiction that could be affected by the Proposed Action were notified during the development of this EA. **Appendix A** contains the list of agencies consulted during this analysis and copies of correspondence.

Government to Government Consultation. Executive Order (EO) 13175, *Consultation and Coordination with Indian Tribal Governments*, directs federal agencies to coordinate and consult with federally recognized Native American tribal governments whose interests might be directly and substantially affected by activities on federally administered lands. Consistent with EO 13175, DoD Instruction 4710.02, *Interactions with Federally-Recognized Tribes*, and AFI 90-2002, *Air Force Interaction with Federally-recognized Tribes*, federally recognized tribes that are historically affiliated with the geographic regions of each installation being considered for the Proposed Action will be invited to consult on all proposed undertakings that have a potential to affect properties of cultural, historical, or religious significance to the tribes. The tribal consultation process is distinct from NEPA consultation or the interagency coordination processes, and it requires separate notification of all relevant tribes. The timelines for tribal consultation also are distinct from those of other consultations. The point-of-contact for Native American tribes is the Installation Commander. Native American tribal governments that were consulted with regarding the Proposed Action are listed in **Appendix A**.

In May 2019, Redstone Arsenal conducted a meeting with Native American tribes having a historic affiliation with the installation. The Air Force sent consultation letters to Native American tribes historically affiliated with Buckley, Peterson, and Schriever AFBs in June 2019. Tribal responses received to date are summarized as follows:

- The Mandan, Hidatsa and Arikara Nation, also known as the Three Affiliated Tribes, requested to be a consulting party to the Proposed Action in an email dated 10 June 2019.

- The Southern Ute Indian Tribe requested to be a consulting party to development of the pPA in a letter dated 11 July 2019.
- The Cherokee Nation requested to be a consulting party to the Proposed Action in a letter dated 16 July 2019.
- The Rosebud Sioux Tribe requested to be a consulting party to the Proposed Action in correspondence dated 22 July 2019.

Letters announcing the availability of the EA and Draft FONSI for public review were sent to Native American tribes historically affiliated with the DoD installations being considered during the 30-day public comment period. Tribal responses received to date are provided in **Appendix A** and are summarized as follows:

- The Santa Ynez Band of Chumash Indians Elders Council indicated that Vandenberg AFB contains very sensitive areas, and asked that the Air Force meet with them in a letter dated 25 July 2019. The Air Force initiated consultation with the Santa Ynez Band of Chumash Indians in a letter dated 29 August 2019. In subsequent email correspondence, the tribe indicated they did not have objections to the Proposed Action.
- The Muscogee (Creek) Nation indicated that many archaeological sites are within and around the Redstone Arsenal, and requested that a registered professional archaeologist monitor ground-disturbing activities, and that the Air Force confirm if Redstone Arsenal is selected in a letter dated 12 August 2019.
- The Cheyenne and Arapaho Tribes requested to be contacted if any changes occur to the Area of Potential Effect (APE) or if inadvertent discoveries are made in a letter dated 15 August 2019.
- The Cherokee Nation requested to be a consulting party; indicated that significant cultural and historic resources are outside of the APE at Redstone Arsenal; and did not object to the project if they are contacted if there are changes to the scope of activities or if items of cultural significance are discovered, and if the Air Force contacts other Tribal and Historic Preservation Offices in a letter dated 23 August 2019.

Other Agency Consultation. This EA addresses potential effects on cultural resources resulting from the Proposed Action at the DoD installations being considered. However, surveys to assess site-specific potential effects on historic properties on or near the interim and permanent site alternatives that are ultimately selected for implementation of the Proposed Action will not be conducted prior to completion of this EA. Therefore, for site alternatives on the Colorado installations, the Air Force is proposing the development of a project-specific Programmatic Agreement (pPA), as allowed for in 36 CFR 800.14(b)(1)(ii) “when effects on historic properties cannot be fully determined prior to approval of an undertaking.” If a site alternative in Colorado is selected for implementation of the Proposed Action, the pPA would commit the Air Force to conducting additional Section 106 consultation following signature of the FONSI (if appropriate based on the analysis presented in the EA), but prior to beginning construction of the proposed facility. Execution of the pPA would be contingent on the concurrence the Colorado State Historic Preservation Officer (SHPO), federally recognized Native American tribes, and other relevant stakeholders.

A letter proposing development of the pPA was sent to the Colorado SHPO in June 2019. In a letter dated 28 June 2019, the Colorado SHPO concurred that a pPA for the Proposed Action is appropriate and agreed to participate in its development. The City of Aurora; City of Colorado Springs; Three Affiliated Tribes of the Mandan, Hidatsa, and Arikara Nation; Southern Ute Indian Tribe; and Rosebud Sioux Tribe notified the Air Force of their intention to participate in the development of the pPA and sign as consulting parties. The Advisory Council on Historic Preservation acknowledged the filing of the executed pPA in

correspondence dated 3 September 2019, and indicated filing of the PA and implementation of its terms fulfils the requirements of Section 106 of the National Historic Preservation Act (NHPA).

Letters announcing the availability of the EA and Draft FONSI for public review were sent to the California and Alabama SHPOs during the 30-day public comment period. In a letter dated 2 August 2019, the Alabama SHPO acknowledged receipt of the EA and Draft FONSI. The Air Force would complete all required consultation with the Alabama SHPO prior to construction, should an alternative be selected at Redstone Arsenal. The Air Force initiated consultation with the California SHPO and sought concurrence with the Air Force's APE; its determination of eligibility for all the buildings in the APE as not eligible for listing in the National Register of Historic Places (NRHP); and its finding that the Proposed Action (Section 106 undertaking) would result in No Historic Properties Affected in a letter dated 3 September 2019. In a letter dated 4 October 2019, the California SHPO concurred with the Air Force's findings that buildings in the APE are not eligible for listing in the NRHP. The Air Force would complete all required consultation with the California SHPO prior to construction, should an alternative be selected at Vandenberg AFB.

Copies of relevant correspondence are provided in **Appendix A**.

Public Involvement. Letters announcing the availability of the EA and Draft FONSI for public review were sent to the agencies, organizations, individuals, and Native American tribes listed in **Appendix A** during the 30-day public comment period.

A Notice of Availability (NOA) announcing the 30-day public comment period and the availability of the EA and Draft FONSI for public review was published in the following newspapers serving the localities near each DoD installation being considered:

- Buckley AFB, Colorado: *Denver Post*, *Aurora Sentinel*
- Peterson AFB, Colorado: *Denver Post, The Gazette*
- Schriever AFB, Colorado: *Denver Post*, *Aurora Sentinel*
- Vandenberg AFB, California: *Lompoc Record*, *Santa Maria Times*
- Redstone Arsenal, Alabama: *Huntsville Times*

The NOA was published once in the *Aurora Sentinel* for Schriever and Buckley AFBs, and once in the *Denver Post* for all three Colorado installations. The NOA provided a website address for downloading the EA and Draft FONSI; contact information for requesting a copy of the EA and Draft FONSI on compact disc; addresses of local libraries where printed copies of the EA and Draft FONSI could be viewed; and instructions for submitting comments on the EA and Draft FONSI electronically or by postal mail.

The correspondence received is provided in **Appendix A**.

1.5 RELATED ENVIRONMENTAL AND PLANNING DOCUMENTS

The analysis presented in this EA is drawn from relevant documents previously prepared by others. These documents are cited as appropriate and incorporated in the EA by reference.

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2.0 DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

2.1 PROPOSED ACTION

2.1.1 Proposed Facilities

USSPACECOM headquarters would be established at one of five DoD installations, which include four AFBs and Redstone Arsenal. The installations are described in **Section 2.3**. A Military Construction action would be required for the permanent location. Existing, vacant office/administrative space or leased office/administrative space on or outside the installations being considered, and/or temporary/modular facilities would be used in the interim until the permanent headquarters facility is operational. USSPACECOM is expected to require permanent facility construction to accommodate approximately 1,870 personnel in an administrative headquarters facility setting. This requirement includes 498,000 square feet of office/administrative space and 502,000 square feet for parking, totaling 1,000,000 square feet, or approximately 23 acres in accordance with Air Force Manual 32-1084, *Facility Requirements*.

To conduct operations prior to the completion of the permanent construction (estimated to be 2025), temporary basing would include 193,000 square feet for interim facility space, and an estimated 502,000 square feet for parking. Functional space requirements for interim facilities are less than those for permanent because some ancillary areas (e.g., common areas, break rooms) can be smaller, fewer in number, or are not required in facilities that will be occupied temporarily. Both the interim and permanent facilities would use existing infrastructure to the extent possible at the location ultimately selected through the Air Force's basing process. To maximize flexibility for siting USSPACECOM headquarters operations, the proposed interim and permanent facilities would not necessarily be at the same installation. Implementation of the Proposed Action is expected to be completed in the following sequence:

- **Interim** – USSPACECOM headquarters would occupy new temporary/modular buildings and/or existing, vacant office/administrative space or leased office/administrative space on or outside the selected installation in 2019, with a staff growing to approximately 1,870 personnel.
- **Permanent** – The final permanent headquarters facility would be occupied at the selected location in 2025 with a staff of approximately 1,870 personnel. The timeline assumes that Military Construction funding would be approved in FY 2022.

The perimeter of all alternative sites can be accessed by existing roads at the DoD installations being considered. Existing roads would either be modified or extended to enter access driveways from the roads to the proposed facility. The access driveway would lead to a drop-off area near the proposed building entrance, and the parking lot for the building. Each alternative site will have a specific design for road improvements required to create safe access/egress for vehicles and pedestrians. Improvements needed could include creating an intersection from the existing road to the new access driveway; widening roads for turn lanes into the new access driveway, widening roads for merge lanes to safely egress the access driveway and enter the traffic flow on the main road; adding or adjusting traffic signals on route to the access driveway; and reconstructing deteriorating pavement for an increased traffic load. Road access is considered in the transportation resource analysis in this EA, with the assumption that the DoD installations being considered would be able to accommodate the road and access driving needs of the proposed facility. Design of the proposed facility would include roadway improvements needed on the selected installation to accommodate the proposed facility.

Once USSPACECOM is established, and FOC is realized, the new headquarters facility would provide operational space for approximately 1,870 personnel in a typical headquarters setting. The majority of the facility would be sensitive compartmented information facility (SCIF) space, and open administrative space, offices, conference rooms, classrooms, kitchen, dining, and break rooms. USSPACECOM operations would include command and control of global DoD space operations, support to other combatant commands, defense of U.S. and allied space operations, the gaining and maintaining of space superiority, and the evolution of DoD space capabilities and training. The headquarters facility would require force protection level 2. Force protection level 2 applies to Air Force assets whose loss, theft, destruction, misuse, or compromise would cause significant harm to the war-fighting capability of the U.S. The level of security must result in a significant deterrence against hostile acts. If deterrence fails, this level of security will ensure a significant probability of detecting, intercepting, and defeating a hostile force before it is able to seize, damage, or destroy the asset(s).

2.1.2 Construction

2.1.2.1 Interim Facilities

Interim facilities would involve the use of existing, vacant office/administrative space or leased office/administrative space on or outside the selected installation, and/or new temporary/modular buildings that would be purchased or leased by the Air Force and placed on a suitable site within the selected installation's secure perimeter. The interim use of existing office and administrative buildings on or outside the selected installation would likely involve reconfiguring interior office space within existing buildings. Site preparation for interim modular facilities would generally include some or all the following: vegetation clearing and grubbing; minor soil filling, excavation, compacting, grading, and leveling; directional boring and/or trenching to install connections to existing utility systems on the installation; and spreading gravel for temporary vehicular parking areas. Placement of the interim modular buildings would follow; in most cases, it is anticipated that the buildings would be towed to the site and maneuvered into place by heavy trucks, then leveled by workers using temporary masonry, concrete, and/or wood block foundation piers. Workers would build steps and/or wheelchair ramps using pressure-treated lumber to provide personnel access to the modular buildings; and in some instances, may build low elevated walkways or breezeways between buildings or other areas of the interim site to allow personnel to avoid low-lying areas where water or mud may accumulate during rain or snow events.

Once the permanent USSPACECOM headquarters is operational, the temporary modular facilities and associated structures would be removed from the interim site and utility connections would be cut and capped. The interim site, including temporary parking areas, would either be revegetated in compliance with the installation's planting guidelines or developed for another use, in accordance with the installation's *Installation Development Plan* or *Real Property Master Plan*.

Installation- or site-specific variations for the establishment of temporary facilities on the interim site alternatives are discussed in **Section 2.3**, as applicable.

2.1.2.2 Permanent Facility

Construction of the proposed facility would include site preparation (e.g., vegetation clearing; soil excavation, filling, grading, and leveling; trenching or directional boring to install/extend utilities); installation of foundation piles and concrete foundation slab; erection of structural steel; the expansion and/or creation of vehicle parking areas; and creation of, upgrades to, or extension of on-base roads and pedestrian sidewalks to the new facility. Construction would be initiated in 2021, and be completed in 2025. Prior to construction disturbance, engineer survey crews would locate and stake project infrastructure and temporary disturbance areas, including staging areas and excavation stockpile areas.

Existing utilities would be located and flagged in the area prior to excavation. The engineer survey crew would consist of 5 to 10 personnel for approximately 25 days.

Site preparation would begin with installation of sediment control best management practices (BMPs), and then clearing and grubbing of existing vegetation on the site. Once the site is prepared, excavation would begin for foundation footings and drilled piers using large excavation and drilling equipment. The foundation would consist of reinforced-concrete grade beams and walls spanning between a deep foundation of drilled piers (caissons). If retaining walls are required, they would be supported on spread footings. Concrete to be placed via concrete truck delivery would come from an existing off-installation ready-mix plant(s). Communication, electrical power, potable water, sanitary sewer, and stormwater utilities would be extended from existing on-base utility infrastructure while excavations are open. Once the concrete in the foundation and retaining walls are completely cured and utility services are installed, the excavations outside the foundation would be backfilled and compacted to create the designed ground contours around the building. Crews of 30 to 40 personnel would be conducting the excavation, foundation, and utility work for approximately 240 days.

Limited laydown areas and storage areas would be used by the contractor during demolition and construction of the project. The contractor may need to use a remote contractor storage area to help reduce site disturbance in the construction area. Existing on-base laydown areas (i.e., contractor yards) would be used for this purpose as available and to the extent possible. Materials may need to be brought to the site each day as needed in the construction process. In addition, due to space limitations on the selected site, access restrictions, and/or other site-specific factors, it may be necessary for construction workers to park remotely and use shuttle buses due to lack of parking at the construction site.

Preparation of the interim and permanent sites that are ultimately selected for implementation would include improvements to and/or extensions of existing roads and utility infrastructure on the receiving installation. Consistent with the Air Force's strategic basing initiative, existing roads and utility infrastructure are available in proximity (i.e., less than 1 mile) to all permanent site alternatives and all interim site alternatives that would involve the use of temporary/modular buildings. The extent of road and utility improvements needed to facilitate the construction and operation would vary depending on which site alternatives are ultimately selected for implementation. Road and utility improvements required would occur within the boundaries of the selected installation, and would be similar in character to those occurring with relative frequency on public and private lands near the installation (e.g., road widening and resurfacing; installation of culverts and curb and gutter; extension of existing utilities to new or expanded facilities). Improvements also may be required at installation and restricted area (RA) access points to accommodate additional personnel. This may include additional or reconfigured traffic lanes, and reconfigured secured portal access areas. Improvements by DoD to public roads and utilities outside the DoD installations being considered to support the Proposed Action are not anticipated.

Vertical construction of the permanent facility would occur after the foundation is complete. Construction contractors would complete the superstructure, exterior finishes, utilities work, and interior finishes of the facility. Construction materials would be delivered via a designated construction traffic route from off-installation vendors. Construction of exterior concrete flatwork (e.g., sidewalks, plazas, parking areas) and exterior perimeter security measures would occur during this time. Machinery such as mobile cranes, loader-tractors, fork lifts, air compressors, and welding equipment would be used during this phase. Crews of 50 to 60 personnel would be involved in construction for approximately 360 days.

New parking would be constructed near the new building, and would consist of either surface parking or parking garages.

Force protection measures for the new facility will be incorporated in accordance with the Unified Facilities Criteria (UFC) 4-010-01, *DOD Minimum Antiterrorism Standards for Buildings*, February 9, 2012 (DoD, 2012). Construction would comply with applicable building, fire, and safety codes. Construction activities would require compliance with the U.S. Environmental Protection Agency's (EPA) Construction General Permit in force at the time of construction, and with the Energy Independence and Security Act (EISA) Section 438 requirements (representative permitting requirements potentially applicable to the Proposed Action are listed in **Appendix D**). Construction activities would be implemented using sustainable design concepts as outlined in the UFCs and the selected installation's applicable standards. Sustainable design concepts emphasize state-of-the-art strategies for site development, efficient water and energy use, and improved indoor environmental quality. Stormwater management employed would use low-impact development (LID) as required by EISA Section 438, and the selected installation's municipal separate storm sewer system (MS4) permit. Design practices that could be implemented to manage stormwater include porous pavement, rain gardens, and enhancement of riparian buffers.

2.1.3 Operation

USSPACECOM headquarters operations would include command and control of global DoD space operations, support to other combatant commands, defense of U.S. and allied space operations, the gaining and maintaining of space superiority, and the evolution of DoD space capabilities and training. The floorplan would support SCIF space, open administrative space, offices, conference rooms, classrooms, kitchen, dining, and break rooms.

At final staffing, the Proposed Action would generate 1,000 new permanent jobs. Staffing would begin in 2019 in the temporary facilities, and gradually increase to a total staff of approximately 1,870. Staff would transfer from the interim to the permanent facility after construction of the permanent facility is complete.

2.2 EVALUATION OF CANDIDATE INSTALLATIONS FOR USSPACECOM

The Air Force must analyze reasonable alternatives to the proposed action and the no action alternative in all EAs and EISs, as fully as the proposed action alternative (32 CFR 989.8[a]). Reasonable alternatives are those that meet the underlying purpose and need for the proposed action, and that would cause a reasonable person to inquire further before choosing a particular course of action. The Air Force need not analyze highly speculative alternatives, such as those requiring a major, unlikely change in law or governmental policy. If the Air Force identifies a large number of reasonable alternatives, it may limit alternatives selected for detailed environmental analysis to a reasonable range or to a reasonable number of examples covering the full spectrum of alternatives (32 CFR 989.8[b]). The Air Force may expressly eliminate alternatives from detailed analysis, based on reasonable selection standards (e.g., operational, technical, or environmental standards suitable to a particular project). The Air Force may develop written selection standards to firmly establish what is a reasonable alternative for a particular project, but they must not so narrowly define these standards that they unnecessarily limit consideration to the proposal initially favored by proponents (32 CFR 989.8[c]). If a potential site meets all selection standards identified, it is a reasonable alternative for further evaluation in the EA; if not, the site is an alternative that was considered but not carried forward for further evaluation.

The Air Force used a tiered approach to select candidate sites. Initially, the Air Force used two criteria to select candidate installations to potentially host USSPACECOM headquarters. Once the installations were identified, the installations were asked to provide available locations (sites) on the installations for both interim and permanent facilities. Standard strategic basing site survey criteria were subsequently used to evaluate sites during site survey visits. These initial criteria, described below, and the standard site survey criteria, described in **Section 2.3**, constitute reasonable selection standards and adhere to regulations for the evaluation of alternatives codified at 32 CFR 989.8.

1. Is the base a DoD space installation (e.g., satellite operations/command and control, missile warning)?
2. Does the base have a DoD space component or center for operational synergies and efficiencies (e.g., Missile Warning Center, National Space Defense Center, Combined Space Operations Center)?

Fourteen installations met at least one of these criteria; however, only six installations met both criteria (see **Table 2.2-1**).

Table 2.2-1
Initial Evaluation of USSPACECOM Candidate Locations

Installation	Installation Selection Criterion[1]	
	DoD Space Installation	DoD Space Component or Center
Buckley AFB	✓	✓
Cape Cod Air Force Station (AFS)	✓	✗
Cavalier AFS	✓	✗
Cheyenne Mountain AFS	✓	✓
Fort Meade	✗	✓
Kirtland AFB	✗	✓
Los Angeles AFB	✓	✗
NAS Point Mugu	✓	✗
New Boston AFS	✓	✗
Patrick AFB	✓	✗
Peterson AFB	✓	✓
Redstone Arsenal	✓	✓
Schriever AFB	✓	✓
Vandenberg AFB	✓	✓

Note:

[1] ✓ = meets or partially meets criterion

✗ = fails to meet criterion

The six installations meeting both criteria in **Table 2.2-1** are described below.

- Cheyenne Mountain Air Force Station (AFS): Cheyenne Mountain AFS is on Cheyenne Mountain near Colorado Springs in El Paso County. The facility was built for the North American Aerospace Defense Command (NORAD) Combat Operations Center. NORAD moved day-to-day operations to its headquarters on Peterson AFB in 2006. Day-to-day operations were subsequently moved back in 2011 after a major overhaul and renovation. The location now supports U.S. Strategic

Command's Missile Warning Center, other strategic warning and survivable capabilities, and provides a ready alternative operating location for NORAD's command center.

- Buckley AFB: Buckley AFB is approximately 13 miles southeast of downtown Denver, Colorado, and covers approximately 3,287 acres of federally owned land in Aurora in Arapahoe County. The 460th Space Wing (SW) is the host of the installation, and its mission is to provide space-based warning and awareness to protect the homeland and global warfighters. The 460th SW hosts 93 tenant organizations, including the Colorado Air National Guard, the Colorado Army National Guard, the Navy Operational Support Center (NOSC), the Aerospace Data Facility-Colorado, and the Air Reserve Personnel Center. Approximately 3,100 active-duty personnel, 4,000 Guard and Reserve personnel, 2,400 civilian employees, and 2,500 contract employees are assigned to the base (USAF, 2016a).
- Peterson AFB: Peterson AFB covers approximately 1,385 acres immediately north of the Colorado Springs Municipal Airport in El Paso County, Colorado, approximately 7 miles east of downtown Colorado Springs. Approximately 200 acres of the installation are federally owned, with the remaining 1,185 acres leased from the City of Colorado Springs. The 21st SW is the host unit providing missile warning and space control to North American Aerospace Defense Command and U.S. Strategic Command through a network of command and control units and ground and space-based sensors operated by geographically separated units around the world. Approximately 5,800 military personnel and 4,500 civilians are assigned to Peterson AFB (USAF, 2018).
- Schriever AFB: Schriever AFB occupies 3,840 acres in central El Paso County, Colorado, approximately 8 miles east of Peterson AFB and 10 miles east of Colorado Springs. Schriever AFB is home to the 50th SW, which provides command and control for military satellites and manages the worldwide Air Force Satellite Control Network. Mission activities are conducted within a fenced 356-acre RA within the 2-mile by 3-mile installation boundary. Schriever AFB is surrounded by grasslands and ranches in a sparsely populated setting. Approximately 7,060 military and civilian personnel are assigned to Schriever AFB (Lawton, 2019).
- Vandenberg AFB: Vandenberg AFB covers approximately 99,572 acres along California's Central Coast in Santa Barbara County, and is the third largest Air Force base in the nation. The installation is headquarters for the 30th SW, which manages DoD space and missile testing, and placing satellites into polar orbit from the West Coast. Critical mission elements of Vandenberg AFB include six operating space launch complexes; eight operating intercontinental ballistic missile silos with associated test range area; a 15,000-foot-long airfield; and satellite tracking and communication facilities. Two private commercial space companies, Firefly and SpaceX, use launch and support facilities at Vandenberg AFB. Approximately 6,860 military and civilian personnel are assigned to the installation (USAF, 2019a).
- Redstone Arsenal: Redstone Arsenal is a U.S. Army Garrison in Madison County in northern Alabama's 13-county region referred to as the Tennessee Valley. Huntsville, the county seat and fastest-growing city, borders Redstone Arsenal on the north and east, with the Tennessee River forming the installation's southern boundary. Redstone Arsenal is 110 miles south of Nashville, Tennessee, and 185 miles northwest of Atlanta, Georgia.

  Redstone Arsenal covers 38,162 acres, including 25,860 Test Area acres and 3,000 buildable acres. The installation has over 10 miles of Tennessee Riverfront with barge docks for transporting large equipment and components. Infrastructure assets at Redstone Arsenal include a 7,297-foot runway, more than 200 miles of roads with an interstate connection, a railhead with two spurs, 19 million square feet of building space, and 352 privatized housing units.

Approximately 800 military personnel, 17,500 civilian employees, and 22,200 contractors are assigned to Redstone Arsenal. The majority of these personnel are associated with the Army and Department of Defense, while approximately 15 percent work for the National Aeronautics and Space Administration (NASA), and a smaller number work for the Department of Justice. Major tenants at Redstone Arsenal include the Combat Capabilities Development Command Aviation, Missile Center, NASA Marshall Space Flight Center, U.S. Missile Defense Agency, U.S. Space and Missile Defense Command, Program Executive Office, Missiles and Space, and Headquarters, U.S. Army Aviation and Missile Command.

2.3 EVALUATION OF CANDIDATE SITES FOR USSPACECOM

Fourteen potential interim and 19 potential permanent sites for USSPACECOM headquarters were identified at the six candidate installations identified in **Section 2.2**. Potential interim and permanent sites were evaluated based on the selection standards presented in **Table 2-3-1**. The evaluation of potential interim and permanent sites at the six installations based on these selection standards is outlined in **Section 2.3.1** to **Section 2.3.7**. Additional information on the site selection process is included in **Appendix F.**

Table 2.3-1
Interim/Permanent Site Selection Criteria

Category	Selection Standard
Cost and Timing	Cost-reasonable in terms of one-time and recurring costs of construction and operation
	Area construction costs factors are within acceptable parameters per Unified Facilities Criteria 3-701-01
	Area locality pay factors are cost-absorbable
	Construction and development timing supports full operational capability schedule
Interim/Permanent Capacity and Support	Provides approximately 193,000 square feet for interim construction, and approximately 427,000 square feet for permanent construction
	Provides approximately 402,000 square feet of privately owned vehicle parking area for additional 1,870 personnel
	Provides 2,500 square feet for multilevel server racks
	Provides sufficient electric, water, gas, sewer, emergency generation and communications to support 24/7 operations and 1,870 personnel
	Supports security requirements for 24/7 ops and 1,870 personnel for a priority level 2 equivalent asset
	Provides sufficient transportation/security screening infrastructure to support additional 1,870 personnel
	Provides adequate on-base housing, general officer support, medical/dental, services support, and community support functions for 1,870 personnel
Environmental	Avoids or minimizes air quality impacts
	Avoids or minimizes cultural resources impacts
	Avoids or minimizes biological resources impacts
	Avoids or minimizes other environmental resource impacts

2.3.1 Cheyenne Mountain AFS

No suitable sites were identified at Cheyenne Mountain AFS; therefore, the installation was eliminated from further consideration as a host site for USSPACECOM headquarters.

2.3.2 Buckley AFB

2.3.2.1 Alternatives Considered

Four interim and two permanent site alternatives were evaluated at Buckley AFB (see **Figures 2.3-1** to **2.3-4**). These alternatives were evaluated against the selection standards for the Proposed Action outlined in **Section 2.3** and **Table 2.3-1**. Three interim and permanent site alternatives were eliminated from further analysis on the following grounds:

- Interim, North of Gym/Shopette: asbestos present in soil, thereby failing to meet Environmental Category criteria;
- Interim/Permanent, Building 1005: does not provide required area for building construction and parking and requires relocation of existing personnel, thereby failing to meet Interim/Permanent Capacity and Support Category criteria; and
- Interim, North Corner District: electric utilities may not be adequate, and the interim facility would increase congestion for permanent site and nearby roadways, thereby failing to meet Interim/Permanent Capacity and Support Category criteria.

One interim and two permanent site alternatives for the Proposed Action meet all established selection standards for the Proposed Action and are retained for further evaluation in this EA. These sites are described in **Sections 2.3.2.2** through **2.3.2.4**.

2.3.2.2 Interim Site Alternative 1 (West End District)

Interim Site Alternative 1 consists of an approximately 11.5-acre parcel in the installation's West District along the western side of Telluride Street and north of Keystone Boulevard (see **Figures 2.3-2** and **2.3-3**). The site consists of previously disturbed but currently undeveloped land adjacent to, but outside of the installation's RA. Land cover on the site consists of maintained vegetation (i.e., grass). A dirt road connecting Powder Horn Street and Keystone Boulevard crosses the site. On-base housing is to the south and southwest of the site, and an off-base elementary school is to the west. Building 210 is to the north of the site, and the RA is across Powder Horn Street to the east.

In addition to the temporary facilities conceptually described in **Section 2.1.2**, one or more temporary generators and aboveground storage tanks would be constructed within the RA to provide electrical service to the modulars for the duration of their use until the permanent USSPACECOM headquarters facility is operational.

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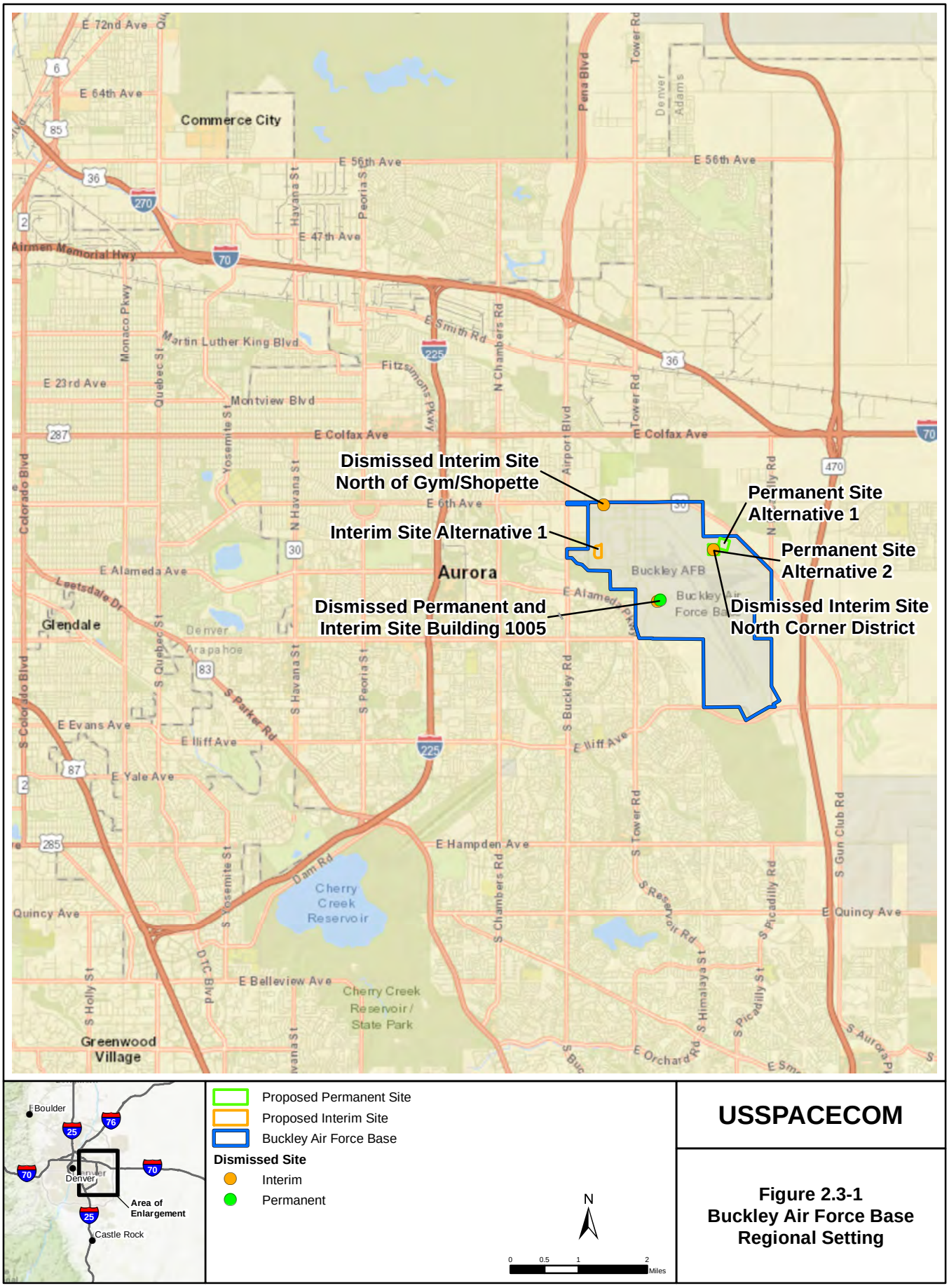

USSPACECOM

Figure 2.3-1
Buckley Air Force Base
Regional Setting

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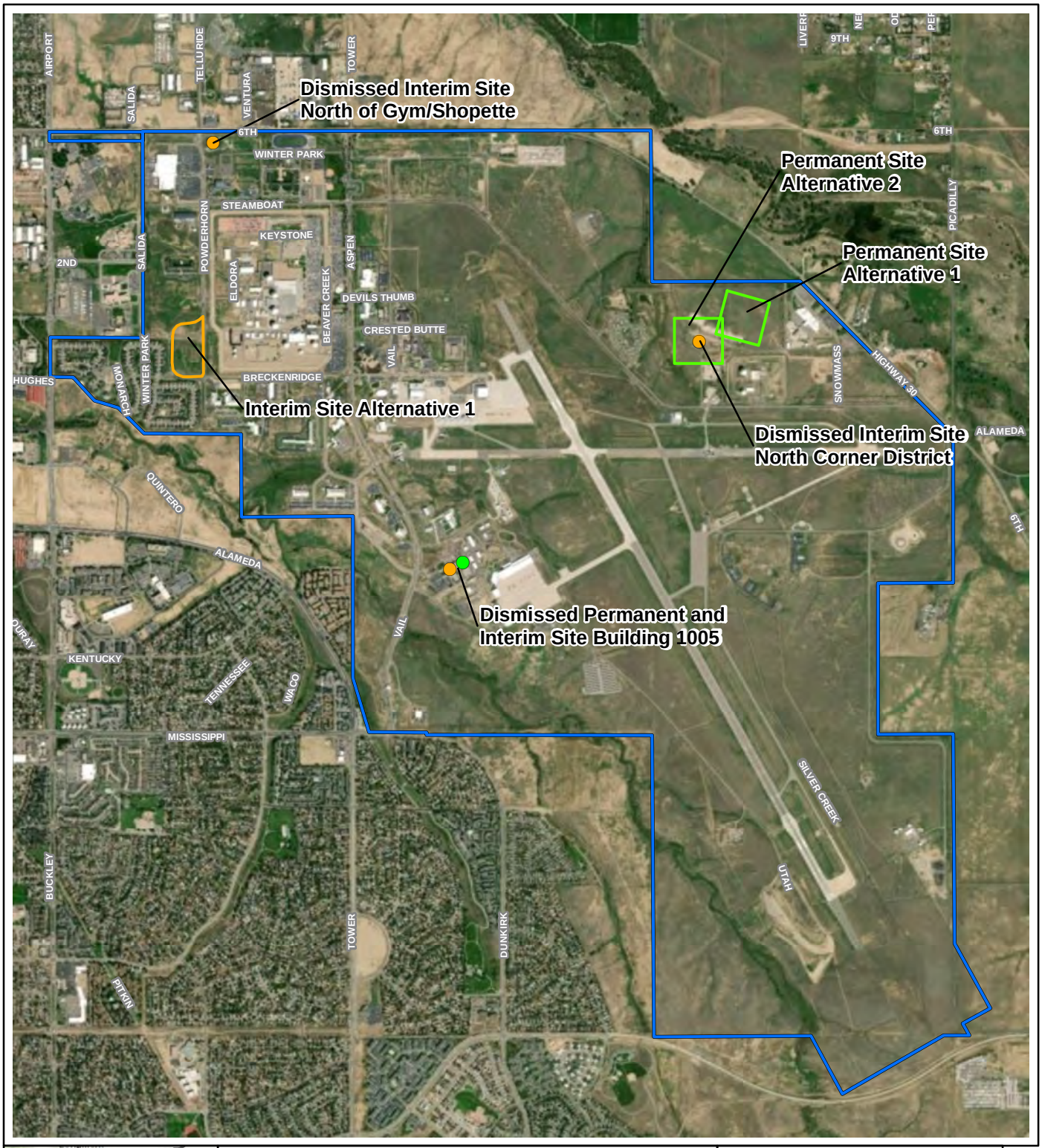

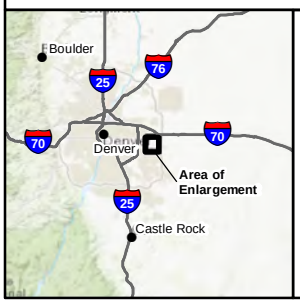

Proposed Permanent Site
Proposed Interim Site
Buckley Air Force Base

Dismissed Site

Interim
Permanent

N

0 700 1,400 2,800
Feet

USSPACECOM

Figure 2.3-2
Buckley
Air Force Base

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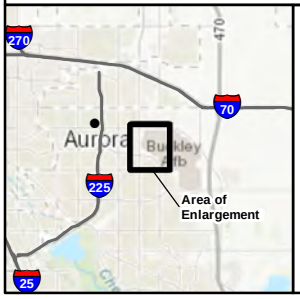

Proposed Interim Site
Buckley Air Force Base

N

0 500 1,000 2,000 Feet

USSPACECOM

Figure 2.3-3
Buckley Air Force Base
Interim Site
Alternative 1

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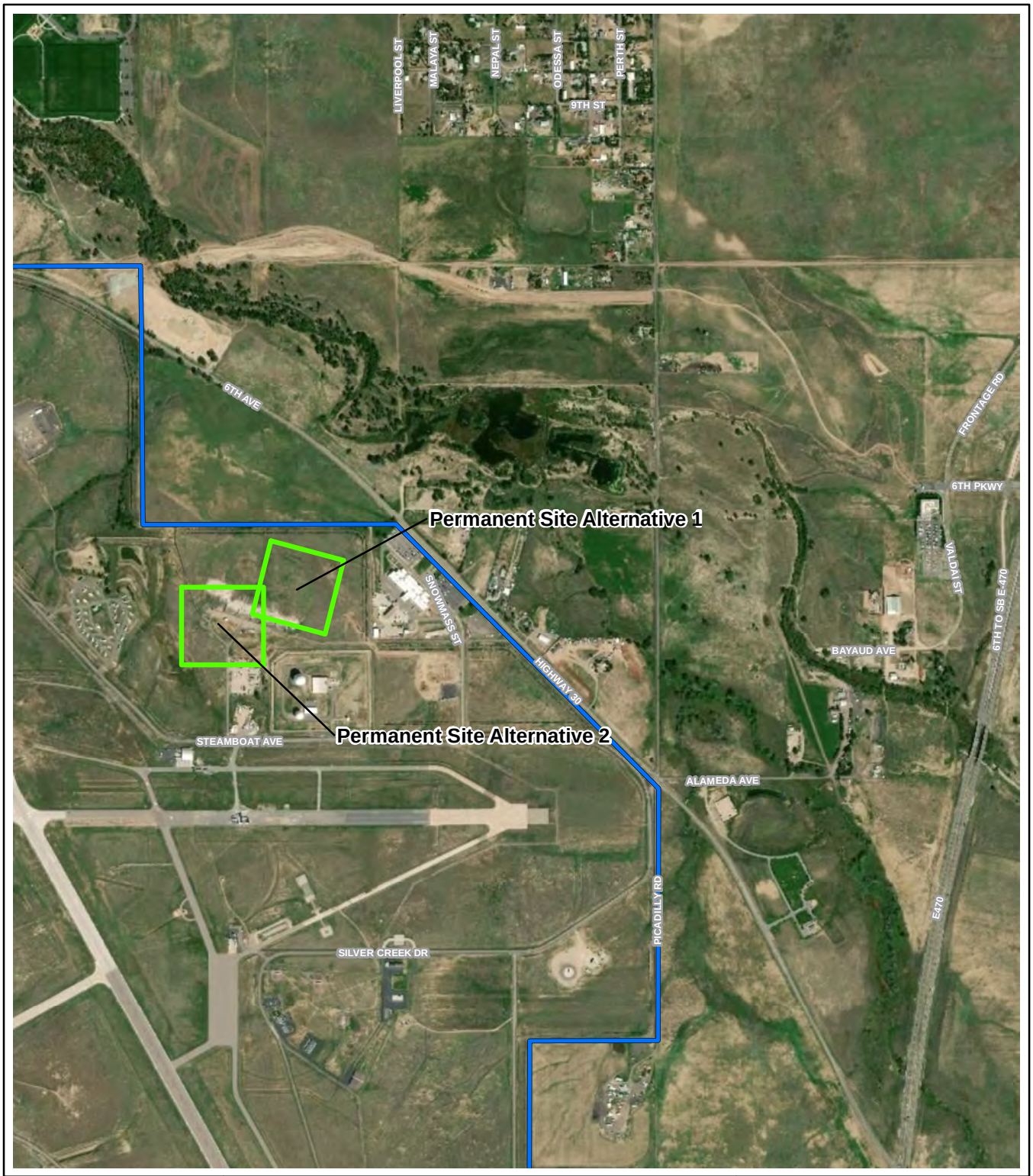

USSPACECOM

Figure 2.3-4
Buckley Air Force Base
Permanent Site
Alternatives

2.3.2.3 Permanent Site Alternative 1 (North Corner Site 1)

Permanent Site Alternative 1 covers approximately 13.8 acres in the installation's Northeast District (see **Figures 2.3-2** and **2.3-4**). The site primarily consists of maintained vegetation (i.e., grass) and partially overlaps a former skeet range. East Steamboat Avenue provides vehicular access to the site. A previously disturbed but currently undeveloped field borders the site to the north; an NOSC to the east; a radome facility to the south; and a portion of the former skeet range to the west. The southeastern corner of this site overlaps a small area of Permanent Site Alternative 2, discussed below.

2.3.2.4 Permanent Site Alternative 2 (North Corner Site 2)

Permanent Site Alternative 2 is immediately southwest of, and is similar in size to Permanent Site Alternative 1 (see **Figures 2.3-2** and **2.3-4**). Therefore, conditions on this site are similar to those described above for Permanent Site Alternative 1. However, Permanent Site Alternative 2 overlaps multiple structures and pedestrian facilities associated with the former skeet range. One of these structures has been repurposed and is currently used as an on-base thrift store. This site also overlaps a portion of the on-base "contractor yard" (i.e., construction material and equipment lay-down area) and encompasses a segment of Loveland Street that provides access from East Steamboat Avenue.

2.3.3 Peterson Air Force Base

2.3.3.1 Alternatives Considered

One interim and one permanent site alternatives were evaluated at Peterson AFB (see **Figures 2.3-5** to **2.3-7**). These alternatives were evaluated against the selection standards for the Proposed Action outlined in **Section 2.3** and **Table 2.3-1**. The Peterson AFB interim and permanent site alternatives meet all established selection standards for the Proposed Action, and are retained for further evaluation in this EA. These alternatives are described in **Sections 2.3.3.2** and **2.3.3.3**.

2.3.3.2 Interim Site Alternative 1 (Command Complex and Leased Off-base Office Space)

Interim Site Alternative 1 is east of Building 3 in the installation's Command Complex (see **Figures 2.3-6** and **2.3-7**). The site is identified in the Peterson AFB IDP for future development of headquarters-type administrative facilities similar in scale and use to existing Buildings 1, 2, and 3 (at this time, however, no permanent occupants for this site have been identified). The site covers approximately 1.5 acres along the eastern side of Vandenberg Street. Modular/temporary buildings leased or purchased by the Air Force would be placed on this site to accommodate approximately 545 personnel. Temporary privately owned vehicle (POV) parking for the facility would be established on an adjacent, approximately 4-acre site further to the east on land within a larger parcel leased by Peterson AFB from the Colorado Springs Airport (this land lease was analyzed in an EA prepared in 2018 [USAF, 2018]). Both parcels are previously disturbed but currently undeveloped, with the exception of a soft-surface running track on the parcel where the temporary modular facilities would be placed. Land cover on the site primarily consists of maintained vegetation (i.e., grass).

The remaining, approximately 1,325 personnel would occupy existing, available off-base office space within 4 miles of Peterson AFB's West Gate. The precise location of this space has not been identified; however, it is anticipated that the Air Force would lease vacant space in existing office buildings in an office park or similar commercial setting with associated on-site parking and accessible from major highways and arterial roads.

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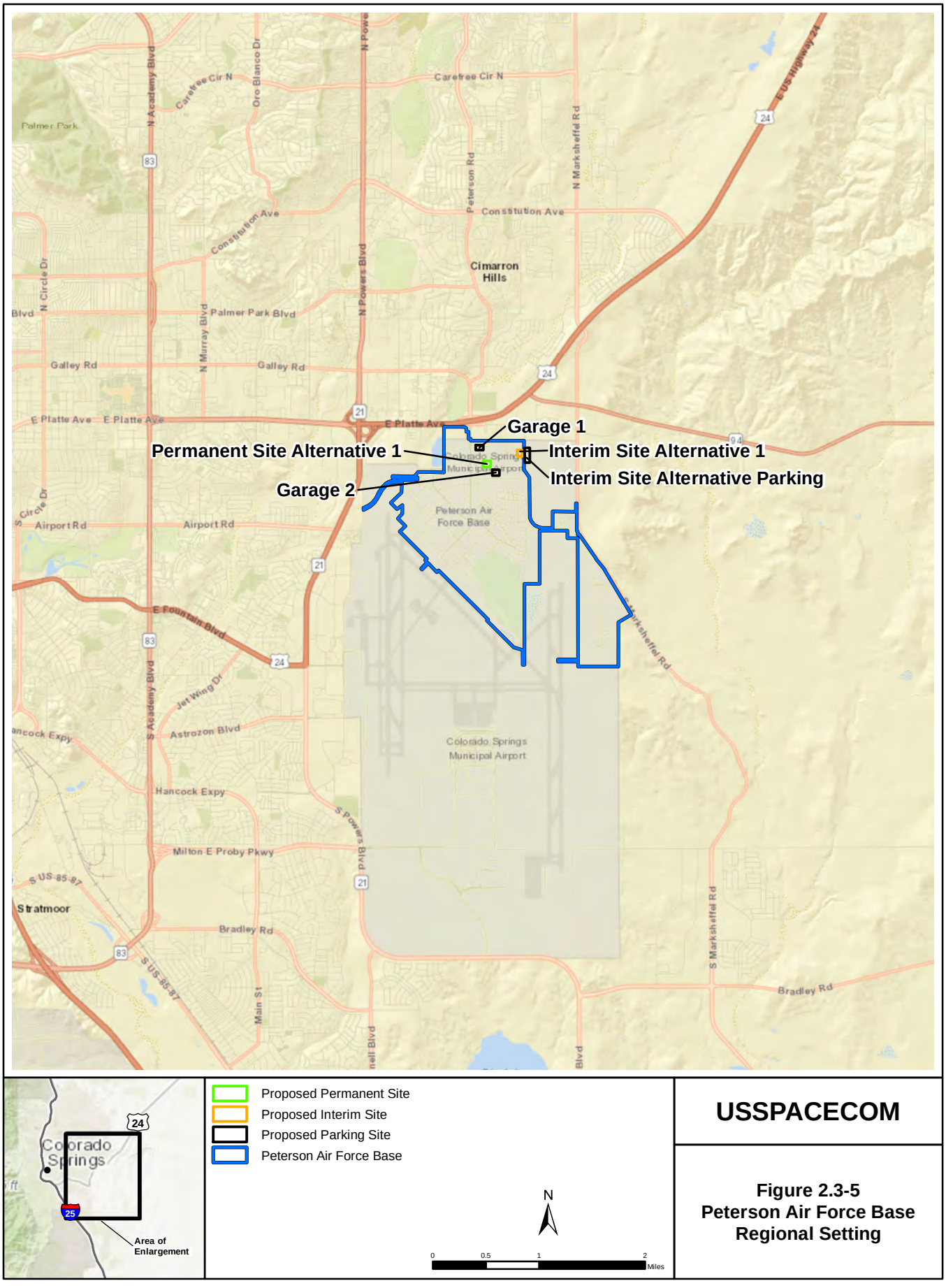

USSPACECOM

Figure 2.3-5
Peterson Air Force Base
Regional Setting

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Proposed Permanent Site
Proposed Interim Site
Proposed Parking Site
Peterson Air Force Base

N

0 750 1,500 3,000 Feet

USSPACECOM

Figure 2.3-6
Peterson
Air Force Base

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Proposed Permanent Site
Proposed Interim Site
Proposed Parking Site
Peterson Air Force Base

N

0 250 500 1,000 Feet

USSPACECOM

Figure 2.3-7
Peterson Air Force Base Interim and Permanent Site Alternatives

2.3.3.3 Permanent Site Alternative 1 (Command Complex)

Permanent Site Alternative 1 is immediately south of Buildings 1 and 2 in the Command Complex (see **Figures 2.3-6** and **2.3-7**). The site covers approximately 2.8 acres and would encompass most of an existing POV parking lot along the northern side of Vandenberg Street. This alternative would include the construction of two POV multi-story parking garages to replace parking eliminated by construction of USSPACECOM headquarters, and to provide for USSPACECOM parking needs.

The first parking garage would be built immediately north of Building 1 on the site of an existing POV parking lot. This garage would be built prior to beginning construction of the proposed facility to replace an existing POV parking that would be removed by the alternative.

The second parking garage would be built during construction of the proposed permanent facility on the site of an existing parking lot along the southern side of Vandenberg Street. This garage would be a dedicated POV parking facility for USSPACECOM personnel.

2.3.4 Schriever Air Force Base

2.3.4.1 Alternatives Considered

Three interim and four permanent site alternatives were evaluated at Schriever AFB (see **Figures 2.3-8** to **2.3-11**). These alternatives were evaluated against the selection standards for the Proposed Action outlined in **Section 2.3** and **Table 2.3-1**. One interim and two permanent site alternatives were eliminated from further analysis because they fail to meet Interim/Permanent Capacity and Support Category criteria:

- Interim, South of Building 24: requires additional personnel for security; too close to base/commercial vehicle entry point; and an event would require evacuation because the site is within the cordon area;
- Permanent, East of Consolidated Space Operations Facility (CSOF) (Inside RA): does not provide required area for building construction and parking; and
- Permanent, East Side of RA (Inside RA): requires another restricted area portal entry, construction of additional roads, and full buildout of parking.

Two interim and two permanent site alternatives at Schriever AFB meet all established selection standards for the Proposed Action, and are retained for further evaluation in this EA. These site alternatives are described in **Sections 2.3.4.2** through **2.3.4.5**.

2.3.4.2 Interim Site Alternative 1 (Inside RA / West Side of RA / Leased Off-base Office Space)

Interim Site Alternative 1 at Schriever AFB consists of an approximately 8.7-acre parcel inside the installation's RA (see **Figures 2.3-9** and **2.3-10**). The site is generally bounded by Irwin Avenue to the north, Building 730 to the east, Kepler Avenue to the south, and Beltway Road to the west. The site has remained undeveloped since establishment of the installation. Land cover on the site primarily consists of maintained vegetation (i.e., prairie grass) and includes two pedestrian paths: one that parallels Irwin Avenue along the northern side of the site; and one that crosses diagonally from the site's northwestern corner to Kepler Avenue. Land to the north and south of this site also is included within the RA, and is similarly undeveloped or minimally developed. Development in the RA is primarily concentrated to the east, northeast, and northwest of this site. POV parking areas for RA personnel are outside the RA along the eastern side of Enoch Road. Parking for temporary facilities on this site, if it is selected, would be provided in the existing overflow parking lot west of Enoch Road and south of Irwin Road.

The remaining, approximately 1,325 personnel would occupy existing, available off-base office space within 4 miles of Peterson AFB's West Gate. The precise location of this space has not been identified; however, it is anticipated that the Air Force would lease vacant space in existing office buildings in an office park or similar commercial setting with associated on-site parking and accessible from major highways and arterial roads.

2.3.4.3 Interim Site Alternative 2 (Outside RA / North of Building 24 / Leased Off-base Office Space)

Interim Alternative Site 2 covers an approximately 3.7-acre parcel outside the RA in the installation's West District (see **Figures 2.3-9** and **2.3-11**). The site is on the northwestern corner of the Blue Road-Enoch Road intersection, and is bounded by Enoch Road to the east, Blue Road to the south, and Talon Way to the west and north. The site is currently undeveloped, and land cover consists of maintained vegetation (i.e., prairie grass). Building 24 is to the south on the opposite side of Blue Road. Land to the west and north is undeveloped and consists of prairie grass fields. The RA is to the east on the opposite side of Enoch Road and Hahn Avenue.

If selected, parking for Interim Site Alternative 2 would be provided on an approximately 3.5-acre parcel immediately to the northwest across Talon Way.

The remaining, approximately 1,325 personnel would occupy existing, available off-base office space within 4 miles of Peterson AFB's West Gate. The precise location of this space has not been identified; however, it is anticipated that the Air Force would lease vacant space in existing office buildings in an office park or similar commercial setting with associated on-site parking and accessible from major highways and arterial roads.

2.3.4.4 Permanent Site Alternative 1 (Inside RA) (West Side of RA)

This site is in the RA just north of Interim Site Alternative 1, and covers approximately 9 acres (see **Figures 2.3-9** and **2.3-10**). Characteristics of the site are similar to the other Schriever AFB sites described above in that the site consists of maintained vegetation (i.e., prairie grass) and is not previously developed. Land immediately to the north, east, and south is similarly undeveloped, with more intensive development within the RA somewhat further to the east. RA employee parking lots are to the west beyond the RA fenceline. Parking for this site, if selected, would be provided in those lots.

2.3.4.5 Permanent Site Alternative 2 (Outside RA) (Northwest of Building 24)

Permanent Site Alternative 2 covers approximately 6.6 acres of open, previously undisturbed grassland to the northwest of Interim Site Alternative 2 (see **Figures 2.3-9** and **2.3-11**). The site is within the installation's West District, and is removed from most existing development on the base. The nearest road is Blue Road to the south; however, no existing access roads, driveways, or paths connect the site footprint to that road.

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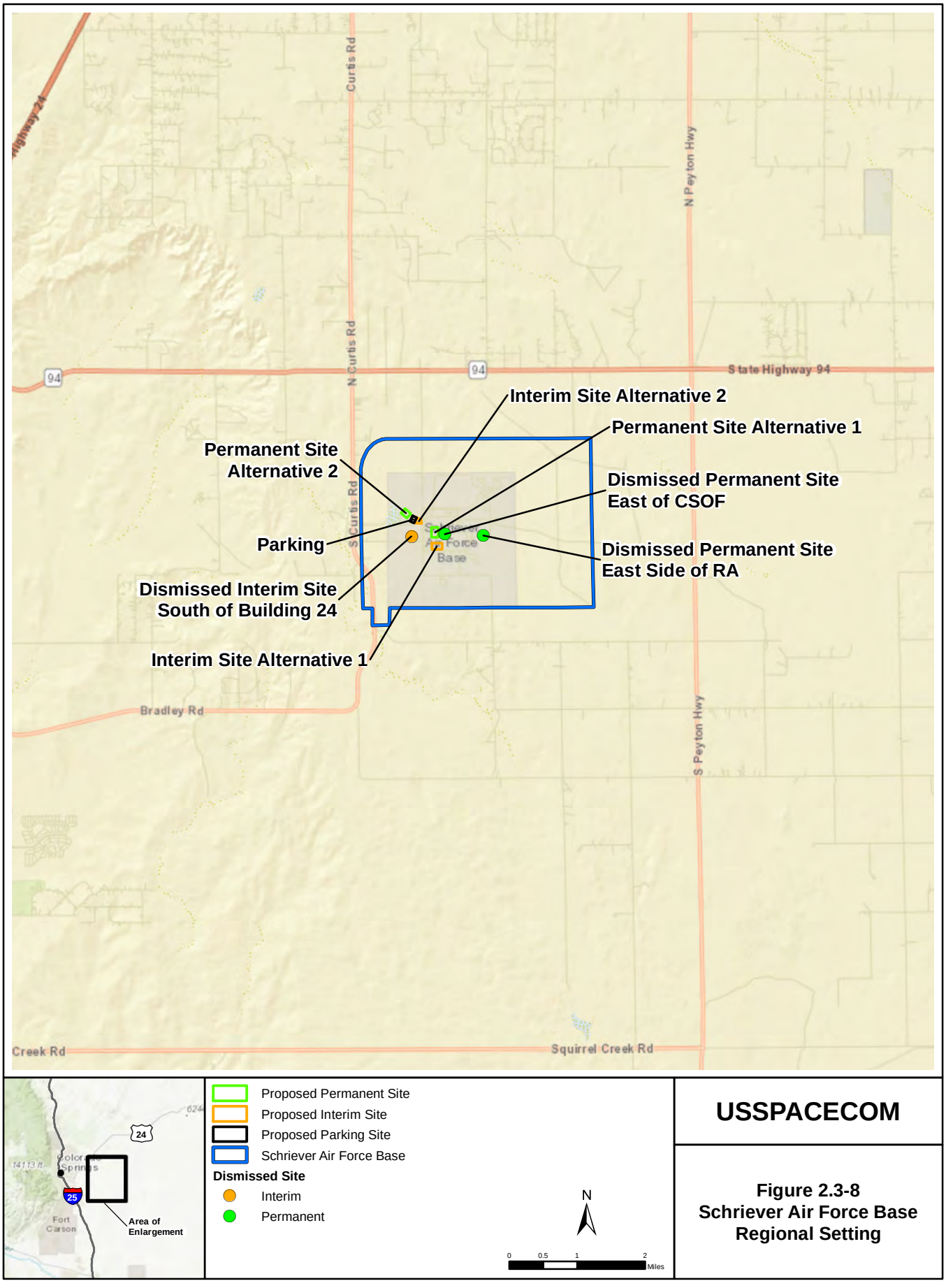

USSPACECOM

Figure 2.3-8
Schriever Air Force Base
Regional Setting

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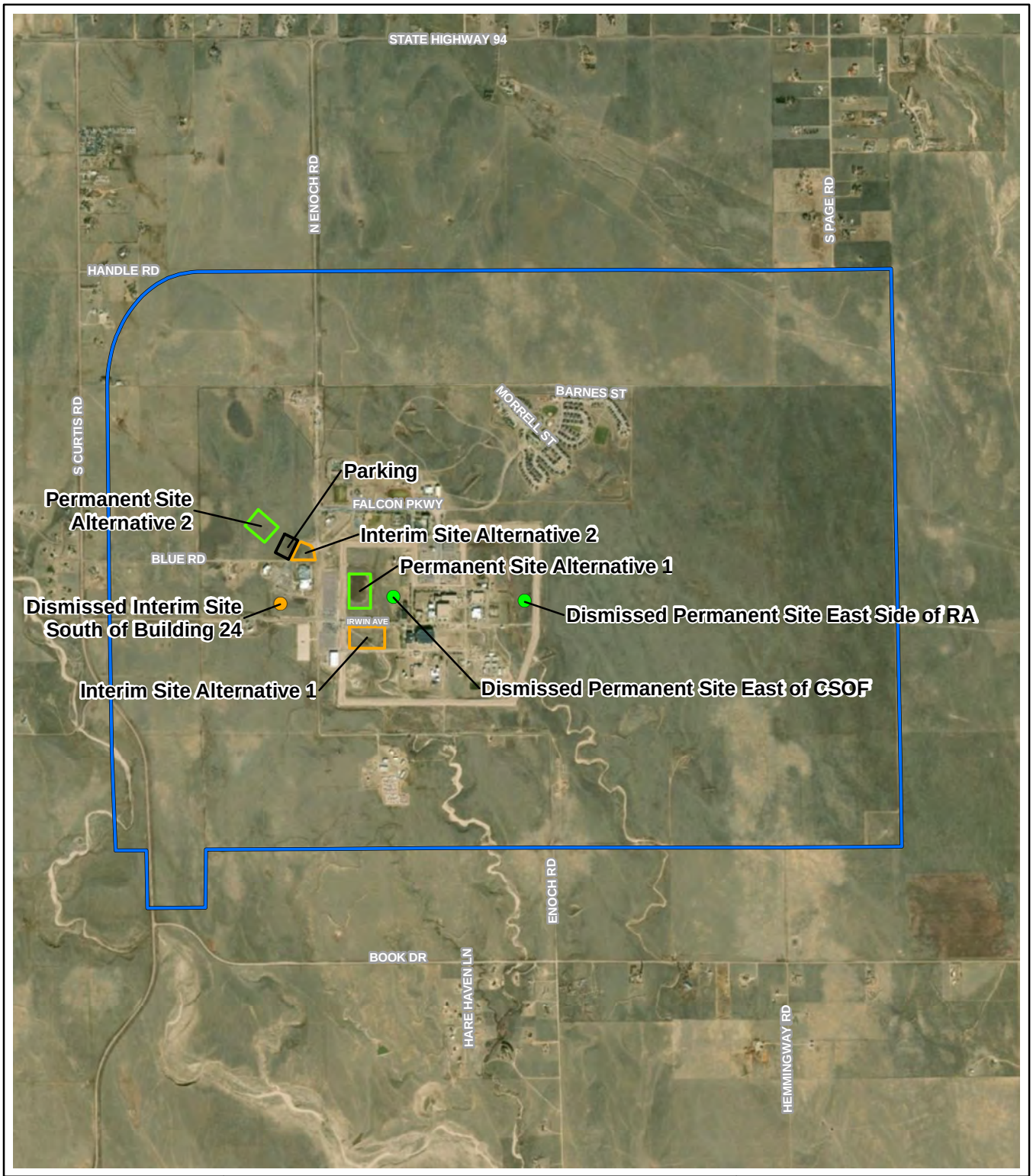

Proposed Permanent Site
Proposed Interim Site
Proposed Parking Site
Schriever Air Force Base

Dismissed Site

Interim
Permanent

N

0 1,250 2,500 5,000 Feet

USSPACECOM

Figure 2.3-9
Schriever
Air Force Base

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Proposed Permanent Site
Proposed Interim Site

N

0 125 250 500 Feet

USSPACECOM

Figure 2.3-10
Schriever Air Force Base
Interim and Permanent
Site Alternatives
Within Restricted Area

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Proposed Permanent Site
Proposed Interim Site
Proposed Parking Site

N

0 125 250 500 Feet

USSPACECOM

Figure 2.3-11
Schriever Air Force Base
Interim and Permanent
Site Alternatives
Outside Restricted Area

2.3.5 Vandenberg Air Force Base

2.3.5.1 Alternatives Considered

Three interim and seven permanent site alternatives were evaluated at Vandenberg AFB (see **Figures 2.3-12** to **2.3-14**). These alternatives were evaluated against the selection standards for the Proposed Action outlined in **Section 2.3** and **Table 2.3-1**. Two interim and six permanent site alternatives were eliminated from further analysis on the following grounds:

- Interim, Building 11777: power, roof, and heating, ventilation, and air conditioning may not be sufficient, thereby failing to meet Interim/Permanent Capacity and Support Category criteria;
- Interim, Building 8401: does not provide required area, thereby failing to meet Interim/Permanent Capacity and Support Category criteria;
- Permanent, 11777: building demolition and power improvements required; potential on-site contamination, thereby failing to meet Interim/Permanent Capacity and Support Category and Environmental Category criteria;
- Permanent, Airfield: undisturbed area with potential biological resources present; does not provide required area, thereby failing to meet Interim/Permanent Capacity and Support Category and Environmental Category criteria;
- Permanent, California North: undisturbed area with potential biological resources present, thereby failing to meet Environmental Category criteria;
- Permanent, California Southwest: planned for other tenant; further distance to substation, thereby failing to meet Interim/Permanent Capacity and Support Category criteria;
- Permanent, Nebraska: undisturbed area with potential biological resources present; conflicts with IDP; does not provide required area, thereby failing to meet Interim/Permanent Capacity and Support Category and Environmental Category criteria; and
- Permanent, Washington: undisturbed area with potential biological resources present; does not provide required area, thereby failing to meet Interim/Permanent Capacity and Support Category and Environmental Category criteria.

One interim and one permanent site alternative at Vandenberg AFB met all established selection standards for the Proposed Action, and are retained for further evaluation in this EA. These site alternatives are described in **Sections 2.3.5.2** and **2.3.5.3**.

2.3.5.2 Interim Site Alternative 1 (Buildings 6523, 7525, and 10577)

Interim Site Alternative 1 consists of minor interior renovations and use of existing Buildings 6523, 7525, and 10577 (see **Figures 2.3-13** and **2.3-14**).

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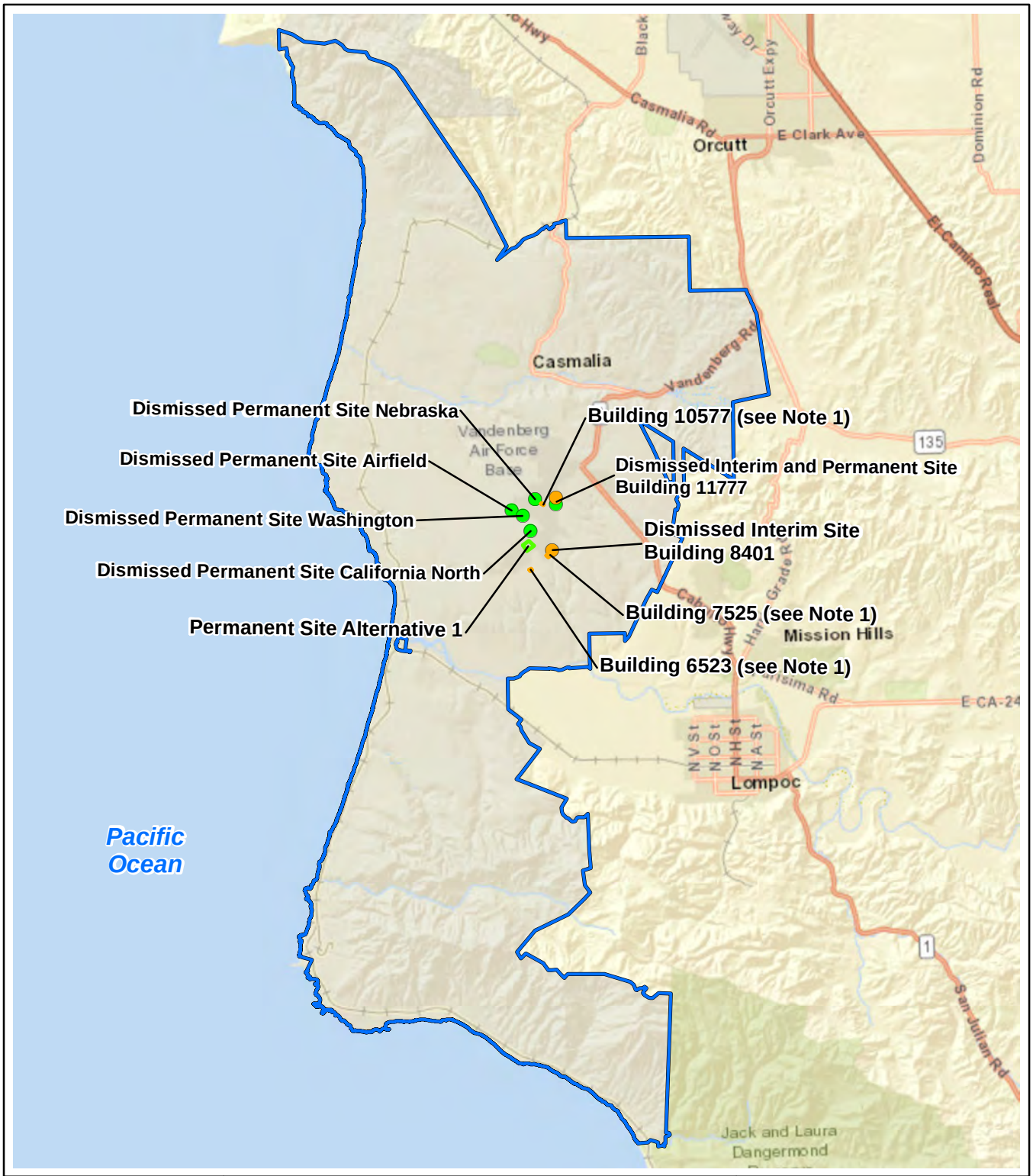

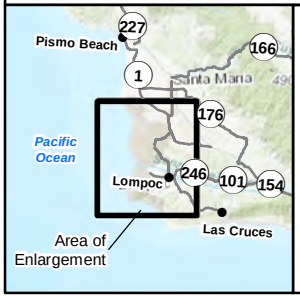

Proposed Permanent Site
Proposed Interim Site
Vandenberg Air Force Base

Dismissed Site

Permanent
Interim

N

0 1 2 4 Miles

Note 1: Interim Site Alternative 1 comprises Buildings 10577, 7525, and 6523.

USSPACECOM

Figure 2.3-12
Vandenberg Air Force Base
Regional Setting

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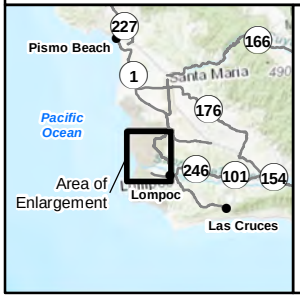

Proposed Permanent Site
Proposed Interim Site
Vandenberg Air Force Base

Dismissed Site

Permanent
Interim

N

0 2,500 5,000 10,000 Feet

Note 1: Interim Site Alternative 1 comprises Buildings 10577, 7525, and 6523.

USSPACECOM

Figure 2.3-13
Vandenberg
Air Force Base

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Proposed Permanent Site
Proposed Interim Site

Note 1: Interim Site Alternative 1 comprises Buildings 10577, 7525, and 6523.

N

0 250 500 1,000 Feet

USSPACECOM

Figure 2.3-14
Vandenberg Air Force Base
Permanent Site Alternative 1
and Interim Site Alternative 1

Building 6523 is at the southwestern corner of the intersection of 13th Street and New Mexico Avenue. The approximately 50,000-square-foot office building is used by RGNext; relocation of this tenant to another existing facility at Vandenberg AFB would be necessary. The entire building would be used following minimal interior modifications. POV parking would be provided in existing lots in the vicinity of the facility.

Building 7525 is at the southeastern corner of the intersection of 10th Street and Utah Avenue. The building is within the Former Area of Concern 143. The site has been investigated and closed by state regulatory agencies. The office building is used by United Launch Alliance; relocation of this tenant to another existing facility at Vandenberg AFB would be necessary. Approximately 100,000 square feet would be used in the building following interior renovations, including construction of a 20,000-square-foot mezzanine area. Roofing, asbestos, and plumbing work also would be completed. POV parking would be provided in existing lots adjacent to the facility.

Building 10577 is on the southern side of Nebraska Avenue, west of California Boulevard. Approximately 40,000 square feet of vacant office space would be used in the building. Minimal interior modifications would be required. POV parking would be provided in existing lots adjacent to the facility.

2.3.5.3 Permanent Site Alternative 1 (California South)

The permanent site alternative at Vandenberg AFB covers approximately 22.3 acres in the installation's intensively developed cantonment area (see **Figures 2.3-13** and **2.3-14**). The site is bounded by California Boulevard to the northwest, 10th Street to the northeast, Arizona Avenue to the southeast, and 12th Street to the southwest. The site is divided into four similarly sized quadrants by 11th Street, which extends northwest to southeast; and Alabama Avenue, which extends northeast to southwest between 10th and 12th streets.

The site is previously disturbed, and was part of Camp Cooke during World War II. At that time, the majority of buildings were heated by fuel oil that was stored in underground storage tanks (USTs). The site is within the Former Area of Interest 608 that consists of many UST locations. The Bureau of Reclamation removed all the known tanks in the early 1990s. All UST locations have been closed by the Regional Water Quality Control Board for No Further Action.

Suspected habitat for the federally threatened vernal pool fairy shrimp (*Branchinecta lynchi*) was previously documented on the site; however, USFWS has determined that the suspected habitat is unsuitable habitat for this species, and conditions supporting such habitat were not observed during a site visit conducted in May 2019.

Existing uses on the site's northern, eastern, and southern quadrants consist of paved parking lots that are bordered by areas of maintained lawn and ornamental trees and shrubs. These lots are used as overflow parking for nearby administrative facilities in the 7000 Complex. The site's eastern quadrant is occupied by a modular office building, storage facility, and paved parking/lay-down area used by American Water, the installation's private water utility contractor. These facilities are similarly surrounded by areas of maintained lawn and ornamental vegetation. American Water is scheduled to vacate this site once a new facility, currently under construction, is completed.

On-base roads in the vicinity of the site are considered to be in acceptable condition. In addition to the 7000 Complex mentioned above, nearby uses to the northeast and east predominantly consist of administrative facilities. Land to the southeast predominantly consists of paved parking areas, while land to the south and southwest is previously disturbed but currently vacant, and consists of maintained lawn and ornamental vegetation.

2.3.6 Redstone Arsenal

2.3.6.1 Alternatives Considered

Three interim and four permanent site alternatives were evaluated at Redstone Arsenal (see **Figures 2.3-12** to **2.3-16**). These alternatives were evaluated against the selection standards for the Proposed Action outlined in **Section 2.3** and **Table 2.3-1**. One interim and three permanent site alternatives were dismissed from analysis on the following grounds:

- Interim, Buildings 5303 and 5304: dispersed vacant spaces, requires consolidation of existing personnel, and costly, thereby failing to meet Cost and Timing Category and Interim/Permanent Capacity and Support Category criteria;
- Permanent, Area 1: would require relocation of 30-inch industrial water main and overhead 161-kilovolt electrical transmission lines and poles crossing the site. An archaeological site also may need to be addressed, thereby failing to meet Cost and Timing Category, Interim/Permanent Capacity and Support Category, and Environmental Category criteria;
- Permanent, Area 3: would require substantial upgrades for redundant power (i.e., additional cost), provides minimal space for future expansion, and inconsistent land uses, thereby failing to meet Cost and Timing Category, Interim/Permanent Capacity and Support Category, and Environmental Category criteria; and
- Permanent, Area 4: would require substantial upgrades for redundant power (i.e., additional cost), thereby failing to meet thereby failing to meet Cost and Timing Category and Interim/Permanent Capacity and Support Category criteria.

Two interim and one permanent site alternatives at Redstone Arsenal meet all established selection standards for the Proposed Action, and are retained for further evaluation in this EA. These site alternatives are described in **Sections 2.3.6.2** through **2.3.6.4**.

2.3.6.2 Interim Site Alternative 1 (Redstone Gateway, and Buildings 5201 and 5220)

Interim Site Alternative 1 would involve using space that would be leased by the Air Force in one or more office buildings currently being built in an enhanced use lease (EUL) area on the northwestern side of Redstone Arsenal near Gate 9 within the installation's secure perimeter (see **Figures 2.3-16** and **2.3-17**). This site is approximately 150 acres and is administered by the U.S. Army Corps of Engineers (USACE). NEPA analysis for the site has been completed (USACE, 2008). Tenant(s) for the facilities being built on the EUL area have not yet been identified. It is anticipated that facilities currently under construction in the EUL area would be ready for occupancy in Spring 2020. Parking for USSPACECOM personnel would be provided in adjacent parking lots.

This alternative also includes minor interior renovations and use of existing Buildings 5201 and 5220.

Building 5201 is at the southeastern corner of the intersection of Martin Road Southwest and Linder Road. Approximately 7,400 square feet of existing capacity in the office building would be used following minor interior renovations. POV parking would be provided in existing lots adjacent to the facility.

Building 5220 is in a building complex at the northeastern corner of the intersection of Martin Road Southwest and Mills Road Southwest. Approximately 120 staff would be accommodated in the office building following the planned relocation of U.S. Space and Missile Defense Command and interior modifications. POV parking would be provided in existing lots adjacent to the facility.

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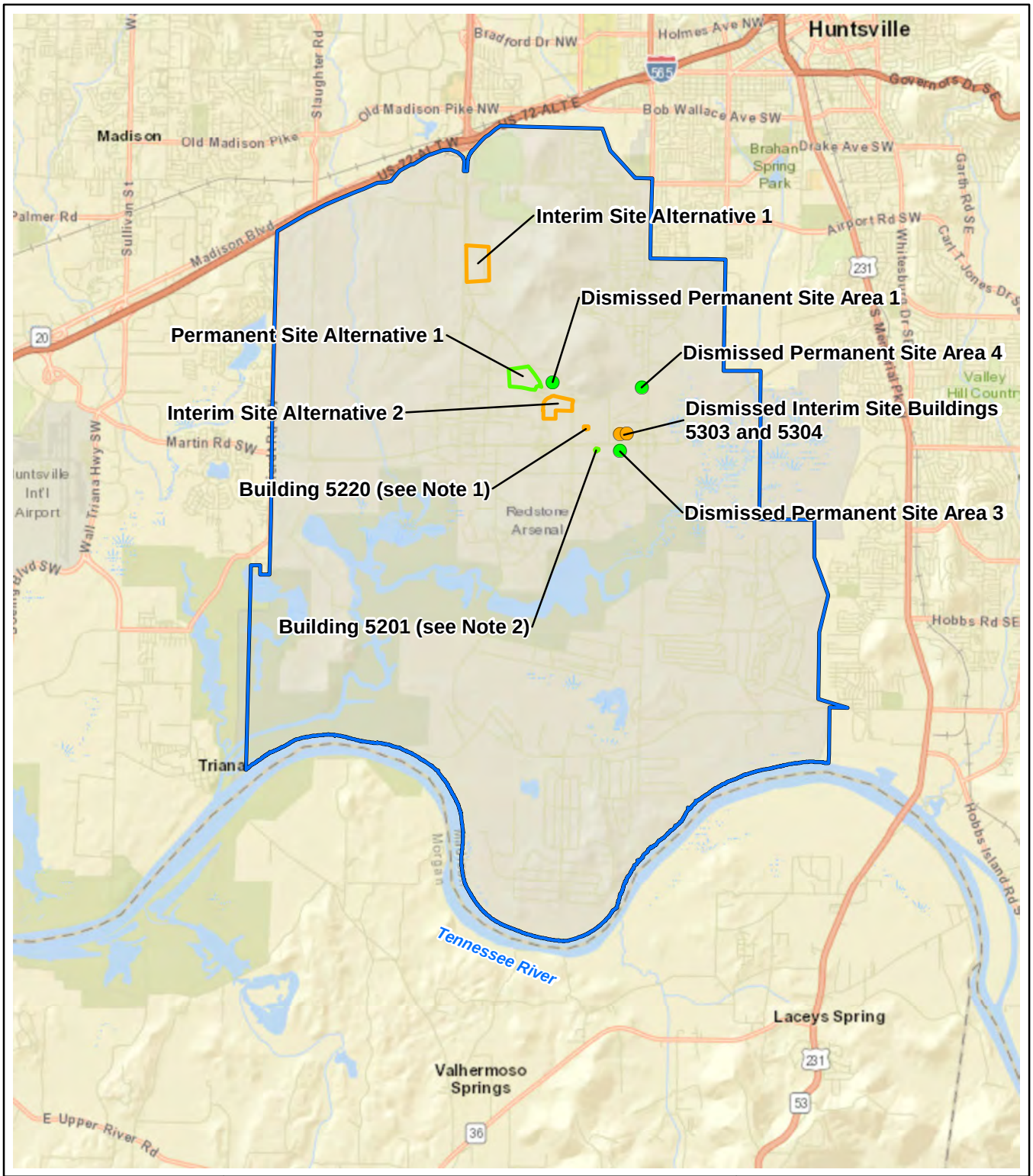

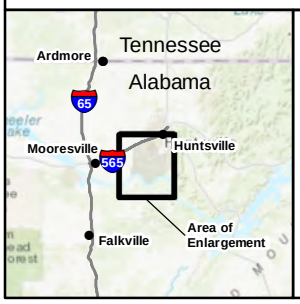

Proposed Permanent Site
Proposed Interim Site
Redstone Arsenal

Dismissed Site

Permanent
Interim

N

0 0.5 1 2 Miles

Note 1: Building 5220 is included as part of Interim Site Alternative 1 and Interim Site Alternative 2

Note 2: Building 5201 is included as part of Permanent Site Alternative 1, Interim Site Alternative 1, and Interim Site Alternative 2.

USSPACECOM

Figure 2.3-15
Redstone Arsenal
Regional Setting

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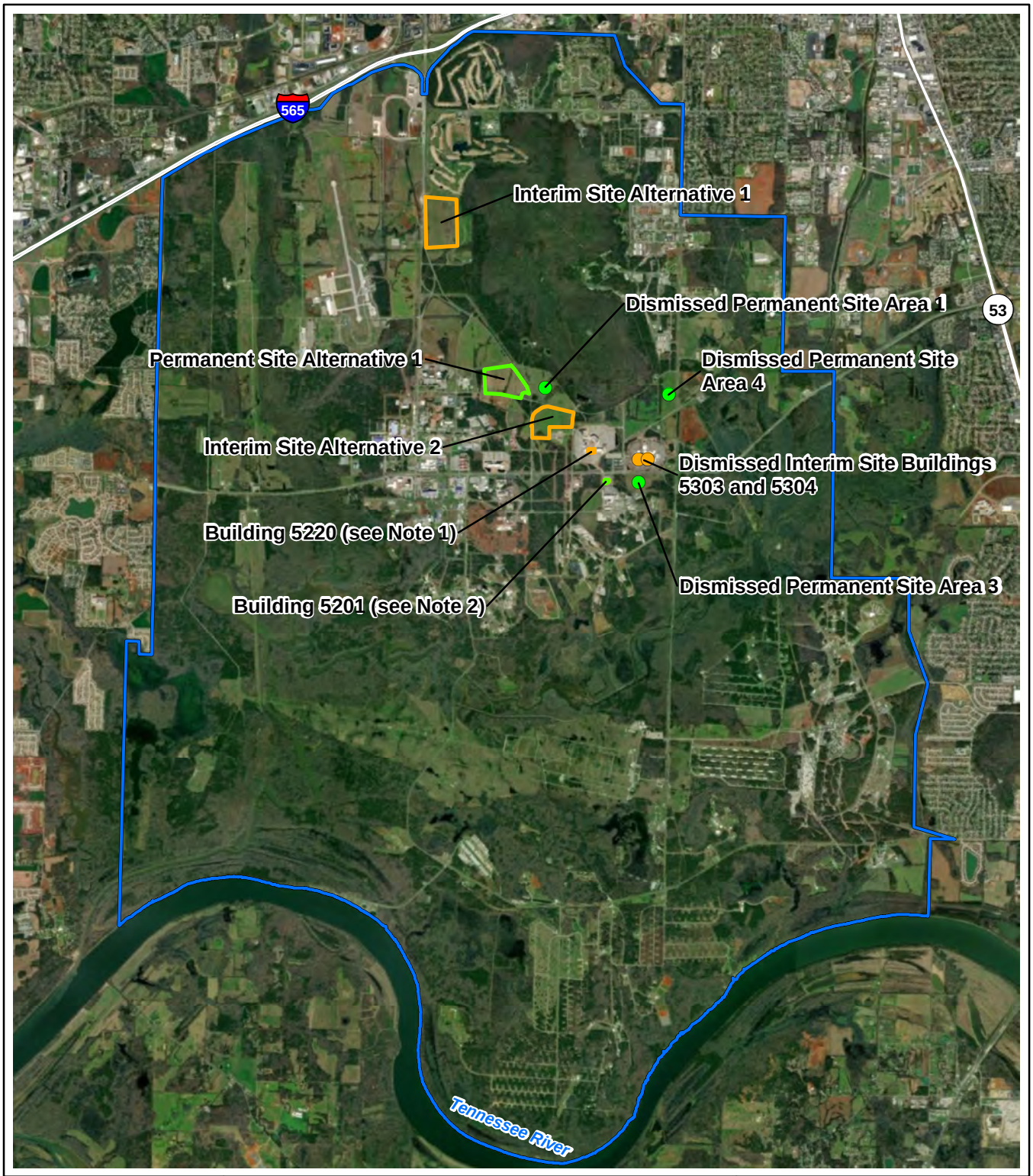

Proposed Permanent Site
Proposed Interim Site
Redstone Arsenal

Dismissed Site

Permanent
Interim

Note 1: Building 5220 is included as part of Interim Site Alternative 1 and Interim Site Alternative 2

Note 2: Building 5201 is included as part of Permanent Site Alternative 1, Interim Site Alternative 1, and Interim Site Alternative 2.

N

0 1,500 3,000 6,000 Feet

USSPACECOM

Figure 2.3-16
Redstone Arsenal

2.3.6.3 Interim Site Alternative 2 (Area 2, and Buildings 5201 and 5220)

Interim Site Alternative 2 covers approximately 69 acres at the southeastern corner of the Mills/Toftoy Thruway-Neal Road intersection (see **Figures 2.3-16** and **2.3-17**). The site is immediately northwest of U.S. Missile Defense Agency headquarters, and bounded by Neal Road to the north, Mills/Toftoy Thruway to the east, a minimally developed property containing an electrical substation to the south, and the Toftoy Thruway/Marshall Road to the west. Land cover on the site predominantly consists of maintained grass; a small wooded area with a potential small wetland is in the southwestern corner of the site. An ephemeral drainage crosses the northwestern corner of the site. Modular buildings would be erected on this site to temporarily accommodate USSPACECOM personnel. POV parking would be provided in an adjacent gravel parking area.

This alternative also includes minor interior renovations and use of existing Buildings 5201 and 5220, described in **Section 2.3.6.2** for Interim Site Alternative 1.

2.3.6.4 Permanent Site Alternative 1 (Area 5 and Building 5201)

Permanent Site Alternative 1 covers 64 acres on the northwestern side of the Neal Road-Toftoy Thruway interchange (see **Figures 2.3-16** and **2.3-17**). The site is bounded by Marshall Drive to the north, Toftoy Thruway to the east, Neal Road to the south, and a wooded area to the west. The site is currently undeveloped, and is leased by USACE for livestock grazing. Vegetation consists of tall grasses that are periodically mowed. A narrow wooded area running approximately north to south centrally bisects the site into nearly equal eastern and western halves. Two noncontiguous archaeological sites have been previously documented on the site and have been determined to be non-eligible.

This alternative also includes minor interior renovations and use of existing Building 5201, described in **Section 2.3.6.2** for Interim Site Alternative 1.

2.3.7 No Action Alternative

The No Action Alternative consists of the USSPACECOM headquarters not being constructed at one of the five DoD installations. There would be no use of interim facilities, and no operation activities. Surface disturbance and other activities associated with the interim and final/permanent facilities would not occur under the No Action Alternative. Without approval of the USSPACECOM headquarters, the directed USSPACECOM would not be able to effectively perform the strategic objectives outlined in FY 2018 NDAA Section 1601c.

The No Action Alternative does not meet the Proposed Action's purpose and need. However, it is analyzed in this EA in accordance with CEQ regulations to provide a baseline against which the impacts of the Proposed Action can be compared.

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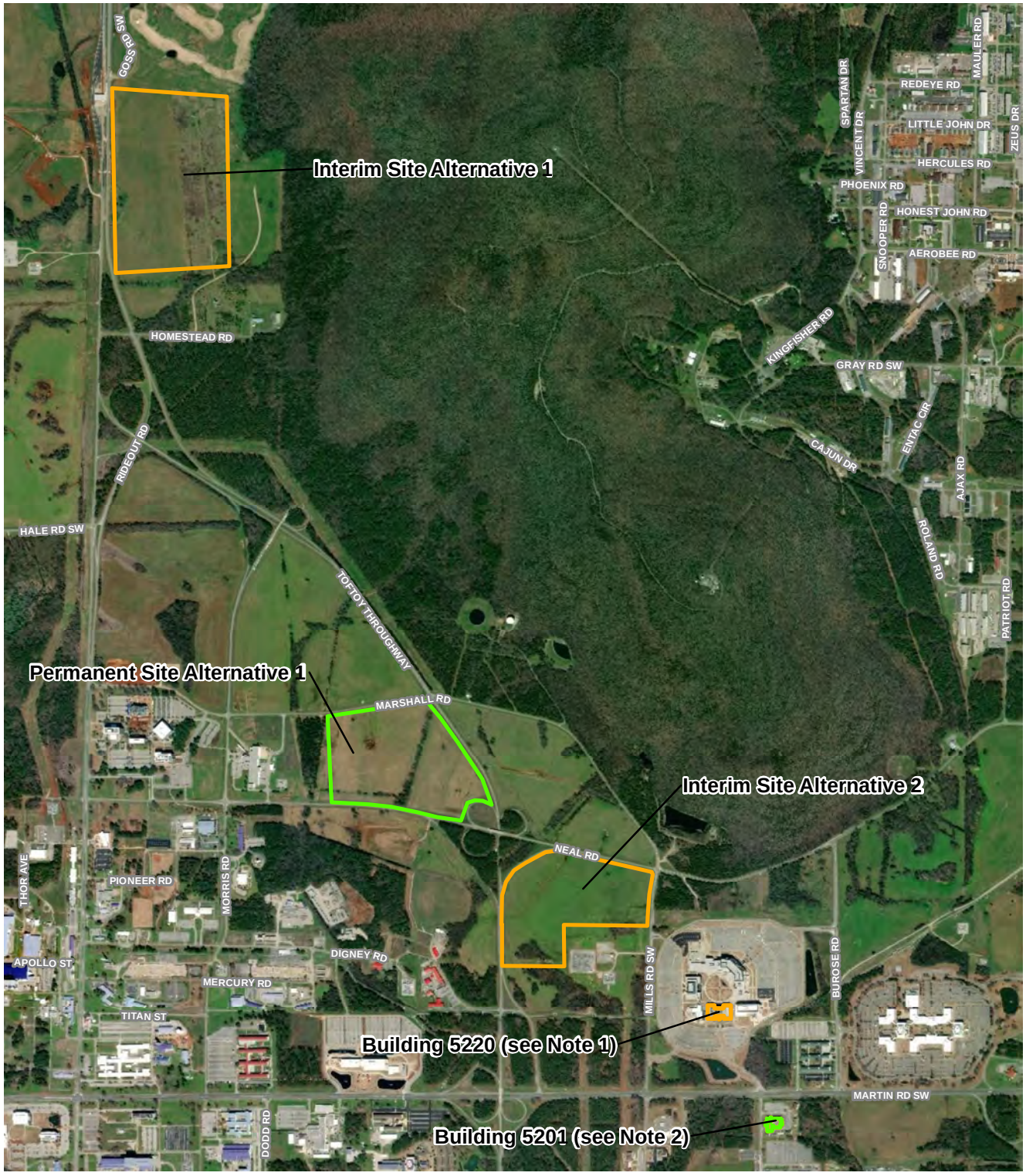

Proposed Permanent Site
Proposed Interim Site

Note 1: Building 5220 is included as part of Interim Site Alternative 1 and Interim Site Alternative 2.
Note 2: Building 5201 is included as part of Permanent Site Alternative 1, Interim Site Alternative 1, and Interim Site Alternative 2.

N

0 500 1,000 2,000 Feet

USSPACECOM

Figure 2.3-17
Redstone Arsenal
Interim and Permanent
Site Alternatives

3.0 AFFECTED ENVIRONMENT

3.1 INTRODUCTION

This chapter describes the affected environment at Buckley AFB, Peterson AFB, Schriever AFB, Vandenberg AFB, and Redstone Arsenal. It provides information to serve as a baseline from which to identify and evaluate environmental changes associated with implementation of the Proposed Action. Impacts on the resources described in this chapter are presented in **Chapter 4.0**.

The Region of Influence (ROI) is defined for each resource potentially affected by the proposed alternatives. The ROI determines the geographical area to be addressed as the Affected Environment. The ROI is contiguous with the boundaries of the proposed site alternatives for some resources, and may extend beyond those boundaries for other resources.

Resources dismissed from detailed analysis in the EA, and the justification for their dismissal, are presented in **Table 3.1-1**.

Table 3.1-1
Resources Dismissed from Detailed Analysis in the EA

Environmental Resource	Justification
Land Use and Aesthetics	No potential to affect land use outside the installations.
	Would not be sited within quantity-distance (Q-D) arcs or antiterrorism/force protection boundaries associated with other facilities.
	Would not be within safety clearance zones (i.e., “imaginary surfaces”) established by the Federal Aviation Administration and DoD associated with existing runways where development is prohibited or restricted.
	Would be designed in accordance with applicable installation design guidelines and aesthetically compatible with other facilities at the installation(s).
	No potential to impact aesthetic qualities outside the selected installation(s).
Safety and Occupational Health	Construction activities associated with the Proposed Action would be conducted in accordance with applicable federal, state, Air Force, and local worker safety and regulatory requirements and guidelines, including those established by the Occupational Safety and Health Administration (OSHA). Adherence to these requirements would substantially minimize the potential for severe worker injuries during construction.
	Operational activities would largely consist of office and administrative duties, and would have little potential to result in severe worker injuries.
	Adherence to established safety requirements, practices, and guidelines would apply, and further minimize the potential for worker injury.
	Would not be sited within Q-D arcs.
	Air Force has determined existing electrical, data/communication, water, sewer, and stormwater management utilities and infrastructure at DoD installations being considered have sufficient capacity to accommodate the Proposed Action.

Table 3.1-1
Resources Dismissed from Detailed Analysis in the EA

Environmental Resource	Justification
Utilities and Infrastructure	Utility and infrastructure improvements or upgrades would consist of trenching, directional boring, or similar activities to install service connections between the new facilities and existing distribution infrastructure.
	No substantial upgrades to existing utility and infrastructure capacity on or near the DoD installations would be required to accommodate the Proposed Action.
	Construction and operation of the Proposed Action would have no potential to interrupt or degrade utility service to existing facilities or customers on or outside the DoD installations.
	Noise associated with the Proposed Action would be limited to that associated with construction of the new interim and permanent facilities.
Noise	Intensity and duration of such noise would vary throughout the project's construction phase and would be primarily limited to daytime working hours.
	Noise generated by the project would be similar to that generated by the construction of other facilities of similar size and scale and would not be particularly unusual.
	Exposure of noise-sensitive populations to construction noise would be limited to a relatively small number of military and civilian personnel on the selected installations.
	No noise-sensitive receptors are on or near the site alternatives.
	Given the locations of the site alternatives at each DoD installation, noise associated with construction of the Proposed Action would have no potential to be experienced by receptors outside the selected DoD installations, including residential populations and noise-sensitive receptors.
	Once the Proposed Action is operational, construction-related noise would cease. No noise would be generated by the interim and permanent facilities.
	The Proposed Action would have no potential to create a new, long-term source of noise.

3.2 TRANSPORTATION

This section describes the existing vehicular transportation network on and around the five DoD installations being considered for the Proposed Action. Mass transit, bicycle, and pedestrian infrastructure are not addressed in this analysis because it is anticipated that impacts on the transportation network would primarily consist of increases in vehicular traffic associated with the proposed interim and permanent facilities.

The ROI for the transportation analysis consists of the vehicular transportation network on and near the five DoD installations being considered.

3.2.1 Buckley AFB

Buckley AFB is in the Denver Metropolitan Area, approximately 2 miles south of Interstate (I) 70, and 2 miles east of I-225. I-70 is an east-west route that provides regional access to the Denver Metropolitan Area from Kansas, and continues west into the Rocky Mountains. I-225 runs north-south, and connects I-70 to I-25 through Aurora. The regional transportation network is illustrated on **Figure 2.3-1**.

Local roadways on and adjacent to Buckley AFB include 6th Avenue (State Highway [SH] 30), Mississippi Avenue, Airport Boulevard, Jewell Avenue, Alameda Parkway, and Aspen Drive (see **Figures 2.3-2** through **2.3-4**). From I-225, 6th Avenue and Mississippi Avenue provide access into Buckley AFB at the North and South gates, respectively. In addition, Extension-470 Toll Highway (E-470) runs north-south, approximately 0.5 mile east of Buckley AFB.

In the Buckley AFB vicinity, 6th Avenue is an undivided two-lane (one lane in each direction) roadway. West of Airport Parkway, Mississippi Avenue has five lanes, three westbound and two eastbound, separated by a median. Mississippi Avenue continues to the east of Aspen Drive as an undivided, two-lane roadway.

Regional access to Buckley AFB is provided by I-225 to 6th Avenue or Mississippi Avenue, as well as E-470 to 6th Avenue or Mississippi Avenue, both via Jewell Avenue. There are two local intersections that provide direct access into Buckley AFB:

- The northern intersection at 6th Avenue and Aspen Drive allows eastbound travelers access to the north gate on Aspen Drive via one right-turn lane that is approximately 525 feet long. Westbound travelers are allowed to make left turns onto Aspen Drive via one turn lane that is approximately 350 feet long.
- The southern intersection at Mississippi Avenue and Aspen Drive allows eastbound travelers access to the South Gate on Aspen Drive via two left-turn lanes: one extending from the intersection of Mississippi Avenue and Alameda Parkway; and another extending approximately 350 feet from Aspen Drive. Westbound travelers are allowed to make right turns onto Aspen Drive from one turn lane that is approximately 1,200 feet long.

Estimated Average Annual Daily Traffic (AADT) volumes on roads near Buckley AFB are provided in **Table 3.2-1**.

Table 3.2-1
Estimated AADT Traffic Volumes on Roads near Buckley AFB

Road	Station ID Number	Estimated AADT Volume
US-30 (6th Avenue) nearest to the intersection of US 30 and Aspen Drive	101129	21,000
I-225 nearest to the intersection of I-225 and Mississippi Avenue	106446	151,000

Source: CDOT, 2019.

Approximately 8,000 personnel are assigned to Buckley AFB (USAF, 2016a). This number does not include National Guard and Reserve personnel, who do not necessarily travel to and from the installation each day. An estimated 9,033 vehicles enter and exit Buckley AFB each workday (i.e., Monday through Friday) (Rodgers, 2019).

3.2.1.1 Interim Site Alternative 1 (West End District)

Interim Site Alternative 1 is in the northwestern quadrant of Buckley AFB at the intersection of Telluride Street and Breckenridge Avenue. The site is west of the RA and northeast of the Buckley Family Housing neighborhood. Telluride Street, Breckenridge Avenue, and A Basin Avenue would provide access to Interim Site Alternative 1 from Aspen Drive (**Figure 2.3-2**). Vehicles traveling to Interim Site Alternative 1 could access Buckley AFB from the North and South gates. It would not be necessary for vehicular traffic to travel through residential areas of the installation to access the site.

3.2.1.2 Permanent Site Alternative 1 (North Corner Site 1)

Permanent Site Alternative 1 is near the northeastern boundary of Buckley AFB, adjacent to the NOSC. From Aspen Drive, Steamboat Avenue provides access to Loveland Street that terminates near Permanent Site Alternative 1 (**Figure 2.3-3**). Vehicles traveling to Permanent Site Alternative 1 could use either the North or South gate to access the installation. It would not be necessary for vehicular traffic to travel through residential areas of the installation to access the site.

3.2.1.3 Permanent Site Alternative 2 (North Corner Site 2)

Permanent Site Alternative 2 is adjacent to and northeast of Permanent Site Alternative 1. Vehicular access to the site would be the same as described for Permanent Site Alternative 1 (**Figure 2.3-3**). It would not be necessary for vehicular traffic to travel through residential areas of the installation to access the site.

3.2.2 Peterson AFB

Peterson AFB is in the eastern portion of Colorado Springs, adjacent to U.S. Highway (US) 24, approximately 0.7 mile southeast of the US-24/SH-21 interchange, and 0.5 mile southwest of SH-94. US-24 is an east-west route that provides regional access to Colorado Springs from I-70, and continues west into the Rocky Mountains. SH-21 runs north-south, and connects SH-83 to I-25 through the eastern portion of Colorado Springs. The regional transportation network is illustrated on **Figure 2.3-3**.

Local roadways in and adjacent to Peterson AFB include Peterson Boulevard, Marksheffel Road, Space Village Avenue, and Stewart Avenue (see **Figure 2.3-4**). From US 24, Stewart Avenue, Peterson Boulevard, and Marksheffel Road provide access into Peterson AFB at the West, North, and

East gates, respectively. The Colorado Springs Airport is adjacent to and immediately south of Peterson AFB.

In the Peterson AFB vicinity, Stewart Avenue is an undivided, four-lane (two lanes in each direction) roadway. Near the West Gate, Stewart Avenue becomes a divided six-lane roadway with three lanes in each direction. North of Space Village Avenue, Peterson Boulevard has four lanes, two in each direction, separated by a median. South of Space Village Drive, Peterson Road receives a third southbound lane up to the North Gate. From US 24, Marksheffel Road has four lanes, two in each direction, separated by a paved median. South of the East Gate, Marksheffel Road becomes a two-lane, undivided roadway.

Regional access to Peterson AFB is provided by US 24 to Peterson Boulevard, Stewart Avenue via Airport Road, or Marksheffel Road. From US 24, there are three local intersections that provide direct access into Peterson AFB:

- The northern intersection at Peterson Boulevard and Space Village Avenue allows eastbound travelers, exiting from US 24, access to the North Gate on Peterson Boulevard via one right-turn lane originating as the right lane of US 24, bypassing the stoplight at Peterson Road and Space Village Avenue, and continuing as an additional southbound lane onto Peterson Boulevard. Westbound travelers from US 24 exit onto the service road, and are allowed access onto Peterson Road via one left-turn lane. Westbound travelers along Space Village Avenue are allowed to make left turns onto Peterson Boulevard from the main traffic lane, which becomes a left-turn lane. Space Village Avenue terminates at Peterson Boulevard.
- The western intersection at US 24/ SH-21 and Airport Road allows northbound travelers along US 24 to make right turns onto Airport Road via one turn lane that is approximately 600 feet long. Southbound travelers along US 24 are allowed to make left turns onto Airport Road via two turn lanes that are approximately 575 feet long. Travelers entering Peterson AFB are allowed to turn right from Airport Road onto Stewart Avenue via two turn lanes. At this point, Airport Road becomes Stewart Avenue before travelers enter Peterson AFB from the West Gate.
- The eastern intersection at Marksheffel Road and the East Gate allows northbound travelers to make left turns into the East Gate entrance from a turn lane that is approximately 520 feet long. Southbound travelers are allowed to make right turns into the East Gate entrance from the right travel lane, which becomes a turn lane that is approximately 825 feet from the intersection.

Estimated AADT volumes on roads near Peterson AFB are provided in **Table 3.2-2**.

Table 3.2-2
Estimated AADT Traffic Volumes on Roads near Peterson AFB

Road	Station ID Number	Estimated AADT Volume
US 24 near its intersection with Peterson Boulevard	100849	41,000
SH-94 near its intersection with Airport Road	100920	61,000

Source: CDOT, 2019.

Approximately 10,300 personnel are assigned to Peterson AFB (USAF, 2018). This number does not include National Guard and Reserve personnel, who do not necessarily travel to and from the installation each day. An estimated 31,200 vehicles enter and exit Peterson AFB each workday (Shafer, 2019).

3.2.2.1 Interim Site Alternative 1 (Command Complex)

Interim Site Alternative 1 is near the northeastern corner of Peterson AFB, east of Vandenberg Street and adjacent to Building 3 in the installation's Command Complex. From Peterson Boulevard, Vandenberg Street would provide access to Interim Site Alternative 1 (**Figure 2.3-5**). Vehicles traveling to Interim Site Alternative 1 would likely access Peterson AFB from the North Gate. The proposed parking site would be east of Interim Site Alternative 1 on Colorado Springs Municipal Airport property. It would not be necessary for vehicular traffic to travel through residential areas of the installation to access the site.

3.2.2.2 Permanent Site Alternative 1 (Command Complex and Leased Off-base Office Space)

Permanent Site Alternative 1 is near the North Gate of Peterson AFB along Vandenberg Street, in an existing parking lot immediately south of Buildings 1 and 2 in the Command Complex (**Figure 2.3-5**). From Peterson Boulevard, Vandenberg Street provides access to Permanent Site Alternative 1. Employees at Permanent Site Alternative 1 would likely access Peterson AFB from the North Gate. Proposed parking sites include Garage 1 and Garage 2, which would be built on existing parking lots northwest and southeast, respectively, of Permanent Site Alternative 1.

The precise location of existing off-base office space that would be leased by the Air Force under this alternative, if selected, has not been identified, but would be within a four-mile radius of Peterson AFB's West Gate. It is anticipated that vacant space would be leased in existing office buildings in an office park or similar commercial setting that would be accessible from major highways and arterial roads.

3.2.3 Schriever AFB

Schriever AFB is approximately 9 miles east of Peterson AFB and Colorado Springs, and 1.5 miles south of SH-94. SH-94 is an east-west route that provides regional access to Colorado Springs from US-287, and terminates at US 24 near Peterson AFB. The regional transportation network is illustrated on **Figure 2.3-5**.

Local roadways on and adjacent to Schriever AFB include Enoch Road, South Curtis Road, Blue Road, South Page Road, Handle Road, and Irwin Road (see **Figure 2.3-6**). From SH-94, Enoch Road provides direct access into Schriever AFB from the North Entry, and South Curtis Road provides access to the West Entry on Irwin Road.

In the Schriever AFB vicinity, Enoch Road is an undivided two-lane (one lane in each direction) roadway. South Curtis Road and Irwin Road also are undivided two-lane (one lane in each direction) roadways.

Regional access to Schriever AFB is provided by SH-94 to Enoch Road and South Curtis Road. There are two local intersections that provide direct access into Schriever AFB:

- The northern intersection at SH-94 and Enoch Road allows eastbound travelers access to the North Entry on Enoch Road via one right-turn lane that is approximately 600 feet long, that merges onto Enoch Road. Westbound travelers are allowed access onto Enoch Road via one left-turn lane that is approximately 250 feet long.
- The western intersection at South Curtis Road and Irwin Road allows northbound travelers to make right turns onto Irwin Road via one turn lane that is approximately 325 feet long. Southbound travelers along South Curtis Road are allowed to make left turns onto Irwin Road via one turn lane that is approximately 225 feet long. The West Entry is on Irwin Road, approximately 0.7 mile east of South Curtis Road.

AADT along Colorado Department of Transportation (CDOT) highways was identified for SH-94. In 2018, estimated AADT volume on SH-94 near its intersection with South Curtis Road (station ID number 103945) was 11,000 vehicles (CDOT, 2019).

Approximately 8,000 personnel are assigned to Schriever AFB (USAF, 2017a). An estimated 8,427 vehicles enter and exit Schriever AFB each workday (Lawton, 2019).

3.2.3.1 Interim Site Alternative 1 (Inside RA / West Side of RA / Leased Off-base Office Space)

Interim Site Alternative 1 is along the western boundary of the Schriever AFB RA. Interim Site Alternative 1 is bordered by Irwin Avenue to the north, Kepler Avenue to the south, and Beltway to the west (**Figure 2.3-7**). Kepler Avenue and Irwin Avenue could provide access to Interim Site Alternative 1. Employees at Interim Site Alternative 1 could access Schriever AFB from the North or West Entry. It would not be necessary for vehicular traffic to travel through residential areas of the installation to access the site.

The precise location of existing off-base office space that would be leased by the Air Force under this alternative, if selected, has not been identified, but would be within a four-mile radius of Peterson AFB's West Gate. It is anticipated that vacant space would be leased in existing office buildings in an office park or similar commercial setting that would be accessible from major highways and arterial roads.

3.2.3.2 Interim Site Alternative 2 (Outside RA / North of Building 24 / Leased Off-base Office Space)

Interim Site Alternative 2 is in the West District of Schriever AFB, outside the RA. Interim Site Alternative 2 is bounded by Talon Way to the west and north, and Enoch Road to the east (**Figure 2.3-8**). Talon Way and Enoch Road could provide access to Interim Site Alternative 2. Parking for Interim Site Alternative 2 would be provided by a 3.5-acre parcel bounded to the east by Talon Way. Employees at Interim Site Alternative 2 could access Schriever AFB from the North or West Entry. It would not be necessary for vehicular traffic to travel through residential areas of the installation to access the site.

The precise location of existing off-base office space that would be leased by the Air Force under this alternative, if selected, has not been identified, but would be within a four-mile radius of Peterson AFB's West Gate. It is anticipated that vacant space would be leased in existing office buildings in an office park or similar commercial setting that would be accessible from major highways and arterial roads.

3.2.3.3 Permanent Site Alternative 1 (Inside RA) (West Side of RA)

Permanent Site Alternative 1 is along the western boundary of the Schriever AFB RA. Interim Site Alternative 1 is bordered by Irwin Avenue to the north, Kepler Avenue to the south, and Beltway to the west (**Figure 2.3-7**). Kepler Avenue and Irwin Avenue could provide access to Permanent Site Alternative 1. Employees at Permanent Site Alternative 1 could access Schriever AFB from the North or West Entry. It would not be necessary for vehicular traffic to travel through residential areas of the installation to access the site.

3.2.3.4 Permanent Site Alternative 2 (Outside RA) (Northwest of Building 24)

Permanent Site Alternative 2 is in an open field in the West District of Schriever AFB, outside the RA and adjacent to Interim Site Alternative 2. Talon Way, Blue Road, and Enoch Road could provide access to Permanent Site Alternative 2 (**Figure 2.3-8**). Employees at Permanent Site Alternative 2 could access

Schriever AFB from the North or West Entry. It would not be necessary for vehicular traffic to travel through residential areas of the installation to access the site.

3.2.4 Vandenberg AFB

Vandenberg AFB is along the Pacific Coast of California, just west of the City of Lompoc, and bounded by State Route (SR) 1 to the east and the Pacific Ocean to the west. SR-1 is a north-south route that provides regional access from Los Angeles to San Francisco. SR-246 and SR-135 also provide regional access from US-101 to Vandenberg AFB. SR-246 is an east-west route that connects the City of Lompoc to US-101; and SR-135 is a north-south route that connects US-101 to SR-1 before terminating in the City of Santa Maria. The regional transportation network is illustrated on **Figure 2.3-7**.

Local roadways on and adjacent to Vandenberg AFB include California Boulevard, Lompoc-Casmalia Road, Utah Street, Washington Avenue, SR-246/West Ocean Avenue, 13th Street, and Santa Lucia Canyon Road (see **Figure 2.3-9**). SR-1 provides direct access to the main entrance on California Boulevard. From SR-1, West Lompoc-Casmalia Road provides access to a northern entry on Utah Street, and Santa Lucia Canyon Road provides access to the Lompoc Gate on Washington Avenue. SR-1 also provides access to a southern entry on 13th Street via SR-246/West Ocean Avenue.

In the Vandenberg AFB vicinity, SR-1 is a divided four-lane (two lanes in each direction) roadway. West Lompoc-Casmalia Road and Santa Lucia Canyon Road are undivided two-lane (one lane in each direction) roadways. In the City of Lompoc, SR-246 becomes West Ocean Avenue, an undivided two-lane roadway with access to the southern entry on 13th Street.

Regional access to Vandenberg AFB from US-101 is provided by SR-1, SR-246, and SR-135. SR-1 provides direct access to the main entrance on California Boulevard, as well as access to Washington Avenue via Santa Lucia Canyon Road, and Utah Street via West Lompoc-Casmalia Road. SR-246 provides access to 13th Street via West Ocean Avenue. SR-135 provides regional access from US-101 to SR-1. There are four local intersections that provide direct access into Vandenberg AFB:

- The northern intersection at Utah Street and West Lompoc-Casmalia Road allows northbound travelers along West Lompoc-Casmalia Road access to the northern entry on Utah Street by making left turns from the main traffic lane. Southbound travelers along West Lompoc-Casmalia Road are allowed to make right turns onto Utah Street from the main traffic lane. No turn lanes are provided at this intersection.
- The main entrance intersection at SR-1 and California Boulevard allows northbound travelers along SR-1 to make left turns onto California Boulevard via two turn lanes that are approximately 300 feet long. One turn lane also functions as the main traffic lane. Southbound travelers along SR-1 are allowed to drive straight into the main entrance on California Boulevard from two main traffic lanes, because SR-1 turns 90 degrees at this intersection to continue south.
- The Lompoc Gate intersection at Santa Lucia Canyon Road and Washington Avenue allows northbound travelers along Santa Lucia Canyon Road access to Lompoc Gate by making left turns onto Washington Avenue via one turn lane that is approximately 500 feet long. Southbound travelers along Santa Lucia Canyon Road can make right turns onto Washington Avenue without stopping via two turn lanes, one of which is approximately 300 feet long. The inside turn lane also functions as the main traffic lane.
- The southern intersection at West Ocean Avenue and 13th Street allows westbound travelers along Ocean Avenue to make right turns onto 13th Street via one relatively narrow turn lane, modified from the shoulder, that is approximately 200 feet long. Eastbound travelers along

Ocean Avenue are allowed to make left turns onto 13th Street via one turn lane that is approximately 150 feet long.

Estimated AADT volumes on roads near Vandenberg AFB are provided in **Table 3.2-3**.

Table 3.2-3
Estimated AADT Traffic Volumes on Roads At and Near Vandenberg AFB

Road	Estimated AADT Volume	
	Back AADT	Ahead AADT
SR-1 at its intersection with SR-246 (West Ocean Avenue)	13,500	11,600
SR-1 at its intersection with West Lompoc-Casmalia Road (Vandenberg AFB main gate)	28,200	20,100
SR-1 at its intersection with SR-135	14,900	17,800

Source: Caltrans, 2016.

Approximately 10,642 personnel are assigned to Vandenberg AFB. The 24-hour volume at the Lompoc Gate, which serves as the installation's truck inspection gate, is approximately 2,800 vehicles (USAF, 2019a). The estimated morning peak hour demand volume at the Santa Maria gate (the installation's Main Gate) is approximately 2,600 vehicles (Curry-Bumpass, 2019). Daily vehicle counts for other Vandenberg AFB gates were not available.

Conservatively assuming that 80 percent of assigned personnel travel to and from Vandenberg AFB on normal workdays (i.e., Monday through Friday) driving their individual personal vehicles, approximately 8,513 vehicles enter and leave the base each day.

3.2.4.1 Interim Site Alternative 1 (Buildings 6523, 7525, and 10577)

Interim Site Alternative 1 comprises three buildings (6523, 7525, and 10577). Building 6523 is southwest of the intersection of 13th Street and Utah Avenue, with access from 13th Street. Building 7525 is east of the intersection of Iceland Avenue and 10th Street, with access from Iceland Avenue and 10th Street. Building 10577 is south of Nebraska Avenue, near the intersection of Nebraska Avenue and California Boulevard. Access to Building 10577 is from Nebraska Avenue. See **Figure 2.3-10** for the location of these buildings. Employees at Interim Site Alternative 1 could access Vandenberg AFB from any entry point; however, the main entrance would likely be used most often. It would not be necessary for vehicular traffic to travel through residential areas of the installation to access the site.

3.2.4.2 Permanent Site Alternative 1 (California South)

Permanent Site Alternative 1 is centrally located at a parking area bounded by California Boulevard, 12th Street, Arizona Avenue, and 10th Street (**Figure 2.3-10**). California Boulevard provides direct access to Permanent Site Alternative 1. From California Boulevard, 12th Street, Arizona Avenue, and 10th Street provide access to Permanent Site Alternative 1. Employees at Permanent Site Alternative 1 could access Vandenberg AFB from any entry point; however, the main entrance would likely be used most often. It would not be necessary for vehicular traffic to travel through residential areas of the installation to access the site.

3.2.5 Redstone Arsenal

Redstone Arsenal is southwest of Huntsville, Alabama and is bounded by I-565 to the north and the Tennessee River to the south. I-565 is an east-west route that provides regional access from Huntsville, west to I-65, which provides access from Birmingham, Alabama to Nashville, Tennessee. US-231 is a north-south route that begins at the Florida Gulf Coast, and provides regional access from Montgomery, Alabama. The regional transportation network is illustrated on **Figure 2.3-9**.

Local roadways in and adjacent to Redstone Arsenal include Zierdt Road, Rideout Road, Drake Avenue, Goss Road, Patton Road, Martin Road Southwest, and Redstone Road (see **Figure 2.3-11**). Zierdt Road provides access from I-565 to the western entrance on Martin Road Southwest. Rideout Road provides direct access from I-565 to the northwestern entrance. Patton Road provides access from I-565 to the northeastern entrance on Goss Road, as well as direct access to another entry point approximately 1 mile south of Goss Road near the intersection of Patton Road and Talwell Drive. US-231 provides access to the Redstone Arsenal Truck Entrance along Martin Road, approximately 1.5 miles east of Patton Road. US-231 also provides access to a sixth entrance, identified along Redstone Road, approximately 1.6 miles east of Patton Road.

In the Redstone Arsenal vicinity, Zierdt Road is under construction, and will be a divided four-lane road. Most of the construction is complete, although not open yet. Rideout Road is a divided four-lane (two lanes in each direction) roadway. Near the arsenal entrance, Rideout Road has five southbound and three northbound traffic lanes. Drake Avenue has four traffic lanes, two in each direction, divided by a center turn lane. Patton Road is undivided, and has four lanes: two in each direction. Martin Road Southwest is divided, and the roadway has four lanes: two in each direction. Redstone Road is a two-lane undivided road.

Regional access to Redstone Arsenal is provided by I-565 and US-231. I-565 provides access to the western entrance on Martin Road Southwest via Zierdt Road; the northeastern entrance on Goss Road via Patton Road, and direct access to the entrances on Patton Road and Rideout Road. US-231 provides direct access to the truck entrance on Martin Road Southwest, and the southernmost entrance on Redstone Road. There are six local intersections that provide direct access into Redstone Arsenal:

- The intersection at Zierdt Road and Martin Road Southwest allows southbound travelers along Zierdt Road access to the western entrance on Martin Road Southwest by making left turns from a turn lane that is approximately 175 feet long. Northbound travelers along Zierdt Road are allowed to make right turns onto Martin Road Southwest from the main traffic lane. No turn lane is provided to northbound travelers at this intersection.
- The intersection at I-565 and Rideout Road allows eastbound travelers along I-565 to make non-stop right turns onto Rideout Road via one exit lane. Westbound travelers along I-565 are allowed to make non-stop left turns onto Rideout Road via one flyover exit lane that converges with the eastbound exit lane before both lanes continue onto Rideout Road.
- The intersection at I-565 and Patton Road allows eastbound travelers along I-565 to make right turns onto Patton Road via one turn lane (approximately 425 feet long) after yielding to southbound vehicles on Patton Road. Westbound travelers along I-565 are allowed to make left turns onto Patton Road via two turn lanes derived from the main traffic lanes of the frontage road. One of the turn lanes also functions as the main traffic lane that continues straight onto the frontage road.
- The intersection at Patton Road and Goss Road allows southbound travelers along Patton Road to make right turns onto Goss Road via one turn lane that is approximately 400 feet long.

Northbound travelers along Patton Road are allowed to make left turns onto Goss Road via one turn lane that is approximately 75 feet long. Westbound travelers along Drake Avenue can use the two main traffic lanes to drive straight onto Goss Road, and enter Redstone Arsenal.

- The intersection at US-231 and Martin Road Southwest allows northbound travelers along US-231 to make left turns from the frontage road onto Martin Road Southwest via two turn lanes that are approximately 420 feet long. Southbound travelers along US-231 are allowed to make non-stop right turns from the frontage road onto Martin Road via one turn lane that is approximately 650 feet long.
- The intersection at US-231 and Redstone Road allows northbound travelers along US-231 to make left turns onto Redstone Road via two turn lanes that are approximately 200 feet long. Southbound travelers along US-231 are allowed to make right turns onto Redstone Road via one turn lane, after yielding to westbound vehicles on Redstone Road.

Estimated AADT volumes on roads near Redstone Arsenal are presented in **Table 3.2-4**.

Table 3.2-4
Estimated AADT Traffic Volumes on Roads near Redstone Arsenal

Road	Station ID Number	Estimated AADT Volume
I-565 near intersection with Zeirdt Road	447	70,230
Rideout Road nearest to the intersection of I-565	124	33,120
I-565 near Patton Road entrance to Redstone Arsenal	89	111,000
US-231 near Drake Avenue, with access to Redstone Arsenal entrances along Goss Road and Patton Road	65	110,600
US-231 near Redstone Arsenal Truck Entrance	69	65,300
US-231 near Redstone Road entrance to Redstone Arsenal	73	44,560

Source: ALDOT, 2017.

In addition to the estimated AADT volumes shown in **Table 3.2-4**, approximately 42,000 vehicles enter and leave Redstone Arsenal each day (Skinner, Pers. Comm., 2019).

3.2.5.1 Interim Site Alternative 1 (Redstone Gateway, and Buildings 5201 and 5220)

Interim Site Alternative 1 is approximately 0.75 mile south of the entrance along Rideout Road, adjacent to the Redstone Golf Course (**Figure 2.3-12**). Rideout Road and/or Goss Road Southwest would provide access along the western boundary of Interim Site Alternative 1. Employees at Interim Site Alternative 1 would likely access Redstone Arsenal from the entrances on Rideout Road and Goss Road Southwest. It would not be necessary for vehicular traffic to travel through residential areas of the installation to access the site.

3.2.5.2 Interim Site Alternative 2 (Area 2, and Buildings 5201 and 5220)

Interim Site Alternative 2 is adjacent to and directly south of Permanent Site Alternative 1. Interim Site Alternative 2 is bounded by Neal Road to the north, Mills Road to the east, Toftoy Thruway to the west, and an electrical substation to the south. From Rideout Road, Neal Road provides access to Interim Site Alternative 2. Neal Road also provides access to Interim Site Alternative 2 from Patton Road. Employees at Interim Site Alternative 2 would likely access Redstone Arsenal from entrances along Rideout Road

and Patton Road. It would not be necessary for vehicular traffic to travel through residential areas of the installation to access the site.

3.2.5.3 Permanent Site Alternative 1 (Area 5 and Building 5201)

Permanent Site Alternative 1 is approximately 1.25 miles east of Rideout Road, and bounded by Neal Road to the south, Marshall Road to the north, and Toftoy Thruway to the east. From Rideout Road, Neal Road provides access to Permanent Site Alternative 1. Neal Road also provides access to Permanent Site Alternative 1 from Patton Road. Employees at Permanent Site Alternative 1 would likely access Redstone Arsenal from entrances along Rideout Road and Patton Road. It would not be necessary for vehicular traffic to travel through residential areas of the installation to access the site.

3.3 HAZARDOUS MATERIALS AND HAZARDOUS WASTE

3.3.1 General

This section describes the use of hazardous materials and the generation of hazardous and non-hazardous solid waste at the five DoD installations being considered for the Proposed Action. The ROI for hazardous materials, hazardous waste, and non-hazardous solid waste is the boundaries of each installation being considered and the boundaries of each site alternative.

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

Hazardous wastes are defined by the Resource Conservation and Recovery Act (RCRA) at 42 USC §6903(5), as amended by the Hazardous and Solid Waste Amendments, as "a solid waste, or combination of solid wastes, which because of its quantity, concentration, or physical, chemical, or infectious characteristics may (a) cause, or significantly contribute to an increase in mortality or an increase in serious irreversible, or incapacitating reversible, illness; or (b) pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed."

In addition to threatening human health and well-being, the improper release of or exposure to hazardous materials and wastes also may threaten wildlife, plants, fish, and their habitats, soil systems, and water resources. Localized conditions such as soil, topography, water resources, and climate may affect the extent of contamination from or exposure to hazardous substances.

Hazardous materials at Air Force Installations are used, handled, stored, and managed in accordance with AFI 32-7086, *Hazardous Materials Management* and Air Force Pamphlet 32-7043; *Hazardous Waste Management Guide.* The use, handling, storage, and management of hazardous materials on Army installations is regulated in accordance with Army Regulation 200-1, *Environmental Protection and Enhancement*, and Department of Army Pamphlet 710-7, *Hazardous Materiel Management Program*. Hazardous wastes generated on DoD installations are managed and disposed of in accordance with Hazardous Waste Management Plans (HWMPs) prepared by each installation.

Asbestos-containing material (ACM), lead-based paint (LBP), and polychlorinated biphenyls (PCBs) may be present in some building materials and equipment. Exposure to these substances poses a risk to human health. When present on DoD installations, these substances are managed, removed, and disposed of in compliance with applicable federal, state, and DoD regulations.

The DoD Environmental Restoration Program (ERP) was established to provide for the cleanup of environmental contamination at DoD installations. Eligible ERP sites include those contaminated by past defense activities that require cleanup under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA), and certain corrective actions required by RCRA. Non-ERP sites are remediated under the Compliance-Related Cleanup Program.

Non-hazardous solid waste (i.e., municipal solid waste) generated on DoD installations is managed and disposed of in accordance with each installation's *Integrated Solid Waste Management Plan*. Such waste

is periodically collected by a licensed private contractor and transported to permitted facilities outside each installation for disposal.

3.3.2 Buckley AFB

Buckley AFB is designated as a Small Quantity Generator of hazardous waste by the EPA. Hazardous waste at Buckley AFB is primarily generated by aircraft, ground vehicles, and general installation maintenance, and includes flammable solvents, fuel, lubricants, paint, filters, and batteries. Buckley AFB maintains a Spill Prevention, Control, and Countermeasures (SPCC) Plan that establishes responsibilities, prevention guidelines, and contingency plans in the event of a hazardous materials release, in accordance with EPA requirements.

Non-hazardous solid waste generated at Buckley AFB includes municipal solid waste (e.g., discarded paper, cardboard, packaging), industrial waste, and construction and demolition debris.

3.3.2.1 Interim Site Alternative 1 (West End District)

Interim Site Alternative 1 (West End District) is currently undeveloped, and primarily consists of maintained vegetation. No active IRP, Compliance Restoration Program (CRP), or Military Munitions Response Program (MMRP) sites are on or near the site; however, there is one regulatorily closed CRP site, Fuel Laboratory Area, near the site (USAF, 2014a,b). Publicly available historic aerial imagery shows two aboveground storage tanks formerly located on the eastern portion of the site; these tanks appear to have been removed sometime between October 2011 and November 2013. Additional information on these tanks, including records of regulatory closure, was not available at the time this EA was prepared. It is unlikely that hazardous materials, hazardous waste, or non-hazardous solid waste are currently generated, used, or stored on the site; however, such substances may be present in nearby facilities, including those in the installation's RA to the east.

3.3.2.2 Permanent Site Alternative 1 (North Corner Site 1)

Permanent Site Alternative 1 (North Corner Site 1) is currently undeveloped, and primarily consists of maintained vegetation. There are no active or regulatorily closed IRP, CRP, or MMRP sites on or near the site (North Corner Site 1) (USAF, 2014a,b). The site overlies a former skeet range. Buckley AFB has executed a contract to remove lead associated with the former skeet range in soils underlying the site; this work would be completed prior to the beginning of construction of the proposed permanent facility, if this site is selected. Lead removal under this contract would be limited to soils on the site, and would not include existing structures or pavements associated with the former skeet range.

It is unlikely that hazardous materials, hazardous waste, or non-hazardous solid waste are generated, used, or stored at Permanent Site Alternative 1. However, small quantities of such materials and waste may be present as part of routine operational and maintenance activities at the NOSC to the east; the radome facility, contractor storage yard, and/or Airmen's Attic (on-base thrift store) to the south; and/or the family travel camp to the west. If present at these locations, hazardous materials, hazardous waste, and/or non-hazardous solid waste are generated, managed, and disposed of in accordance with applicable federal, state, and Air Force regulatory requirements.

3.3.2.3 Permanent Site Alternative 2 (North Corner Site 2)

Conditions at Permanent Site Alternative 2 (North Corner Site 2) with respect to hazardous materials, hazardous waste, and non-hazardous solid waste are similar to those described above for Permanent Site 1 (North Corner Site 1). This site also overlies a portion of the former skeet range, including a

number of structures and pavements formerly associated with that facility. The southern portion of the site also overlies a small portion of the contractor storage yard. There are no active IRP, CRP, or MMRP sites on or near the site; however, there is one regulatorily closed CRP site, Former Transformer Building Area, in the site. This site has received regulatory closure, and no further action is required (USAF, 2014a,b). ACM and/or LBP may be present in existing structures on the site, associated with the former skeet range.

3.3.3 Peterson AFB

Peterson AFB is designated as a Small Quantity Generator of hazardous waste by EPA. The installation maintains an SPCC Plan that establishes responsibilities, prevention guidelines, and contingency plans in the event of a hazardous materials release, in accordance with AFI 32-4002 *Hazardous Material Emergency Planning and Response Compliance*, and EPA requirements for spill prevention, control, and countermeasures.

Hazardous and non-hazardous solid waste generated at Peterson AFB primarily consists of municipal solid waste (e.g., discarded paper, cardboard, packaging), construction and demolition debris, fuel, lubricants, oil, industrial solvents, corrosives, flammable solvents, paint, filters, and batteries.

3.3.3.1 Interim Site Alternative 1 (Command Complex and Leased Off-base Office Space)

Interim Site Alternative 1, including the proposed interim parking area, is currently undeveloped and primarily consists of maintained vegetation. The site was previously used for construction laydown/storage. No active or regulatorily closed IRP, CRP, or MMRP sites are on or near the site. Based on review of aerial imagery, known historical land use, and current land use, the use and storage of hazardous materials may have occurred as part of the site's previous function as a temporary construction lay-down area during construction of Buildings 1, 2, and 3 at Peterson AFB. It is unlikely that hazardous materials, hazardous waste, or non-hazardous solid waste are currently generated, used, or stored on the site; however, such substances may be present in nearby facilities.

The precise location of existing off-base office space that would be leased by the Air Force under this alternative, if selected, has not been identified. It is anticipated that the use of hazardous materials and generation of hazardous waste at the leased facility would be limited to small quantities of such substances associated with routine commercial building maintenance, and that collection and disposal of non-hazardous solid waste would be contracted by the facility's property management company.

3.3.3.2 Permanent Site Alternative 1 (Command Complex)

Permanent Site Alternative 1 and the proposed sites of Garage 1 and Garage 2 are currently paved POV parking lots. No active or regulatorily closed IRP, CRP, or MMRP sites are on or near the site. Based on review of aerial imagery, known historical land use, and current land use, hazardous materials such as petroleum residues and/or other hazardous byproducts are potentially present in parking lot surface and subsurface materials. It is unlikely that hazardous materials, hazardous waste, or non-hazardous solid waste are currently generated, used, or stored on the site; however, such substances may be present in nearby facilities.

3.3.4 Schriever AFB

Schriever AFB is designated as a Very Small Quantity Generator of hazardous materials by the EPA. Hazardous and non-hazardous solid waste at Schriever AFB primarily consists of municipal solid waste

(e.g., discarded paper, cardboard, packaging), construction and demolition debris, fuel, lubricants, oil, industrial solvents, corrosives, flammable solvents, paint, filters, and batteries.

3.3.4.1 Interim Site Alternative 1 (Inside RA / West Side of RA / Leased Off-base Office Space)

Interim Site Alternative 1 (Inside RA) is currently undeveloped and primarily consists of maintained vegetation and two pedestrian paths. No active or regulatorily closed IRP, CRP, or MMRP sites are on or near the site. Based on review of aerial imagery, known historical land use, and current land use, the use and storage of hazardous materials at or in the immediate vicinity of the site is unlikely. In addition, no hazardous or solid waste is likely generated on the site. Small quantities of such wastes are likely generated by routine operational and maintenance activities at existing facilities to the east of the site.

Parking for this alternative would be provided in the existing paved POV overflow parking area to the west of the site outside the RA. No hazardous waste is generated at or in the immediate vicinity of these areas.

The precise location of existing off-base office space that would be leased by the Air Force under this alternative, if selected, has not been identified. It is anticipated that the use of hazardous materials and generation of hazardous waste at the leased facility would be limited to small quantities of such substances associated with routine commercial building maintenance, and that collection and disposal of non-hazardous solid waste would be contracted by the facility's property management company.

3.3.4.2 Interim Site Alternative 2 (Outside RA / North of Building 24 / Leased Off-base Office Space)

Interim Site Alternative 2 (Outside RA) and the proposed parking area are currently undeveloped, and primarily consist of maintained vegetation. Based on review of aerial imagery, known historical land use, and current land use, the use and storage of hazardous materials at the site is unlikely. Small quantities of such wastes are likely generated by routine operational and maintenance activities at existing facilities to the south of the site.

The precise location of existing off-base office space that would be leased by the Air Force under this alternative, if selected, has not been identified. It is anticipated that the use of hazardous materials and generation of hazardous waste at the leased facility would be limited to small quantities of such substances associated with routine commercial building maintenance, and that collection and disposal of non-hazardous solid waste would be contracted by the facility's property management company.

3.3.4.3 Permanent Site Alternative 1 (Inside RA) (West Side of RA)

Permanent Site Alternative 1 (Inside RA) is currently undeveloped, and primarily consists of maintained vegetation. No active or regulatorily closed IRP, CRP, or MMRP sites are on or near the site. Based on review of aerial imagery, known historical land use, and current land use, the use and storage of hazardous materials at or in the immediate vicinity of the site is unlikely. No hazardous or solid waste is likely generated on the site. Small quantities of such wastes are likely generated by routine operational and maintenance activities at existing facilities to the east of the site.

Parking for this alternative would be provided by existing paved POV overflow parking area outside the RA to the west. No hazardous or solid waste is likely generated on the site. Small quantities of such wastes are likely generated by routine operational and maintenance activities at existing facilities to the east of this area.

3.3.4.4 Permanent Site Alternative 2 (Outside RA) (Northwest of Building 24)

The Permanent Site Alternative (Outside RA) is currently undeveloped grassland. Based on review of aerial imagery, known historical land use, and current land use, the use and storage of hazardous materials at or in the immediate vicinity of the site is unlikely. No hazardous or solid waste is unlikely generated on the site. Small quantities of such wastes are likely generated by routine operational and maintenance activities at existing facilities to the south-southeast of the site.

3.3.5 Vandenberg AFB

Hazardous and solid waste at Vandenberg AFB primarily consists of municipal solid waste (e.g., discarded paper, cardboard, packaging), construction and demolition debris, fuel, lubricants, oil, industrial solvents, corrosives, flammable solvents, paint, filters, and batteries.

3.3.5.1 Interim Site Alternative 1 (Buildings 6523, 7525, and 10577)

Two ERP sites are near Building 7525. ACM has not been documented in Building 10577, but is present in Building 7525 (Tetra Tech, 2009a,b). No ACM surveys have been conducted at Building 6523; therefore, there is a potential for ACM to be present at that facility until documented otherwise. LBP has been documented in Buildings 6523 and 10577 (Acacia Environmental Management, 2000; Law Crandall, 1998). No LBP surveys have been conducted at Building 7525; therefore, there is a potential for LBP to be present until documented otherwise. Hazardous waste or non-hazardous solid waste are currently generated, used, or stored at Buildings 6523 and 7525; and are likely generated, used, or stored in Building 10577 and nearby facilities.

3.3.5.2 Permanent Site Alternative 1 (California South)

Permanent Site Alternative 1 was part of Camp Cooke during World War II, and consists of paved parking lots, a modular office facility, contractor storage facility, and paved parking/lay-down area used by the installation's private water utility contractor. No active or regulatorily closed IRP, CRP, or MMRP sites are on or near the site. Based on current and historic land use, hazardous materials such as petroleum residues and/or other hazardous byproducts are potentially present in parking lot surface and subsurface materials. ACM and LBP are potentially present in existing facilities on the site, depending on their date of construction. It is likely that hazardous and solid waste is generated on the site by the current occupants as part of routine operational and maintenance activities. Any such waste is managed and disposed of in accordance with applicable federal, state, and Air Force regulatory requirements.

3.3.6 Redstone Arsenal

Hazardous and solid waste generated at Redstone Arsenal includes municipal solid waste (e.g., discarded paper, cardboard, packaging), construction debris, scrap metal, aluminum, lead acid batteries, printer toner cartridges, fuel, lubricants, flammable solvents, and oil.

The Garrison Installation Restoration Program of Redstone Arsenal, in conjunction with the EPA and the Alabama Department of Environmental Management, has implemented enforceable land use controls for the use of installation-wide groundwater. Redstone Arsenal's installation-wide groundwater Interim Record of Decision prohibits the use of groundwater for drinking water purposes. It also requires the management of all current and future non-potable uses to limit human exposure. Additionally, well installation is not permitted without the review and approval of the Garrison Installation Restoration Branch. Any intrusive activities that may expose workers to groundwater (including seeps and springs) must be reviewed by the Installation Restoration Branch/Directorate of Public Works (DPW) through DPW

Job Order Request procedures. The Interim Record of Decision recommends surrounding communities not use groundwater/well water for potable use due to potential contamination.

Redstone Arsenal maintains a BMPs Plan that identifies baseline BMPs applicable to spill prevention and response procedures, preventative maintenance, hazardous material/waste disposal procedures, use of least toxic materials when possible, and management of oil/water separator components.

3.3.6.1 Interim Site Alternative 1 (Redstone Gateway, and Buildings 5201 and 5220)

No impacts from hazardous materials, hazardous waste, or solid waste were identified in NEPA documentation prepared for development of the Redstone Gateway complex (USACE, 2008). The types and quantities of hazardous materials used and stored, and hazardous and non-hazardous waste generated at the Redstone Gateway complex (once complete) and Buildings 5201 and 5220 are similar to those at administrative and office facilities of similar size and use at Redstone Arsenal. All such materials and waste are used, stored, handled, and disposed of in accordance with the installation's HWMP and Integrated Solid Waste Management Plan. It is unlikely that ACM and LBP would be present in these facilities based on their relatively recent date of construction.

3.3.6.2 Interim Site Alternative 2 (Area 2, and Buildings 5201 and 5220)

The Area 2 component of Interim Site Alternative 2 is currently undeveloped, and primarily consists of maintained vegetation. No hazardous materials are used or stored, and no hazardous or non-hazardous solid waste is generated on Area 2. Pesticides and herbicides may be periodically applied at Area 2 to maintain vegetation and control insects and pests. No active or regulatorily closed IRP, CRP, or MMRP sites are on or near the site. Two IRP sites underlie land to the east of Area 2.

Conditions at Buildings 5201 and 5220 are described above.

3.3.6.3 Permanent Site Alternative 1 (Area 5 and Building 5201)

Permanent Site Alternative 1 is currently undeveloped, and consists of an active agricultural field used for livestock grazing. No hazardous materials are used or stored, and no hazardous or non-hazardous solid waste is generated on the site. Pesticides and herbicides may be periodically applied on the site to maintain vegetation and control insects and pests. No active or regulatorily closed IRP, CRP, or MMRP sites are on the site; however, two ERP sites underlie land to the south of the site.

3.4 SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE

Socioeconomics accounts for the basic attributes and resources associated with the human environment, particularly population and economic activity. Human population is affected by regional birth and death rates, and net in- or outmigration. Economic activity typically comprises employment, personal income, and industrial growth. Impacts on these fundamental socioeconomic indicators also can influence other components such as housing availability and public services provision (e.g., schools, emergency response, utilities).

It is anticipated that socioeconomic impacts from the Proposed Action would be experienced primarily by communities adjacent to or near the selected DoD installation(s). Therefore, the socioeconomic ROI for evaluation at each installation includes the nearest sizable municipality or municipalities and their respective county seat. **Table 3.4-1** lists the installations and their geographic ROI. The ROI for environmental justice at each installation is limited to the nearest major municipality.

Table 3.4-1
Installation Socioeconomics ROI

Candidate Site	Municipality	County
Buckley AFB	Aurora	Arapahoe
Peterson AFB	Colorado Springs	El Paso
Schriever AFB	Colorado Springs	El Paso
Vandenberg AFB	Lompoc / Santa Maria	Santa Barbara
Redstone Arsenal	Huntsville	Madison

Note:
AFB = Air Force Base.

The primary socioeconomic categories assessed for the ROI of each installation include population, housing, and employment. The environmental justice categories evaluated for each installation account for low-income, minority, and youth populations. **Table 3.4-2** through **Table 3.4-5** include key data indicators for each of the socioeconomic and environmental justice categories for each installation; **Table 3.4-3** applies to both Peterson AFB and Schriever AFB because they share the same geographic ROI. **Sections 3.4.1** to **3.4.4** also include workforce and housing stock date for each installation.

EO 12898, *Environmental Justice*, was issued by the President on February 11, 1994. Objectives of the EO, as it pertains to this EA, include development of federal agency implementation strategies and identification of low-income and minority populations potentially affected because of proposed federal actions.

Accompanying EO 12898 was a Presidential Transmittal Memorandum referencing existing federal statutes and regulations to be used in conjunction with EO 12898. One of the items in this memorandum was the use of the policies and procedures of NEPA. The memorandum indicates that:

> Each federal agency shall analyze the environmental effects, including human health, economic and social effects, of federal actions, including effects on minority communities and low-income communities, when such analysis is required by the NEPA 42 USC section 4321 et. seq.

In addition to environmental justice issues are concerns pursuant to EO 13045, *Protection of Children from Environmental Health Risks and Safety Risks*. This EO directs federal agencies to identify and assess environmental health and safety risks that may disproportionately affect children.

Although an environmental justice analysis is not mandated by NEPA, DoD has directed that NEPA will be used as the primary mechanism to implement the provision of these EOs.

Unless otherwise noted, information in this section is drawn from the following U.S. Census Bureau American Community Survey 5-Year Estimates:

- DPO5 Demographic and Housing Estimates (United States Census Bureau, 2017a);
- DPO4 Selected Housing Characteristics (United States Census Bureau, 2017b);
- DPO3 Selected Economic Characteristics (United States Census Bureau, 2017c); and
- S1701 Poverty Status in the Past 12 Months (United States Census Bureau, 2017d).

3.4.1 Buckley AFB

Socioeconomic and environmental justice data for the Buckley AFB ROI are presented in **Table 3.4-2**. Aurora accounted for approximately 57 percent of Arapahoe County's population. For both Aurora and Arapahoe County, approximately 4 percent of housing units were vacant in 2017. Civilians accounted for over 99 percent of the total labor force in 2017 in both Aurora and Arapahoe County. The percent of the population that lived below the poverty level and was a minority population in 2017 was higher in Aurora compared to Arapahoe County. Aurora and Arapahoe County had a similar proportion of children (i.e., under the age of 18) in 2017.

Approximately 3,100 active-duty personnel, 4,000 Guard and Reserve personnel, 2,400 civilian employees, and 2,500 contract employees are assigned to Buckley AFB, in addition to 36,000 retirees and 40,000 veterans and dependents. There are approximately 350 privately managed homes on the base (USAF, 2016a).

Table 3.4-2
Buckley AFB Socioeconomic and Environmental Justice Data

Demographic Indicators	City of Aurora	Arapahoe County
Socioeconomic Indicators		
Total Population	357,323	626,612
Total Housing Units	132,931	246,011
Occupied Housing Units	127,134	235,263
Vacant Housing Units	5,797	10,748
Total Labor Force	194,962	350,215
Civilian Labor Force	193,626	348,571
Armed Forces	1,336	1,644
Environmental Justice Indicators		
Population Below Poverty Level (percent)	13.7	9.9
Minority Population (percent)	38.8	28.1
Population Under 18 Years of Age (percent)	26.0	24.3

Notes:

Minority population accounts for individuals who list their racial status as a race other than white alone and/or list their ethnicity as Hispanic or Latino. That is, all people other than non-Hispanic white-alone individuals. The word "alone" in this case indicates that the person is of a single race, not multiracial.

Sources: U.S. Census Bureau 2017a,b,c,d.

3.4.2 Peterson AFB and Schriever AFB

Socioeconomic and environmental justice data for the Peterson AFB and Schriever AFB ROI are presented in **Table 3.4-3**. Colorado Springs accounted for approximately 57 percent of El Paso County's population. For both Colorado Springs and El Paso County, approximately 6 percent of housing units were vacant in 2017. In 2017, civilians accounted for over 95 percent of the total labor force in Colorado Springs, and nearly 92 percent of the total labor force in El Paso County. Nearly 13 percent of the population in Colorado Springs and approximately 11 percent of the population in El Paso County lived below the poverty level in 2017. Colorado Springs and El Paso County both had minority populations that accounted for slightly over 20 percent of their total population in 2017. Colorado Springs and El Paso County also had a similar proportion of children (i.e., under the age of 18) in 2017, at 24 percent and 25 percent of their total population, respectively.

Peterson AFB employs approximately 5,800 military personnel, 2,700 appropriated fund civilians, and 1,800 other civilians. There are 667 homes (564 new homes and 103 legacy homes) within the family housing areas on the base. The homes are at 96 to 98 percent occupancy, with 13 to 27 units available. The four dormitories on Peterson AFB can accommodate up to 410 personnel (USAF, 2018).

Table 3.4-3
Peterson AFB and Schriever AFB Socioeconomic and Environmental Justice Data

Demographic Indicators	City of Colorado Springs	El Paso County
Socioeconomic Indicators		
Total Population	450,000	674,826
Total Housing Units	186,609	265,305
Occupied Housing Units	176,026	249,745
Vacant Housing Units	10,583	15,560
Total Labor Force	238,562	355,473
Civilian Labor Force	227,695	326,339
Armed Forces	10,867	29,134
Environmental Justice Indicators		
Population Below Poverty Level (percent)	12.8	11.1
Minority Population (percent)	21.8	20.5
Population Under 18 Years of Age (percent)	23.8	24.8

Notes:

Minority population accounts for individuals who list their racial status as a race other than white alone and/or list their ethnicity as Hispanic or Latino. That is, all people other than non-Hispanic white-alone individuals. The word "alone" in this case indicates that the person is of a single race, not multiracial.

Sources: U.S. Census Bureau 2017a,b,c,d.

3.4.3 Vandenberg AFB

Socioeconomic and environmental justice data for the Vandenberg AFB ROI are presented in **Table 3.4-4**. Lompoc and Santa Maria accounted for approximately 34 percent of Santa Barbara County's population. Collectively, for Lompoc and Santa Maria, approximately 4 percent of housing units were vacant in 2017, while in Santa Barbara County over 7 percent of housing units were vacant in 2017. Civilians accounted for over 99 percent of the total labor force in 2017 in Lompoc, Santa Maria, and in Santa Barbara County. The percent of the population that lived below the poverty level, was a minority

population, and were children (i.e., under the age of 18) in 2017 was higher in Lompoc and Santa Maria compared to Santa Barbara County.

Vandenberg AFB had a total daytime population of nearly 11,000, accounting for Air Force and contractor personnel, civilian employees, and military dependents. There are 999 privately managed homes on site, 132 of which were vacant. Vandenberg AFB also provides medical and logistics services to more than 8,000 local retirees (USAF, 2019a).

Table 3.4-4
Vandenberg AFB Socioeconomic and Environmental Justice Data

Demographic Indicators	Cities of Lompoc/Santa Maria	Santa Barbara County
Socioeconomic Indicators		
Total Population	148,553	442,996
Total Housing Units	43,016	155,339
Occupied Housing Units	41,181	144,015
Vacant Housing Units	1,835	11,324
Total Labor Force	69,512	228,432
Civilian Labor Force	69,091	226,687
Armed Forces	421	1,745
Environmental Justice Indicators		
Population Below Poverty Level (percent)	19.2	15.4
Minority Population (percent)	29.3	25.3
Population Under 18 Years of Age (percent)	30.3	22.4

Notes:

Minority population accounts for individuals who list their racial status as a race other than white alone and/or list their ethnicity as Hispanic or Latino. That is, all people other than non-Hispanic white-alone individuals. The word "alone" in this case indicates that the person is of a single race, not multiracial.

Sources: U.S. Census Bureau 2017a,b,c,d.

3.4.4 Redstone Arsenal

Socioeconomic and environmental justice data for the Redstone Arsenal ROI are presented in **Table 3.4-5**. Huntsville accounted for approximately 58 percent of Madison County's population. For Huntsville, approximately 11 percent of housing units were vacant in 2017; while in Madison County, over 9 percent of housing units were vacant in 2017. Civilians accounted for over 99 percent of the total labor force in 2017 in both Huntsville and Madison County. The percent of the population that lived below the poverty level and was a minority population was higher in Huntsville compared to Madison County. Huntsville and Madison County had a similar proportion of children (i.e., under the age of 18) in 2017.

Approximately 800 military personnel, 17,500 civilian employees, and 22,200 contractors are assigned to Redstone Arsenal. There are 352 privatized housing units on the base.

Table 3.4-5
Redstone Arsenal Socioeconomic and Environmental Justice Data

Demographic Indicators	City of Huntsville	Madison County
Socioeconomic Indicators		
Total Population	190,501	353,213
Total Housing Units	90,856	157,000
Occupied Housing Units	81,296	142,253
Vacant Housing Units	9,560	14,747
Total Labor Force	96,709	182,611
Civilian Labor Force	96,330	181,578
Armed Forces	379	1,033
Environmental Justice Indicators		
Population Below Poverty Level (percent)	18.3	13.6
Minority Population (percent)	37.7	31.5
Population Under 18 Years of Age (percent)	21.3	22.3

Note:

Minority population accounts for individuals who list their racial status as a race other than white alone and/or list their ethnicity as Hispanic or Latino. That is, all people other than non-Hispanic white-alone individuals. The word “alone” in this case indicates that the person is of a single race, not multiracial.

Sources: U.S. Census Bureau 2017a,b,c,d.

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3.5 AIR QUALITY

Air quality conditions addressed in this EA consists of climate change, conformity with national and applicable state air quality standards, and existing air quality at the five DoD installations being considered for the Proposed Action, and the interim and permanent site alternatives on those installations. The ROI for air quality is the site alternatives, boundaries of each candidate installation, and the regional airshed in which each candidate is located.

3.5.1 Climate Change and Greenhouse Gas Emissions

Greenhouse gases (GHGs) are compounds that contribute to the greenhouse effect. The greenhouse effect is a natural phenomenon where gases trap heat within the surface-troposphere (lowest portion of the earth's atmosphere) system, causing heating at the surface of the earth. The primary long-lived GHGs directly emitted by human activities are carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6). This EA predicts CO_2 levels as appropriate for disclosure purposes. The heating effect from these gases is considered the probable cause of the global warming observed over the last 50 years (EPA, 2009). Global warming and climate change can affect many aspects of the environment.

The Intergovernmental Panel on Climate Change reports that since 1750, the largest contribution to total radiative forcing is caused by the increase in atmospheric concentration of CO_2 (Intergovernmental Panel on Climate Change, 2013). In addition, "the atmospheric concentrations of CO_2, CH_4, and nitrous oxide have increased to levels unprecedented in at least the last 800,000 years. CO_2 concentrations have increased by 40 percent since pre-industrial times, primarily from fossil fuel emissions, and secondarily from net land use change emissions" (Intergovernmental Panel on Climate Change, 2013). Climate change impacts at the five DoD installations being considered are discussed in **Section 3.5.3**.

GHGs do not have applicable ambient standards or emission limits under the major environmental regulatory programs. However, GHGs have the ability to trap heat from the sun within the earth's atmosphere and play an important role in determining the earth's climate. Several activities contribute to climate change, including activities using combustion engines, which are anticipated to occur as part of the construction phase of this project.

On December 15, 2009, the U.S. EPA Administrator recognized potential risks to public health or welfare, and signed an endangerment finding regarding GHGs under Section 202(a) of the federal Clean Air Act (CAA; EPA, 2009). The finding states that current and projected concentrations in the atmosphere of the six key well-mixed GHGs—CO_2, CH_4, N_2O, HFCs, PFCs, and SF_6—threaten the public health and welfare of current and future generations. The GHG emissions are quantified in terms of CO_2 equivalent (CO_2e). Unifying emissions in terms of CO_2e allows for the comparison of different GHG based on their Global Warming Potential (GWP). GWP is a measure of the amount of energy a ton of gas absorbs over a given period of time, relative to 1 ton of CO_2. The CO_2e is derived by multiplying the emissions of the gas by its GWP. Methane is estimated to have a GWP of 28 to 36, while N_2O has a GWP of 265 to 298 times that of CO_2 for a 100-year timescale (EPA, 2019a). This EA presents the Proposed Actions GHG emissions as CO_2e.

3.5.2 National and State Ambient Air Quality Standards

Air quality in any given location is defined by the concentration of various pollutants in the atmosphere, generally expressed in units of parts per million (ppm) or micrograms per cubic meter ($\mu g/m^3$). Air quality is determined by the type and amount of pollutants emitted into the atmosphere, the size and topography of the air basin, and the prevailing meteorological conditions. The significance of a pollutant concentration

is determined by comparing it to federal and/or state ambient air quality standards. The CAA, 42 USC Sections 7401-7671(q) provides that emission sources must comply with the air quality standards and regulations that have been established by federal, state, and county regulatory agencies. These standards and regulations focus on (1) the maximum allowable ambient pollutant concentrations; and (2) the maximum allowable emissions from individual sources.

The CAA requires all states to control air pollution emission sources so that NAAQS are met and maintained. The National Ambient Air Quality Standards (NAAQS) establishes maximum acceptable concentrations for nitrogen dioxide (NO_2), carbon monoxide (CO), sulfur dioxide (SO_2), particulate matter with an aerodynamic diameter of 10 microns or less (PM_{10}), particulate matter with an aerodynamic diameter of 2.5 microns or less ($PM_{2.5}$), ozone, and lead; these are known as criteria pollutants. The NAAQS are established by the EPA and are outlined in 40 CFR 50.

In addition to federal regulations, the CAA provides states with the authority to regulate air quality within state boundaries. Each state is required to comply with NAAQS, and can enact additional and/or more stringent air quality standards. Colorado, California, and Alabama enacted additional air quality standards that are at least as restrictive as the NAAQS, and include pollutants for which national standards do not exist. California also has established maximum acceptable concentrations of hydrogen sulfide (H_2S), vinyl chloride (chloroethene), and sulfates. Given the extremely low levels of lead, H_2S, vinyl chloride, and SO_2 emissions from potential project sources, lead, H_2S, vinyl chloride, and suspended standards are not addressed further in this analysis. The state and national ambient air quality standards are shown in **Table 3.5-1**.

NAAQS represent the maximum allowable atmospheric concentrations that may occur to protect public health and welfare, and include a reasonable margin of safety to protect the more sensitive individuals in the population. The objective is for all areas to meet the NAAQS, which are promulgated by the EPA, and apply nationwide. Areas that meet the NAAQS standard for a criteria pollutant are designated as being in attainment. An area that does not meet the NAAQS is designated as a nonattainment area on a pollutant-by-pollutant basis. The nonattainment classifications for CO and PM_{10} are further divided into moderate and serious categories. Ozone nonattainment areas are further classified—based on the severity of the pollution problem—as basic, marginal, moderate, serious, severe, or extreme. A maintenance area is an area that has recently been redesignated as an attainment area from a former nonattainment area. However, during the maintenance period, most of the CAA rules for a nonattainment area are still applicable to a maintenance area. Attainment status for each of the DoD installations are given below.

Table 3.5-1
State and National Ambient Air Quality Standards

Pollutant	Averaging Time	Air Quality Standards Concentration			
		NAAQS[1,5]	Colorado Ambient Air Quality Standards[2]	California Ambient Air Quality Standards[3]	Alabama Ambient Air Quality Standards[4]
Ozone	8-hour	0.070 ppm	0.12 ppm[4]	0.070 ppm	0.070 ppm
	1-hour	--	--	0.09 ppm	--
Carbon Monoxide	8-hour	9.0 ppm	--	9.0 ppm	9.0 ppm
	1-hour	35.0 ppm	34.9 ppm	20.0 ppm	35.0 ppm
Nitrogen Dioxide	Annual Mean	53 ppb	53 ppb	30 ppb	53 ppb
	1-hour	100 ppb	--	180 ppb	100 ppb

Table 3.5-1
State and National Ambient Air Quality Standards

Pollutant	Averaging Time	Air Quality Standards Concentration			
		NAAQS[1,5]	Colorado Ambient Air Quality Standards[2]	California Ambient Air Quality Standards[3]	Alabama Ambient Air Quality Standards[4]
Sulfur Dioxide	24-hour	-	-	0.04 ppm	-
	3-hour	0.5 ppm	0.27 ppm		0.5 ppm
	1-hour	75 ppb	--	250 ppb	75 ppb
Particulate Matter (PM_{10})	Annual arithmetic mean			20 µg/m^3	
	24-hour	150 µg/m^3	--	50 µg/m^3	150 µg/m^3
Particulate Matter - Fine ($PM_{2.5}$)[3]	Annual arithmetic mean	12.0 µg/m^3	--	12 µg/m^3	12.0 µg/m^3
	24-hour	35 µg/m^{3**}	--	--	35 µg/m^3

Notes:

[1] National standards (other than ozone, particulate matter, and those based on annual arithmetic mean) must not to be exceeded more than once a year. The 8-hour ozone standard is attained when the fourth highest 8-hour concentration averaged over three years, is equal to or less than the standard. The 24-hour PM_{10} standard is attained is not to be exceeded more than once per year. The 24-hour $PM_{2.5}$ standard is met when the Three year average of the 98th percentile of the 24-hour concentrations at each population-oriented monitor within an area is less than the standard. The 1-hour SO_2 standard is met when the 3-year average of the 99h percentile of the 1-hour concentrations at each population-oriented monitor within an area is less than the standard (EPA, 2019b).

[2] Colorado standards for 3-hour SO_2 and 1-hour CO are not to be exceeded. For 1-hour ozone, the expected number of days per calendar year, with maximum hourly average concentration greater than 0.12 ppm must be equal to or less than 1 (CDPHE, 2018).

[3] California standards for ozone, carbon monoxide, sulfur dioxide (1- and 24-hour), nitrogen dioxide, and particulate matter (PM_{10}, $PM_{2.5}$, and visibility reducing particles) are not to be exceeded. All other standards cannot be equaled or exceeded (CARB, 2016).

[4] National Standards are applied in Alabama (ADEM Admin. Code r. 335-3-.03).

[5] The 1997 $PM_{2.5}$ NAAQS was revoked for *maintenance* areas on October 24, 2016 (81 FR 58010) and EPA has indicated that USAF compliance with the General Conformity Rule of the CAA is not required for these areas redesignated as maintenance areas.

3.5.3 Existing Air Quality

This section describes applicable air quality rules and designations that inform air quality status at each of the air sheds associated with the Proposed Alternatives. These include Title V status, CAA Conformity designations, as well as Hazardous Air Pollutant regulations. Additionally, this section discusses the climate change impacts at each site.

3.5.3.1 Buckley AFB

The Baseline inventory for Buckley AFB is provided in **Table 3.5-2**.

Table 3.5-2
Total Baseline Emission Inventory for Buckley AFB (tons/year)

VOC	NO_X	CO	PM_{10}[1]	SO_2
46.5	222.2	619.7	4.3	28.7

Notes:

[1] $PM_{2.5}$ is not provide and is assumed to be equivalent to PM_{10}

CO = carbon monoxide.

NO_X = oxides of nitrogen.

PM_{10} = particulate matter with an aerodynamic diameter of 10 microns or less.

SO_2 = sulfur dioxide.

VOC = volatile organic compound.

Source: USACE, 2014.

Buckley AFB Title V Status

As required by the Clean Air Act, Title V operating permits are required for large stationary sources of emissions. An operating permit is issued either by the state or EPA to all large sources ("major" sources) and a limited number of smaller sources (called "area" sources, "minor" sources, or "non-major" sources). Under the Title V program of the Clean Air Act, a facility is categorized as a major source if its potential to emit from stationary sources exceeds 10 or 25 tons per year of any single or combination of Hazardous Air Pollutants (HAPs), respectively, or 100 tons per year of any criteria pollutant. Examples of these sources include; combustion sources such as boilers and emergency generators; water heaters, aircraft operations, fuel storage and transfer; operational sources such as chemical usage, welding, and woodworking; and fugitive emissions such as cooling towers and surface coating/paint booths. Buckley AFB is a major source operating under the CAA Title V permit.

Buckley AFB Clean Air Act Conformity

The Clean Air Act's General Conformity (40 CFR Part 93, Subpart B) provisions require Federal agencies to ensure that planned Federal actions located in an area designated "nonattainment" or "maintenance" for air quality criteria pollutants do not impair State and local efforts to improve or maintain air quality. The Federal agency is responsible for approving an action is required to determine if the action conforms to the applicable nonattainment or maintenance area State Implementation Plan. An air conformity applicability analysis and possibly a formal air conformity determination are required for federal actions in nonattainment or maintenance areas. The rules specify *de minimis* emission levels by pollutant to determine the applicability of conformity requirements for a project. If total emissions of the proposed alternatives are less than applicable criteria thresholds, conformity requirements for a project will be met.

Buckley AFB is in Arapahoe County, Colorado. Arapahoe County is in a maintenance area for CO and $PM_{10,}$ and a marginal nonattainment area for ozone (ACAM, 2019). It is considered attainment for all other criteria pollutants. Because of the nonattainment and maintenance status, the following *de minimis* criteria apply to project alternatives assessed on or near Buckley AFB: 100 tons per year (tpy) of PM_{10},100 tpy of CO, 50 tpy of VOC, and 100 tpy of NO_x (Solutio Environmental, 2017).

Buckley AFB HAPs

In addition to the criteria pollutants discussed above, HAPs also are regulated under the CAA. The EPA has identified a total 188 HAPs that are known or suspected to cause health effects in small doses. HAPs are emitted by a wide range of man-made and naturally occurring sources, including combustion mobile

and stationary sources. However, unlike the NAAQS for criteria pollutants, federal ambient air quality standards do not exist for non-criteria pollutants.

Buckley AFB Climate Change

As a result of climate change, most of Colorado has warmed 1 or 2 degrees Fahrenheit (°F) in the last century, with heat waves and droughts becoming more common (EPA, 2016a). Changes in temperature and precipitation are affecting snowpack—the amount of snow that accumulates on the ground—because snowpack has decreased since the 1950s, due to earlier melting and less precipitation falling as snow. Snow melting earlier in spring means less water flows through the Colorado River and is stored in reservoirs, which is used later in the year. Rising temperatures and recent droughts in the region have killed many trees by drying out soils, increasing the risk of forest fires, or enabling outbreaks of forest insects. Higher temperatures and drought are likely to increase the severity, frequency, and extent of wildfires in Colorado, which could harm property, livelihoods, and human health. Wildfire smoke can reduce air quality and increase medical visits for chest pains, respiratory problems, and heart problems. The size and number of western forest fires have increased substantially since 1985 (EPA, 2016a). According to a recent DoD report (DoD, 2019), Buckley AFB is currently impacted, and has the potential to be impacted, by recurrent wildfires and the potential for recurrent flooding due to the effects of a changing climate.

3.5.3.2 Peterson AFB

The Baseline inventory for Peterson AFB is provided in **Table 3.5-3.**

Table 3.5-3
Total Baseline Emission Inventory for Peterson AFB, 2015 (tons/year)

VOC	NO_X	CO	PM_{10}[1]	SO_2
21.74	12.72	9.66	1.93	0.14

Notes:

[1] $PM_{2.5}$ is not provide and is assumed to be equivalent to PM_{10}.

CO = carbon monoxide.

NO_X = oxides of nitrogen.

PM_{10} = particulate matter with an aerodynamic diameter of 10 microns or less.

SO_2 = sulfur dioxide.

VOC = volatile organic compound.

Source: USAF, 2016b.

Peterson AFB Title V Status

Peterson AFB is a major source of criteria pollutants under the Title V program because it has the potential to emit more than 100 tons of the criteria pollutants for ozone in terms of its precursors (VOCs and NO_X) and PM_{10}.

Peterson AFB Clean Air Act Conformity

Peterson AFB is in El Paso County, Colorado. A portion of El Paso County, including Peterson AFB, is in a maintenance area for CO (USAF, 2019b). All other criteria pollutants are in attainment. Therefore, the following *de minimis* criteria apply this area: 100 tpy of CO (Solutio Environmental, 2017).

Peterson AFB HAPs

Federal ambient air quality standards do not exist for non-criteria pollutants.

Peterson AFB Climate Change

The climate change impacts affecting Peterson AFB are the same as discussed for Buckley AFB. According to a recent DoD report (DoD, 2019), Peterson AFB is currently, and has the potential to be impacted by recurrent wildfires and drought due to the effects of a changing climate.

3.5.3.3 Schriever AFB

The Baseline inventory for Schriever AFB is provided in **Table 3.5-4.**

Table 3.5-4
Total Baseline Emission Inventory for Schriever AFB, 2014 (tons/year)

VOC	NO_X	CO	PM_{10}[1]	SO_2
13.8	20.1	33.3	4.4	14.5

Notes:

[1] $PM_{2.5}$ is not provide and is assumed to be equivalent to PM_{10}.

CO = carbon monoxide.

NO_X = oxides of nitrogen.

PM_{10} = particulate matter with an aerodynamic diameter of 10 microns or less.

SO_2 = sulfur dioxide.

VOC = volatile organic compound.

Source: ACAM, 2019.

Schriever AFB Title V Status

Schriever AFB is currently a minor source for criteria pollutants and HAPs, and is in the process of obtaining a Title V operating permit.

Schriever AFB Clean Air Act Conformity

Schriever AFB is in El Paso County, Colorado. A portion of El Paso County, including Schriever AFB, is in a maintenance area for CO (ACAM, 2019). All other criteria pollutants are in attainment. Therefore, the following *de minimis* criteria apply this area: 100 tpy of CO (Solutio Environmental, 2017).

Schriever AFB HAPs

Federal ambient air quality standards do not exist for non-criteria pollutants.

Schriever Climate Change

The climate change impacts effecting Schriever AFB are the same as discussed for Buckley AFB. According to a recent DoD report (DoD, 2019), Schriever AFB is currently, and has the potential to be impacted by recurrent wildfires and drought due to the effects of a changing climate.

3.5.3.4 Vandenberg AFB

The Baseline inventory for Vandenberg AFB is provided in **Table 3.5-5**.

Table 3.5-5
Total Net Baseline Emission Inventory for Vandenberg AFB, 2017 (tons/year)

VOC	NO_X	CO	PM_{10}[1]	SO_2
25.05	50.84	60.06	6.78	6.01

Notes:

[1] $PM_{2.5}$ is not provide and is assumed to be equivalent to PM_{10}.

CO = carbon monoxide.

NO_X = oxides of nitrogen.

PM_{10} = particulate matter with an aerodynamic diameter of 10 microns or less.

SO_2 = sulfur dioxide.

VOC = volatile organic compound.

Source: SBCAPCD, 2017.

Vandenberg AFB Title V Status

Vandenberg AFB is a major source operating under the CAA Title V permit.

Vandenberg AFB Clean Air Act Conformity

Vandenberg AFB is in Santa Barbara County, California. Santa Barbara County is in attainment for all criteria pollutants based on NAAQS (USAF, 2019b). Additionally, Santa Barbara County is in attainment/unclassified all California Ambient Air Quality Standards (CAAQS), except for ozone and PM_{10} (CARB, 2019). The state of California does not have *de minimis* values for its nonattainment or maintenance areas. Therefore, no *de minimis* criteria apply this area.

Vandenberg AFB HAPs

Federal ambient air quality standards do not exist for non-criteria pollutants.

Vandenberg AFB Climate Change

Over the last century, Southern California, where Vandenberg AFB is located, has warmed about 3°F, with less rain falling (EPA, 2016b). Heat waves are becoming more common, increasing the need for water. However, water supply is reducing, because snow is melting earlier in spring and rising temperatures are increasing the rate at which water evaporates from the soils and surface waters. The precipitation is unlikely to increase as much as evaporation does, leading to drier soils. Droughts are likely to become more severe, because the periods without rain are likely to become longer. Higher temperatures and drought are likely to increase the severity, frequency, and extent of wildfires, which could harm property, livelihoods, and human health. Additionally, the combination of more fires and drier conditions may expand deserts and otherwise change parts of California's landscape. Because Vandenberg AFB is along the coast, the base would be impacted by sea level rise. Sea level is likely to rise between 1 and 4 feet in the next century. Along some ocean shores, homes will fall into the water as beaches, bluffs, and cliffs erode; but along shores where seawalls protect shorefront homes from erosion, beaches may erode up to the seawall and then vanish (EPA, 2016b). According to a recent DoD report (DoD, 2019), Vandenberg AFB is currently, and has the potential to be impacted by recurrent flooding, drought, and wildfires due to the effects of a changing climate.

3.5.3.5 Redstone Arsenal

The Baseline inventory for Redstone Arsenal is provided in **Table 3.5-6.**

Table 3.5-6
Total Baseline Emission Inventory for Redstone Arsenal, 2018 (tons/year)

VOC	NO_2	CO	PM_{10}[1]	SO_2
41	23	391	60	0.22

Notes:

[1] $PM_{2.5}$ is not provide and is assumed to be equivalent to PM_{10}.

CO = carbon monoxide.

NO_2 = nitrogen dioxide.

PM_{10} = particulate matter with an aerodynamic diameter of 10 microns or less

SO_2 = sulfur dioxide.

VOC = volatile organic compound.

Source: Bridges, Pers. Comm., 2019.

Redstone Arsenal Title V Status

Redstone Arsenal is classified as a major source under the Title V program of the CAA Title V permit.

Redstone Arsenal Clean Air Act Conformity

Redstone Arsenal is in Madison County, Alabama. Madison County is in attainment for all criteria pollutants (ACAM, 2019). Therefore, no *de minimis* criteria apply to this area.

Redstone Arsenal HAPs

Federal ambient air quality standards do not exist for non-criteria pollutants.

Redstone Arsenal Climate Change

In the future, Alabama, will probably experience more severe floods and drought, and will become warmer. Even though Alabama has not become warmer over the past 50 years, the soils have become drier as evaporation has increased. Annual precipitation in Alabama has increased 5 to 10 percent since the first half of the 20th Century. Although rainfall during spring is likely to increase during the next 40 to 50 years, the total amount of water running off into rivers or recharging groundwater is likely to decline, as increased evaporation offsets the greater rainfall. Droughts are likely to be more severe, because periods without rain may be longer, and very hot days will be more frequent. Higher temperatures and changes in rainfall are unlikely to substantially reduce forest cover in Alabama, although the composition of trees in the forests may change. More droughts would reduce forest productivity, and climate change also is likely to increase the damage from insects and disease. Along the coast, sea level is rising about 1 inch every 8 years. In addition, the changing climate is likely to increase damage from tropical storms, reduce crop yields, harm livestock, increase the number of unpleasantly hot days, and increase the risk of heat stroke and other heat-related illnesses (EPA, 2016c). According to a DoD report assessing climate change effects on various DoD installations (DoD, 2019), Huntsville, Alabama, where Redstone Arsenal is located, has the potential to experience recurrent flooding to due to climate change.

3.6 BIOLOGICAL RESOURCES

Biological resources addressed in this EA consist of vegetation, wetlands, wildlife, aquatic species, special-status species (i.e., those receiving additional protection through federal or state legislation or other designation), and habitat. This section discusses the presence and conditions of biological resources at the five DoD installations being considered for the Proposed Action, and the interim and permanent site alternatives on those installations.

The ROI for biological resources is described below:

- Vegetation communities and land covers – resources contained entirely within the boundaries of the interim and permanent site alternatives, because impacts from the Proposed Action would have no potential to extend beyond those boundaries;
- Wildlife – resources contained within a 0.5-mile buffer around the interim and permanent site alternatives due to the mobility of wildlife species, particularly birds and large mammals; and
- Aquatic Resources – resources contained within the boundaries of the interim and permanent site alternatives, and the downstream portions of receiving waterbodies to the primary tributaries at a distance of up to 3 miles. This corresponds to the ROI for surface water.

The Proposed Action would have no potential to affect marine species, because none of the site alternatives are adjacent to, or would drain directly to marine waterbodies. Therefore, marine species are not addressed in this EA.

Information in this section is drawn from previously prepared documents and studies, as noted, along with site visits to observe and characterize biological resources, which were conducted in May and June 2019 to support the preparation of this EA. The U.S. Fish and Wildlife Service (USFWS) Information for Planning and Consultation (IPaC) website at *https://ecos.fws.gov/ipac/*, was queried to identify federally listed threatened and endangered species and critical habitat potentially occurring at each installation.

3.6.1 Buckley AFB

3.6.1.1 Installation Conditions

Vegetation. Vegetation on and near existing Buckley AFB facilities is generally categorized as developed and/or urban landscaped with crested wheatgrass mixed with some forbs (i.e., herbaceous plant that is not a grass). Urban landscaped areas include large mature ornamental trees. Seventeen plant species identified on the installation are included on the 2017 Colorado Department of Agriculture Noxious Weed List (Sovell and Doyle, 2018a).

Wetlands are present in some bottomland meadows at Buckley AFB. However, none are present on the interim and permanent site alternatives.

Special-Status Plant Species. No federally or state-listed plant species have been documented at Buckley AFB (Sovell and Doyle, 2018a; USAF, 2016a) (**Appendix B, Table B-1**).

Wildlife. Wildlife habitat on the installation includes urban landscape, grassland, mid-grass prairie, riparian (including open meadows and trees along streams), ornamental tree stands, weedy disturbed areas, and yucca stands. **Table 3.6-1** lists common wildlife species that are known or have potential to occur on or in the vicinity of Buckley AFB, and/or the interim and permanent site alternatives on the installation.

Table 3.6-1
Common Wildlife Species Known or Potentially Occurring At or Near Buckley AFB

Common Name	Scientific Name
Birds[1]	
Western meadowlark	*Sturnella neglecta*
Horned lark	*Eremophila alpestris*
Lark bunting	*Calamospiza melanocorys*
Western burrowing owl	*Athene cunicularia*
American kestrel	*Falco sparverius*
Swainson's hawk	*Buteo swainsoni*
Prairie falcon	*Falco mexicanus*
Northern shoveler	*Anas clypeata*
Blue winged teal	*Anas discors*
Canada goose	*Branta canadensis*
Killdeer	*Charadrius vociferus*
Great blue heron	*Ardea herodias*
Ferruginous hawk	*Buteo regalis*
Golden eagle	*Aquila chrysaetos*
Red-tailed hawk	*Buteo jamaicensis*
Mammals	
Black-tailed prairie dog[2]	*Cynomys ludovicianus*
Fox squirrel	*Sciurus carolinensis*
Thirteen-lined squirrel	*Citellus tridecemlineatus*
Red fox	*Vulpes vulpes*
American badger	*Taxidea taxus*
Coyote	*Canis latrans*
Mule deer[3]	*Odocoileus hemionus*
Amphibians and Reptiles	
Bullfrog	*Lithobates catesbeiana*
Western chorus frog	*Pseudacris maculate*
Painted turtle	*Chrysemys picta*
Prairie rattlesnake	*Crotalus viridis*
Northern many-lined skink	*Plestiodon multivirgatus*
Western terrestrial garter snake	*Thamnophis elegans*
Plains garter snake	*Thamnophis radix*
Lined snake	*Tropidoclonion lineatum*

Notes:

[1] Most, if not all birds occurring on Buckley AFB are protected under the Migratory Bird Treaty Act of 1918, as amended.

[2] Buckley AFB has implemented a prairie dog eradication program.

[3] Unlikely to occur on Buckley AFB due to the installation perimeter fence, as well as existing and ongoing development activities.

Sources USAF, 2016a.

Special-Status Wildlife Species. No federally listed threatened and endangered wildlife species have been documented at Buckley AFB (Sovell and Doyle, 2018a). One state-listed species and two state species of concern potentially occur at Buckley AFB (**Table 3.6-2**). Other special-status wildlife species that were evaluated because potential habitat may be present at Buckley AFB are provided in **Appendix B**, **Table B-1**.

Table 3.6-2
Special-Status Wildlife Species Potentially Occurring at Buckley AF

Common Name (*Scientific Name*)	Colorado Status	Habitat
Western burrowing owl (*Athene cunicularia*)	Threatened	Primarily found in grasslands and mountain parks, usually in or near prairie dog towns.
Ferruginous hawk (*Buteo regalis*)	Species of Special Concern	Ideal habitat is open grasslands and shrub steppe. They nest in flat, rolling, or rugged terrain in open areas, including shortgrass prairie, canyons, and isolated trees in grasslands, shrublands, or riparian areas.
Black-tailed prairie dog (*Cynomys ludovicianus*)	Species of Special Concern	Occurs in low vegetative growth prairie areas. Buckley AFB has instituted a comprehensive prairie dog removal control program. It is an ongoing program that has already been previously implemented, and is unrelated to the Proposed Action.

Sources: Sovell and Doyle, 2018a; USAF, 2016a.

Aquatic Species. No federally or state-listed fish species are present in streams at Buckley AFB (USAF, 2016a). Fish species surveys have not been conducted in perennial streams at Buckley AFB. There are no fish in Williams Lake, which is approximately 850 feet west of Permanent Site 1 and 30 feet west of Permanent Site 2, because it has been drained; with only a small remaining wetted area at the time of the site visit, conducted in June 2019 to support the preparation of this EA.

3.6.1.2 Interim and Permanent Site Alternative Conditions

Site-specific information for Buckley AFB regarding vegetation, wildlife, aquatic habitat, and special-status species is provided in **Table 3.6-3**.

Table 3.6-3
Buckley AFB Site-specific Biological Resource Conditions

Site Alternatives	Dominant Vegetation Type/Wildlife Habitat	Wildlife Habitat Quality[1]	Wildlife Species Observed	Wetlands Present Within Boundary	Special-status Species (Status[2])	Aquatic Habitat	Aquatic Species Present
Interim Site Alternative 1 (West End District)	Weedy (cheatgrass) grassland – uplands with man-made drainage along eastern boundary	Low	Western meadowlark, cliff swallow, American robin, eastern kingbird	None	Western burrowing owl (ST) Ferruginous hawk and black-tailed prairie dog (SSC)	None within the site boundary. Intermittent habitat in East Toll Gate Creek (0.25 mile from boundary). Perennial habitat in Sand Creek (5 miles downstream of boundary).	None within the site boundary or intermittent streams outside of boundary.
Permanent Site Alternative 1 (North Corner Site 1)	Disturbed, grassland mainly noxious weeds – part of skeet range	Low	Western meadowlark, cliff swallow, American robin, eastern kingbird, mourning dove, red-tailed hawk, common raven	None	Same as Interim Site 1	None within the site boundary. Intermittent habitat in Murphy Creek (0.2 mile from boundary). Perennial habitat in Sand Creek (5 miles downstream of boundary).	Same as Interim Site 1.
Permanent Site Alternative 2 (North Corner Site 2)	Disturbed, grassland mainly noxious weeds – part of skeet range; wetlands from drained lake to west of site	Low	Same as Permanent Site 1	None	Same as Interim Site 1	None within the site boundary. Intermittent habitat in East Murphy Creek (0.5 mile from boundary). Perennial habitat in Sand Creek (5 miles downstream of boundary).	Same as Interim Site 1.

Notes:

[1] Low habitat quality based on the relatively large amount of existing disturbance and moderate to high presence of noxious weeds.

[2] Status: ST = Colorado Threatened and SSC = Colorado Species of Special Concern.

3.6.2 Peterson AFB

3.6.2.1 Installation Conditions

Vegetation. Vegetation on Peterson AFB primarily consists of highly managed traditional turf and shrub and tree landscaping interspersed with lower-maintenance areas featuring swathes of rock mulch or xeric grasses and native forbs. Natural vegetation occurs only on the eastern portion of the installation, and is composed of mid- to tallgrass prairie within a life zone largely dominated by shortgrass plains. Common plant species occurring at Peterson AFB are listed in **Table 3.6-4**.

No wetlands exist at Peterson AFB (USAF, 2018).

Table 3.6-4
Common Plant Species at Peterson AFB

Common Name	Scientific Name	Comments
Ponderosa pine	*Pinus ponderosa*	Commonly occurring in landscaped / managed areas of the installation.
Austrian pine	*P. nigra*	
Green ash	*Fraxinus pennsylvanica*	
Russian olive	*Elaeagnus angustifolia*	
Siberian elm	*Ulmus pumila*	
Needle-and-thread	*Hesperostipa comata*	Dominant grass species in the eastern portion of the installation.
Buffalo grass	*Buchloe dactyloides*	Present in eastern and main portions of base; planted in areas for low maintenance.
Blue grama	*Chondrosum gracile*	Present in eastern and main portions of base.
Six-weeks fescue	*Vulpia octoflora*	Other common plant species.
Western wheatgrass	*Pascopyrum smithii*	
Indian ricegrass	*Achnatherum hymenoides*	
Prickly pear	*Opuntia polyacantha*	
Brittle cacti	*O. fragilis*	
Yucca	*Yucca glauca*	
Fringed sage	*Artemisia frigida*	

Source: USAF, 2018.

Special-Status Plant Species. No federally or state-listed plant species have been documented at Peterson AFB (Sovell and Doyle, 2018b; USAF, 2014c) (**Table B-1** in **Appendix B**).

Wildlife. Wildlife habitats on Peterson AFB include urban landscape and mid- to tallgrass prairie. Common wildlife species known or potentially occurring at or near Peterson AFB are listed in **Table 3.6-5**. Bird species at and around Peterson AFB were identified by the USFWS IPaC system as having the potential to be year-round residents, or having the potential to breed if suitable habitat is present on Peterson AFB.

Table 3.6-5
Common Wildlife Species Known or with Potential to Occur At or Near Peterson AFB

Common Name	Scientific Name	Comments
Birds		
Golden eagle	*Aquila chrysaetos*	Year-round resident.
Ferruginous hawk	*Buteo regalis*	
Bald eagle	*Haliaeetus leucocephalus*	
Cassin's Finch	*Carpodacus cassinii*	
Prairie falcon	*Falco mexicanus*	
Loggerhead shrike	*Lanius ludovicianus*	
Western grebe	*Aechmophorus occidentalis*	Potential to breed at Peterson AFB, if suitable habitat is present.
Western burrowing owl	*Athene cunicularia*	
Swainson's hawk	*Buteo swainsoni*	
American bittern	*Botaurus lentiginosus*	
Lark bunting	*Calamospiza melanocorys*	
Western snowy plover	*Charadrius alexandrines*	
Mountain plover	*C. montanus*	
Red-headed woodpecker	*Melanerpes erythrocephalus*	
Lewis's woodpecker	*M. lewis*	
Long-billed curlew	*Numenius americanus*	
Williamson's sapsucker	*Sphyrapicus thyroideus*	
Dickcissel	*Spiza americana*	
Brewer's sparrow	*Spizella breweri*	
Virginia's warbler	*Vermivora virginiae*	
Mammals		
Pronghorn	*Antilocapra americana*	
Mule deer	*Odocoileus hemionus*	
Coyote	*Canis latrans*	
Red fox	*Vulpes*	
Black-tailed prairie dog	*Cynomys ludovicianus*	Active burrows observed in undisturbed areas.
Eastern cottontail	*Sylvilagus floridanus*	Present extensively near base housing.
Plains pocket gopher	*Geomys bursarius*	Present in grassland habitat.
Ord's kangaroo rat	*Dipodomys ordi*	
Prairie vole	*Microtus ochrogaster*	
Meadow vole	*M. pennsylvanicus*	
Deer mice	*Peromyscus* spp.	

Table 3.6-5
Common Wildlife Species Known or with Potential to Occur At or Near Peterson AFB

Common Name	Scientific Name	Comments
Amphibians and Reptiles		
Woodhouse's toad	*Bufo woodhousii*	
Prairie lizard	*Sceloporus undulatus*	
Western terrestrial garter snake	*Thamnophis elegans*	

Notes:

[1] Potential breeder as well as year-round resident.

Sources: Peterson AFB, 2018; USAF, 2014c.

Special-Status Wildlife Species. No federally listed wildlife species occur at Peterson AFB (Sovell and Doyle, 2018b; USAF, 2014). State-listed species and state species of concern potentially occurring at Peterson AFB are the same as those listed for Buckley AFB (Sovell and Doyle, 2018b) (**Section 3.6.1.1**, **Table 3.6-2**). Other special-status wildlife species that were evaluated because potential habitat may be present at Peterson AFB are provided in **Appendix B**, **Table B-1**.

Aquatic. Aquatic habitats at Peterson AFB are limited to a short stretch of the East Fork of Sand Creek and three maintained ponds in the vicinity of the golf course in the developed portion of the installation. No fish or amphibians have been documented at Peterson AFB (Sovell and Doyle, 2018b). Sand Creek is outside of the installation, but it receives stream flow from East Fork Sand Creek. Fish species in Sand Creek are expected to be similar to Fountain Creek, which is 5 miles southwest of the Peterson AFB boundary. Common fish species occurring in Fountain Creek are listed in **Table 3.6-6**. No federally or state-listed fish species are present in streams in Peterson AFB (Sovell and Doyle, 2018b; USAF, 2018).

Table 3.6-6
Common Fish Species Potentially Occurring in Sand Creek

Common Name	Scientific Name
White sucker	*Catostomus commersoni*
Longnose sucker	*Catostomus catostomus*
Longnose dace	*Rhinichthys cataractae*
Creek chub	*Semotilus atromaculatus*
Brook stickleback	*Culaea inconstans*
Fathead minnow	*Pimephales promelas*

Source: U.S. Air Force Academy, 2019.

3.6.2.2 Interim and Permanent Site Alternative Conditions

Site-specific information for Peterson AFB regarding vegetation, wildlife, aquatic habitat, and special-status species is provided in **Table 3.6-7**.

Table 3.6-7
Peterson AFB Site-specific Biological Resource Conditions

Site Alternatives	Dominant Vegetation Type/Wildlife Habitat	Wildlife Habitat Quality[1]	Wildlife Species Observed	Wetlands Present Within Boundary	Special-Status Species	Aquatic Habitat	Aquatic Species Present
Interim Site Alternative 1 (Command Complex)	Disturbed Planted Grassland Seed	Low	Western meadowlark	None	Western burrowing owl (ST) Ferruginous hawk and black-tailed prairie dog (SSC)	None within the site boundary. Intermittent habitat in East Fork Sand Creek (0.8 mile from boundary). Perennial habitat in Sand Creek (5 miles downstream of boundary).	None within the site boundary or intermittent streams outside of boundary. Nongame fish species potentially present in Sand Creek.
Interim Site Alternative 1 Parking	Grassland, grazed, prairie dog town	Low	Black-tailed prairie dog, western meadowlark, pronghorn antelope	None	Same as Interim Site 1	Same as Interim Site 1.	Same as Interim Site 1.
Permanent Site Alternative 1 (Command Complex)	Disturbed – parking lot	Low	Eastern cottontail	None	None	Same as Interim Site 1, except East Fork Sand Creek is 0.5 mile from the boundary.	Same as Interim Site 1.
Permanent Site Alternative 1 Parking Garage 1	Disturbed – parking lot	Low	None	None	None	Same as Permanent Site 1.	Same as Interim Site 1.
Permanent Site Alternative 1 Parking Garage 2	Disturbed – parking lot	Low	None	None	None	Same as Permanent Site 1.	Same as Interim Site 1.

Notes:

[1] Low habitat quality based on the relatively large amount of existing disturbance and moderate to high presence of noxious weeds.

[2] Status: ST = Colorado Threatened and SSC = Colorado Species of Special Concern.

3.6.3 Schriever AFB

3.6.3.1 Installation Conditions

Vegetation. Schriever AFB is in the shortgrass prairie ecosystem. Trees occur infrequently on the shortgrass prairie; however, small, isolated tree stands occur on the installation along a draw south of Enoch Road near Building 800, around three former farmsteads, and near a windmill southeast of the RA. Vegetation in landscaped areas such as the base entryway, Falcon Parkway, medians in parking areas, and recreational areas consists of irrigated turf grasses, native grass plantings, and native and ornamental shrubs and trees (USAF, 2015b). Common species of vegetation occurring at Schriever AFB are listed in **Table 3.6-8**.

Small wetlands are present in two playas and ephemeral areas that occasionally support water, but none were determined to be jurisdictional waters/wetlands (USACE, 2013).

Table 3.6-8
Common Plant Species at Schriever AFB

Common Name	Scientific Name	Comments
Blue grama	*Chondrosum gracile*	Dominant species in prairie habitat.
Buffalo grass	*Buchloe dactyloides*	
Three-awn grass	*Aristida purpurea*	
Dropseed	*Sporobolus cryptandrus*	
Needle-and-thread grass	*Hesperostipa comata*	
Saltgrass	*Distichlis stricta*	Species typically associated with natural depressions.
Common spikerush	*Eleocharis palustris*	
Needle spikerush	*E. acicularis*	
Sedge	*Carex* spp.	
Cottonwood	*Populus deltoides*	Scattered common tree species.
Box elder	*Acer negundo*	
Hawthorne	*Crataegus* spp.	

Source: USAF, 2017a.

Special-Status Plant Species. No federally or state-listed plant species have been documented at Schriever AFB (Sovell and Doyle, 2018c; USAF, 2015b, 2017a) (**Appendix B, Table B-1**).

Wildlife. Wildlife habitats on the installation include urban landscape and shortgrass prairie. Common wildlife species known or with potential to occur on or near Schriever AFB are listed in **Table 3.6-9**. The bird species were identified by the USFWS IPAC database as having the potential to be year-round residents, or having the potential to breed if suitable habitat is present on Schriever AFB (USAF, 2017a). Amphibian species are similar to species listed in **Section 3.6.2** in **Table 3.6-5**.

Table 3.6-9
Common Wildlife Species Known or with Potential to Occur At or Near Schriever AFB

Common Name	Scientific Name	Comments
Birds		
The short-eared owl	*Asio flammeus*	Potentially winters on Schriever AFB if suitable habitat is present.
Golden eagle	*Aquila chrysaetos*	Year-round resident.
Ferruginous hawk	*Buteo regalis*	
Bald eagle	*Haliaeetus leucocephalus*	
Prairie falcon[1]	*Falco mexicanus*	
Loggerhead shrike	*Lanius ludovicianus*	
Western burrowing owl	*Athene cunicularia*	Potential to breed at Schriever AFB if suitable habitat is present.
Swainson's hawk	*Buteo swainsoni*	
American bittern	*Botaurus lentiginosus*	
Lark bunting	*Calamospiza melanocorys*	
Western snowy plover	*Charadrius alexandrines*	
Mountain plover	*C. montanus*	
Red-headed woodpecker	*Melanerpes erythrocephalus*	
Lewis's woodpecker	*M. lewis*	
Long-billed curlew	*Numenius americanus*	
Williamson's sapsucker	*Sphyrapicus thyroideus*	
Dickcissel	*Spiza americana*	
Brewer's sparrow	*Spizella breweri*	
Mammals		
Pronghorn	*Antilocapra americana*	
Mule deer	*Odocoileus hemionus*	
Coyote	*Canis latrans*	
Red fox	*Vulpes vulpes*	
Black-tailed prairie dog	*Cynomys ludovicianus*	Active burrows observed in undisturbed areas.
Eastern cottontail	*Sylvilagus floridanus*	Present extensively near base housing.
Plains pocket gopher	*Geomys bursarius*	Present in grassland habitat.
Ord's kangaroo rat	*Dipodomys ordi*	
Prairie vole	*Microtus ochrogaster*	
Meadow vole	*M. pennsylvanicus*	
Deer mice	*Peromyscus* spp.	
Reptiles		
Western rattlesnake	*Crotalus viridis*	Common reptile species.
Lesser earless lizard	*Holbrookia maculata*	
Western terrestrial garter snake	*Thamnophis elegans*	
Bull snake	*Pituophis melanoleucus*	

Notes:

[1] Potential breeder, as well as year-round resident.

Sources: USFWS, 2015a, as cited in Schriever AFB, 2017; USAF, 2016, as cited in Schriever AFB, 2017; USAF, 2015.

Special-Status Wildlife Species. No federally listed wildlife species occur at Schriever AFB (Sovell and Doyle, 2018c; USAF, 2015b). Five state-listed or special concern wildlife species were recorded at Schriever AFB in 2017 or 2018 (**Table 3.6-10**) (Sovell and Doyle, 2018c). Other special-status wildlife species that were evaluated because potential habitat may be present at Schriever AFB are provided in **Appendix B**, **Table B-1**.

Table 3.6-10
Special-Status Wildlife Species Potentially Occurring at Schriever AFB

Common Name (*Scientific Name*)	**Colorado Status**	**Habitat**
Western burrowing owl (*Athene cunicularia*)	Threatened	Primarily found in grasslands and mountain parks, usually in or near prairie dog towns.
Ferruginous hawk (*Buteo regalis*)	Species of Special Concern	Ideal habitat is open grasslands and shrub steppe. They nest in flat, rolling, or rugged terrain in open areas, including shortgrass prairie, canyons, and isolated trees in grasslands, shrublands, or riparian areas.
Black-tailed prairie dog (*Cynomys ludovicianus*)	Species of Special Concern	Occurs in low vegetative growth prairie areas. Schriever AFB has instituted a comprehensive prairie dog removal program. It is an ongoing program that has already been previously implemented and unrelated to the Proposed Action.
Long-billed curlew (*Numenius americanus*)	Species of Special Concern	Species were reported as potentially occurring at Schriever AFB (Sovell and Doyle, 2018c). These species are not expected to occur at the sites due to the lack of suitable habitat.
Swift fox (*Vulpes velox*)	Species of Special Concern	

Aquatic Species. Habitats for aquatic species at Schriever AFB include playas and ephemeral drainages. No fish or amphibians were documented on the installation during surveys conducted in 2017 and 2018, because ephemeral aquatic habitats on the installation were dry at the time (Sovell and Doyle, 2018c). No federally or state-listed fish species have been documented in streams in Schriever AFB (Sovell and Doyle, 2018c; USAF, 2017a).

Interim and Permanent Site Alternative Conditions

Site-specific information for Schriever AFB regarding vegetation, wildlife, aquatic habitat, and special-status species is provided in **Table 3.6-11**.

Table 3.6-11
Schriever AFB Site-specific Biological Resource Conditions

Site Alternatives	Dominant Vegetation Type/Wildlife Habitat	Wildlife Habitat Quality[1]	Wildlife Species Observed	Wetlands Present Within Boundary	Special-status Species	Aquatic Habitat	Aquatic Species Present
Interim Site Alternative 1 (Inside RA) (West Side of RA)	Grassland – uplands with some manmade drainage along eastern boundary	Moderate	Western meadowlark, cliff swallow, American robin, Eastern kingbird	None	Western burrowing owl (ST) Ferruginous hawk and black-tailed prairie dog (SSC)	Two ephemeral streams are within 1 mile of the boundary.	None in or outside of the site boundary.
Interim Site Alternative 2 (Outside RA) (North of Building 24)	Grassland with some seasonally wet patches, noxious weeds, and abandoned prairie dog burrows	Low	Inactive prairie dog burrows	None	Same as Interim Site 1.	Same as Interim Site 1.	Same as Interim Site 1.
Permanent Site Alternative 1 (Inside RA) (West Side of RA)	Disturbed grassland / noxious weed field	Low	Western meadowlark, cliff swallow, American robin, Eastern kingbird	None	Same as Interim Site 1.	Same as Interim Site 1.	Same as Interim Site 1.
Permanent Site Alternative 2 (Outside RA) (Northwest of Building 24)	Grassland. parking site has some seasonally wet patches	Moderate	Black-tailed prairie dogs, unknown raptor nest, western meadowlark, American robin, eastern kingbird, prairie	None	Same as Interim Site 1.	Same as Interim Site 1.	Same as Interim Site 1.

Notes:

[1] Low habitat quality based on the relatively large amount of existing disturbance and moderate to high presence of noxious weeds. Moderate quality because of relatively less disturbance and no noxious weeds.

[2] Status: ST = Colorado Threatened and SSC = Colorado Species of Special Concern.

3.6.4 Vandenberg AFB

3.6.4.1 Installation Conditions

Vegetation. Vandenberg AFB is in the Central California Foothills and Coastal Mountains ecoregion, which is characterized as a Mediterranean climate with hot, dry summers and cool, moist winters (Griffith et al., 2016). Areas to the north, east, and south are dominated, respectively, by nonnative grasslands; developed areas associated with the City of Lompoc approximately 6 miles east of the base boundary; and native scrub and woodland upland and riparian habitats. Common regional land uses include livestock grazing, agricultural development, and oil and gas development; these activities also occur on portions of the base. To the west, Vandenberg AFB is bounded by 42 miles of undeveloped Pacific Ocean coastline (USAF, 2015a).

Due to its geographic location at the transition point between the Southern Coast and Western Transverse ranges, and its proximity to the Pacific Ocean, Vandenberg AFB exhibits a varied topography and diversity of vegetation communities. Approximately 14 major ecotypes occur within the boundaries of Vandenberg AFB, including numerous types of forested areas, wetlands, central coast maritime chaparral, coastal scrub, coastal strand, coastal salt marsh, freshwater marsh, and native and non-native grasslands, as well as saltwater and freshwater aquatic habitats (USAF, 2015a). Vegetation throughout the cantonment area and at Permanent Site Alternative 1 and adjacent to Interim Site Alternative 1 is dominated by nonnative grassland. This vegetation type occurs most commonly in areas that have been subjected to prior disturbance, allowing weedy nonnative species that are adapted to frequent disturbance to invade and dominate a site (ManTech SRS Technologies, Inc., 2011). Nonnative grasslands have replaced the majority of native grasslands on Vandenberg AFB, and occupy a large percentage of the grasslands present on the installation. Common plant species in native grasslands on Vandenberg AFB are provided in **Table 3.6-12**.

Table 3.6-12
Common Plant Species in Grasslands at Vandenberg AFB

Common Name	Scientific Name	Comments
Bromes	*Bromus* spp.	Introduced annual grass species.
Wild oats	*Avena fatua* and *A. barbata*	
Mediterranean barley	*Hordeum murinum* and *H. marinum*	
Ryegrass	*Lolium* spp.	
Fescues	*Festuca* spp.	
Mustards	*Brassica nigra* and *Hirschfeldia incana*	Introduced herbs.
Filarees	*Erodium* spp.	
Iceplant	*Carpobrotus* and *Mesembryanthemum* spp.	

Sources: 30 CEC, 2016; USAF, 2015a.

Base boundaries encompass portions of three major watersheds and approximately eight minor watersheds. Previous mapping efforts conducted by USFWS and California Polytechnic University identified perennial and seasonal wetlands, including freshwater marshes and coastal salt marshes, seasonal wetlands, and artificial ponds within the boundaries of Vandenberg AFB (USAF, 2015a). No perennial wetlands occur within the boundaries of Permanent Site Alternative 1. However, USFWS has identified one vernal pool feature in the site, which is described below in the Special-Status Aquatic

Species section. No perennial wetlands occur in or adjacent to Interim Site Alternative 1, although a potential vernal pool is located adjacent to the existing parking lot of Building 6523.

Special-Status Plant Species. Five federally and state-listed threatened or endangered plant species have been documented at Vandenberg AFB. **Table B-2** in **Appendix B** lists special-status plant species for which suitable habitat may occur at the installation. No special-status plant species or suitable habitat for these species was observed on or near Permanent Site Alternative 1 at Vandenberg AFB during the site visit conducted in May 2019 to support the preparation of this EA, and no special-status plant species or suitable habitat are expected to occur at the interim site alternative.

Wildlife. Wildlife habitats on Vandenberg AFB are varied; however, in the vicinity of Permanent Site Alternative 1 and at Interim Site Alternative 1, habitats are limited due to development in the cantonment area. Habitats at the sites and their vicinity include urban landscape, including ruderal areas and ornamental tree stands; and nonnative and native vegetated habitats, including grasslands, limited coastal scrubland, and scattered native and nonnative woodland stands. Wildlife species that may occur include resident and migratory native and nonnative bird species, as well as common amphibian, reptile, and mammalian species (**Table 3.6-13**). Native resident and migratory bird species are abundant on Vandenberg AFB, although species diversity in nonnative grasslands and developed areas is more limited. Wildlife species at Vandenberg AFB are managed following the installation's *Fish and Wildlife Management Plan* (USAF, 2011a). Occurrence of some of mammal species is rare in the installation's developed areas.

Table 3.6-13
Common Wildlife Species Known or Potentially Occurring in Grassland Communities at Vandenberg AFB

Common Name	Scientific Name
Birds	
California scrub jay[2,3]	*Aphelocoma californica*
House finch[2,3]	*Haemorhous mexicanus*
California quail[1,3]	*Callipepla californica*
Spotted towhee[2,3]	*Pipilo maculatus*
California towhee[2,3]	*Melozone crissalis*
Western meadowlark[2,3]	*Sturnella neglecta*
Song sparrow[2,3]	*Melospiza melodia*
American crow[2,3]	*Corvus brachyrynchos*
Red-tailed hawk[2,3]	*Buteo jamaicensis*
Great horned owl[2,3]	*Bubo virginianus*
American kestrel[2,3]	*Falco sparverius*
Turkey vulture[2]	*Cathartes aura*
Northern harrier[2,3]	*Circus hudsonius*
Mammals	
Botta's pocket gopher	*Thomomys bottae*
California ground squirrel	*Otospermophilus beecheyi*
California pocket mouse	*Chaetodipus californicus*
Deer mouse	*Peromyscus* spp.
Desert brush rabbit[1]	*Sylvilagus audubonii*

Table 3.6-13
Common Wildlife Species Known or Potentially Occurring in Grassland Communities at Vandenberg AFB

Common Name	Scientific Name
Black-tailed jack-rabbit[1]	*Lepus californicus*
Mule deer[1]	*Odocoileus hemionus*
Coyote	*Canis latrans*
Bobcat	*Lynx rufus*
American badger	*Taxidea taxus*
Gray fox	*Urocyon cinereoargenteus*
Raccoon	*Procyon lotor*
Virginia opossum	*Didelphis virginiana*
Striped skunk	*Mephitis*
Amphibians and Reptiles	
Western fence lizard	*Sceloporus occidentalis*
Western skink	*Plestiodon skitonianus*
Southern alligator lizard	*Elgaria multicarinata*
Gopher snake	*Pituophis catenifer*
California kingsnake	*Lampropeltis getula californiae*
Pacific rattlesnake	*Crotalus oreganus*
Western toad	*Anaxyrus boreas*
Baja California tree frog	*Psuedacris hypochondriaca hypochondriaca*

Notes:

[1] Game species.

[2] Most, if not all birds are protected under the Migratory Bird Treaty Act of 1918, as amended, unless otherwise noted.

[3] Year-round resident bird species at Vandenberg AFB.

Source: USAF, 2011a.

Special-Status Wildlife Species. Twelve federally listed threatened and endangered wildlife species have been documented at Vandenberg AFB; one additional species, western spadefoot (*Spea hammondii*), is currently under review for federal listing. One federally listed species, vernal pool fairy shrimp (*Branchinecta lynchi*), has potential to occur in the vicinity of Interim Site Alternative 1, but does not occur within the proposed site boundary (USAF, 2011a). USFWS has issued a PBO for Vandenberg AFB that includes an assessment of potential impacts on vernal pool fairy shrimp as a result of base operations, and appropriate avoidance and minimization measures to protect the species (USFWS, 2015).

With the exception of western spadefoot, also considered a California species of special concern, no special-status species or suitable habitat for them were observed on or near Permanent Site Alternative 1 at Vandenberg AFB during the site visit conducted in May 2019 to support the preparation of this EA. Other special-status wildlife species that were evaluated because potential habitat may be present at Vandenberg AFB are provided in **Appendix B**, **Table B-2**.

The western spadefoot is a terrestrial, fossorial amphibian that breeds in seasonal pools after heavy winter or spring rain events, or in permanent artificial ponds where vertebrate predators are absent, such as cattle ponds. Juveniles and adults spend the majority of their lives in upland refugia, which include

burrows dug by the spadefoot, or small mammal burrow complexes. This species occurs in grasslands, oak woodlands, coastal sage scrub, and chaparral habitats associated with washes, floodplains, alluvial fans, playas, and alkali flats (Thomson et al., 2016). There is a low potential for this species to occur in sandy upland areas, and breed in the vernal pool feature previously identified on Permanent Site Alternative 1, if the hydroperiod is suitable. However, there are no documented occurrences in the site or in adjacent areas.

Aquatic Species. Vandenberg AFB supports aquatic habitats in the Santa Ynez River, a major regional river, and perennial streams such as Bear, Honda, and San Antonio Creeks. The Santa Ynez River is approximately 2.8 miles south of the permanent site alternative boundary. In addition, an unnamed ephemeral drainage is approximately 0.6 mile southeast of the site boundary in Oak Canyon. This discussion focuses on species in the Santa Ynez River, because it would potentially receive runoff from the site alternatives, and is the only perennial waterway within 3 miles and downstream of the sites.

Twenty-five fish species inhabit the Santa Ynez River watershed (Santa Ynez River Technical Advisory Committee, 2000). Ten of these species are native to the Santa Ynez River: four species occur in freshwater habitat, and six in the estuary. Fifteen fish species have been introduced to the watershed. Game species in the freshwater portion of the river include the native steelhead/rainbow trout (*Oncorhynchus mykiss*), and introduced smallmouth bass (*Micropterus dolomieui*), largemouth bass (*M. salmoides*), sunfishes (*Lepomis* spp.), crappies (*Pomoxis* spp.), channel catfish (*Ictalurus punctatus*), and black bullhead (*Ameiurus melas*).

Special-Status Aquatic Species. One federally endangered species, steelhead trout (federally endangered as the Southern California Evolutionarily Significant Unit), occurs in the freshwater portion of the Santa Ynez River below Bradbury Dam. The arroyo chub (*Gila orcuttii*), a California Species of Special Concern, also has been documented in that waterway (USAF, 2011a; University of California, 2019).

Steelhead trout are the oceangoing form of rainbow trout. Juveniles spend 1 to 3 years growing in freshwater before migrating to the ocean (Godwin and Hilton, 1995). After 1 to 2 years in the ocean, adults return to spawn in freshwater, usually between January and April, in the Santa Ynez River system. Steelhead historically used the lower mainstem primarily as a migration corridor to the tributaries, and the upper basin above Bradbury Dam for spawning and year-round rearing habitat. Therefore, the Santa Ynez River near Lompoc represents a migration corridor for steelhead. Typically, California steelhead migrate to the ocean at 1 to 2 years of age (i.e., 5 to 10 inches long). The juvenile outmigration period typically is February through May, but the timing of migration is dependent on streamflows.

Arroyo chub were extirpated from large portions of their range, but they were introduced to the California Central Coast in the 1930s and 1940s. The species is adapted to waterways that fluctuate between high winter flows and low summer flows, and is tolerant of the changes in dissolved oxygen and water temperature associated with this regime. Typically, arroyo chub prefer slow-flowing and backwater areas with sandy or muddy substrates (USAF, 2011a; University of California, 2019). The species has been documented in both the Santa Ynez River and San Antonio Creek (USAF, 2011a).

No waterways or perennial wetlands occur within the boundaries of Interim Site Alternative 1. One federally listed species, the federally threatened vernal pool fairy shrimp (*Branchinecta lynchi*) may occur in vernal pools within the vegetated habitats immediately adjacent to the existing parking lot associated with Building 6523 at Interim Site Alternative 1. This species is included in the Vandenberg AFB PBO, issued by the USFWS in December 2015 (USFWS, 2015).

The vernal pool fairy shrimp is a small, aquatic crustacean approximately 0.5 to 1 inch in length, which occurs in seasonally inundated vernal pools in California from as far south as Riverside County north to Shasta County. Throughout its range, a variety of vernal pool habitats may support this species, from clear, sandstone rock pools to turbid, alkaline grassland pools; suitable vernal pools on Vandenberg AFB generally consist of topographic depressions over an impermeable clay hardpan layer. Suitable pools typically measure less than 0.5 acre in size and support grassy or muddy substrates. Eggs persist as protected cysts in the dried mud during dry periods, and then hatch following winter rain events that inundate the pools. Fairy shrimp mature and breed in approximately 41 days, dependent on temperatures.

No waterways or perennial wetlands occur within the boundaries of Permanent Site Alternative 1. One vernal pool feature was previously identified and mapped in the southeastern quadrant of the site. The vernal pool was previously determined by the USFWS to be unsuitable for vernal pool fairy shrimp (*Branchinecta lynchi*) due to its insufficient hydroperiod. During the field investigation, conducted in May 2019 to support preparation of this EA, the feature was dry. There was no observable evidence of hydrology, and no hydrophytic vegetation present.

3.6.4.2 Interim and Permanent Site Alternative Conditions

Site-specific information for Vandenberg AFB regarding vegetation, wildlife, aquatic habitat, and special-status species is provided in **Table 3.6-14**.

3.6.5 Redstone Arsenal

3.6.5.1 Installation Conditions

Vegetation. Redstone Arsenal is in the southwest portion of Madison County in northern Alabama. Regional land use is classified as urban/suburban (residential), agricultural, water, wetlands, forests, industrial, pastures, and open vegetated areas (Easterwood, 2017). Redstone Arsenal encompasses 38,162 acres that are situated southwest of Huntsville (Godwin and Hilton, 1995). Redstone Arsenal is in the Tennessee Valley physiographic region. Of Redstone Arsenal's 38,162 acres, 5,617 acres consist of a portion of Wheeler National Wildlife Refuge (WNWR), which encompasses the majority of Redstone Arsenal's wetland communities (Army, 2017). Three types of wetland communities are present at Redstone Arsenal: wet-mesic river floodplain forest, forested palustrine wetlands, and springs. However, none of these wetland communities are present at the proposed Permanent or Interim Site Alternatives.

The Permanent and Interim Site Alternatives are in upland areas, which generally consist of urban/suburban, agricultural land (e.g., livestock pastures, hayfields), forested, and mountain valleys associated with Bradford, Hatton, Weeden, and Madkin Mountains. These upland areas consist of agricultural vegetation communities (i.e., fenced cattle pastures and hayfields) that are transected with forested hedgerows along modified dry ditches. Common species of vegetation occurring in these areas are listed in **Table 3.6-15**. Grass blends in these areas provide foraging options for livestock, and adequate foraging of seasonal cool and warm grasses for wildlife and wintering resident birds. Upland grassland communities are managed for non-native species through routine mowing and periodic herbicide application.

Table 3.6-14
Vandenberg AFB Site-specific Biological Resource Conditions

Site Alternatives	Dominant Vegetation Type/Wildlife Habitat	Wildlife Habitat Quality[2]	Wildlife Species Observed	Wetlands Present Within Boundary	Special-status Species[3]	Aquatic Habitat	Aquatic Species Present
Interim Site Alternative 1 (Buildings 6523, 7525, and 10577) [1]	Developed building site	Low	None	None	None	None within site boundary. Potential vernal pools adjacent to existing infrastructure.	Vernal pool fairy shrimp potentially present in vernal pool features adjacent to Building 6523.
Permanent Site Alternative 1 (California South)	Development and grassland dominated by invasive grasses and forbs, with ornamental trees and small patches of native shrubs	Low	California scrub jay, gopher snake, western fence lizard, Botta's pocket gopher, mule deer	Vernal pool	Western spadefoot (SSC) Southern steelhead (FE) Arroyo chub (SSC)	One vernal pool within site boundary. One ephemeral drainage within 0.6 mile of boundary. Santa Ynez located 2.8 miles downstream.	None within site boundary or ephemeral streams downstream of boundary. Game and nongame fish in the Santa Ynez River, approximately 2.8 miles south of site boundary.

Notes:

[1] Visual observation of this site was not conducted during the May 2019 site visit to support preparation of this EA. Information presented in this table is based on review of publicly available aerial imagery and background documentation provided by Vandenberg AFB natural resources staff.

[2] Low habitat quality based on the relatively large amount of existing disturbance and moderate to high presence of noxious weeds. Moderate quality because of relatively less disturbance and no noxious weeds.

[3] Status: FE = Federal Endangered; SSC = CDFW Species of Special Concern.

Table 3.6-15
Common Plant Species in Grasslands at Redstone Arsenal

Common Name	Scientific Name	Comments
Fescue	*Festuca arundinacea*	Pasture and hayfields and upland grassland community.
Clovers	*Trifolium* spp.	
Coastal bermuda grass	*Cynodon dactylon*	
Rye	*Secale ereale*	
Barley	*Hordeum* spp.	
Oats	*Avena* spp.	
Tricale	*Triticale hexaploide*	
Kudzu	*Pueraria montana*	
Bush honeysuckle	*Diervilla* sp.	
Ailanthus	*Ailanthus altissima*	
Callery pear	*Pyrus calleryana*	
Chestnut oak	*Quercus prinus*	Forested hedgerows in grassland community.
Southern red oak	*Q. falcate*	
Southern white oak	*Q. alba*	
American beech	*Fagus grandifolia*	
Cottonwood	*Populus deltoides*	
American elm	*Ulmus americana*	
Tree-of-heaven	*Ailanthus altissima*	
Red mulberry	*Morus rubra*	
Sweetgum	*Liquidambar styraciflua*	
Honey locust	*Gleditsia triacanthos*	
Eastern red cedar	*Juniperus virginiana*	
Possumhaw	*Illex decidua*	
Sugarberry	*Celtis laevigata*	
American persimmon	*Diospyros virginiana*	
Chinese privet	*Ligustrum sinense*	
Sassafras	*Sassafras albidaum*	

Source: Army, 2017.

Special-Status Plant Species. Two federally listed or candidate plant species with potential habitat at Redstone Arsenal include Price's potato bean (*Apios priceana*), and Morefield's leather flower (*Clematis morefieldii*). However, no suitable habitat for these species is present at the Permanent and Interim Site Alternatives on Redstone Arsenal (**Appendix B, Table B-3**).

Wildlife. Bird species documented on Redstone Arsenal are diverse due to the variety of habitats present on the installation (Best et al., 2010). An estimated 48 mammal species inhabit Redstone Arsenal (Army, 2017). These species are distributed across Redstone Arsenal's various habitats, including wetland and stream; riparian/floodplain; forested, bottomland hardwoods; open grasslands, subterranean caves; mountainous; and urban landscape. Common wildlife species known or suspected to occur in grassland and pasture land with forested hedgerows at Redstone Arsenal are listed in **Table 3.6-16**. Wildlife game

species also are noted in the table. White-tailed deer frequent these areas for foraging (Alabama Natural Heritage Program [ANHP], 2019).

Table 3.6-16
Common Wildlife Species Known or Potentially Occurring in Grassland and Forested Hedgerow Communities at Redstone Arsenal

Common Name	Scientific Name
Birds	
Northern bobwhite[1]	*Colinus virginianus*
European starling	*Sturnus vulgaris*
Mourning dove[1]	*Zenaida macroura*
Barn swallow	*Hirundo rustica*
Northern mockingbird	*Mimus polyglottos*
Eastern towhee	*Pipilo erythrophthalmus*
Field sparrow	*Spizella pusilla*
Northern cardinal	*Cardinalis*
Carolina chickadee	*Poecile carolinensis*
Eastern bluebird[2]	*Sialia sialia*
Indigo bunting[2]	*Passerina cyanea*
American goldfinch[2,3]	*Carduelis tristis*
American crow[3]	*Corvus brachyrhynchos*
Blue jay[3]	*Cyanocitta cristata*
Common grackle[3]	*Quiscalus quiscula*
Chipping sparrow[3]	*Spizella passerine*
Eastern meadowlark[3]	*Sturnella magna*
American robin[2]	*Turdus migratorius*
Mammals	
Hispid cotton rat	*Sigmodon hispidus*
Golden mouse	*Ochrotomys nuttalli*
Pine vole	*Microtus pinetorum*
House mouse	*Mus musculus*
White-footed mouse	*Peromyscus leucopus*
Eastern cottontail[1]	*Slyvilagus floridanus*
Fox squirrel[1]	*Sciurus niger*
Gray squirrel	*S. carolinensis*
Coyote	*Canis latrans*
Red fox	*Vulpes vulpes*
Bobcat	*Lynx rufus*
White-tailed deer[1]	*Odocoileus virginianus*
Amphibians and Reptiles	
Eastern box turtle	*Terrapene carolina carolina*
Cottonmouth	*Agkistrodon piscivorus*

Table 3.6-16
Common Wildlife Species Known or Potentially Occurring in Grassland and Forested Hedgerow Communities at Redstone Arsenal

Common Name	Scientific Name
Eastern fence lizard	*Sceloporus undulatus*
Five-lined skink	*Eumeces fasciatus*
Eastern garter snake	*Thamnophis sirtalis sirtalis*
Upland chorus frog	*Pseudaris triserata*
Bullfrog	*Lithobates catesbeianus*
Green frog	*L. clamitans*
American toad	*Anaxyrus americanus*
Dusky salamander	*Desmognathus fuscus*

Notes:

[1] Game species.

[2] Most, if not all birds are protected under the Migratory Bird Treaty Act of 1918, as amended, otherwise noted.

[3] Year-round resident.

Source: Best et al., 2010; Army, 2017; Godwin and Hilton, 1995.

Special-Status Wildlife Species. Redstone Arsenal contains habitat for 29 special-status species, including 13 federally listed species (Army, 2017). Suitable habitat is potentially present on or near the interim and permanent sites at Redstone Arsenal for the federally endangered gray bat (*Myotis grisescens*), endangered Indiana bat (*Myotis sodalis*), and threatened northern long-eared bat (*Myotis septentrionalis*) (**Appendix B, Table B-3**). Potential habitat for these species consists of waterways in or adjacent to the sites that are used for foraging and breeding, as well as forested areas that provide shelter and roosting habitats. Other special-status wildlife species that were evaluated because potential habitat may be present at Redstone Arsenal are provided in **Appendix B**, **Table B-3**.

Aquatic Species. Redstone Arsenal contains diverse aquatic habitat consisting of rivers, streams, springs, and wetlands (Godwin and Hilton, 1995). The installation lies in the Indian Creek drainage basin, with Indian Creek draining the western portion and Huntsville Spring Branch draining the eastern portion. Common fish species occurring in waterways on and near Redstone Arsenal consist of warmwater species represented by sunfishes, bass, pike, minnows, mosquitofish, and darters (Godwin and Hilton, 1995; McGregor et al., 2015). Common game fish species include largemouth bass, spotted bass (*Micropterus punctatus*), chain pickerel (*Esox niger*), and numerous sunfish species and bluegill. Common and abundant species collected in Indian Creek and its tributaries near the Redstone Arsenal included black darter (*Etheostoma duryi*), flame chub (*Hemitrema flammea*), striped shiner (*Luxilus chrysocephalus*), and sunfishes (*Lepomis* spp.) (Godwin and Hilton, 1995; McGregor et al., 2015).

Special-Status Aquatic Species. No federally listed fish species have been documented in or near the interim or permanent site alternatives. **Table B-3** in **Appendix B** lists special-status aquatic species for which suitable habitat may be present on or near Redstone Arsenal. One state-protected fish species, Tuscumbia darter (*Etheostoma tuscumbia*) is present in Indian Creek and its tributaries in Redstone Arsenal (McGregor et al., 2015). Habitat primarily consists of vegetated spring pools and runs with slow current; such habitat is typically associated with watercress (*Nasturtium officionale*) or other aquatic plants or algae over clean substrates of fine gravel, sand, and silt (NatureServe, 2013).

Suitable habitat for the following protected snail and mussel species has the potential to occur at Redstone Arsenal: skirted hornsnail (*Pleurocera pyrenella*) (petitioned for federal listing), spectaclecase (*Cumberlandia mondanta*) (federally endangered), pink mucket (*Lampsilis abrupta*) (federally endangered), longsolid (*Fusconaia subrotundra*) (petitioned for federal listing), and round-rib elimia (*Elimia nassula*) (petitioned for federal listing). To date, however, such habitat has not been documented on the installation (Army, 2017).

3.6.5.2 Interim and Permanent Site Alternative Conditions

Site-specific information for Redstone Arsenal regarding vegetation, wildlife, aquatic habitat, and special-status species is provided in **Table 3.6-17**. Ditches present on the site alternatives at Redstone Arsenal were observed to be ephemeral to possibly intermittent, with some channels with accessibility to be mowed by the land leasee. Water in the ditches provides an additional water source for grazing livestock.

Table 3.6-17
Redstone Arsenal Site-specific Biological Resource Information

Site Alternatives	Dominant Vegetation Type/Wildlife Habitat	Wildlife Habitat Quality[1]	Wildlife Species Observed	Wetlands Present Within Boundary	Special-status Species[2]	Aquatic Habitat	Aquatic Species Present
Interim Site Alternative 1 (Redstone Gateway, and Buildings 5201 and 5220)	Not Applicable (N/A)[3, 4]						
Interim Site Alternative 2 (Area 2, and Buildings 5201 and 5220)[5]	Managed hayfield with small forest/open upland grasslands and hardwood forest	Moderate[2]	Vole species	Potential wetland in forested area[6]	Gray bat (FE, SP) Indian bat (FE, SP) Northern long-eared bat (FT, SP) Tuscumbria darter (SP)	Fifteen unnamed perennial or intermittent streams within 3 miles of Area 2 boundary.	Game and non-game fish species in Indian Creek.
Permanent Site Alternative 1 (Area 5 and Building 5201)[7]	Managed pasture and hayfields with small forested hedgerows/open upland grasslands and hardwood forest	Moderate	Eastern kingbird, Eastern bluebird, American goldfinch, house finch, and black angus cattle	None	Gray bat (FE, SP) Indian bat (FE, SP) Northern long-eared bat (FT, SP)	No perennial streams within site boundary. Indian Creek, Mullens Big Springs, and Huntsville Springs Branch, and 10 unnamed perennial or intermittent streams within 3 miles of boundary.	Same as Interim Site Alternative 2.

Notes:

[1] Low habitat quality based on the relatively large amount of existing disturbance and moderate to high presence of noxious weeds. Moderate quality because of relatively less disturbance and no noxious weeds, and presence of trees in border areas.

[2] Status: FE = Federal Endangered; FT = Federal Threatened; and SP = Alabama Protected.

[3] NEPA documentation prepared for the development of the Redstone Gateway complex (USACE, 2008) identified no noteworthy biological resources or significant impacts on such resources.

[4] Work to accommodate USSPACECOM personnel at Buildings 5201 and 5220, if this alternative is selected, would consist of interior renovations only and would have no potential to affect biological resources.

[5] Conditions described in this row pertain to Area 2 only; also see Note 3.

[6] Hydrology and hydric vegetation were present; however, a soil sample was unattainable to determine if hydric soils were present. NWI wetland was depicted in USFWS inventory that was located in the southeastern corner adjacent to the forest and site boundary.

[7] Conditions described in this row apply to Area 2 only; also see Note 3 with respect to Building 5201.

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3.7 CULTURAL RESOURCES

Cultural resources are defined as any prehistoric or historic place, site, building, structure, object, or collection of these elements that was built or used by people. Some cultural resources, such as Traditional Cultural Places and Sacred Sites, may be places without any visible evidence of human use or modification. A restricted class of cultural resources are those that are designated as *historic properties*, which are defined at 36 CFR 800.16(l)(1) as "any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places [NRHP]."

This section identifies cultural resources investigations and known cultural resources in and adjacent to the proposed interim and permanent site alternatives at Buckley, Peterson, Schriever, and Vandenberg AFBs and Redstone Arsenal. Most of the areas encompassed in these five installations have been surveyed for cultural resources. Although it is likely that most of the surficial archaeological resources have been discovered at the five installations, the potential for buried cultural resources remains (USAF, 2015c:77, 2017b: 44, 2019c:35; Army, 2012:5-71). Therefore, it is important that all ground-disturbing activities – including grading, excavating, digging, trenching, or ripping – that have the potential for impacts on subsurface archaeological materials be reviewed for effects on extant but previously unidentified cultural resources. The likelihood (low, medium, and high) of encountering previously undocumented cultural resources is assessed for each installation (**Tables 3.7-1** through **3.7-5**), based on such factors as topography, soil depths, proximity to usable resources (e.g., water, food, and toolstone), and previous disturbances. Site observations were conducted in May and June 2019 to support preparation of this EA.

To identify potential effects to historic properties, the APE is defined to address both direct and indirect effects. The APE for direct and indirect effects encompasses those areas that might be affected by construction activities within the building site of each alternative, plus a reasonable buffer for the passage and usage of equipment, utilities, and the like. The APE for indirect effects coincides with the direct APE, and takes into consideration the viewshed; that is, the likelihood that visual intrusions may compromise the integrity of nearby historic properties.

In addition to these conventional cultural resources investigations, the Air Force and candidate installations also are conducting ongoing government-to-government consultation with several Native American tribes that claim cultural affiliation to lands encompassed by the installations. Conducted in compliance with AFI 90-2002, *Air Force Interactions with Federally Recognized Tribes*, these consultations are intended to build relationships and address potential impacts on Protected Tribal Resources, as defined by DoDI 4710.02, DoD Interactions with Federally Recognized Tribes.

3.7.1 Buckley AFB

Between 1983 and 2012, 23 cultural resources investigations were completed at Buckley AFB, including archaeological studies, architectural studies, cultural resources reports, cultural resources management plans, and historic landscape studies (USAF, 2015c:68-70). Approximately 3,268 acres, or 99 percent of the installation, have been surveyed for archaeological resources. This total includes 3,108 acres outside the Aerospace Data Facility-Colorado (ADF-C), which has restricted access, and 160 acres in the ADF-C.

As of 2015, 43 archaeological sites have been documented at Buckley AFB (USAF, 2015c:73). This total includes 32 prehistoric sites, six historic sites (including a segment of the Smoky Hill Trail, 5AH.207), and five multicomponent sites. None of the 43 sites have been recommended eligible for listing in the NRHP (USAF, 2015c:73), and the NRHP eligibilities of 42 sites have received official concurrence from the Colorado SHPO. In addition to these 39 sites, 25 isolated finds (24 prehistoric and 1 historic) have been

recorded at Buckley AFB (USAF, 2015c:73). None of the isolated finds are considered eligible for listing in the NRHP.

Since 1990, eight architectural and historical studies have been conducted at Buckley, and 447 buildings and structures have been documented. Of these 447 resources, six are considered eligible for listing in the NRHP, and two buildings are considered eligible for the NRHP pending official concurrence from the Colorado SHPO (USAF, 2015c:76). The NRHP-eligible properties include six satellite communications ground terminals (Buildings 402, 403, 404, 405, 432, and 435) and two maintenance hangars (Buildings 801 and 909). Of these, the closest to the alternative sites are Buildings 402, 403, 404, and 405, which are approximately 0.25 mile from Interim Site Alternative 1. No historic districts or historic landscapes are present at Buckley AFB. The Colorado SHPO has concurred with these findings.

The following cultural resources are located within one of the alternative locations at Buckley Air Force Base, and are reviewed in this EA for potential effects.

Interim Site Alternative 1

1. Site 5AH.535 – historic cantonment area, officially not eligible
2. Building 200 – officially not NRHP eligible; demolished
3. Building 202 – constructed in 1995, and has not been evaluated for Cold War-era significance under Criteria Consideration G
4. Building 210 – constructed in 2000, and has not been evaluated for Cold War-era significance under Criteria Consideration G
5. Building 444 – radome constructed in 1999, and has not been evaluated for Cold War-era significance under Criteria Consideration G
6. Building 445 – radome constructed in 2001, and has not been evaluated for Cold War-era significance under Criteria Consideration G
7. Building 446 – constructed in 1999, this generator pad is outside the Cold War-era context
8. Building 12407 – constructed in 1987, this jet fuel storage tank has been demolished
9. Building 12417 – constructed in 1987, this jet fuel storage tank has been demolished

Permanent Site Alternatives 1 and 2

1. Building 1101 – site 5AH.2277 is officially not eligible for the NRHP
2. Building 1103 – constructed in 1977, this pump station is not connected to Cold War-era activities
3. Building 1106 – constructed in 1999, this small pavilion is outside the Cold War-era context
4. Building 1108 – constructed in 1968, this skeet house is not eligible for the NRHP
5. Building 1109 – constructed in 1968, this skeet house is not eligible for the NRHP
6. Building 1110 – constructed in 1986, this club house is not eligible for the NRHP

Table 3.7-1 summarizes the documented cultural resources at Buckley AFB that could be affected by the alternatives under consideration. The potential for buried cultural materials is assessed on the basis of topography, soil depth, proximity to usable resources, and previous disturbance(s). If none of these factors are present for a location, then the potential is listed as low; if one or two of these factors are present, then the potential is medium; and if all of the factors are present, then the potential is high.

Interim Site Alternative 1 has a low potential for buried cultural materials because soils are shallow; it occupies level terrain; is far from usable resources; and it has been heavily disturbed. The two permanent site alternatives are on shallow slopes overlooking Sand Creek to the north, so the potential for buried cultural materials is considered medium.

Table 3.7-1
Buckley AFB Site-specific Cultural Resources Information

Alternatives	Number of Sites Within Site Boundary	Number of Isolated Finds Within Site Boundary	Number of NRHP Eligible Sites Within Site Boundary	Potential for Buried Cultural Materials
Interim Site Alternative 1 (West End District)	1 (5AH.535)	0	0	Low
Permanent Site Alternative 1 (North Corner Site 1)	0	0	0	Medium
Permanent Site Alternative 2 (North Corner Site 2)	2 (5AH.2277, 5AH.207)	0	0	Medium

3.7.2 Peterson AFB

Eight archaeological surveys have been conducted at Peterson AFB, and 100 percent of the base has been surveyed for archaeological resources (USAF, 2017b:39). All potentially historic buildings at Peterson AFB have been inventoried and evaluated for NRHP eligibility. These buildings were determined eligible as a historic district; were established in 1991 as the Original Colorado Springs Municipal Airport Historic District; and were listed in the NRHP in 1996 (USAF, 2017b:42).

As of 2017, 11 archaeological resources have been documented at Peterson AFB (USAF, 2017b:39). This total includes five historic sites, a railroad grade, dump, foundation, ditch, and large homestead, and six isolated finds. Four of the sites are considered not eligible for listing in the NRHP, and one site has been assessed as needing additional data before NRHP eligibility can be determined. The Colorado SHPO has concurred with only one of these determinations. None of the isolated finds is eligible for the NRHP.

The Peterson AFB historic district (5EP.774) contains five buildings: the City Hangar (979), utility/maintenance (980), Municipal Terminal (981), Broadmoor Hangar (982), and Spanish House/caretakers residence (999), four contributing elements (979, 981, 982, 999), and one non-contributing element (980), all of which are part of the original Colorado Springs Municipal Airport dating from 1928 through the 1940s (USAF, 2017b:42). None of these properties are within the APE.

The proposed Interim Site Alternative Parking area lies outside the boundary of Peterson AFB. Aerial photographs of this area reveal a complex pattern of curvilinear features that continue to the north, east, and south. Previous research in the area has concluded that these are manmade furrows that control water runoff and soil degradation. They were constructed by crews from the Civilian Conservation Corps during the 1930s, and many other examples can be found throughout El Paso County, where they have not been obliterated by modern development. In the aggregate, these features are probably eligible for listing in the NRHP. Site observations concluded that the furrows in the Interim Site Alternative Parking area are degraded and not particularly good examples of these landscape features. They do not support the NRHP eligibility of a larger cultural landscape. Some isolated historic artifacts (purple glass fragments

and variously sized fragments of sheet metal) also were observed in the Interim Site Alternative Parking area during the site visit. They are recognized as isolated finds, and represent the arbitrary discard of miscellaneous debris by nearby residents.

Table 3.7-2 summarizes the documented cultural resources at Peterson AFB that could be affected by the alternatives under consideration. The potential for buried cultural materials is assessed on the basis of topography, soil depth, proximity to usable resources, and previous disturbance(s). If none of these factors are present for a location, then the potential is listed as low; if one or two of these factors are present, then the potential is medium; and if all of the factors are present, then potential is high. Interim Site Alternative 1, Permanent Site Alternative 1, and the two proposed garages have a low potential for buried cultural materials because soils are shallow, they occupy level terrain far from usable resources, and the areas are heavily disturbed. The proposed Interim Site Alternative Parking has relatively deep soils and is relatively undisturbed, so the potential for buried cultural materials is considered medium.

Table 3.7-2
Peterson AFB Site-specific Cultural Resources Information

Alternative	Number of Sites Within Site Boundary	Number of Isolated Finds Within Site Boundary	Number of NRHP Eligible Sites Within Site Boundary	Potential for Buried Cultural Materials
Interim Site Alternative 1 (Command Complex)	0	0	0	Low
Interim Site Alternative Parking	1 (soil retention furrows)	1 (modern debris)	0	Medium
Permanent Site Alternative 1 (Command Complex)	0	0	0	Low
Garage 1	0	0	0	Low
Garage 2	0	0	0	Low

3.7.3 Schriever AFB

Five archaeological surveys and one building inventory have been completed at Schriever AFB (USAF, 2019c:33-34). The original 640 acres of Falcon AFS were surveyed in 1982. Between 1990 and 1992, the remaining acreage of the installation was surveyed. Additional surveys of a transmission line corridor and access road to the West (Irwin) Gate also were surveyed in the 1990s. By 1996, a total of 3,640 acres, or 95 percent of the installation, had been surveyed for archaeological resources. The draft Integrated Cultural Resources Management Plan (ICRMP) noted that it has been more than 20 years since Schriever AFB has been intensively surveyed for cultural resources, and a new survey is planned for 2019 (USAF, 2019c:35). A historic ranch at the southwestern edge of the installation that was recognized in the 1990s is now old enough to be documented.

As of 2019, 26 archaeological resources have been documented at Schriever AFB (USAF, 2019c:44-46). This total includes one prehistoric site (a sparse lithic scatter) and seven historic sites (four windmill and stock watering areas and three ranches or homesteads). The remaining 18 resources are isolated finds, including prehistoric ground stone artifacts and chipped stone artifacts (flakes, cores, and projectile

points), as well as miscellaneous historic artifacts. None of the 26 resources have been recommended eligible for listing in the NRHP.

Schriever AFB includes 140 real property facilities (USAF, 2019c: Appendix B). All of these properties were built after 1985, and only seven of the buildings or structures have been recorded. None of the recorded buildings are recommended eligible for listing in the NRHP.

Based on previous surveys, it is likely that most, if not all, of the surficial archaeological sites at Schriever AFB have been discovered. However, playa locations at the western edge of the installation and the alluvial terraces along the many dry arroyos are likely locations for buried cultural resources (USAF, 2019c:35). All proposed ground-disturbing activities must take into consideration the possibility that they may impact buried archaeological sites.

Table 3.7-3 summarizes the documented cultural resources at Schriever AFB that could be affected by the alternatives under consideration. All of the locations have low potential for buried cultural materials, given their locations on the landscape and the extent of previous disturbances.

Table 3.7-3
Schriever AFB Site-specific Cultural Resources Information

Alternative	Number of Sites Within Site Boundary	Number of Isolated Finds Within Site Boundary	Number of NRHP Eligible Sites Within Site Boundary	Potential for Buried Cultural Materials
Interim Site Alternative 1 (Inside RA) (West Side of RA)	0	0	0	Low
Interim Site Alternative 2 (Outside RA) (North of Building 24)	0	0	0	Low
Permanent Site Alternative 1 (Inside RA) (West Side of RA)	0	0	0	Low
Permanent Site Alternative 2 (Outside RA) (Northwest of Building 24)	0	0	0	Low
Parking Area	0	0	0	Low

3.7.4 Vandenberg AFB

Cultural resources investigations at Vandenberg AFB are summarized in the installation's ICRMP (Lebow and Moratto 2005; Palmer et al. 2005a,b) and a variety of subsequent compliance documents. To date, more than 90 percent of the facility's 99,572 acres have been surveyed for cultural resources, including the area encompassing the proposed Permanent Site Alternative 1. These studies have documented more than 2,500 cultural resources, including archaeological sites, Native American traditional and heritage sites, 19th and early 20th Century historical structures, Cold War structures and buildings, and a variety of historic roads, trails, and landscapes. The facility also contains one National Historic Landmark (Space Launch Complex 10 and associated buildings), and the Anza National Historic Trail.

Of the more than 2,200 known archaeological resources at Vandenberg AFB, most date to the prehistoric period (before A.D. 1760), and include six named Chumash villages (Lospe, Saxpilil, Estep, Lompoc, Nocto, and Shilimaqshtush), along with the remains of a variety of seasonal and temporary encampments, rockshelters, shell middens, toolstone quarries, and rock art (Glassow, 1996). The facility also contains a wide variety of historic-period archaeological resources that date to as early as the 1870s, and relate to general historical themes of agriculture, defense, extractive industry, settlement, and transportation (Palmer et al., 2005a). More than 100 historic buildings and structures have been recorded on Vandenberg AFB, and have been classified into thematic categories of agriculture, defense, domestic, funerary, and transportation (Palmer et al., 2005b). Of these, most are related to 19th and early 20th Century agricultural activities, although many are military structures, including at least 72 that are related to the Cold War. Other buildings on the facility include domestic properties such as residences, bunkhouses, and garages.

The defined APE includes the areas within the project sites for Permanent Site Alternative 1 and Interim Site Alternative 1, which are within the main cantonment area at Vandenberg AFB, that might be affected by both temporary and permanent construction activities. The APE includes the areas within the project site that are subject to direct impacts from construction and a 0.25-mile radius study area around the Permanent Site Alternative 1 footprint that may be subject to indirect effects such as visual and atmospheric intrusions resulting from new construction.

Previous cultural resources investigations specific to the main cantonment area at Vandenberg AFB are summarized by Lebow and Peterson, who documented a number of previously known archaeological sites and completely re-surveyed the area in 2007 (Lebow and Peterson, 2008). These studies identified a total of 28 archaeological sites in or immediately adjacent to the cantonment area, including 17 prehistoric sites, 10 historic sites, and one that is undescribed. The prehistoric sites consist mainly of sparse scatters of artifacts and occasional pieces of marine shell; the historic resources include scatters of debris, the remains of a World War II prisoner-of-war camp, and several segments of concrete drainage ditches and culverts constructed by the prisoners. None of these sites are in the area of Permanent Site Alternative 1; the closest being CA-SBA-3575H, a series of drainage ditch segments approximately 1,380 feet (0.26 mile) to the southwest. None of the 28 isolated finds reported by Lebow and Peterson (2008) in the cantonment area are in the area proposed for Permanent Site Alternative 1.

A built environment survey of the study area identified 15 buildings that were more than 50 years old (Buildings 6523, 7000, 7403, 7414, 7420, 7425, 7430, 7437, 7525, 8190, 8195, 8305, 8310, 8312, and 10577). The buildings are primarily utilitarian in style, have had multiple functions and occupants since their construction, and have been altered. Two of these buildings (Buildings 7000 and 8310) were previously determined as not eligible for listing in the NRHP, with concurrence from the California SHPO. All 15 buildings identified in the APE have been evaluated as not eligible for listing in the NRHP. The Air Force's determination of eligibility for all the buildings in the APE as not eligible for listing in the NRHP and its finding that the undertaking would result in No Historic Properties Affected were submitted to the California SHPO for concurrence in a letter dated 3 September 2019. In a letter dated 4 October 2019, the California SHPO concurred with the Air Force's findings that buildings in the APE are not eligible for listing in the NRHP. The Air Force would complete all required consultation with the California SHPO prior to construction, should an alternative be selected at Vandenberg AFB.

Table 3.7-4 summarizes documented cultural resources at Vandenberg AFB that could be affected by the alternatives under consideration.

Table 3.7-4
Vandenberg AFB Site-specific Cultural Resources Information

Alternative	Number of Sites Within Site Boundary	Number of Isolated Finds Within Site Boundary	Number of NRHP Eligible Sites Within Site Boundary	Potential for Buried Cultural Materials
Interim Site Alternative 1 (Buildings 6523, 7525, and 10577)	0	0	0	None
Permanent Site Alternative 1 (California South)	0	0	0	Low

3.7.5 Redstone Arsenal

Between 1978 and 2012, 97 Section 106–related cultural resources compliance efforts were completed at Redstone Arsenal. As a result, 100 percent of Redstone Arsenal has been inventoried for archeological resources. Six archaeological surveys were conducted at Redstone Arsenal between 1978 and 2009, and those investigations inventoried 100 percent of the base (US Army, 2012: Appendix E). In addition, 12 architectural investigations have been conducted at Redstone Arsenal. However, the architectural inventory of all potentially historic buildings at Redstone Arsenal has not been completed (Army, 2012).

As of 2012, 955 archaeological sites have been documented at Redstone Arsenal (Army, 2012). This total includes 660 sites with prehistoric components, and 451 sites with historic components; 156 sites possessed both prehistoric and historic components. Although none of the identified sites are listed on the NRHP, 43 sites have been determined to be eligible for listing in the NRHP, and 398 have been assessed as potentially eligible for listing in the NRHP. A total of 514 sites have been recommended as not eligible for listing in the NRHP. Two previously recorded sites were identified within the boundaries of Permanent Site Alternative 1; however, both have been recommended as not eligible for listing in the NRHP (Army, 2012).

Excluding engineering structures, such as roads and flagpoles, approximately 2,616 buildings existed at Redstone Arsenal in 2011. Two of those buildings were constructed prior to 1941; 715 were constructed between 1941 and 1946; 1,008 were constructed between 1946 and 1989; and the remaining 891 buildings were constructed after 1989. A total of 1,275 buildings have been assessed for NRHP eligibility; of that number, 437 were assessed as eligible for listing in the NRHP, and 837 were assessed as not eligible for listing in the NRHP. Additionally, four National Historic Landmarks, all of which are associated with the Marshall Space Flight Center, and four NRHP districts have been identified on Redstone Arsenal. No built resources are on or in the viewshed of the proposed Redstone Arsenal site alternatives (Army, 2012).

The defined APEs for the Redstone Arsenal alternatives include the areas within each alternative that are subject to direct impacts from construction, as well as buildings within a 0.25 mile radius that may be subject to indirect effects such as visual and atmospheric intrusions. At Redstone Arsenal, Permanent Site Alternative 1 was subjected to a Phase I cultural resources survey in 1998 (Alexander et al., 1998). Two archaeological sites were identified on the property at that time. One of the sites dated from the early 20th Century, while the other possessed a 20th-Century component and an unknown prehistoric period component. Both sites were recommended as not eligible for listing in the NRHP.

A Phase I cultural resources survey was conducted on Interim Site Alternative 2 in 2000 (Alexander et al., 2000). At that time, no cultural resources were identified on Interim Site Alternative 2; however, an

archaeological site was identified approximately 150 feet south of the southwestern corner of this alternative site. The site consisted of a low-density scatter of unidentified prehistoric lithic artifacts, and the site was recommended as not eligible for listing in the NRHP.

Of the two buildings that would be modified under the current Redstone Arsenal Alternatives, Building 5201 has been evaluated as ineligible for the NRHP (Army, 2012), while Building 5220 was built in 2003, and is therefore also ineligible. Additionally, one NRHP-eligible building at Redstone Arsenal, Building 4381, is within the portion of the APE considered for indirect visual effects. Built in 1942, this building was originally a manufacturing plant, later served as the Structures and Mechanics Laboratory during the Cold War, and was most recently used for administration. It has been determined individually eligible for the NRHP for its Cold War associations. Satellite imagery, however, indicates that this building and its immediate context have been extensively modified within the last two decades. Building 4381 is approximately 900 feet west of Interim Site Alternative 2.

Table 3.7-5 summarizes documented cultural resources at Redstone Arsenal that could be affected by the alternatives under consideration.

Table 3.7-5
Redstone Arsenal Site-specific Cultural Resources Information

Alternatives	Number of Sites Within Site Boundary	Number of Isolated Finds Within Site Boundary	Number of NRHP Eligible Sites Within Site Boundary	Potential for Buried Cultural Materials*
Interim Site Alternative 1 (Redstone Gateway, and Buildings 5201 and 5220)	0	0	0	Low
Interim Site Alternative 2 (Area 2, and Buildings 5201 and 5220)	0	0	0	Low
Permanent Site Alternative 1 (Area 5 and Building 5201)	2	0	0	Medium

3.8 GEOLOGICAL AND PALEONTOLOGICAL RESOURCES

This section discusses geological and paleontological conditions underlying each site alternative and the candidate installations. The ROI for geological and paleontological resources is the boundaries of the site alternatives and the candidate installations.

3.8.1 Buckley AFB

Topography. Buckley AFB is relatively flat, with elevations ranging from 5,500 feet above mean sea level (amsl) in the northwest to 5,650 feet amsl in the southeast (USAF, 2016a).

Physiography. Buckley AFB lies in the Colorado Piedmont region of the Great Plains Physiographic Province. Because this is the western edge of the Great Plains, the Colorado Piedmont is the highest elevation of this province, at just over 5,000 feet amsl. Characteristic landforms in the Colorado Piedmont are flat to rolling plains consisting of uplands (areas between stream channels and their associated floodplains and terraces) and lowlands (essentially the valley bottoms). Although the South Platte River accounts for a significant portion of the lowlands in the Colorado Piedmont, these lowlands are less prominent in upstream reaches near Denver. Buckley AFB is in an upland area, which the urban nature of the surrounding area tends to mask (USAF, 2016a).

Buckley AFB is in the Denver Basin, a structural depression formed during the Laramide Orogeny, a mountain-building event approximately 67 million years ago. The basin covers 6,700 square miles, extending from Greeley in the north to Colorado Springs in the south; and from Limon westward to the Front Range. It is part of the larger Denver structural basin that extends north and east into Wyoming, Nebraska, and Kansas (Air National Guard, 1998).

Surficial and Bedrock Geology. Surficial deposits consist of unconsolidated, eolian (windblown), and alluvial (deposited by water) sediments that may reach a thickness of 30 feet; these sediments were initially deposited during the Pleistocene epochs, and continue to be deposited today. These deposits overlay sandstone and siltstone layers atop the shale floor of the Denver Basin (Air National Guard, 1998).

Surficial units are mapped as undifferentiated loess, eolian sand, and colluvium of Holocene age in the uplands, along with Pre-Piney Creek alluvium, Piney Creek Alluvium, and Post-Piney Creek alluvium of Holocene and Pleistocene age in the lowlands. Also mapped at the surface, and presumably continuing as bedrock beneath the Quaternary units, is Castle Rock Conglomerate, the upper part of the Dawson Formation, and upper part of the Denver Formation (TKcd) of Cretaceous and Paleogene age (Chase and McConaghy, 1972). These units are 300 to 1,400 feet thick.

Geologic layers in the basin are in excess of 13,000 feet thick, and range in age from Late Pennsylvanian through Quaternary. The Denver Basin comprises seven principal sedimentary formations, listed in descending order in the basin: the Castle Rock Conglomerate; the Dawson Arkose; the Denver, Arapahoe, and Laramie formations; the Fox Hills Sandstone; and an 8,000-foot-thick, relatively impermeable shale formation, the Pierre Shale, which forms the bottom of the basin (USAF, 2016a).

3.8.1.1 Paleontological Resources

Because some parts of the Piney Alluvium and pre-Piney Creek alluvium are of Pleistocene age, they are assigned a moderate sensitivity for paleontological resources. Conversely, the undifferentiated loess, eolian sand, and colluvium are assigned a low sensitivity. The Castle Rock Conglomerate, upper part of

the Dawson Formation, and upper part of the Denver Formation are assigned a high level of sensitivity for paleontological resources (Chase and McConaghy, 1972).

3.8.1.2 Mineral Resources

Coal reserves are present beneath the surface of Buckley AFB; however, these reserves are economically nonrecoverable due to their low quality and depth beneath the surface. Although mineral reserves (i.e., sand and gravel) are present in the area, economically desirable reserves do not exist on Buckley AFB. No other significant mineral resources are present at Buckley AFB (USAF, 2016a). There a history of oil and gas production from the Pierre Shale within Denver City limits, and of coal mining from beds in the Denver and Laramie formations, although there are no currently active coal mines in the Denver Basin. Sand and gravel extractions from stream channels have previously occurred near Buckley AFB, and well logs indicate potential subsurface sources of sand and gravel also are nearby. However, no serious efforts have been made to evaluate the economic viability of such extractions under current urbanizing conditions and regulations. Placer mining of gold and silver also has occurred along Cherry Creek and the South Platte River (in Denver and Arapahoe counties). The presence of such placer deposits also provides an opportunity for gold and/or silver extraction as a component of any sand and gravel mining operations (USAF, 2016a).

3.8.1.3 Seismicity

In general, Colorado is not considered at risk from significant earthquake damage. The state is ranked 30th in the nation in terms of Annualized Earthquake Losses by the Federal Emergency Management Agency (FEMA), and Denver is located in an area with the least restrictive category for Uniform Building Code requirements related to earthquakes (Seismic Zone 1). However, due to the presence of unconsolidated native and fill materials immediately underlying developed areas of Buckley AFB, along with the presence of perched groundwater, the potential exists for liquefaction (i.e., soils flow like a liquid) to occur if a strong earthquake were to occur (USAF, 2016a).

3.8.1.4 Soils

The U.S. Department of Agriculture – Natural Resources Conservation Service has prepared descriptions and maps of the soil associations present at Buckley AFB. Soil associations are landscapes exhibiting distinctive groupings of soil types. Five soil types were identified within the proposed site boundary, most of which are classified as moderately to highly erodible.

The major soil associations at Buckley AFB are classified as Fondis Weld, Renohill-Buick-Litle, Bresser-Truckton, and Weld-Deertail (USAF, 2016a). Other areas on Buckley AFB were identified as gravel pits, rock outcrop complex, terrace escarpments, and sandy alluvial land. Soil characteristics are provided in **Table 3.8-1.** Bresser-Truckton is only considered prime farmland if it is irrigated, and if the product of Erodibility (I) and climate factor (C) does not exceed 60.

Table 3.8-1
Buckley AFB Site-specific Soil Characteristics

Soil Type	Depth (inches)	Landform	Stabilization Characteristics	Prime Farmland
Bresser-Truckton sandy loams	60	Drainageway, stream terrace	Ponding	Yes[1]
Fondis silt loam	60	Drainageway	Ponding	Yes[1]
Fondis-Colby silt loams	60	Drainageway	Ponding	Yes[1]

Table 3.8-1
Buckley AFB Site-specific Soil Characteristics

Soil Type	Depth (inches)	Landform	Stabilization Characteristics	Prime Farmland
Renohill-Litle-Thedalund complex	28	Drainageway	Ponding	No
Weld-Deertrail silt loams	60	Plain		No

[1] Prime farmland if irrigated, otherwise not considered prime farmland.

3.8.2 Peterson AFB

3.8.2.1 Topography

Peterson AFB is situated on predominantly flat land sloping from northwest to southeast at a grade of less than 3 percent. Slopes of greater than 10 percent occur only on the eastern edge of Peterson East. The northwestern portion of the base gradually slopes toward the drainage of the East Fork of Sand Creek, which cuts through the northwestern corner of the installation. Elevations range from approximately 6,135 feet amsl in the southeastern corner of the base to approximately 6,276 feet amsl in the northeastern corner of the base (USAF, 2018).

3.8.2.2 Physiography

Peterson AFB is situated on the western edge of the Denver Basin geologic formation. The underlying sediments consist of unconsolidated deposits eroded from the Rocky Mountains. Identified as the high plains of the Colorado Piedmont of the Great Plains Physiographic Province, the area is composed of sandy foothills and plains of low relief. The Colorado Piedmont is a mature elevated plain, dissected by numerous streams. In the local area, this includes Fountain Creek and Sand Creek. The region is characterized by rolling grasslands that terminate at the eastern edge of the central Rocky Mountains.

The base is underlain by 25 to 100 feet of Quaternary alluvium (primarily sand and gravel) from tributaries of the Arkansas River. These deposits are underlain by the Arapahoe Formation, which consists of a 200-foot-thick sequence of interbedded conglomerate, sandstone, siltstone, and shale. The deposits of the Laramie and Fox Hills Formations underlie the Arapahoe Formation. The Laramie Formation (500 to 600 feet thick) is composed of sandstone and shale. The sandstone is fine to medium texture, friable, and carbonaceous. The Fox Hills Formation, about 100 feet thick, consists of sandstone and siltstone interbedded with shale. Pierre Shale underlies the Laramie-Fox Hills Formation (U.S. Geological Survey [USGS], 1987).

3.8.2.3 Surficial and Bedrock Geology

Madole and Thorson (2003) map most of Peterson AFB surface geology as younger eolian sand (Qes_1), wind-deposited sediment of middle and early Holocene, and possibly late Pleistocene age, ranging from 3 to 20 feet in thickness. Beneath this eolian deposit lies either middle or old alluvium. Although middle alluvium (Qam) is late Pleistocene age, ranging from 20 to 50 feet thick, old alluvium one (Qao_1) is middle Pleistocene age, ranging from 3 feet to 30 feet thick, and occupies higher areas of the landscape than middle alluvium. The nearest bedrock outcrops are of late Cretaceous age, ranging from the marine Pierre Shale to the continental Fox Hills and Laramie formations. These have a high sensitivity for paleontological resources (USGS, 2003).

3.8.2.4 Paleontological Resources

Each of the Quaternary units is assigned a high sensitivity for paleontological resources. The continental Fox Hills and Laramie formations and the marine Pierre Shale are assigned a high sensitivity for paleontological resources.

3.8.2.5 Mineral Resources

Deposits of economic interest in the region include coal, sand, and gravel, along with possibilities for oil and gas.

3.8.2.6 Seismicity

Geologic hazards are not known to exist in the vicinity of Peterson AFB. The nearest major faults are 75 to 100 miles from Peterson AFB (USGS, 2019a); therefore, there is a low risk of major damage from mass ground movement or seismic activity. The USGS database shows that there is a 10 percent chance that a peak acceleration of 3.5 percent of gravity would be exceeded in 50 years at Peterson AFB (USGS, 2015). This would approximately equal a value of V to VI on the Modified Mercalli Scale for earthquake intensity (4.0 to 4.4 on the Richter Scale). Earthquakes of this magnitude would typically cause breakage of windows or plaster, or other slight damage. Since 1969, there have been 18 earthquakes within 62 miles of Peterson AFB, with magnitudes ranging from 2.5 to 4.0 (USGS, 2019b).

3.8.2.7 Soils

Five soil types are found on Peterson AFB: Blakeland loamy sand, Blendon sandy loam, Ellicott loamy coarse sand, and two types of Truckton sandy loam (0 to 3 percent and 3 to 9 percent slopes); none of these soil types is considered prime farmland. The soil type found in the proposed site boundary, and the predominant soil type on Peterson AFB, is Blakeland loamy sand (**Table 3.8-2**). This soil type is generally suitable for construction, but has severe limitations for excavations due to the high potential for excavations to cave in. Blakeland loamy sand also has a high potential for erosion and rapid permeability (USAF, 2018).

Table 3.8-2
Peterson AFB Site-specific Soil Characteristics

Soil Type	Depth (inches)	Landform	Stabilization Characteristics	Prime Farmland
Blakeland loamy sand	60	Hills, flats	High Erosion	No

3.8.3 Schriever AFB

3.8.3.1 Topography

Topography at Schriever AFB consists of gently sloping plains to rolling hills, dissected by stream channels. Several depressions are scattered throughout the northwest, southwest, north-central, and south-central areas of the base. Elevations range from about 6,380 feet amsl near the northwestern corner of the base to about 6,095 feet amsl at the installation's southeastern corner. The most important topographic factor influencing base development is slope greater than 10 percent; only small areas along a few drainages on the base have slopes steeper than 10 percent (USAF, 2017a).

3.8.3.2 Physiography

Schriever AFB is situated on the western edge of the Denver Basin geologic formation. The underlying sediments consist of unconsolidated deposits eroded from the Rocky Mountains. The area is identified as the high plains of the Colorado Piedmont of the Great Plains Physiographic Province, and is composed of sandy foothills and plains of low relief. The region is characterized by rolling grasslands that terminate at the eastern edge of the central Rocky Mountains. The Colorado Piedmont is a mature elevated plain, dissected by numerous streams. In the local area, this includes Chico and Black Squirrel Creeks and their tributaries (USAF, 2017a).

The base is underlain by about 25 to 100 feet of Quaternary alluvium (primarily sand and gravel) from tributaries of the Arkansas River. These deposits are underlain by the Arapahoe Formation, which consists of a 200-foot-thick sequence of interbedded conglomerate, sandstone, siltstone, and shale. The deposits of the Laramie and Fox Hills Formations underlie the Arapahoe Formation. The Laramie Formation (500 to 600 feet thick) is composed of sandstone and shale. The sandstone is fine to medium texture, friable, and carbonaceous. The Fox Hills Formation, about 100 feet thick, consists of sandstone and siltstone interbedded with shale. Pierre Shale underlies the Laramie-Fox Hills Formation (USGS, 1987).

3.8.3.3 Surficial and Bedrock Geology

The surface at Schriever AFB has been mapped as Quaternary alluvium (Qal) and Piney Creek alluvium (Qpc) in the drainages, and Nussbaum Alluvium (Qn) in the uplands (Soister, 1968). Mainly in stream channels, Quaternary alluvium is grayish-yellow sand, gravel, and silt generally less than 25 feet thick. Piney Creek alluvium is mostly clayey sandy silt and silty sand, generally 5 to 15 feet thick, with known bison bone inclusions. Nussbaum alluvium is loosely consolidated granite pebble gravel, at least 145 feet thick, in the uplands (USGS, 1968).

Bedrock beneath these surface formations is Dawson Formation or Laramie Formation. About 1,350 feet thick, the Dawson Formation contains sandstone, conglomerate, and shale. The Laramie Formation is less than 400 feet thick, with shale, sandstone, and coal beds (USGS, 1968).

3.8.3.4 Paleontological Resources

Bedrock beneath the proposed site could be either Dawson Formation or Laramie Formation; it is therefore assigned a moderate sensitivity. The Nussbaum Alluvium was listed as Pleistocene age by Soister (1968); however, Scott (1982) argued for a Pliocene age, based on fossils of *Stegomastodon*, a proboscidean. It is assigned a moderate sensitivity because fossils are not abundant. The Dawson Formation has produced fossilized mammals of Paleocene age about 800 to 1,100 feet above base, along with dinosaur bones and Late Cretaceous leaves in the lower half. The Laramie Formation has produced 10 genera of dinosaurs, a few mammals, crocodiles, 5 kinds of turtles, 4 kinds of amphibians, 2 fish, and 4 types of shark. Therefore, it is assigned a high sensitivity for paleontological resources.

3.8.3.5 Mineral Resources

Deposits of economic interest in the region include coal, sand, and gravel, along with possibilities for oil and gas. Subbituminous coal beds occur in the upper member of the Laramie Formation, with one or more lenticular coal beds of poor quality in the overlying Dawson Formation. The Nussbaum Alluvium provides sand and gravel deposits.

3.8.3.6 Seismicity

Geologic hazards are not known to exist in the vicinity of Schriever AFB. The nearest major faults are 75 to 100 miles from the base (USGS, 2019a); therefore, there is a low risk of major damage from mass ground movement or seismic activity. The USGS database shows that there is a 10 percent chance that a peak acceleration of 3.5 percent of gravity would be exceeded in 50 years at Schriever AFB (USGS, 2015). This would approximately equal a value of V to VI on the Modified Mercalli Scale for earthquake intensity (4.0 to 4.4 on the Richter Scale). Earthquakes of this magnitude would typically cause breakage of windows or plaster, or other slight damage. Since 1969, there have been 18 earthquakes within 62 miles of Schriever AFB, with magnitudes ranging from 2.5 to 4.0 (USGS, 2019b).

3.8.3.7 Soils

Soils at Schriever AFB are situated on level to moderately undulating slopes formed in arkosic (derived from quartz and feldspar-rich granite) sedimentary rocks derived from aeolian (windblown) and alluvial (water deposited) sediment.

Nine soil types occur at Schriever AFB (USAF, 2017a). These soil types consist primarily of loamy sand, and silt loam textures. The soils are well-drained to somewhat excessively drained, with a depth to the water table (i.e., the upper limit where the soil or rock material is saturated with water) of 6 feet or greater. The Ascalon sandy loam is the predominant soil type, covering the southwestern two-thirds of the property. The Bresser sandy loam is the second-most abundant soil type, covering the majority of the northeastern one-third of the property.

The sandy loam soils (Ascalon, Blendon, and Bresser) have a moderate infiltration rate, moderate permeability, and moderate water-holding capacity. Surface runoff is slow, and hazards of erosion and soil blowing are moderate. The loamy sand soils (Blakeland, Ellicott, Sampson, and Truckton) have rapid infiltration rate, low to moderate permeability, and low to moderate water holding capacity. Surface runoff is slow, the erosion hazard is moderate to high, and soil blowing is moderate to severe. The Keith silt loam has moderate permeability, and a high water-holding capacity. Surface runoff is slow, and the erosion hazard is moderate.

In general, the soils have slight to moderate constraint for building sites. The Ellicott loamy coarse sand, located in an intermittent drainage south of the RA, is subject to flooding, and is therefore classified as having severe constraints for building development. The Samson silt loam is southeast of the RA near the center of the property, and is classified as having a moderate constraint for building development due to frost action (USAF, 2017a).

One soil type occurs within the proposed site boundary at Schriever AFB. Ascalon sandy loam is highly erodible and considered prime farmland soil if irrigated. However, these soils are not currently irrigated, and therefore would not be considered prime farmland soils as defined by the Farmland Protection Policy Act. Soil characteristics are provided in **Table 3.8-3**.

Table 3.8-3
Schriever AFB Site-specific Soil Characteristics

Soil Type	Depth (inches)	Landform	Stabilization Characteristics	Prime Farmland
Ascalon sandy loam	60	Flats	Highly erodible	No

3.8.4 Vandenberg AFB

3.8.4.1 Topography

Vandenberg AFB lies along 42 miles of the south-central California coastline approximately 275 miles south of San Francisco. Complete with coastal bluffs and sandy beaches, these 42 miles of undeveloped coastline are in the southwestern portion of the Santa Maria basin. Base boundaries begin with the Casmalia Hills to the north, and the Santa Ynez Mountains and Sudden Flats to the south. Between these two ranges are the broad and generally flat areas of the San Antonio Terrace, Burton Mesa, and Lompoc Terrace, on which most of the Vandenberg AFB mission occurs. Surface topography at Vandenberg AFB is varied, with the highest topographic relief in the south. The generally moderate slopes of the Casmalia Hills to the north rise to over 1,300 feet; and to the south, the much steeper canyon slopes of Tranquillion Mountain represent a dramatic backdrop to the southern coastal flats (USAF, 2015a).

3.8.4.2 Physiography

Vandenberg AFB is a geologically complex area that includes the transition zone between the Southern Coast Range and Western Transverse Range Geomorphic Provinces of California. Major geomorphic features of Vandenberg AFB include the Casmalia Hills, San Antonio Terrace, Barka Slough, Purisima Hills, Burton Mesa, Lompoc Valley, Lompoc Terrace, Santa Ynez Mountains, and Sudden Flats (USAF, 2015).

3.8.4.3 Surficial and Bedrock Geology

The geology of Vandenberg AFB is dynamic. Marine sedimentary rocks of Late Mesozoic age (140 to 70 million years before the present) and Cenozoic age (70 million years to the present) underlie the installation. Extensive folding and faulting throughout the Vandenberg AFB area have created four structural regions: the Santa Ynez Range, the Lompoc lowland, the Los Alamos syncline, and the San Rafael Mountain uplift (USAF, 2015a).

Vandenberg AFB is characterized by generally northwest-trending ridges and valleys. Major geologic features in Vandenberg AFB include the Santa Ynez Mountains, Casmalia Hills, Purisima Hills, Santa Ynez Valley Dune Complex, Sudden Flats, beaches, and rocky headlands. The Santa Ynez River and San Antonio Creek are the two major drainages traversing Vandenberg AFB (USAF, 2014d).

The proposed sites at Vandenberg AFB are in the Surf quadrangle (Gray, 2005). Surficial geology is mapped as older Quaternary alluvium (Qo), a late Pleistocene, poorly consolidated deposit of sand and pebble gravel (USGS, 1988). The near-surface geology includes the Orcutt formation, which consists of middle- to upper-Pleistocene eolian nonmarine sand and gravel underlain by the Paso Robles and the Monterey formations. The Orcutt formation ranges from less than 1 foot to 150 feet in thickness. Sand in the Orcutt formation is described as loose, medium-grained, massive, and light-buff in color. The basal portion of the Orcutt formation consists of well-rounded pebbles of quartzite, igneous rocks, and Monterey chert and shale (USAF, 2014d). The bedrock at this site is the Monterey Formation, a late-Miocene thinly bedded, siliceous shale with thin limestone strata (USGS, 1988).

3.8.4.4 Paleontological Resources

The older Quaternary alluvium is assigned a high sensitivity for the many Pleistocene mammals recovered from it. The Monterey Formation's historic yields of fossil fish, birds, sea lions, and whales are well known. Fierstine et al. (2012) documented at least 47 species of fossil fish described from specimens

found in quarries in the Monterey Formation that lie south of Lompoc and west of Vandenberg AFB. For these reasons, the Monterey Formation is assigned a high sensitivity for paleontological resources.

3.8.4.5 Mineral Resources

Mineral resources in Santa Barbara County include sand, gravel, and crushed stone. Dimension stone, natural stone harvested to provide specific dimensions like blocks or slabs, also is mined in the county. In addition, diatomite also is mined in the county. Diatomite is a soft, white sedimentary rock, formed from fossilized diatoms: single-celled aquatic algae. Diatomite is composed almost entirely of silica.

3.8.4.6 Seismicity

Vandenberg AFB is in an active seismic hazard area near two major faults: the San Andreas and the San Gregorio Faults. The San Andreas Fault system, the major geologic boundary between the North American and the Pacific tectonic plates, passes through much of the state of California. The main trace of the San Andreas Fault runs up through the central coast region between the Carizo Plain and the Diablo range, shifting towards the Santa Cruz Mountains in the north. During an earthquake, soils in lowland areas are susceptible to liquefaction, possibly resulting in landslides. Known fault lines in the vicinity of the proposed sites include Lions Head fault, running northwest to southeast; and Santa Ynez River fault roughly running west to east (USGS, 2019a).

The USGS database shows a 10 percent chance of an earthquake with peak acceleration exceeding 25 percent of gravity in the next 50 years at Vandenberg AFB. Such an earthquake would potentially cause damage to structures and roughly correspond to a Mercalli V and a Richter 4.5 event (USGS, 2015). Since 1969, there have been 1,229 earthquakes greater than Richter 2.5 within 62 miles of Vandenberg AFB; the greatest was 6.0. Since 1969, 312 earthquakes greater than Richter 2.5 have occurred within 31 miles of Vandenberg AFB; the greatest was 4.9, including a 4.3 in Lompoc in October of 2017(USGS, 2019b).

3.8.4.7 Soils

Dominant soil types on Vandenberg AFB include the following seven associations:

1. The **Tangair-Narlon** association of poorly drained and moderately well drained sands and loamy sands, located primarily on terraces.
2. The **Marina-Oceano** association of drained sands found on mesas and dunes.
3. The **Chamise-Arnold-Crow Hill** association of well-drained and somewhat excessively drained sand to clay loams on high terraces and uplands.
4. The **Concepcion-Botella** association of well-drained loamy sands, fine sandy loams, and silty clay loams found on terraces and in small valleys.
5. The **Sorrento-Mocho Camarillo** association of well-drained to somewhat poorly drained sandy loams to silty clay loams on floodplains and alluvial fans.
6. The **Shedd-Santa Lucia-Diablo** association of well-drained, shaley clay loam found on strongly sloping to very steeply sloping topography.
7. The **Los Osos-San Andreas-Tierra** association of well-drained to moderately well-drained soils of fine sandy loams to sand found in strongly sloping to very steep terrain (USAF, 2015a).

Characteristics of soils on the alternative sites are provided in **Table 3.8-4**.

Table 3.8-4
Vandenberg Site-specific Soil Characteristics

Soil Type	Depth (inches)	Landform	Stabilization Characteristics	Prime Farmland
Narlon loamy sand	67	Terraces	Highly erodible	No
Tangair sand	56	Terraces	Highly erodible	No

3.8.5 Redstone Arsenal

3.8.5.1 Topography

Topography at Redstone Arsenal is gently rolling, sloping gently towards the Tennessee River. Redstone Arsenal has high areas in the north, including Weeden and Madkin Mountains, along with low valleys and floodplains. Elevations range from 560 feet amsl in the valleys to 1,239 feet amsl on Mount Madkin, with most features between 600 to 650 feet amsl (Army, 2017).

3.8.5.2 Physiography

Redstone Arsenal lies on the eastern edge of the Highland Rim section of the Interior Low Plateaus near the southern extent of the Appalachian Highlands Region. Madkin and Weeden Mountains, with their Mississippian carbonates and sandstones, are considered outliers of the Cumberland Plateau to the east.

3.8.5.3 Surficial and Bedrock Geology

Much of the surface and shallow subsurface of Madison County is sedimentary; composed of the Fort Payne Chert and Tuscumbia Limestone. Although low areas of Redstone Arsenal area are characterized by Tuscumbia Limestone underlain by Fort Payne Chert, Fort Payne Chert is the surface formation on the higher elevations. Each of these formations averages 160 feet in thickness. Surface and near-surface parts of these units weather into clayey soils and karst terrains characterized by solution-enhanced fractures able to store and transmit large amounts of water. Many of these karst features are connected to surface-water bodies, enabling rapid water exchange between the surface and subsurface. Because fractures are scarce, large amounts of groundwater do not commonly traverse long distances (Geological Survey of Alabama, 2015).

In ascending order, overlying the Tuscumbia Limestone are generally oolitic limestone beds of the Monteagle Limestone, locally present shale and limestone of the Pride Mountain Formation, sandstone and shale beds of the Hartselle Sandstone, limestone of the Bangor Limestone, and sandstones and thin shale beds of the Pennsylvanian Pottsville Formation distances (Geological Survey of Alabama, 2015).

The surface geology of Redstone Arsenal consists of an unconsolidated material called regolith, derived from alluvial deposits and the weathering of bedrock. Regolith derived from Tuscumbia Limestone consists of moderate red to moderate red-orange clay; and porous, powdery, rectangular to irregular blocks of chert. Regolith derived from the weathering of the Fort Payne Chert includes dense chert or rectangular blocks of fossiliferous chert (Army, 2017).

3.8.5.4 Mineral Resources

Mining in the region includes gravels, chert, and limestone. No exclusive mineral resources are in Redstone Arsenal.

3.8.5.5 Seismicity

Redstone Arsenal is in a relatively moderate seismic hazard area. The nearest major fault zones are the Southern Appalachian Seismic Zone 50 miles to the east-northeast, and the New Madrid Seismic Zone 200 miles to the northwest. The USGS database shows a 10 percent chance of an earthquake with peak acceleration exceeding 5.5 percent of gravity in the next 50 years at Redstone Arsenal. Such an event would potentially cause moderate damage to structures, and roughly correspond to a Mercalli V and a Richter 4.5 (USGS, 2015). Since 1969, there have been 13 earthquakes greater than Richter 2.5 within 50 miles of Redstone Arsenal; the greatest was 3.9 in 2001 (USGS, 2019b).

3.8.5.6 Soils

More than 90 different soils, representing 19 different soil series, have been mapped in Redstone Arsenal (Army, 2014). The predominant soil type mapped by the U.S. Department of Agriculture (USDA) in Redstone Arsenal grounds is a deep, well-drained to moderately drained silt loam to silty clay loam. Major soil associations at Redstone Arsenal are classified as Decatur and Abernathy-Emory (USDA, 2019). In addition to other silt loams, a clay pit also is included in the considered Redstone Arsenal sites. Soil characteristics are provided in **Table 3.8-5**.

Table 3.8-5
Redstone Arsenal Site-specific Soil Characteristics

Soil Type	Depth (inches)	Landform	Stabilization Characteristics	Prime Farmland[1]
Abernathy-Emory fine sandy loams	80	Drainageway	Ponding	Yes
Abernathy-Emory silt loams	63	Drainageway	Ponding	Yes
Captina and capshaw silt loams	40	Stream terraces		Yes
Colbert silty clay loam	40	Ridges		No
Cookeville silt loam	60	Ridges		Yes
Cumberland loam	60	Ridges		Yes
Decatur silty clay loam	80	Interfluves, hillslopes		Yes
Dunning silty clay	50	Depressions	Ponding	FSWI
Etowah silt loams	60	Terraces		Yes
Hermitage cherty silt loam	60	Hills		FSWI
Hollywood silty clay	50	Flats	Ponding	Yes
Ooltewah silt loam	60	Depressions	Ponding	FSWI
Pits, clay	--	Hillslopes		No
Talbott silty clay loam	60	Hills		Yes
Tupelo silt loam	60	Stream terraces		Yes

[1] FSWI = farmland of statewide importance.

3.9 WATER RESOURCES

Water resources addressed in this section consist of surface waterbodies (e.g., streams, lakes, ponds, reservoirs, playas, and vernal pools); groundwater; and floodplains. This section discusses the presence and conditions of water resources at the five DoD installations being considered for the Proposed Action and the interim and permanent site alternatives on those installations. Streams are characterized as ephemeral (i.e., flow only briefly during and following a period of rainfall in the drainage area) and intermittent (i.e., flows for at least some part of the year and obtains its flow from surface runoff and groundwater discharge).

The ROI for surface water resources includes the boundaries of the site alternatives, as well as the downstream portions of streams to the primary tributaries at a distance of approximately 3 miles. This distance is used because the extent of downstream flow would be limited due to the predominance of ephemeral and intermittent streams within and outside of the site boundaries at all locations except Redstone Arsenal. The ROI for groundwater includes the portion of the groundwater basin that underlies each installation.

3.9.1 Buckley AFB

3.9.1.1 Installation Conditions

Surface Water. The ROI is in the South Platte Basin (USGS hydrologic unit catalog [HUC] #101900) and the Sand Creek Watershed (HUC #1019000302). The primary surface water drainage system in the region is the South Platte River, which is approximately 15 miles northwest of Buckley AFB. The eastern portion of the base drains into Sand and Murphy creeks, which flow to the South Platte River. Both of these creeks are situated east of the base. The western portion of the installation drains into East Toll Gate Creek, which flows generally along the installation's southwest boundary to Toll Gate Creek (USAF, 2016a).

The principal surface waterbody at Buckley AFB is Williams Lake, which is in the northeastern portion of the base. The lake was constructed in 1961, and has had a maximum surface area of 30 acres, although the average size of the lake since 1975 has been approximately 10 acres. The water supply for Williams Lake consists of local runoff augmented by a 1,500-gallon-per-hour supply well (USAF, 2016a). The lake is currently being allowed to drain to eliminate its attraction to birds and wildlife, and corresponding risk for collisions between birds/wildlife and aircraft.

Stormwater runoff generated on the installation is conveyed through a network of inlets, ditches, culverts, and underground pipes. Areas on the western portion of the base drain to East Toll Gate Creek. Areas on the eastern portion of the base drain to Sand and Murphy creeks. Buckley AFB maintains a base-wide Stormwater Pollution Prevention Plan (SWPPP) to manage the quantity and quality of stormwater generated on and discharged from the installation through good housekeeping practices, preventative maintenance, erosion and sediment control, and spill prevention.

Groundwater. The Denver Basin underlies Buckley AFB and consists of four principal bedrock aquifers, which include, from deepest to shallowest: Laramie-Fox Hills, Arapahoe, Denver, and Dawson aquifers (USAF, 2016a). These formations are deepest in the central part of the aquifer, and shallow near the edges of the Denver Basin. Pierre shale underlies the Fox Hills sandstone, and is considered to be the base of the Denver Basin aquifer system because of its thickness and low permeability. There also are surface alluvial deposits near East Tollgate and Sand creeks, which bear water at Buckley AFB (USAF, 2016a).

Groundwater flow is generally to the northwest, following the trend of stream drainages toward the South Platte River north of Denver. Groundwater quality is generally good in the Denver and Arapahoe aquifers, and meets drinking water standards. Water drawn from the Laramie/Fox Hills Aquifer may contain methane and hydrogen sulfide, which can cause objectionable taste and odors. Water from the Laramie/Fox Hills Aquifer also may contain excessive iron and fluoride concentrations (USAF, 2016a). Water yields in the Laramie-Fox Hills Aquifer are low, and therefore have not been used extensively as water supplies.

Floodplains. The southeastern and northwestern portions of Buckley AFB contain 100-year floodplains associated with the East Toll Gate and Sand creeks, respectively. However, there are no 100-year floodplains within the boundaries of the interim and permanent sites.

3.9.1.2 Interim and Permanent Site Alternative Conditions

Site-specific information for Buckley AFB focuses on surface water characteristics, because floodplains are not present, and there are no differences regarding groundwater in relation to the sites. The surface water characteristics are provided in **Table 3.9-1**.

Table 3.9-1
Buckley AFB Site-specific Water Resource Information

Site Alternatives	Number of Waterbodies within Site Boundary	Number of Ephemeral Streams within 3 miles and Downstream of the Project Disturbance Area	Number of Streams (intermittent or perennial) Located within 3 miles and Downstream of the Project Disturbance Area	Number and Type of Lentic Waterbody[1] Outside and Within 0.5 mile of Site Boundary
Interim Site Alternative 1 (West End District)	0	0	1	0
Permanent Site Alternative 1 (North Corner Site 1)	0	0	1	1 (Walker Lake)
Permanent Site Alternative 2 (North Corner Site 2)	0	0	1	(Walker Lake)

[1] Lentic waterbody is standing water that includes ditches, ponds, seasonal pools, playas, reservoirs, and lakes.

3.9.2 Peterson AFB

3.9.2.1 Installation Conditions

Surface Water. Peterson AFB lies within the Upper Arkansas Basin (HUC #110200) and the Middle Fountain Creek Watershed (HUC #1102000303), which drain to the Arkansas River (approximately 35 miles south of the base). Stream flow in Peterson AFB is limited to East Fork of Sand Creek, which is an intermittent stream that flows through the northwestern corner of the installation (USAF, 2018).

Multiple surface water impoundments are situated on and near Peterson AFB. A series of sewage treatment ponds owned by the Cherokee Water and Sanitation District lie along the northern base boundary and adjacent to East Fork of Sand Creek. Two water retention impoundments at the Colorado

Springs Municipal Airport are adjacent to the southeastern corner of Peterson AFB. Three small impoundments are on the installation's golf course. Two of the impoundments hold potable water, and one collects stormwater. Gutter inlets collect runoff, which is transported to the retention ponds or East Fork of Sand Creek through underground piping. Pond W-3, in the southeastern corner of Peterson AFB, collects runoff from developed areas in that part of the installation and the flightline. This water is used for irrigation of the golf course. Runoff from the northwestern portion of the base is directed to outfalls on or near the East Fork of Sand Creek (USAF, 2018).

Stormwater drainage on Peterson AFB drains to a network of inlets and underground pipes (USAF, 2018). Stormwater generated on the installation is discharged from five stormwater outfalls. A sixth outfall discharges to the airport detention pond. Stormwater runoff from the northern portion of Peterson AFB (Command Area and along Paine Street) flows to an outfall along East Fork of Sand Creek near the Main Gate. Stormwater runoff in the vicinity of the North Gate flows into a localized area of inlets and infiltrates into the ground (USAF, 2018). Peterson AFB maintains a Stormwater Management Plan (SWMP) and SWPPP to manage the quality and quantity of stormwater generated on the base through good housekeeping practices, preventative maintenance, erosion and sediment control, and spill prevention (USAF, 2016c, d).

Groundwater. Peterson AFB is at the southern edge of the Denver Aquifer system (see **Section 3.9.1**). The portion of the Laramie-Fox Hills Aquifer underlying Peterson AFB varies between 50 and 100 feet in thickness and ranges between 600 and 700 feet deep along the northern edge of the installation (USAF, 2018). The southern boundary of the Arapahoe Aquifer is about 2,000 feet north of the North Gate. The Denver Aquifer is about 2 miles north of the North Gate, and the Dawson Aquifer is about 6 miles to the north (USAF, 2018).

The area's principal unconfined aquifer is in the alluvial sediments of the Fountain Creek Valley. This shallow aquifer ranges in depth from 0.8 foot to more than 100 feet (USAF, 2018). This aquifer is hydraulically isolated from the Denver Basin aquifer system.

Floodplains. FEMA classifies most of Peterson AFB as Flood Zone X, indicating areas determined to be outside the 500-year floodplain (USAF, 2018). The only area in Peterson AFB that contains a FEMA-mapped floodplain is in the northwestern corner of the base where the 100-year floodplain occurs in association with the East Fork of Sand Creek (USAF, 2018). There are no 100-year floodplains within the boundaries of the interim and permanent sites.

3.9.2.2 Interim and Permanent Site Alternative Conditions

Site-specific information for Peterson AFB focuses on surface water characteristics, because floodplains are not present, and there are no differences regarding groundwater for the sites. Surface water characteristics are provided in **Table 3.9-2**.

Table 3.9-2
Peterson AFB Site-specific Water Resource Information

Site Alternatives	Number of Waterbodies within Site Boundary	Number of Ephemeral Streams within 3 miles and Downstream of the Project Disturbance Area	Number of Streams (intermittent or perennial) Located within 3 miles and Downstream of the Project Disturbance Area	Number and Type of Lentic Waterbody[1] Outside and Within 0.5 mile of Site Boundary
Interim Site Alternative 1 (Command Complex)	0	0	1	4 (ponds)
Permanent Site Alternative 1 (Command Complex)	0	0	1	4 (ponds)

[1] Lentic waterbody is standing water that includes ditches, ponds, seasonal pools, playas, reservoirs, and lakes.

3.9.3 Schriever AFB

3.9.3.1 Installation Conditions

Surface Water. Schriever AFB is in the Upper Arkansas Basin (HUC #110200) and the Chico Creek Watershed (HUC #1102000403), which drain to the Arkansas River (approximately 35 miles to the south of the Schriever AFB). No perennial or intermittent streams flow across Schriever AFB. However, three ephemeral streams are present on the installation. Two of these ephemeral channels are generally parallel, and flow from north to south through the RA, and then continue southeast to the southern border of Schriever AFB and beyond. Channel depths of these streams reach up to 15 feet. They flow about 7 miles south of the base, where they discharge into the ground near Chico Creek. The third ephemeral stream, a tributary of the West Fork of the Black Squirrel Creek, originates approximately 2 miles north of Schriever AFB, and flows just inside the northeastern corner of the AFB (USAF, 2017a).

There are two playas (i.e., seasonal lakes) in the northwestern portion of the base, and two small ephemeral lakes in the southeastern portion. The playas are located outside of the RA. There also are two ephemeral lakes east of the RA. None of the surface water features on Schriever AFB are identified as Waters of the United States (USAF, 2017a).

The stormwater drainage system consists of a network of natural and manmade swales, ditches, and erosion control structures (USAF, 2017a). Culverts are present in the ephemeral drainages in improved and semi-improved land areas. Stormwater drainage ditches are along Enoch Road and Irwin Avenue west of the RA. These ditches flow to a drainage channel about 750 feet south of the intersection of Irwin Avenue and Enoch Road. This drainage channel then drains to an ephemeral stream channel. Stormwater drainage generally flows south-southeast across the installation. Stormwater generated on the base is not discharged directly to any receiving waterbodies.

Groundwater. Schriever AFB is near the southern edge of the Denver Aquifer system (**Section 3.9.1**,). The Laramie-Fox Hills and Arapahoe Aquifers underlie most of the base. The Denver Aquifer underlies approximately 32 acres of the northern edge of Schriever AFB, while the Dawson Aquifer is about 9 miles to the north of the base. The Denver Basin is recharged principally by the infiltration and percolation of precipitation received in the area (USAF, 2017a).

The area directly underlying Schriever AFB includes no or minor water-bearing formations (El Paso County, 2003, as cited in USAF, 2017). Depth to groundwater in the vicinity of Schriever AFB is approximately 50 feet. Water is supplied to Schriever AFB by wells in the Upper Black Squirrel Designated Groundwater Basin that are owned and operated by the Cherokee Metropolitan District. This aquifer is near the community of Ellicott, 6 miles east of the base.

Water yields in the Laramie-Fox Hills Aquifer are low, and therefore have not been used extensively as a potable water supply. Some water withdrawn from the Laramie-Fox Hills Aquifer is of marginal value due to oxygen-deficient conditions, which give rise to hydrogen sulfide and methane gases (USAF, 2017a). Water in the Arapahoe Aquifer is generally a sodium bicarbonate or sodium sulfate type. Groundwater flow in both the Arapahoe and Laramie-Fox Hills aquifers is towards the north-northeast.

Floodplains. FEMA classifies most of Schriever AFB as Flood Zone X, indicating areas determined to be outside the 500-year floodplain (USAF, 2017a). The only area in Schriever AFB that contains a mapped floodplain is in the northeastern corner of the base, and is associated with the West Fork of Black Squirrel Creek (USAF, 2017a). There are no 100-year floodplains within the boundaries of the interim and permanent site alternatives.

3.9.3.2 Interim and Permanent Site Alternative Conditions

Site-specific information for Schriever AFB focuses on surface water characteristics, because floodplains are not present, and there are no differences regarding groundwater for the sites. The surface water characteristics are provided in **Table 3.9-3**.

Table 3.9-3
Schriever AFB Site-specific Water Resource Information

Alternatives/Sites	Number of Waterbodies within Site Boundary	Number of Ephemeral Streams within 3 miles and Downstream of the Project Disturbance Area	Number of Streams (intermittent or perennial) Located within 3 miles and Downstream of the Project Disturbance Area	Number and Type of Lentic Waterbody[1] Outside and Within 0.5 mile of Site Boundary
Interim Site Alternative 1 (Inside RA) (West Side of RA)	0	2	0	0
Interim Site Alternative 2 (Outside RA) (North of Building 24)	1	2	0	0
Permanent Site Alternative 1 (Inside RA) (West Side of RA)	0	2	0	0
Permanent Site Alternative 2 (Outside RA) (Northwest of Building 24)	0	2	0	2 (playas)

[1] A lentic waterbody is standing water that includes ditches, ponds, seasonal pools, playas, reservoirs, and lakes.

3.9.4 Vandenberg AFB

3.9.4.1 Installation Conditions

Surface Water. Vandenberg AFB is in the Central California Coastal Basin (HUC #180600) and the Shuman Canyon-Frontal Pacific Ocean Watershed (HUC #1806000902). The major drainage in this watershed is the Santa Ynez River, which is approximately 3 miles south of the interim and permanent site alternatives. The Santa Ynez River watershed encompasses approximately 897 square miles, draining from the river's headwaters in the Santa Ynez Mountains westward through the Santa Ynez Valley before emptying directly into the Pacific Ocean (Coastal Watershed Planning and Assessment Program, 2019). The mainstem of the lower Santa Ynez River passes through the urban and residential zones of Lompoc, Buellton, Solvang, and Santa Ynez (Block and Francis, 2013). The river near Lompoc includes a narrow meandering stretch to the Lompoc Narrows and emerges onto the broad, flat Lompoc Plain (Santa Ynez River Technical Advisory Committee, 2000). The river flows another 13 miles to the Pacific Ocean.

Groundwater. Vandenberg AFB is in Santa Barbara County, where groundwater supplies about 77 percent of domestic, commercial, industrial, and agricultural water (USAF, 2015a). The alluvium is the major aquifer in the groundwater system underlying the base. The Santa Barbara Formation is the major water-bearing unit for the Goleta, Foothill, and Santa Barbara Basins (Davis and Kulongoski, 2016). The formation consists of fine- to medium-grained marine sandstone. The Santa Barbara Formation is overlain with older alluvial and terrace deposits, which are composed of clay, sand, silt, and gravel. The typical depth to groundwater is approximately 50 to 140 feet below the surface (USAF, 2011a). The lower layer of the alluvium is the main water-bearing zone. Groundwater movement generally follows the surface-drainage patterns (Berenbrock, 1988). Predominant groundwater flow is towards the Pacific Ocean (USAF, 2011a). Previous groundwater sampling indicated that inorganic constituents such as iron, manganese, sulfate, and total dissolved solids that have human-health benchmarks were present at high relative concentrations in 5 percent of the primary aquifer system, and at moderate concentrations in 32 percent (Davis and Kulongoski, 2016). In contrast to inorganic constituents, organic constituents with human-health benchmarks were not detected at high relative concentrations in the primary aquifer system in the Santa Barbara study unit. Groundwater used for drinking water from this aquifer is treated to meet human health standards.

Floodplains. The project sites are not in a FEMA designated 100-year floodplain.

3.9.4.2 Interim and Permanent Site Conditions

Site-specific information for Vandenberg AFB focuses on surface water characteristics, because floodplains are not present. The surface water characteristics are provided in **Table 3.9-4**.

Table 3.9-4
Vandenberg Site-specific Water Resource Information

Alternatives/Sites	Number of Waterbodies within Site Boundary	Number of Ephemeral Streams within 3 miles and Downstream of the Project Disturbance Area	Number of Streams (intermittent or perennial) Located within 3 miles and Downstream of the Project Disturbance Area	Number and Type of Lentic Waterbody[1] Outside and Within 0.5 mile of Site Boundary
Interim Site Alternative 1 (Buildings 6523, 7525, and 10577)	0	0	1	0
Permanent Site Alternative 1 (California South)	1 (vernal pool)	0	1	0

[1] Lentic waterbody is standing water that includes ditches, ponds, seasonal pools, playas, reservoirs, and lakes.

3.9.5 Redstone Arsenal

3.9.5.1 Installation Conditions

Surface Water. Redstone Arsenal is in the Middle Tennessee-Elk Basin (HUC #060300) and the Huntsville Spring Branch-Indian Creek Watershed (HUC #0603000205). The major stream in this basin is the Tennessee River, which is approximately 5 to 6.5 miles to the south of the interim and permanent site alternatives. Redstone Arsenal is along the northern bank of the Tennessee River, about 46 miles above Wheeler Dam and 17 miles downstream from Guntersville Dam (Army, 2017). The Huntsville Spring Branch has a drainage area of 86 square miles, and flows southwestward to join Indian Creek, a tributary of the Tennessee River. Indian Creek, which enters the northern edge of the installation, drains an area of 143 square miles and joins the Tennessee River at river mile 321. Indian Creek drains approximately 12,000 acres of the installation, and the Huntsville Spring Branch drains approximately13,000 acres. The southern portion of the installation drains to the Tennessee River through smaller, unnamed channels.

Stormwater runoff generated on Redstone Arsenal is conveyed through a network of inlets, ditches, and culverts that connect to streams draining towards the Tennessee River (Matrix Design Group, 2018). Three primary streams convey stormwater on the installation: MacDonald Creek, Indian Creek, and Huntsville Spring Branch. Tributaries to Indian Creek receive stormwater runoff on the eastern portion of the installation, while MacDonald Creek and Huntsville Spring Branch are the receiving streams on the eastern portion of Redstone Arsenal. Historically, the installation has been subject to flooding as a result of weather events and the effect of urbanized development (Matrix Design Group, 2018). Stormwater management on Redstone Arsenal adheres to guidance in the *Alabama Handbook for Erosion Control, Sediment Control and Stormwater Management on Construction Sites and Urban Areas* (Army, 2017). The installation also maintains an SWMP to manage the quantity and quality of stormwater generated on and discharged from Redstone Arsenal.

Groundwater. Three distinct hydrogeological units are present at Redstone Arsenal: the unconsolidated layers of clay and gravel at the ground surface; the underlying Tuscumbia Limestone and Fort Payne Chert; and the Chattanooga Shale below (Army, 2014). Regional groundwater flow in these subsurface drainage basins is primarily from north to south/southwest toward the Tennessee River (Shaw, 2003). Portions of Redstone Arsenal have a shallow water table with groundwater occurring at 2 feet or less below ground surface. More commonly, groundwater depth is between 20 and 125 feet below ground

surface. None of the aquifers in Madison County have been designated as a sole-source aquifer per Section 1424(2)g of the Safe Drinking Water Act of 1974 (Army, 2014).

Groundwater quality degradation is a concern at Redstone Arsenal due to impacts from industrial practices north of the installation and industrial activities formerly occurring on the installation. Consequently, Redstone Arsenal has implemented an Interim Installation-Wide Groundwater Land Use Control to prevent the extraction and use of groundwater for potable purposes, and provide management control for non-potable uses of groundwater on the installation (Shaw, 2009).

Floodplains. Approximately one-third of the Redstone Arsenal is in the 100-year floodplain of the Tennessee River. However, none of the interim or permanent site alternatives are in a FEMA-designated 100-year floodplain.

3.9.5.2 Interim and Permanent Site Alternative Conditions

Site-specific information for Redstone Arsenal focuses on surface water characteristics, because floodplains are not present, and there are no differences regarding groundwater for the sites. Surface water characteristics are provided in **Table 3.9-5**. Three named perennial streams are within 3 miles of the site boundaries: Indian Creek, Mullens Big Springs, and Huntsville Springs Branch. The named perennial stream closest to the sites is Mullens Big Springs, which is 0.4 mile from Interim Site 1 and 0.9 mile from Permanent Site 1. The approximate distance from the sites to the other two named perennial streams ranges from 1.5 to 3 miles.

Table 3.9-5
Redstone Arsenal Site-specific Water Resource Information

Alternatives/Sites	Number of Waterbodies within Site Boundary	Number of Ephemeral Streams within 3 miles and Downstream of the Project Disturbance Area	Number of Streams (intermittent or perennial) Located within 3 miles and Downstream of the Project Disturbance Area	Number and Type of Lentic Waterbody[1] Outside and Within 0.5 mile of Site Boundary
Interim Site Alternative 1 (Redstone Gateway, and Buildings 5201 and 5220)	1	0	11	5 (ponds)
Interim Site Alternative 2 (Area 2, and Buildings 5201 and 5220)	1	0	15	1 (pond)
Permanent Site Alternative 1 (Area 5 and Building 5201)	0	0	10	4 (reservoirs and ponds)

[1] Lentic waterbody is standing water that includes ditches, ponds, seasonal pools, playas, reservoirs, and lakes.

4.0 ENVIRONMENTAL CONSEQUENCES

4.1 INTRODUCTION

This chapter presents the results of the analysis of potential environmental effects associated with implementing Proposed Action at Buckley AFB, Peterson AFB, Schriever AFB, Vandenberg AFB, and Redstone Arsenal. The Proposed Action and all reasonable alternatives are analyzed. Changes to the natural and human environments that may result from the Proposed Action and alternatives were evaluated relative to the existing environment as described in **Chapter 3.0**. For most resources addressed in this section, potential impacts are described as either short-term (i.e., those that would occur during construction and cease once the proposed facility is operational) and long-term (i.e., those that would result from the operation of the proposed facility). The potential for significant environmental consequences was evaluated using the context and intensity considerations as defined in CEQ regulations for implementing the procedural provisions of NEPA (40 CFR Part 1508.27).

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4.2 TRANSPORTATION

This section discusses impacts from the Proposed Action and No Action Alternative on the vehicular transportation network. Impacts on transportation from the Proposed Action would be considered significant if:

- The associated increase in construction-related traffic would exceed the existing capacity of vehicular transportation networks on and near the installations or contribute to a noticeable degradation of existing traffic conditions; and/or
- The associated increase in personnel at the selected installation would result in an increase in operational traffic volumes that would exceed the capacity of existing vehicular transportation networks on and near the installations or contribute to a noticeable degradation of existing traffic conditions.

4.2.1 General

4.2.1.1 Short-term Impacts

Construction of the proposed interim and permanent facilities would result in temporary increases in construction-related traffic at the selected installation(s) that would include workers' personal commuting vehicles and heavy trucks (e.g., dump trucks, cement trucks, mobile cranes, and delivery trucks). The number and frequency of vehicles traveling to and from the proposed interim and permanent sites during the Proposed Action's construction phase is not known, but would likely vary throughout the campaign. However, it is expected that construction of the proposed permanent facility would generate a larger volume of construction-related traffic than construction of the proposed interim facility, particularly where existing facilities comprise most or all of an interim site alternative (i.e., Vandenberg AFB and Redstone Arsenal Interim Site Alternative 1, respectively), because fewer workers and heavy trucks would be required to prepare the interim sites. It is expected that the number of construction vehicles (and particularly, heavy trucks) would be greatest in the early stages of the permanent facility construction campaign during site initial site preparation activities, pouring of concrete foundations and slabs, and erection of structural steel; and would gradually decrease as the project progresses. Oversize truck loads may be required to haul prefabricated modular buildings to interim sites involving the use of such structures (i.e., all Buckley, Peterson, and Schriever AFB interim site alternatives, and Redstone Arsenal Interim Site Alternative 2); in such cases, oversize truck trips would use appropriate haul routes (e.g., major highways and roads) to the extent possible; be minimized to the fewest trips practicable; be accompanied by marked escort vehicles in accordance with applicable federal, state, and local requirements; and when practicable, occur outside of peak morning and evening commuting periods to minimize disruption of local traffic.

To manage construction-related traffic, the contractor would implement and adhere to a project-specific transportation management plan (TMP) that would specify appropriate routes for construction-related vehicles to follow to and from the site alternatives. Routes in the construction TMP would follow major highways and roads, and avoid residential areas, schools, and other sensitive uses on and outside the installation(s) to the extent possible. The TMP also would identify appropriate parking areas on or near the construction sites for worker and contractor vehicles to prevent conflicts with POV parking at the selected installation(s).

It is expected that most construction activities for the proposed interim and permanent site alternatives would occur Monday through Friday between 7 a.m. and 5 p.m. local time. To the extent possible, high volumes of anticipated construction traffic (e.g., during large concrete pours) would be scheduled outside

of peak morning and evening commuting hours to minimize disruption to local traffic on and outside the selected installation.

Construction-related traffic resulting from the Proposed Action would be similar to that associated with other construction projects of similar type, scale, and duration that occur with relative frequency at each of the DoD installations being considered and their surrounding communities, and would not be particularly unusual. Increases in construction-related traffic from the Proposed Action would remain within the capacity of existing vehicular transportation networks on and near the DoD installations being considered, and would not contribute to a noticeable degradation of existing traffic conditions. On completion of construction for the proposed interim and permanent facilities, vehicular transportation network conditions on and near the selected DoD installations would return to their pre-construction condition.

Therefore, short-term impacts on vehicular transportation networks from the Proposed Action would be negligible or minor, and would not be significant.

4.2.1.2 Long-term Impacts

Once the proposed interim and permanent facilities are operational, an estimated 1,488 additional vehicles would enter and leave the selected installation(s) each workday (i.e., Monday through Friday), assuming USSPACECOM personnel assigned to the proposed facilities travel alone in their POVs (this estimated volume assumes 80 percent of assigned personnel reporting to the proposed facility each workday). This increase would have the potential to affect vehicular transportation networks on and near the selected installation(s) to varying degrees, depending on the installation(s) ultimately selected by the Air Force. With the exception of Vandenberg AFB, all of the DoD installations being considered are in intensively urbanized areas that are supported by extensive vehicular transportation networks. Therefore, it is anticipated that vehicular transportation networks on and near all the DoD installations being considered, with the potential exception of Vandenberg AFB, would have sufficient capacity to handle the additional traffic generated by the Proposed Action in the long term. With respect to the proposed interim alternative, associated traffic volume increases would be temporary, and traffic volumes on and near the selected installation would return to pre-alternative levels if the proposed permanent facility is built and operated at a different installation. As necessary, the selected installation(s) would update their installation-wide TMPs, and modify or enhance their traffic management procedures to accommodate additional traffic generated by the proposed facilities.

Long-term impacts on transportation resulting from the Proposed Action are discussed below for each candidate installation and site alternative. It is assumed that impacts on roads on the selected installation(s) from additional traffic volumes generated by the proposed interim and permanent facilities would generally be the same regardless of which site(s) are selected for implementation. Therefore, the impacts analysis focuses on roads outside the candidate installations.

4.2.2 Buckley AFB

4.2.2.1 Short-term Impacts

Implementation of the Proposed Action at Buckley AFB would have no short-term impacts on the vehicular transportation network on and near the installation beyond those described in **Section 4.2.1.1**. Short-term Impacts on the vehicular transportation network on and near Buckley AFB from the Proposed Action would be negligible or minor, and would not be significant.

4.2.2.2 Long-term Impacts

Anticipated increases in estimated operational traffic volumes at and near Buckley AFB from the Proposed Action are presented in **Table 4.2-1**.

Table 4.2-1
Estimated Change in Traffic Volumes At and Near Buckley AFB from the Proposed Action

Road or Installation	Station ID Number	Existing Estimated AADT Volume or Approximate Traffic Volume (Section 3.2)	Daily Increase in Vehicles from Proposed Action (number)	Percent Change
US-30 near intersection with Aspen Drive	101129	21,000	1,488	7.1
I-225 near intersection with Mississippi Avenue	106446	151,000	1,488	1.0
Buckley AFB	N/A	9,033	1,488	16.5

Source: CDOT, 2019.

As shown in **Table 4.2-1**, potential increases in estimated traffic volumes on off-base roads near Buckley AFB would be small, less than 10 percent, relative to the estimated number of vehicles currently using those roads. These potential increases would be further offset because additional traffic generated by the proposed facilities would be distributed among other roads in the area in addition to those shown in **Table 4.2-1**; therefore, actual traffic volume increases on those roads would likely be much less. It is anticipated that these additional traffic volumes would be accommodated by the existing vehicular transportation network near Buckley AFB without noticeable degradation of traffic conditions.

Additional traffic generated by the Proposed Action would increase traffic volumes on the Buckley AFB road network by an estimated 16.5 percent. Although this would be a notable increase, it would be distributed over a period of time, because total staffing of 1,870 personnel at the proposed interim and permanent facilities would occur over several months or years. The installation would update, develop, and implement applicable transportation management procedures accordingly to accommodate traffic volume increases associated with the proposed facilities.

Therefore, long-term impacts on the vehicular transportation network on and near Buckley AFB from the Proposed Action would be minor and not significant. As noted above, traffic increases from implementation of the interim alternative would be temporary, minor, and not significant if the permanent alternative is not implemented at Buckley AFB.

4.2.3 Peterson AFB

4.2.3.1 Short-term Impacts

Implementation of the Proposed Action at Peterson AFB would have no impacts on the vehicular transportation network on and near the installation beyond those described in **Section 4.2.1.1**. Short-term impacts on the vehicular transportation network on and near Peterson AFB from the Proposed Action would be negligible or minor, and would not be significant.

4.2.3.2 Long-term Impacts

Anticipated increases in estimated operational traffic volumes at and near Peterson AFB from the Proposed Action are presented in **Table 4.2-2**.

Table 4.2-2
Estimated Change in Traffic Volumes At and Near Peterson AFB from the Proposed Action

Road or Installation	Station ID Number	Existing Estimated AADT Volume or Approximate Traffic Volume	Daily Increase in Vehicles from Proposed Action (number)	Percent Change
US-24 near its intersection with Peterson Boulevard	100849	41,000	1,488	3.6
SH-94 near its intersection with Airport Road	100920	61,000	1,488	2.4
Peterson AFB	N/A	31,200	1,488	4.8

Source: CDOT, 2019.

As shown in **Table 4.2-2**, potential increases in estimated traffic volumes on off-base roads near Peterson AFB would be small, less than 4 percent, relative to the estimated number of vehicles currently using those roads. These potential increases would be further offset because additional traffic generated by the proposed facilities would be distributed among other roads in the area, in addition to those shown in **Table 4.2-2**; therefore, actual traffic volume increases on those roads would likely be much less. It is anticipated that these additional traffic volumes would be accommodated by the existing vehicular transportation network near Peterson AFB without noticeable degradation of traffic conditions.

Additional traffic generated by the Proposed Action would increase traffic volumes on the Peterson AFB road network by an estimated 4.8 percent. This would be a marginal increase in the context of existing traffic volumes entering and leaving Peterson AFB and would be further minimized because the total staffing of 1,870 personnel at the proposed interim and permanent facilities would occur over several months or years. The installation would update, develop, and implement applicable transportation management procedures accordingly to accommodate traffic volume increases associated with the proposed facilities.

Therefore, long-term impacts on the vehicular transportation network on and near Peterson AFB from the Proposed Action would be minor and not significant. As noted above, traffic increases from implementation of the interim alternative would be temporary, minor, and not significant if the permanent alternative is not implemented at Peterson AFB.

4.2.4 Schriever AFB

4.2.4.1 Short-term Impacts

Implementation of the Proposed Action at Schriever AFB would have no impacts on the vehicular transportation network on and near the installation beyond those described in **Section 4.2.1.1**. Short-term impacts on the vehicular transportation network on and near Schriever AFB from the Proposed Action would be negligible or minor, and would not be significant.

4.2.4.2 Long-term Impacts

Anticipated increases in estimated operational traffic volumes at and near Schriever AFB from the Proposed Action are presented in **Table 4.2-3**.

Table 4.2-3
Estimated Change in Traffic Volumes At and Near Schriever AFB from the Proposed Action

Road or Installation	Station ID Number	Existing Estimated AADT Volume or Approximate Traffic Volume	Daily Increase in Vehicles from Proposed Action (number)	Percent Change
SH-94 near its intersection with South Curtis Road	103945	11,000	1,488	13.5
Schriever AFB	N/A	8,427	1,488	17.7

Source: CDOT, 2019.

As shown in **Table 4.2-3**, potential increases in estimated traffic volumes on off-base roads near Schriever AFB would exceed 13 percent, relative to the estimated number of vehicles currently using those roads. However, these potential increases would be offset because additional traffic generated by the proposed facilities would be distributed among other roads in the area, in addition to that shown in **Table 4.2-3**; therefore, actual traffic volume increases on those roads would likely be much less. It is anticipated that the additional traffic volumes would be accommodated by the existing vehicular transportation network near Schriever AFB without noticeable degradation of traffic conditions.

Additional traffic generated by the Proposed Action would increase traffic volumes on the Schriever AFB road network by an estimated 17.7 percent. Although this would be a substantial increase, it would be distributed over a period of time because total staffing of 1,870 personnel at the proposed interim and permanent facilities would occur over several months or years. The installation would update, develop, and implement applicable transportation management procedures accordingly to accommodate traffic volume increases associated with the proposed facilities.

Therefore, long-term impacts on the vehicular transportation network on and near Schriever AFB from the Proposed Action would be minor and not significant. As noted above, traffic increases from implementation of the interim alternative would be temporary, minor, and would not be significant if the permanent alternative is not implemented at Schriever AFB.

4.2.5 Vandenberg AFB

4.2.5.1 Short-term Impacts

Implementation of the Proposed Action at Vandenberg AFB would have no impacts on the vehicular transportation network on and near the installation beyond those described in **Section 4.2.1.1**. Short-term impacts on the vehicular transportation network on and near Vandenberg AFB from the Proposed Action would be negligible or minor, and would not be significant.

4.2.5.2 Long-term Impacts

Anticipated increases in estimated operational traffic volumes at and near Vandenberg AFB from the Proposed Action are presented in **Table 4.2-4**.

Table 4.2-4
Estimated Change in Traffic Volumes At and Near Vandenberg AFB from the Proposed Action

Road or Installation	Existing Estimated AADT Volume or Approximate Traffic Volume		Daily Increase in Vehicles from Proposed Action (number)	Percent Change	
	Back AADT	Ahead AADT		Back AADT	Ahead AADT
SR-1 at its intersection with SR-246 (West Ocean Avenue)	13,500	11,600	1,488	11.0	12.8
SR-1 at its intersection with West Lompoc-Casmalia Road (Vandenberg AFB main gate)	28,200	20,100	1,488	5.3	7.4
SR-1 at its intersection with SR-135	14,900	17,800	1,488	10.0	8.4
Vandenberg AFB	8,513		1,488	17.5	

Source: Caltrans, 2019.

As shown in **Table 4.2-4**, potential increases in estimated traffic volumes on off-base roads near Vandenberg AFB would range from 5.3 to almost 13 percent, relative to the estimated number of vehicles currently using those roads. These potential increases would be offset because additional traffic generated by the proposed facilities would be distributed among other roads in the area in addition to those shown in **Table 4.2-4**; therefore, actual traffic volume increases on those roads would likely be much less. It is anticipated that the additional traffic volumes would be accommodated by the existing vehicular transportation network near Vandenberg AFB without noticeable degradation of traffic conditions.

Additional traffic generated by the Proposed Action would increase traffic volumes on the Vandenberg AFB road network by an estimated 17.5 percent. Although this would be a substantial increase, it would be distributed over a period of time because total staffing of 1,870 personnel at the proposed interim and permanent facilities would occur over several months or years. The installation would update, develop, and implement applicable transportation management procedures accordingly to accommodate traffic volume increases associated with the proposed facilities.

Therefore, long-term impacts on the vehicular transportation network on and near Vandenberg AFB from the Proposed Action would be minor and not significant. As noted above, traffic increases from implementation of the interim alternative would be temporary, minor, and not significant if the permanent alternative is not implemented at Vandenberg AFB.

4.2.6 Redstone Arsenal

4.2.6.1 Short-term Impacts

Implementation of the Proposed Action at Redstone Arsenal would have no impacts on the vehicular transportation network on and near the installation beyond those described in **Section 4.2.1.1**. Short-term impacts on the vehicular transportation network on and near Redstone Arsenal from the Proposed Action would be negligible or minor, and would not be significant.

4.2.6.2 Long-term Impacts

Anticipated increases in estimated operational traffic volumes at and near Redstone Arsenal from the Proposed Action are presented in **Table 4.2-5**.

Table 4.2-5
Estimated Change in Traffic Volumes At and Near Redstone Arsenal from the Proposed Action

Road or Installation	Station ID Number	Existing Estimated AADT Volume or Approximate Traffic Volume	Daily Increase in Vehicles from Proposed Action (number)	Percent Change
I-565 near intersection with Zeirdt Road	447	70,230	1,488	2.1
Rideout Road nearest to the intersection of I-565	124	33,120	1,488	4.5
I-565 near Patton Road entrance to Redstone Arsenal	89	111,000	1,488	1.3
US-231 near Drake Avenue, with access to Redstone Arsenal entrances along Goss Road and Patton Road	65	110,600	1,488	1.4
US-231 near Redstone Arsenal Truck Entrance	69	65,300	1,488	2.3
US-231 near Redstone Road entrance to Redstone Arsenal	73	44,560	1,488	3.3
Redstone Arsenal	N/A	42,000	1,488	3.5

Source: ALDOT, 2017.

As shown in **Table 4.2-5**, potential increases in estimated traffic volumes on off-base roads near Redstone Arsenal would vary from 2.1 to 4.5 percent, and would not exceed 5 percent relative to the estimated number of vehicles currently using those roads. These potential increases would be further offset because additional traffic generated by the proposed facilities would be distributed among other roads in the area in addition to that shown in **Table 4.2-5**; therefore, actual traffic volume increases on those roads would likely be less. It is anticipated that the additional traffic volumes would be accommodated by the existing vehicular transportation network near Redstone Arsenal without noticeable degradation of traffic conditions.

Additional traffic generated by the Proposed Action would increase traffic volumes on the Redstone Arsenal road network by less than an estimated 4 percent. In light of the 42,000 vehicles currently accessing the installation each day, this increase would have no potential to contribute to the degradation of traffic conditions at Redstone Arsenal. The installation would update its traffic management procedures accordingly to accommodate traffic volume increases associated with the proposed facilities.

Therefore, long-term impacts on the vehicular transportation network on and near Redstone Arsenal from the Proposed Action would be negligible and not significant. Impacts on traffic conditions from implementation of the interim alternative would be temporary, negligible, and not significant if the permanent alternative is not implemented at Redstone Arsenal.

4.2.7 No Action Alternative

The No Action Alternative would have no impacts on the vehicular transportation network on and near the candidate installations because the proposed interim and permanent USSPACECOM facilities would not be built and operated. The affected environment described in **Section 3.2** would continue to be influenced by ambient environmental conditions and other ongoing development projects on and near the candidate installations.

4.2.8 Impact Summary

Impacts on transportation from the Proposed Action and No Action Alternative are summarized in **Table 4.2-6**.

Table 4.2-6
Summary of Transportation Impacts

Site Alternative	On-Installation Roads		Off-Installation Roads	
	Short-term Impacts	**Long-term Impacts**	**Short-term Impacts**	**Long-term Impacts**
Buckley AFB				
Interim Site Alternative 1 (West End District)	Not significant, negligible or minor short-term impacts	Not significant, minor long-term impacts; impacts would cease if permanent facility is built and operated at another installation	Not significant, negligible or minor short-term impacts	Not significant, minor long-term impacts; impacts would cease if permanent facility is built and operated at another installation
Permanent Site Alternative 1 (North Corner Site 1)	Same as above	Not significant, minor long-term impacts	Same as above	Not significant, minor long-term impacts
Permanent Site Alternative 2 (North Corner Site 2)	Same as above	Same as above	Same as above	Same as above
Peterson AFB				
Interim Site Alternative 1 (Command Complex)	Not significant, negligible or minor short-term impacts	Not significant, minor long-term impacts; impacts would cease if permanent facility is built and operated at another installation	Not significant, negligible or minor short-term impacts	Not significant, minor long-term impacts; impacts would cease if permanent facility is built and operated at another installation
Permanent Site Alternative 1 (Command Complex)	Same as above	Not significant, minor long-term impacts	Same as above	Not significant, minor long-term impacts

Table 4.2-6
Summary of Transportation Impacts

Site Alternative	On-Installation Roads		Off-Installation Roads	
	Short-term Impacts	Long-term Impacts	Short-term Impacts	Long-term Impacts
Schriever AFB				
Interim Site Alternative 1 (Inside RA) (West Side of RA)	Not significant, negligible or minor short-term impacts	Not significant, minor long-term impacts; impacts would cease if permanent facility is built and operated at another installation	Not significant, negligible or minor short-term impacts	Not significant, minor long-term impacts; impacts would cease if permanent facility is built and operated at another installation
Interim Site Alternative 2 (Outside RA) (North of Building 24)	Same as above	Not significant, minor long-term impacts	Same as above	Not significant, minor long-term impacts
Permanent Site Alternative 1 (Inside RA) (West Side of RA)	Same as above	Not significant, minor long-term impacts	Same as above	Not significant, minor long-term impacts
Permanent Site Alternative 2 (Outside RA) (Northwest of Building 24)	Same as above	Same as above	Same as above	Same as above
Vandenberg AFB				
Interim Site Alternative 1 (Buildings 6523, 7525, and 10577)	Not significant, negligible or minor short-term impacts	Not significant, minor long-term impacts; impacts would cease if permanent facility is built and operated at another installation	Not significant, negligible or minor short-term impacts	Not significant, minor long-term impacts; impacts would cease if permanent facility is built and operated at another installation
Permanent Site Alternative 1 (California South)	Same as above	Not significant, minor long-term impacts	Same as above	Not significant, minor long-term impacts
Redstone Arsenal				
Interim Site Alternative 1 (Redstone Gateway, and Buildings 5201 and 5220)	Not significant, negligible short-term impacts	Not significant, negligible long-term impacts; impacts would cease if permanent facility is built and operated at another installation	Not significant, negligible short-term impacts	Not significant, negligible long-term impacts; impacts would cease if permanent facility is built and operated at another installation

Table 4.2-6
Summary of Transportation Impacts

Site Alternative	On-Installation Roads		Off-Installation Roads	
	Short-term Impacts	Long-term Impacts	Short-term Impacts	Long-term Impacts
Interim Site Alternative 2 (Area 2, and Buildings 5201 and 5220)	Same as above	Same as above	Same as above	Same as above
Permanent Site Alternative 1 (Area 5 and Building 5201)	Same as above	Not significant, negligible long-term impacts	Same as above	Not significant, negligible long-term impacts
No Action Alternative	No impacts		No impacts	

4.2.9 Mitigation Measures

No mitigation measures would be required because impacts on transportation resources would not be significant. Although impacts on transportation resources at Vandenberg AFB would not be significant, the Air Force would continue to coordinate with Caltrans related to state highway system requirements and permits.

4.3 HAZARDOUS MATERIALS AND HAZARDOUS WASTE

This section discusses impacts from hazardous materials and hazardous waste and non-hazardous solid waste associated with the Proposed Action and No Action Alternative. Impacts on hazardous materials and hazardous waste from the Proposed Action would be considered significant if:

- An increase in hazardous materials or hazardous waste used, stored, or requiring disposal exceeded the installations' capacity to use, manage, store, or dispose of them; caused the installation to exceed thresholds prescribed by its EPA generator designation; or exceeded the capacity of receiving landfills or recycling facilities.
- It increased the risk of soil or groundwater contamination by hazardous materials; interrupted, delayed, or impeded any ongoing cleanup efforts; or created new or substantial human or environmental health risks.

4.3.1 General

4.3.1.1 Short-term Impacts

In the short term, construction of the proposed interim and permanent USSPACECOM facilities would involve the handling, use, and storage of hazardous materials, and the generation of corresponding quantities of hazardous and non-hazardous solid waste. Hazardous materials anticipated to be used during construction of the proposed facilities would include paints, thinners, solvents, and petroleum-based products (e.g., fuels and lubricants for construction vehicles and equipment). The quantities of hazardous materials used during the facilities' construction phases would be small relative to the quantities of such materials used and stored at the selected installation(s). Construction-related hazardous materials would be handled and used by authorized personnel in accordance with label directions, and would be secured in appropriate cabinets or lockers when not in use. Safety data sheets would be maintained on the construction sites for all hazardous materials in use for the duration of the alternatives' construction phases. Temporary or portable petroleum storage tanks for on-site refueling of construction vehicles and equipment would include all necessary secondary containment and life safety apparatus, and would be operated and maintained in accordance with the selected installation's applicable policies, regulations, and procedures. On-site maintenance of construction vehicles would either be conducted in accordance with the installation's applicable policies and procedures, or would be prohibited altogether. The use and storage of construction-related hazardous materials associated with the Proposed Action would not exceed the installations' capacity to manage them.

For these reasons, short-term impacts from the use, handling, management, and storage of hazardous materials during construction of the proposed interim and permanent USSPACECOM facilities would remain negligible or minor, and would not be significant.

The use of hazardous materials during construction of the proposed interim and permanent facilities would generate corresponding quantities of hazardous wastes. Such wastes could include discarded packaging, soiled rags, batteries, light bulbs, and used oil or other chemicals. These wastes would be segregated from the non-hazardous solid waste stream, and stored on-site in secured containers in accordance with the installation's HWMP. Once on-site storage limits are reached, construction-related hazardous wastes would be transported by licensed contractors to permitted facilities outside the installation for disposal.

Petroleum residues and/or other hazardous byproducts could be present in surface and shallow subsurface materials on proposed interim and permanent site alternatives formerly or currently used for motor vehicle parking. If such a site is selected for implementation of the Proposed Action, sampling

would be conducted prior to implementing construction activities to determine the presence and concentrations of such substances. Concentrations of hazardous substances exceeding applicable regulatory thresholds would be removed from the site and disposed of at permitted facilities outside the selected installation. Clean fill soils suitable to support construction of the proposed facility would be imported to the site to replace any that are excavated to remove contaminants.

Non-hazardous solid waste that would potentially be generated during construction of the proposed facilities would include treated and non-treated lumber, structural and non-structural steel, discarded paper, cardboard, and plastic packaging, concrete and masonry, gypsum board (i.e., drywall), and similar types of common non-hazardous construction materials. To the extent possible, recyclable materials would be segregated from the non-recyclable waste stream in accordance with applicable Air Force and/or installation policies. All non-hazardous solid wastes would be stored on-site in secured containers, and periodically transported by licensed contractors to permitted facilities outside the installation for recycling or disposal.

In the context of non-hazardous solid wastes generated on a daily basis from the routine operation of existing facilities and ongoing construction and demolition activities at the selected installation(s), short-term impacts from the Proposed Action would remain negligible or minor, and would not be significant.

The use of hazardous materials and the generation of hazardous and non-hazardous solid waste during construction of the proposed interim and permanent facilities would cease on their completion, and would therefore be temporary, further ensuring that impacts would not be significant.

4.3.1.2 Long-term Impacts

Routine operation and periodic maintenance of the proposed interim and permanent USSPACECOM facilities would involve the use of hazardous materials, and generate corresponding quantities of hazardous and non-hazardous solid wastes. Hazardous materials associated with the operation and maintenance of the proposed facilities could include solvents, paints, thinners, cleaning products, pesticides/herbicides, and petroleum-based products such as fuels and lubricants. All such materials would be stored in secured lockers or cabinets when not in use, and would be used by authorized personnel in accordance with label directions. Safety data sheets would be maintained in a centralized, accessible location for all hazardous materials stored and used at the proposed facilities.

Fuel tanks for emergency generators associated with the proposed interim and permanent facilities would include all necessary secondary containment, fire, and life safety equipment. Any such tanks would be installed, operated, and maintained in accordance with applicable federal, state, Air Force, and DoD regulatory requirements. If the emergency generators are determined to be no longer needed (such as when the interim facilities are vacated on completion of the proposed permanent facility), any associated fuel tanks would be removed from the site, and regulatory closure would be obtained from applicable federal or state regulatory agencies.

Hazardous wastes generated by the use of hazardous materials during operational and maintenance activities would be transported by authorized personnel to the installation's centralized accumulation point; stored and managed in accordance with the installation's HWMP; and transported by licensed contractors to permitted facilities outside the installation for disposal. Non-hazardous solid waste would be collected in appropriate bins throughout the facility; segregated for recycling as appropriate, and in accordance with applicable Air Force and installation recycling policies; collected by licensed contractors; and disposed of at permitted facilities outside the installation.

Generally, quantities of hazardous materials used, and hazardous and non-hazardous solid wastes generated at the proposed facilities would be similar and proportionate to other facilities of similar function and scale on the selected installation(s), and would remain small relative to the total quantities of such materials and wastes used, generated, and disposed of at the selected installation(s). The use and generation of such materials and wastes, respectively, would not exceed the installations' capacity to use, manage, store, or dispose of them; cause the installation to exceed thresholds prescribed by its EPA generator designation; or exceed the capacity of receiving landfills or recycling facilities outside the installation. Neither the construction nor operation of the proposed facilities would inhibit or prevent the completion of ongoing remediation activities occurring on sites adjacent to or near the proposed interim and permanent site alternatives.

Therefore, long-term impacts from hazardous materials and hazardous and non-hazardous solid wastes during the operation of the proposed interim and permanent USSPACECOM facilities would be negligible, and would not be significant.

4.3.2 Buckley AFB

4.3.2.1 Interim Site Alternative 1 (West End District)

Construction and operation of the proposed interim USSPACECOM facility at Interim Site Alternative 1 (West End District) and Buckley AFB would have no short-term or long-term impacts from hazardous materials, hazardous wastes, and non-hazardous solid waste beyond those described in **Section 4.3.1**. Therefore, short-term and long-term impacts from hazardous materials, hazardous wastes, and non-hazardous solid wastes would be negligible or minor, and would not be significant.

4.3.2.2 Permanent Site Alternative 1 (North Corner Site 1)

Due to the historic land use of the site, there is a potential for lead contamination in the soil as a result of the former skeet range that may present an environmental risk. Remediation of lead contamination in soils underlying the site would be completed prior to implementation of this alternative, if selected. The removal of lead in soils on the site would represent a beneficial effect on hazardous waste management at Buckley AFB.

Other impacts from hazardous materials, hazardous wastes, and non-hazardous solid waste would be similar to those described in **Section 4.3.1**. Therefore, short-term and long-term impacts from hazardous materials, hazardous wastes, and non-hazardous solid waste resulting from this alternative would be negligible or minor, and would not be significant. The removal of lead in soils on the site would represent a beneficial effect on hazardous waste management at the installation.

4.3.2.3 Permanent Site Alternative 2 (North Corner Site 2)

Due to the historic land use of the site, there is a potential for lead contamination in the soil as a result of the former skeet range, and the potential for ACM and LBP in existing structures that would be demolished. Remediation of lead in soils underlying the site and identification and removal of suspected ACM and LBP in existing structures on the site would be completed prior to implementation of the alternative, if selected. ACM and/or LBP removed from the structures would be transported by licensed contractors to permitted facilities outside the installation for disposal.

Other impacts from hazardous materials, hazardous wastes, and non-hazardous solid waste would be similar to those described in **Section 4.3.1**. Therefore, short-term and long-term impacts from hazardous materials, hazardous wastes, and non-hazardous solid waste resulting from this alternative would be

negligible or minor, and would not be significant. The removal of lead in soils on the site would represent a beneficial effect on hazardous waste management at Buckley AFB.

4.3.3 Peterson AFB

4.3.3.1 Interim Site Alternative 1 (Command Complex and Leased Off-base Office Space) and Permanent Site Alternative 1 (Command Complex)

Impacts from hazardous materials, hazardous wastes, and non-hazardous solid waste resulting from implementation of the proposed interim or permanent alternatives at Peterson AFB, if selected, would be similar to those described in **Section 4.3.1**. Prior to construction, soils underlying existing parking lots that would be disturbed during construction of the proposed permanent facility and associated parking garages would be sampled for petroleum constituents, and/or other substances associated with those areas' use as motor vehicle parking. Soils containing concentrations of such substances exceeding applicable regulatory thresholds would be replaced with clean soils, in accordance with federal, state, local, and Air Force requirements, prior to constructing the proposed facilities. Removal of contaminated soils on the site would represent a beneficial impact on hazardous waste management at Peterson AFB.

Therefore, short-term and long-term impacts from hazardous materials, hazardous wastes, and non-hazardous solid wastes would be negligible or minor, and would not be significant.

4.3.4 Schriever AFB

4.3.4.1 Interim Site Alternative 1 (Inside RA / West Side of RA/ Leased Off-base Office Space), Interim Site Alternative 2 (Outside RA / North of Building 24 / Leased Off-base Office Space), Permanent Site Alternative 1 (Inside RA) (West Side of RA), and Permanent Site Alternative 2 (Outside RA) (Northwest of Building 24)

Short-term or long-term impacts from hazardous materials, hazardous wastes, and non-hazardous solid waste during the construction and operation of either the interim or permanent site alternatives at Schriever AFB, if selected for implementation, would be similar to those described in **Section 4.3.1**. Therefore, short-term and long-term impacts from such materials and wastes would be negligible or minor, and would not be significant.

4.3.5 Vandenberg AFB

4.3.5.1 Interim Site Alternative 1 (Buildings 6523, 7525, and 10577)

Identification and removal of suspected ACM and LBP in all existing structures on the site would be completed prior to implementation of the alternative, if selected. If present, ACM and/or LBP would be removed from the structures prior to the proposed renovations and would be transported by licensed contractors to permitted facilities outside the installation for disposal. This would have a beneficial impact on hazardous waste management at Vandenberg AFB.

Other impacts from hazardous materials, hazardous wastes, and non-hazardous solid waste would be similar to those described in **Section 4.3.1**. Therefore, short-term and long-term impacts from hazardous materials, hazardous wastes, and non-hazardous solid waste resulting from this alternative would be negligible or minor, and would not be significant.

4.3.5.2 Permanent Site Alternative 1 (California South)

Impacts from hazardous materials, hazardous wastes, and non-hazardous solid waste resulting from implementation of the proposed permanent alternative at Vandenberg AFB, if selected, would be similar to those described in **Section 4.3.1**. Prior to construction, soils underlying existing parking lots that would be disturbed during construction of the proposed permanent facility would be sampled for petroleum constituents, and/or other substances associated with that area's use as motor vehicle parking. Soils containing concentrations of such substances exceeding applicable regulatory thresholds would be replaced with clean soils, in accordance with federal, state, local, and Air Force requirements, prior to constructing the proposed facilities. Similarly, prior to demolition of the existing modular office facility, suspected ACM and/or LBP would be identified; and if warranted, removed by licensed contractors and transported to a permitted facility outside the installation for disposal. Removal of these substances, if present, would represent a beneficial impact on hazardous waste management at Vandenberg AFB.

4.3.6 Redstone Arsenal

4.3.6.1 Interim Site Alternative 1 (Redstone Gateway, and Buildings 5201 and 5220)

No impacts from hazardous materials, hazardous waste, or solid waste were identified in NEPA documentation prepared for development of the Redstone Gateway complex (USACE, 2008).

ACM and LBP are unlikely to be present at Buildings 5201 and 5220, considering their relatively recent date of construction; therefore, there would be no impacts from those substances if Interim Site Alternative 1 is selected for implementation. Other impacts from hazardous materials, hazardous wastes, and non-hazardous solid waste would be similar to those described in **Section 4.3.1**. Therefore, short-term and long-term impacts from hazardous materials, hazardous wastes, and non-hazardous solid waste resulting from this alternative would be negligible or minor, and would not be significant.

4.3.6.2 Interim Site Alternative 2 (Area 2, and Buildings 5201 and 5220)

Impacts from hazardous materials, hazardous wastes, and non-hazardous solid waste resulting from the placement and operation of modular facilities on Area 2, if this alternative is selected, would be similar to those described in **Section 4.3.1**. Groundwater installation-wide land use controls would apply to construction activities that may come in contact with site groundwater. Impacts from the use of Buildings 5201 and 5220 would be the same as those described above. Therefore, short-term and long-term impacts from hazardous materials, hazardous wastes, and non-hazardous solid waste resulting from this alternative would be negligible and minor, and would not be significant.

4.3.6.3 Permanent Site Alternative 1 (Area 5 and Building 5201)

There would be no short-term or long-term impacts from hazardous materials and hazardous and non-hazardous solid waste from implementation of the Proposed Action on Permanent Site Alternative 1 at Redstone Arsenal beyond those discussed in **Section 4.3.1** or impacts associated with site groundwater discussed in **Section 4.3.6.2**. Impacts would be negligible or minor, and would not be significant.

4.3.7 No Action Alternative

Under the No Action Alternative, neither the interim nor permanent USSPACECOM Headquarters facilities would be built and operated. This would have no adverse effects from hazardous materials, hazardous waste, and non-hazardous solid waste at the DoD installations being considered. These

substances would continue to be used, generated, and managed at the candidate installations as they currently are. The affected environment described in **Section 3.3** would continue to be influenced by ambient environmental conditions and other ongoing development projects on the candidate installations.

Beneficial impacts resulting from the removal of suspected ACM and LBP in some existing structures and/or petroleum constituents in soils underlying some of the site alternatives under the Proposed Action would not be realized, and these substances would continue to be managed by the respective installations as they currently are.

4.3.8 Impact Summary

Impacts on hazardous material, hazardous waste, and non-hazardous solid waste from the Proposed Action and No Action Alternative are summarized in **Table 4.3-1**.

Table 4.3-1
Summary of Hazardous Material, Hazardous Waste, and Non-Hazardous Solid Waste Impacts by Installation and Site Alternatives

Alternative	Hazardous Materials	Hazardous Waste	ACM and LBP	ERP, CRP, MMRP Sites
Buckley AFB				
Interim Site Alternative 1 (West End District)	Not significant; negligible or minor short-term and long-term impacts	Not significant; negligible or minor short-term and long-term impacts	Not significant; negligible or minor short-term and long-term impacts	Not significant; negligible or minor short-term and long-term impacts
Permanent Site Alternative 1 (North Corner Site 1)	Same as above	Not significant; negligible or minor short-term and long-term impacts, some beneficial impacts	Same as above	Same as above
Permanent Site Alternative 2 (North Corner Site 2)	Same as above	Not significant; negligible or minor short-term and long-term impacts, some beneficial impacts	Same as above	Same as above
Peterson AFB				
Interim Site Alternative 1 (Command Complex)	Not significant; negligible or minor short-term and long-term impacts	Not significant; negligible or minor short-term and long-term impacts	Not significant; negligible or minor short-term and long-term impacts	No impacts
Permanent Site Alternative 1 (Command Complex)	Same as above	Not significant; negligible or minor short-term and long-term impacts, some beneficial impacts	Same as above	Same as above

Table 4.3-1
Summary of Hazardous Material, Hazardous Waste, and Non-Hazardous Solid Waste Impacts by Installation and Site Alternatives

Alternative	Hazardous Materials	Hazardous Waste	ACM and LBP	ERP, CRP, MMRP Sites
Schriever AFB				
Interim Site Alternative 1 (Inside RA) (West Side of RA)	Not significant; negligible or minor short-term and long-term impacts	Not significant; negligible or minor short-term and long-term impacts	Not significant; negligible or minor short-term and long-term impacts	No impacts
Interim Site Alternative 2 (Outside RA) (North of Building 24)	Same as above	Same as above	Same as above	Same as above
Permanent Site Alternative 1 (Inside RA) (West Side of RA)	Same as above	Same as above	Same as above	Same as above
Permanent Site 2 (Outside RA) (Northwest of Building 24)	Same as above	Same as above	Same as above	Same as above
Vandenberg AFB				
Interim Site Alternative 1 (Buildings 6523, 7525, and 10577)	Not significant; negligible or minor short-term and long-term impacts	Not significant; negligible or minor short-term and long-term impacts	Not significant; negligible or minor short-term and long-term impacts, some beneficial impacts	No impacts
Permanent Site Alternative 1 (California South)	Same as above	Same as above	Same as above	Same as above
Redstone Arsenal				
Interim Site Alternative 1 (Redstone Gateway, and Buildings 5201 and 5220)	Not significant; negligible or minor short-term and long-term impacts	Not significant; negligible or minor short-term and long-term impacts	No impacts	No impacts
Interim Site Alternative 2 (Area 2, and Buildings 5201 and 5220)	Same as above	Same as above	Same as above	Same as above
Permanent Site Alternative 1 (Area 5 and Building 5201)	Same as above	Same as above	Same as above	Same as above
No Action	No impacts	No impacts	No impacts	No impacts

4.3.9 Mitigation Measures

No mitigation measures would be required because impacts from hazardous materials and hazardous waste would not be significant. Although impacts from hazardous materials and hazardous waste would not be significant, potential impacts associated with groundwater at Redstone Arsenal would be further reduced through implementation of applicable groundwater installation-wide land use controls.

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4.4 SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE

The potential effects of the Proposed Action on socioeconomics and environmental justice within the ROI are presented in this section. Socioeconomic and environmental justice impacts were evaluated in two distinct ways: (1) short-term impacts from construction of the Proposed Action; and (2) long-term impacts from the continued staffing and operations of the Proposed Action once constructed. Adverse impacts could include human health or environmental impacts (e.g., air, noise or water pollution), and interrelated socioeconomic effects (e.g., employment, displacement of persons or businesses, public service provision).

Socioeconomic impacts from the Proposed Action would be considered significant if:

- The location and distribution of the local population was substantially altered;
- The population would exceed historic growth rates;
- The number of jobs decreased resulting in a substantial rise in regional unemployment rates, or reduced income generation; and/or
- Local housing markets or vacancy rates were substantially affected, or if the need for new social services and support facilities substantially increased.

Environmental justice impacts would be considered significant if the Proposed Action disproportionately impacts a low-income, minority, and/or youth population.

4.4.1 Short-term Socioeconomic and Environmental Justice Impacts

Implementation of the Proposed Action would be expected to have a short-term positive socioeconomic impact for all the alternative sites. The adjacent jurisdictions would secure a positive socioeconomic impact if local contractors are hired to construct the interim or permanent facilities associated with the Proposed Action. If workers from outside the region are used to implement the Proposed Action, positive socioeconomic impacts also would be expected, with direct benefits to accommodation, food, retail, and other industries, in addition to local fiscal benefits from associated sales tax revenues. If the contractor(s) is sourced from outside of the defined ROI, sufficient local lodging accommodations exist to accommodate these workers throughout the proposed construction stages; this is estimated as a maximum of 50 to 60 workers for the most personnel-intensive phase of construction, which would last for approximately 1 year.

Implementation of the Proposed Action would not result in significant or high and adverse short-term environmental justice impacts in the defined ROIs of the proposed candidate sites. Potential environmental justice impacts evaluated in this EA would occur primarily on site (air quality impacts are regional); off-base minority, low-income, and youth populations would not be affected.

4.4.2 Long-term Socioeconomic and Environmental Justice Impacts

Implementation of the Proposed Action would not result in significant long-term socioeconomic impacts for any of the proposed candidate sites, apart from Vandenberg AFB. The nearest sizable municipality, as defined in the ROI in **Table 3.4-1**, for Buckley AFB, Peterson AFB, Schriever AFB, and Redstone Arsenal have an existing supply of housing, schools, and other public and private services to meet the needs of the assumed 1,870 personnel after the construction is completed for the Proposed Action. This finding was made with the conservative assumption that all personnel would be new to the region.

Lompoc and Santa Maria are the nearest sizable municipalities to Vandenberg AFB. Combined, these cities had a total of 1,835 vacant housing units in 2017 (U.S. Census Bureau, 2017b). Additionally, there are a limited number of vacant on-base housing units at Vandenberg AFB. As of 2018, Vandenberg AFB had 999 homes, of which 132 homes were vacant (USAF, 2019a). Applying the same assumption that all personnel would be new to the region, the current housing supply and associated public and private services would not be able to meet the demands of the new population required for the Proposed Action without resulting in significant long-term socioeconomic and environmental justice impacts.

In addition to new population resulting from the Proposed Action, the cities of Lompoc and Santa Maria are forecasted to add 4,100 new households between 2020 and 2025 (Santa Barbara County Association of Governments, 2019). Although these cities have new residential building projects in the development pipeline, it is unlikely that the rate of development will keep pace with forecasted population and household growth even without considering the added personnel for the Proposed Action at Vandenberg AFB. Although it may be feasible for personnel to live in other jurisdictions in northern Santa Barbara County or southern San Luis Obispo County, these communities also face constraints in housing supply.

Nearly 20 percent of the population in Lompoc and Santa Maria lived below the poverty line in 2017 (U.S. Census Bureau, 2017d), and upwards of 60 percent of households that rent spend 30 percent or more of their income on rent (U.S. Census Bureau, 2017b). There are no defined significance thresholds for determining when an individual or population would face a significant housing impact. However, any sizeable increase in demand for housing that is not closely matched by an increase in supply would be expected to result in an increase in housing and rental prices. Low-income populations, which have less discretionary income compared to high-income populations, would face disproportionate impacts if there is increased competition for housing.

Potentially significant and/or disproportionately adverse effects on low-income and environmental justice communities from the Proposed Action in the vicinity of Vandenberg AFB would have no interrelated physical environmental effects. Therefore, these significant and/or disproportionately adverse effects would not, in and of themselves, require the preparation of an Environmental Impact Statement as stated in the CEQ regulations at 40 CFR 1508.14.

4.4.3 No Action Alternative

The No Action Alternative would have no impacts on socioeconomic conditions and environmental justice communities near the five candidate installations. The affected environment described in **Section 3.4** would continue to be influenced by ambient environmental conditions and other ongoing development projects on and near the candidate installations.

4.4.4 Impact Summary

Table 4.4-1 provides a summary of short-term socioeconomic and environmental justice impacts; **Table 4.4-2** provides a summary of long-term socioeconomic and environmental justice impacts.

Table 4.4-1
Summary of Socioeconomic and Environmental Justice Short-Term Impacts

Alternative	Socioeconomics	Environmental Justice
Buckley AFB (Interim and Permanent Site Alternatives)	Beneficial socioeconomic impact on the local economy	No significant environmental justice impacts
Peterson AFB (Interim and Permanent Site Alternatives)	Beneficial socioeconomic impact on the local economy	No significant environmental justice impacts

Table 4.4-1
Summary of Socioeconomic and Environmental Justice Short-Term Impacts

Alternative	Socioeconomics	Environmental Justice
Schriever AFB (Interim and Permanent Site Alternatives)	Beneficial socioeconomic impact on the local economy	No significant environmental justice impacts
Vandenberg AFB (Interim and Permanent Site Alternatives)	Beneficial socioeconomic impact on the local economy	No significant environmental justice impacts
Redstone Arsenal (Interim and Permanent Site Alternatives)	Beneficial socioeconomic impact on the local economy	No significant environmental justice impacts
No Action	No impacts	No impacts

Table 4.4-2
Summary of Socioeconomic and Environmental Justice Long-Term Impacts

Candidate Site	Socioeconomics	Environmental Justice
Buckley AFB (Interim and Permanent Site Alternatives)	No significant socioeconomic impact in the ROI	No significant environmental justice impact in the ROI
Peterson AFB (Interim and Permanent Site Alternatives)	No significant socioeconomic impact in the ROI	No significant environmental justice impact in the ROI
Schriever AFB (Interim and Permanent Site Alternatives)	No significant socioeconomic impact in the ROI	No significant environmental justice impact in the ROI
Vandenberg AFB (Interim and Permanent Site Alternatives)	Significant socioeconomic impact in the ROI from insufficient supply of housing and associated public and private services	Significant or high or adverse environmental justice impact from increased housing competition that would disproportionately impact low-income populations
Redstone Arsenal (Interim and Permanent Site Alternatives)	No significant socioeconomic impact in the ROI	No significant environmental justice impact in the ROI
No Action	No impacts	No impacts

4.4.5 Mitigation Measures

To mitigate potentially significant and/or disproportionately adverse effects on low-income and environmental justice communities in the vicinity of Vandenberg AFB from the Proposed Action and ensure such impacts remain less than significant, the Air Force will incorporate one or more of the following measures in the Proposed Action:

- Develop a plan for identifying and tracking locally available housing options that can help to meet the demand associated with new (out of region) personnel assigned to support long term operations of the proposed action;
- Continue to dedicate staff resources to assist new (out of region) personnel in securing housing;
- Work to identify persons currently living in the region to meet some level of the operational staffing needs; and/or
- Collaborate with public (e.g., cities) and private (e.g., developers) entities in the region that have the capacity and desire to develop new housing.

No mitigation measures would be required at the other candidate installations because impacts on socioeconomic conditions and environmental justice communities would not be significant.

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4.5 AIR QUALITY

This section discusses expected air quality impacts from criteria pollutants, HAPs, and GHG emissions from all Alternatives. The air quality impact analysis follows the Air Force Air Quality EIAP Guide (Solutio Environmental, 2017) for criteria pollutants, HAPs, and GHG emissions.

Air quality impact significance is determined by comparing reasonably foreseeable emissions associated with the Proposed Action (and Alternatives) to those associated with a No Action Alternative (i.e., the net emissions associated with the Proposed Action or Alternatives).

Depending on the geographic location of the Proposed Action and Alternatives, and whether or not these locations are designated nonattainment of applicable National Ambient Air Quality Standards (or state standards), the following specific significance criteria are applied:

- If an area is in non-attainment for a pollutant or pollutants, annual net emissions for those non-attainment pollutants are compared against General Conformity significance thresholds (i.e., de minimis thresholds) established by the federal Clean Air Act. Annual net emissions exceeding an applicable de minimis thresholds are considered a significant impact to air quality. Emissions exceeding de minimis thresholds for non-attainment pollutants would require a formal General Conformity Determination per the federal Clean Air Act.
- If an area is attainment for a pollutant or pollutants, the Air Force uses the General Conformity thresholds established by the Clean Air Act as reasonable proxies for NEPA significance (i.e., NEPA Significance Indicators). Annual net emissions exceeding an applicable NEPA Significance Indicator are considered a significant impact to air quality and would require mitigation.

For GHG emissions, there are currently no quantities or thresholds of GHG emissions established by the Air Force that would be considered “significant” relating to impacts to the environment or human health. Instead, net annual GHG emissions are compared between the Proposed Action and Alternatives and the No Action Alternative to establish relative significance.

4.5.1 Criteria Pollutants Impacts

The Proposed Action would involve operation of construction equipment and vehicles because of construction activities outlined in **Sections 2.1.2** and **2.3**. For the purposes of the air quality analysis, it was assumed that construction activities (e.g., footprint size, size of pavement laydown, length of access roads) would be the same at all DoD installations, except for Peterson AFB. Although, as discussed in **Section 2.3**, there are differences in these activities at each DoD installations, it is expected that the emissions differences would be minor. Because there would be two parking structures at Peterson AFB, the construction emissions are calculated separately. Once construction is complete, operation activities would occur. As discussed in **Section 2.1.3**, the building size and workforce would be same for all alternatives.

The Proposed Action emission from the construction and operations of new USSPACECOM building are calculated using the Air Conformity Applicability Model, Version 5.0.1.4a (ACAM) (see **Appendix E**). ACAM is a simplified emission model that is adequate for a General Conformity Applicability Assessment and cursory NEPA assessment for air quality. The emissions from the construction and operations phase of the Proposed Action are “netted” on an annual basis. Emissions added by the Proposed Action increase the total net emissions, while emissions removed by the Proposed Action reduce the total net emissions. For this project, all activities are increasing the total net emissions. Therefore, potential air quality impacts are expected to result from the anticipated increase in construction and operations emissions. The conformity analysis must consider the greatest annual emissions associated with the

Proposed Action. Because emissions from the Proposed Action can vary from year to year depending on activity, the greatest annual net change in emissions for each pollutant forms the basis of the analysis. The individual pollutant worst-case emission value may occur in a different project year. The annual emissions during construction phase of the project for all alternatives are presented in **Tables 4.5-1** through **4.5-5**.

In addition to the worst-case estimated net-change emissions, the steady-state emissions are presented in **Table 4.5-6**. Steady-state is reached when the Proposed Action is fully implemented and there is no increase or decrease in emissions from the previous year.

4.5.1.1 Buckley AFB

Buckley AFB is in Arapahoe County, Colorado. Arapahoe County is in a maintenance area for CO and PM_{10}, and a marginal nonattainment area for ozone (USAF, 2019b). The county is considered in attainment for all other criteria pollutants. Because of the nonattainment and maintenance status, the following *de minimis* criteria apply to project alternatives assessed on or near Buckley AFB: 100 tpy of PM_{10},100 tpy of CO, 50 tpy of VOC, and 100 tpy of NOx (Solutio Environmental, 2017).

As presented in **Tables 4.5-1** through **4.5-6**, the worst-case estimated net-change emissions for Buckley AFB would be well below the applicable *de minimis* threshold, and a formal general conformity determination is not required.

Unlike the nonattainment or maintenance criteria pollutants, the *de minimis* levels have not been established for attainment criteria pollutants. However, as outlined in the EIAP Guide, the general conformity thresholds (i.e., the *de minimis* thresholds) are used as significance indicators for air quality. General Conformity *de minimis* threshold values are the maximum net change an action can acceptably emit in nonattainment and maintenance areas. These threshold values also would be a conservative indicator that an action's emissions within an attainment area also would be acceptable. In other words, if the threshold is acceptable in nonattainment areas, it also will be acceptable in attainment areas. For the Buckley AFB Proposed Alterative, all attainment criteria pollutants are below the significance indicators presented in **Tables 4.5-1** through **4.5-6**. Therefore, the potential air quality impact from all criteria pollutants is not significant.

4.5.1.2 Peterson AFB

Peterson AFB is in El Paso County, Colorado. A portion of El Paso County, including Peterson AFB, is in a maintenance area for CO (USAF, 2019b). All other criteria pollutants are in attainment. Therefore, the following *de minimis* criterion applies to this area: 100 tpy of CO (Solutio Environmental, 2017).

As presented in **Tables 4.5-1** through **4.5-6**, the worst-case estimated net-change emissions for Peterson AFB would be well below the applicable *de minimis* threshold, and a formal general conformity determination is not required.

As discussed in **Section 4.5.1.1**, the *de minimis* levels have not been established for attainment criteria pollutants. However, based on the EIAP Guide, the general conformity *de minimis* thresholds are used as a significance indicator for air quality. As presented in **Tables 4.5-1** through **4.5-6** the for Peterson AFB proposed alternative, all attainment criteria pollutants are below the significance indicators. Therefore, the potential air quality impact from all criteria pollutants is not significant.

Table 4.5-1
Year 2019 Net Change Emissions Analysis

Pollutant	Proposed Alternatives (tons)					No Action (tons)	Worst-Case Emissions (tons)	Conformity Significance Threshold (ton/yr)			NEPA Significance Indicator (tons/yr)
	Buckley AFB	Peterson AFB	Schriever AFB	Vandenberg AFB	Redstone Arsenal			Buckley AFB	Peterson & Schriever AFB	Vandenberg AFB & Redstone Arsenal	
VOCs	0.5	0.5	0.5	0.4	0.6	0	0.6	50	--	--	100
NO_x	1.7	1.7	1.7	1.5	1.7	0	1.7	100	--	--	100
CO	5.0	5.0	5.0	2.8	5.2	0	5.2	100	100	--	100
SO_2	0.0	0.0	0.0	0.0	0.0	0	0.0	--	--	--	100
PM_{10}	6.1	6.1	6.1	6.1	6.1	0	6.1	100	--	--	100
$PM_{2.5}$	0.1	0.1	0.1	0.1	0.1	0	0.1	--	--	--	100
NH_3	0.0	0.0	0.0	0.0	0.0	0	0.0	--	--	--	100

Notes:

Conformity significance thresholds are applied only for pollutants for which an area is non-attainment per the Clean Air Act. NEPA significance indicators are used for attainment pollutants in each area, per USAF EIAP guidelines.

Sources: ACAM, 2019; Solutio Environmental, 2017.

Table 4.5-2
Year 2020 Net Change Emissions Analysis

Pollutant	Proposed Alternatives (tons)					No Action (tons)	Worst-Case Emissions (tons)	Conformity Significance Threshold (ton/yr)			NEPA Significance Indicator (tons/yr)
	Buckley AFB	Peterson AFB	Schriever AFB	Vandenberg AFB	Redstone Arsenal			Buckley AFB	Peterson & Schriever AFB	Vandenberg AFB & Redstone Arsenal	
VOCs	4.5	4.5	4.5	3.5	4.6	0	4.6	50	--	--	100
NO_x	5.0	5.0	5.0	2.7	5.1	0	5.1	100	--	--	100
CO	49.3	49.3	49.3	23.5	51.2	0	51.2	100	100	--	100
SO_2	0.0	0.0	0.0	0.0	0.0	0	0.0	--	--	--	100
PM_{10}	0.2	0.2	0.2	0.6	0.2	0	0.6	100	--	--	100
$PM_{2.5}$	0.2	0.2	0.2	0.3	0.2	0	0.3	--	--	--	100
NH_3	0.3	0.3	0.3	0.3	0.3	0	0.3	--	--	--	100

Notes:

Conformity significance thresholds are applied only for pollutants for which an area is non-attainment per the Clean Air Act. NEPA significance indicators are used for attainment pollutants in each area, per USAF EIAP guidelines.

Sources: ACAM, 2019; Solutio Environmental, 2017.

Table 4.5-3
Year 2021 Net Change Emissions Analysis

Pollutant	Proposed Alternatives (tons)					No Action (tons)	Worst Case Emissions (tons)	Conformity Significance Threshold (ton/yr)			NEPA Significance Indicator (tons/yr)
	Buckley AFB	Peterson AFB	Schriever AFB	Vandenberg AFB	Redstone Arsenal			Buckley AFB	Peterson & Schriever AFB	Vandenberg AFB & Redstone Arsenal	
VOC	5.9	5.9	5.9	4.6	6.0	0	6.0	50	--	--	100
NO_x	14.9	15.5	14.9	12.4	14.6	0	14.6	100	--	--	100
CO	56.8	57.1	56.8	30.3	58.6	0	58.6	100	100	--	100
SO_2	0.1	0.1	0.1	0.1	0.1	0	0.1	--	--	--	100
PM_{10}	53.3	21.4	53.3	53.8	53.3	0	53.3	100	--	--	100
$PM_{2.5}$	0.5	0.6	0.5	0.6	0.5	0	0.5	--	--	--	100
NH_3	0.3	0.3	0.3	0.3	0.3	0	0.3	--	--	--	100

Notes:

Conformity significance thresholds are applied only for pollutants for which an area is non-attainment per the Clean Air Act. NEPA significance indicators are used for attainment pollutants in each area, per USAF EIAP guidelines.

Sources: ACAM, 2019; Solutio Environmental, 2017.

Table 4.5-4
Year 2022 Net Change Emissions Analysis

Pollutant	Proposed Alternatives (tons)					No Action (tons)	Worst-Case Emissions (tons)	Conformity Significance Threshold (ton/yr)			NEPA Significance Indicator (tons/yr)
	Buckley AFB	Peterson AFB	Schriever AFB	Vandenberg AFB	Redstone Arsenal			Buckley AFB	Peterson & Schriever AFB	Vandenberg AFB & Redstone Arsenal	
VOCs	4.5	4.5	4.5	3.5	4.6	0	4.6	50	--	--	100
NO_x	5.0	5.0	5.0	2.7	5.1	0	5.1	100	--	--	100
CO	49.3	49.3	49.3	23.5	51.2	0	51.2	100	100	--	100
SO_2	0.0	0.0	0.0	0.0	0.0	0	0.0	--	--	--	100
PM_{10}	0.2	0.2	0.2	0.6	0.2	0	0.6	100	--	--	100
$PM_{2.5}$	0.2	0.2	0.2	0.3	0.2	0	0.3	--	--	--	100
NH_3	0.3	0.3	0.3	0.3	0.3	0	0.3	--	--	--	100

Notes:

Conformity significance thresholds are applied only for pollutants for which an area is non-attainment per the Clean Air Act. NEPA significance indicators are used for attainment pollutants in each area, per USAF EIAP guidelines.

Sources: ACAM, 2019; Solutio Environmental 2017.

Table 4.5-5
Year 2023 Net Change Emissions Analysis

Pollutant	Proposed Alternatives (tons)					No Action (tons)	Worst-Case Emissions (tons)	Conformity Significance Threshold (ton/yr)			NEPA Significance Indicator (tons/yr)
	Buckley AFB	Peterson AFB	Schriever AFB	Vandenberg AFB	Redstone Arsenal			Buckley AFB	Peterson & Schriever AFB	Vandenberg AFB & Redstone Arsenal	
VOCs	4.6	4.5	4.6	3.5	4.7	0	4.7	50	--	--	100
NO_x	5.2	5.0	5.2	2.9	5.3	0	5.3	100	--	--	100
CO	49.5	49.4	49.5	23.7	51.4	0	51.4	100	100	--	100
SO_2	0.0	0.0	0.0	0.0	0.0	0	0.0	--	--	--	100
PM_{10}	0.2	0.2	0.2	0.6	0.2	0	0.6	100	--	--	100
$PM_{2.5}$	0.2	0.2	0.2	0.3	0.2	0	0.3	--	--	--	100
NH_3	0.3	0.3	0.3	0.3	0.3	0	0.3	--	--	--	100

Notes:

Conformity significance thresholds are applied only for pollutants for which an area is non-attainment per the Clean Air Act. NEPA significance indicators are used for attainment pollutants in each area, per USAF EIAP guidelines.

Sources: ACAM, 2019; Solutio Environmental, 2017.

Table 4.5-6
Year 2024 Net Change Emissions Analysis

Pollutant	Proposed Alternatives (tons)					No Action (tons)	Worst-Case Emissions (tons)	Conformity Significance Threshold (ton/yr)			NEPA Significance Indicator (tons/yr)
	Buckley AFB	Peterson AFB	Schriever AFB	Vandenberg AFB	Redstone Arsenal			Buckley AFB	Peterson & Schriever AFB	Vandenberg AFB & Redstone Arsenal	
VOCs	4.5	4.5	4.5	3.5	4.7	0	4.7	50	--	--	100
NO_x	5.5	5.5	5.5	3.2	5.8	0	5.8	100	--	--	100
CO	49.8	49.8	49.8	23.9	51.7	0	51.7	100	100	--	100
SO_2	0.0	0.0	0.0	0.1	0.0	0	0.1	--	--	--	100
PM_{10}	0.2	0.2	0.2	0.6	0.2	0	0.6	100	--	--	100
$PM_{2.5}$	0.2	0.2	0.2	0.3	0.2	0	0.3	--	--	--	100
NH_3	0.3	0.3	0.3	0.3	0.3	0	0.3	--	--	--	100

Notes:

Conformity significance thresholds are applied only for pollutants for which an area is non-attainment per the Clean Air Act. NEPA significance indicators are used for attainment pollutants in each area, per USAF EIAP guidelines.

Sources: ACAM, 2019; Solutio Environmental, 2017.

Table 4.5-7
Steady State Emissions Analysis

Pollutant	Proposed Alternatives (tons)					No Action (tons)	Worst Case Emissions (tons)	Conformity Significance Threshold (ton/yr)			NEPA Significance Indicator (tons/yr)
	Buckley AFB	Peterson AFB	Schriever AFB	Vandenberg AFB	Redstone Arsenal			Buckley AFB	Peterson & Schriever AFB	Vandenberg AFB & Redstone Arsenal	
VOC	4.6	4.6	4.6	3.5	4.7	0	4.7	50	--	--	100
NO_x	6.1	6.1	6.1	3.8	6.5	0	6.5	100	--	--	100
CO	50.2	50.2	50.2	24.4	52.3	0	52.3	100	100	--	100
SO_2	0.0	0.0	0.0	0.1	0.0	0	0.1	--	--	--	100
PM_{10}	0.3	0.3	0.3	0.7	0.3	0	0.7	100	--	--	100
$PM_{2.5}$	0.3	0.3	0.3	0.4	0.3	0	0.4	--	--	--	100
NH_3	0.3	0.3	0.3	0.3	0.3	0	0.3	--	--	--	100

Notes:

Conformity significance thresholds are applied only for pollutants for which an area is non-attainment per the Clean Air Act. NEPA significance indicators are used for attainment pollutants in each area, per USAF EIAP guidelines.

Sources: ACAM, 2019; Solutio Environmental, 2017.

4.5.1.3 Schriever AFB

Schriever AFB is in El Paso County, Colorado. A portion of El Paso County, including Schriever AFB, is in a maintenance area for CO (USAF, 2019b). All other criteria pollutants are in attainment. Therefore, the following *de minimis* criterion applies to this area: 100 tpy of CO (Solutio Environmental, 2017).

As presented in **Tables 4.5-1** through **4.5-6**, the worst-case estimated net-change emissions for Schriever AFB would be well below the applicable *de minimis* threshold, and a formal general conformity determination is not required.

As discussed in **Section 4.5.1.1**, the *de minimis* levels have not been established for attainment criteria pollutants. However, based on the EIAP Guide, the general conformity *de minimis* thresholds are used as a significance indicator for air quality. As presented in **Tables 4.5-1** through **4.5-6** for the Schriever AFB proposed alternative, all attainment criteria pollutants are below the significance indicators. Therefore, the potential air quality impact from all criteria pollutants is not significant.

4.5.1.4 Vandenberg AFB

Vandenberg AFB is in Santa Barbara County, California. As stated in **Section 3.5.3.4**, the county is in federal attainment for all criteria pollutants. Therefore, a general conformity is not applicable and a conformity analysis is not required. As discussed in **Section 4.5.4.1**, the *de minimis* levels have not been established for attainment criteria pollutants. However, based on the EIAP Guide, the general conformity *de minimis* thresholds are used as a general indicator for air quality. As presented in **Tables 4.5-1** through **4.5-6** for Vandenberg AFB proposed alternative, all attainment criteria pollutants are below the significance indicators. Therefore, the potential air quality impact is **not significant**. Note that total emissions for Vandenberg are lower than other proposed alternatives due to lower emission factors utilized by ACAM. California has more strict air quality emission standards than the other locations; therefore, calculated emission totals are less.

Therefore, the potential air quality impact from all criteria pollutants is not significant.

4.5.1.5 Redstone Arsenal

Redstone Arsenal is in Madison County, Alabama. As stated in **Section 3.5.3.5**, the county is in attainment for all criteria pollutants. Therefore, a general conformity is not applicable and a conformity analysis is not required. As discussed in **Section 4.5.1.1**, the *de minimis* levels have not been established for attainment criteria pollutants. However, based on the EIAP Guide, the general conformity *de minimis* thresholds are used as a significance indicator for air quality. As presented in **Tables 4.5-1** through **4.5-5** for Redstone Arsenal proposed alternative, all attainment criteria pollutants are below the significance indicators. Therefore, the potential air quality impact from all criteria pollutants is not significant.

4.5.2 No Action Alternative

Under the No Action Alternative, the USSPACECOM buildings would not be constructed at the DoD installations, and there would be no potential for future expansion at the DoD installations. Therefore, no significant impacts to air quality are anticipated. The affected environment described in **Section 3.5** would continue to be influenced by ambient environmental conditions and other ongoing development projects on and near the candidate installations.

4.5.3 Hazardous Pollutant Emissions

Like the attainment criteria pollutants, the *de minimis* levels have not been established for HAPs emissions. For the significance of the HAPs emissions to be evaluated, the HAPs emissions of each alternative are qualitatively compared. This approach is consistent with the EIAP Guide significance evaluation for GHG emissions. For this project, the No Action Alternative has the lowest HAPs emissions, because there would not be any emissions. It is expected that the proposed action alternatives would have very similar levels of HAPs emissions, because the level of construction activities and workforce would be same for all alternatives.

4.5.4 Climate Change and Greenhouse Gas Emissions

Per the EIAP Guide, the annual GHG emissions of each alternative are compared against each other in a relative comparison analysis to establish relative significance. Each alternative's worst-case and steady-state emissions are ranked highest and lowest relative to each other. For this project, the No Action Alternative has the lowest GHG emissions, because there would not be any emissions. A comparison of the alternative GHG emissions is presented in **Table 4.5-8.**

The current and anticipated climate change effects for each DoD installation are discussed **Section 3.5**. Outdoor temperatures are expected to increase at all DoD installations, which would likely require air conditioning usage to increase. In addition, precipitation extremes (e.g., heavier rain in shorter time, longer droughts) are likely at most DoD installations. The DoD installations would have to adjust to these precipitation changes. For example, the DoD installations may need to conserve water during droughts and save extra water during high precipitation times. Rises in sea level are expected to effect Vandenberg AFB. However, because the headquarters is not expected to be near the coast, the effects to the project should be minimal.

All alternatives, except the No Action Alternative, would contribute to climate change, because each alternative is expected to generate GHG emissions. However, given the magnitude of the GHG emissions, the impact to cumulative global climate change is low.

Table 4.5-8
GHG Emissions Analysis

Action Alternatives	CO_2e (MT)						
	2019	2020	2021	2022	2023	2024	Steady State
Buckley AFB	636	4,653	6,994	4,653	4,687	5,219	5,845
Peterson AFB	636	4,653	7,144	4,653	4,660	5,219	5,845
Schriever AFB	636	4,653	6,994	4,653	4,687	5,219	5,845
Vandenberg AFB	606	4,283	6,642	4,283	4,317	4,849	5,475
Redstone Arsenal	659	4,919	7,272	4,919	4,953	5,636	6,423
Minimum Foreseeable	606	4,283	6,642	4,283	4,317	4,849	5,475
Maximum Foreseeable	659	4,919	7,272	4,919	4,953	5,636	6,423

Sources: ACAM, 2019; Solutio Environmental, 2017.

4.5.5 Impact Summary

Impacts on air quality from the Proposed Action and No Action Alternative are summarized in **Table 4.5-9**.

Table 4.5-9
Summary of Impact Indicators for all Alternatives

Alternatives/Sites	Impact Indicators			
	Significant Criteria Pollutant Air Quality Impacts Expected?	**Impact to Cumulative Greenhouse Gas Emissions and Global Climate Change**	**Likelihood of Cumulative Project Effects**	**Mitigation Measures Required?**
Buckley AFB				
Interim Site Alternative 1 (West End District)	No	Low	Low	No
Permanent Site Alternative 1 (North Corner Site 1)	No	Low	Low	No
Permanent Site Alternative 2 (North Corner Site 2)	No	Low	Low	No
Peterson AFB				
Interim Site Alternative 1 (Command Complex)	No	Low	Low	No
Interim Site Alternative Parking	No	Low	Low	No
Permanent Site Alternative 1 (Command Complex)	No	Low	Low	No
Parking Garage 1	No	Low	Low	No
Parking Garage 2	No	Low	Low	No
Schriever AFB				
Interim Site Alternative 1 (Inside RA) (West Side of RA)	No	Low	Low	No
Interim Site Alternative 2 (Outside RA) (North of Building 24)	No	Low	Low	No
Permanent Site Alternative 1 (Inside RA) (West Side of RA)	No	Low	Low	No
Permanent Site Alternative 2 (Outside RA) (Northwest of Building 24)	No	Low	Low	No
Vandenberg AFB				
Interim Site Alternative 1 (Buildings 6523, 7525, and 10577)	No	Low	Low	No
Permanent Site Alternative 1 (California South)	No	Low	Low	No
Redstone Arsenal				

Table 4.5-9
Summary of Impact Indicators for all Alternatives

Alternatives/Sites	Impact Indicators			
	Significant Criteria Pollutant Air Quality Impacts Expected?	**Impact to Cumulative Greenhouse Gas Emissions and Global Climate Change**	**Likelihood of Cumulative Project Effects**	**Mitigation Measures Required?**
Interim Site Alternative 1 [ELU/Redstone Gateway] (Redstone Gateway, and Buildings 5201 and 5220)	No	Low	Low	No
Interim Site Alternative 2 (Area 2, and Buildings 5201 and 5220)	No	Low	Low	No
Permanent Site Alternative 1 [Formerly Site 5] (Area 5 and Building 5201)	No	Low	Low	No
No Action Alternative				
No Action	No	None	None	No

4.5.6 Mitigation Measures

No mitigation measures would be required because impacts on air quality would not be significant. Although impacts on air quality would not be significant, air quality emissions at Vandenberg AFB would be further reduced through implementation of applicable SBCAPCD rules and regulations, including those related to dust control, and diesel particulate and NOx emission reductions.

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4.6 BIOLOGICAL RESOURCES

Potential impacts on biological resources resulting from the Proposed Action and the No Action Alternative are presented in this section. Impacts on biological resources from the Proposed Action would be considered significant if any of the following were to occur:

- Measurable effects on biological resources that affect the availability or natural recovery of populations and their habitat over the long term;
- Project disturbance causes introduced or accelerated the spread of invasive species;
- Loss of individuals or critical habitat for a federally listed species that affects the species over the short or long-term period; and
- Loss of individuals or habitat for a state listed species that affects the species over the short or long-term period and reduces the population.

Impacts on biological resources that would occur generally, and to varying degrees at the proposed interim and permanent sites and DoD installations being considered, are discussed in **Section 4.6.1.** Installation-specific impact discussions are presented in **Sections 4.6.2** through **4.6.6.** The No Action Alternative is discussed in **Section 4.6.7.** A table summarizing impacts is provided in **Section 4.6.8**.

4.6.1 General

4.6.1.1 Vegetation (Common and Special-Status Species)

Short-term Impacts

To varying degrees, construction activities associated with the proposed interim and permanent facilities would clear vegetation from the selected sites. The extent, intensity, and duration of vegetation clearing would vary during the construction phase of the proposed facilities, and would be dependent on the existing vegetative conditions at the selected sites. Vegetation removed during construction would be limited to that necessary to construct the proposed facilities, install utility connections, and/or improve installation roads to accommodate increased volumes of traffic. Vegetation to be preserved on or near the selected sites would be marked, protected, or clearly indicated prior to beginning construction to prevent removal or damage. Cleared areas of the sites that would remain exposed for extended periods would be temporarily revegetated to minimize soil erosion from wind and water. Vegetation removal and/or replacement would be conducted in accordance with the policies of the selected installation's INRMP and/or other applicable natural resources management documents, including time of year (TOY) restrictions on vegetation removal to minimize or prevent impacts on wildlife and their habitat. Accidental spills of hazardous substances (e.g., petroleum products during refueling of construction equipment) potentially affecting on-site vegetation would be minimized or prevented through contractors' adherence to the installation's SPCC Plan, and by providing access to a spill response and cleanup kit in areas where hazardous substances are used. Contractors would minimize the spread or introduction of invasive or non-native species to the extent practicable by adhering to management practices and procedures specified in each installation's INRMP, and/or other applicable policy documents. Large-scale vegetation clearing and removal on the selected sites would be temporary, because it would cease on the completion of the proposed interim and permanent facilities. Vegetation impacts would be contained entirely within the boundaries of the selected sites and/or utility and transportation corridors where improvements are made to accommodate the proposed facilities.

Special-status plant species potentially occurring on or near the selected interim and permanent facility sites would be identified prior to beginning construction activities. If such species are determined to be

present, contractors would adhere to applicable TOY restrictions and/or incorporate measures into project planning and design, in consultation with federal or state regulatory agencies, to minimize or prevent adverse effects on them.

For these reasons, adverse impacts on common and special-status plant species resulting from construction activities associated with the Proposed Action would be negligible or minor, and would not be significant.

Long-term Impacts

In the long term, areas of the interim and/or permanent sites not built on or otherwise developed would be revegetated or otherwise returned to a permeable condition. Vegetation associated with the proposed facilities would be replanted in accordance with the installation's landscape design guidelines, including using applicable native or adapted species/seed mixes. Long-term operation of the proposed interim and permanent facilities would not involve large-scale vegetation clearing or removal, or disturbance of special-status vegetation species. Rather, operational impacts on vegetation would be limited to periodic, targeted mowing, and trimming of ornamental or landscaping vegetation such as grass, shrubs, and trees.

Therefore, long-term impacts on common and special-status vegetation species from the operation of the Proposed Action would be negligible and would not be significant.

4.6.1.2 Wildlife (Common and Special-Status Species)

Short-term Impacts

Disturbance from construction of the proposed interim and permanent facilities would remove vegetation providing wildlife habitat, and displace common wildlife species occurring on the selected sites. Construction noise and increased human activity also would have the potential to disturb common wildlife species on or near the selected sites, and cause them to leave the area. Mobile wildlife species, such as birds and mammals, would likely relocate to areas of similar habitat near the selected interim and permanent sites, while slower-moving or less-mobile species could be inadvertently destroyed by construction activities. Although disturbance, displacement, or inadvertent destruction of animals by construction activities would be an adverse impact, such impacts would occur at the individual, rather than population or species level; and would not inhibit the continued propagation of common wildlife populations and species. In the context of available habitat on the DoD installations being considered and their surrounding regions, the area of habitat that would be removed during construction of the proposed interim and permanent facilities would be small.

Most native North American birds, their eggs, and nests are protected by the Migratory Bird Treaty Act of 1918, as amended. Impacts to migratory birds could include potential disturbance to breeding individuals during the nesting season, particularly if nests occur within or adjacent to the construction sites. Impacts could potentially include direct loss of eggs or nestlings, indirect displacement from increased noise and human presence in the vicinity of the project, and an incremental reduction in foraging habitat. However, possible impacts to breeding birds would depend on a number of variables, including the species, nest location, topographical shielding, breeding phenology, and type of construction activity. Some species, such as the raptors, may have extended breeding periods and/or be more sensitive to noise disturbance during nesting due to the existing disturbance within the ROI. It is important to note that there are a limited number of trees in the grassland habitats at the Buckley, Peterson, Schriever, and Vandenberg sites, and so breeding sites in trees would be less likely. In contrast, breeding areas in wooded areas are more prevalent at the Redstone Arsenal sites.

To minimize impacts to breeding migratory birds in the event of construction during the breeding season, the Air Force would adhere to applicable avoidance and minimization measures presented in the selected installation's INRMP and/or other natural resources management guidelines. Adherence to these requirements would ensure that impacts on birds are negligible or minor.

Individual animals and their habitats could be impacted by the introduction or encroachment of noxious weeds or invasive species and/or accidental releases of petroleum products during construction (e.g., during refueling of construction equipment). Contractors would adhere to the requirements of the installation's INRMP, SPCC Plan, and other applicable regulations and policy documents to prevent or minimize such impacts.

If implementing the Proposed Action on a site where known individuals or populations of special-status species are present cannot be avoided, the Air Force would adhere to applicable TOY restrictions for habitat clearing; conduct surveys to confirm the presence of special-status species, and implement avoidance, minimization, or relocation measures in consultation with USFWS and/or other federal and state regulatory agencies if habitat clearing must be conducted within the TOY restriction period; and/or implement other measures to minimize or prevent adverse effects on special-status species, in consultation with USFWS and/or other federal and state regulatory agencies. Measures to minimize or prevent adverse effects on special-status species resulting from the Proposed Action also would adhere to requirements of each installation's INRMP and other applicable policy documents.

For these reasons, short-term impacts on common and special-status wildlife species resulting from the Proposed Action would remain negligible or minor and would not be significant.

Long-term Impacts

In the long term, it is anticipated that landscape vegetation planted as part of the proposed interim and permanent facilities would provide small areas of suitable habitat for some common wildlife species, particularly those that have adapted to intensively developed environments and high degrees of human activity. The operation of the proposed interim and permanent USSPACECOM Headquarters facilities would not involve disturbance of common or special-status wildlife species including migratory birds. Therefore, the Proposed Action would have no long-term impacts on wildlife and would not be significant.

4.6.1.3 Aquatic Species

Short-term Impacts

There are no perennial waterbodies in the anticipated areas of disturbance on the interim and permanent site alternatives, nor would construction of the proposed interim and permanent facilities involve redirecting, channeling, damming, or withdrawals from waterbodies on or near the selected sites. Therefore, the Proposed Action would have no direct short-term impacts on aquatic species.

Indirect impacts on aquatic species, such as from degradation of water quality from increased concentrations of pollutants or sediments in runoff discharged from the construction sites, would be minimized or prevented by adherence to the requirements of site-specific SWPPPs, erosion and sediment control (E&SC) plans, and/or SWMPs that would be prepared by the construction contractor in accordance with NPDES permit requirements applicable to the selected installation(s). The predominance of ephemeral and intermittent streams downstream from the majority of the site alternatives, with the exception of those at Redstone Arsenal, would further minimize the potential for increased concentrations of pollutants and sediments in runoff to receiving waterbodies from construction activities associated with the Proposed Action. In the long term, any such impacts would be temporary, because they would cease

on the completion of land-disturbing activities associated with the construction of the proposed interim and permanent facilities.

Therefore, the Proposed Action would have no, or negligible, short-term impacts on aquatic species and would not be significant.

Long-term Impacts

The Proposed Action would have no potential to influence conditions supporting aquatic habitat and species. The proposed interim and permanent facilities would not discharge sediments or pollutants directly to local or regional waterbodies, nor would their operation involve the harvesting of aquatic animal or plant species, or redirecting, channeling, damming, or direct withdrawals from local or regional waterbodies. Potable water for the proposed facilities would be supplied by connections to existing water distribution infrastructure on the selected installation(s), and therefore, would not noticeably decrease the volume or flow of water in local or regional waterbodies.

Therefore, the Proposed Action would have no long-term impacts on aquatic species or habitat and would not be significant.

4.6.2 Buckley AFB

4.6.2.1 Interim Site Alternative 1 (West End District), Permanent Site Alternative 1 (North Corner Site 1), Permanent Site Alternative 2 (North Corner Site 2)

Implementation of the Proposed Action at any of the proposed interim or permanent site alternatives at Buckley AFB would have no short-term or long-term impacts on common terrestrial and aquatic vegetation and wildlife species beyond those discussed in **Section 4.6.1.**

As noted in **Section 3.6,** the Air Force is in the process of removing prairie dog populations at all of the Colorado DoD installations being considered; therefore, implementation of the Proposed Action at Buckley AFB would complement and further the objectives of that program, resulting in a beneficial effect.

Some foraging habitat for the state species of special concern ferruginous hawk, and nesting habitat for the state threatened western burrowing owl, could be lost if the Proposed Action is implemented at Buckley AFB. Such areas of habitat would be small, in the context of available habitat that would remain at Buckley AFB and in the surrounding region. The transitory nature of the ferruginous hawk would enable it to forage in nearby areas of similar habitat; potential effects would be minimal. There also could be disturbance to migratory bird species during construction mainly related to foraging. Active nests for migratory birds, if present, would be avoided during construction. As applicable, the contractor would adhere to avoidance and minimization measures described in **Section 4.6.1.2**.

Therefore, short-term and long-term impacts on common and special-status biological resources at Buckley AFB resulting from the implementation of the Proposed Action would be negligible or minor, and would not be significant.

4.6.3 Peterson AFB

4.6.3.1 Interim Site Alternative 1 (Command Complex)

Implementation of the Proposed Action on Interim Site Alternative 1 at Peterson AFB would have no short-term or long-term impacts on common terrestrial and aquatic vegetation and wildlife species beyond

those discussed in **Section 4.6.1**. Implementation of the Proposed Action at Buckley AFB would complement and further the objectives of the Air Force's prairie dog removal program, resulting in a beneficial effect.

Impacts on migratory birds and the state species of special concern ferruginous hawk and state threatened western burrowing owl, and measures to avoid or minimize such impacts, would be similar to those described for Buckley AFB.

For these reasons, impacts on biological resources on Interim Site Alternative 1 at Peterson AFB resulting from the implementation of the Proposed Action would be negligible or minor, and would not be significant.

4.6.3.2 Permanent Site Alternative 1 (Command Complex) (including Garage 1 and Garage 2 sites)

Implementation of the Proposed Action on Interim Site 1 would have no short-term or long-term impacts on biological resources, because the site currently consists of paved parking lots with no or minimal potential for biological resources to be present.

4.6.4 Schriever AFB

4.6.4.1 Interim Site 1 (Inside RA) (West Side of RA), Interim Site 2 (Outside RA) (North of Building 24), Permanent Site 1 (Inside RA) (West Side of RA), Permanent Site 2 (Outside RA) (Northwest of Building 24)

Implementation of the Proposed Action at any of the proposed interim or permanent site alternatives at Schriever AFB would have no short-term or long-term impacts on common terrestrial and aquatic vegetation and wildlife species beyond those discussed in **Section 4.6.1**. Implementation of the Proposed Action at Schriever AFB would complement and further the objectives of the Air Force's prairie dog removal program, resulting in a beneficial effect.

Impacts on migratory birds and the state species of special concern ferruginous hawk and state threatened western burrowing owl, and measures to avoid or minimize such impacts, would be similar to those described for Buckley AFB.

For these reasons, impacts to biological resources on any of the interim or permanent site alternatives at Schriever AFB resulting from the implementation of the Proposed Action would be negligible or minor, and would not be significant.

4.6.5 Vandenberg AFB

4.6.5.1 Interim Site Alternative 1 (Buildings 6523, 7525, and 10577)

Implementation of the Proposed Action at Interim Site Alternative 1 at Vandenberg AFB would have no short-term or long-term impacts on common terrestrial and aquatic vegetation and wildlife species including migratory birds beyond those discussed in **Section 4.6.1**. There would be no or negligible impacts on such species.

Impacts on the federally threatened vernal pool fairy shrimp potentially present in habitats adjacent to Interim Site Alternative 1 would be avoided or minimized through implementation of measures to identify and avoid suitable habitat for this species. Species surveys would be conducted during the appropriate

season to confirm presence or absence adjacent to Interim Site Alternative 1. Occupied or potentially suitable vernal pools would be clearly demarcated and avoided during construction. The contractor would adhere to measures included in the Vandenberg AFB PBO (USFWS, 2015) (see **Section 3.6.4.1**), and to any other applicable avoidance or mitigation measures developed through further consultation between USAF/Vandenberg AFB and USFWS and/or other federal and state regulatory agencies. This would ensure that adverse effects on special-status species are minimized or avoided to the extent possible.

4.6.5.2 Permanent Site Alternative 1 (California South)

Impacts on common terrestrial and aquatic vegetation and wildlife species on Permanent Site Alternative 1 at Vandenberg AFB would be the same as those described above for Interim Site Alternative 1.

There would be no impacts on special-status species because no suitable habitat for such species is present on the site.

4.6.6 Redstone Arsenal

4.6.6.1 Interim Site Alternative 1 (Redstone Gateway, and Buildings 5201 and 5220)

NEPA documentation prepared for the development of the Redstone Gateway complex (USACE, 2008) identified no noteworthy biological resources or significant impacts on such resources.

Interior renovations in Buildings 5201 and 5220 to accommodate USSPACECOM personnel would have no potential to affect common or special-status terrestrial and aquatic vegetation and wildlife species. There could be foraging disturbance to migratory bird species during construction due to increase of human presence. Active nests for migratory birds, if present, would be avoided during construction, or given adequate buffer to minimize disturbance.

4.6.6.2 Interim Site Alternative 2 (Area 2, and Buildings 5201 and 5220)

Implementation of the Proposed Action at the Area 2 component of Interim Site Alternative 2 at Redstone Arsenal would have no short-term or long-term impacts on common terrestrial and aquatic vegetation and wildlife species beyond those discussed in **Section 4.6.1**. There would be no or negligible impacts on such species.

Adverse effects on the federally endangered gray bat and Indiana bat and federally threatened northern long-eared bat would be minimized or avoided through adherence to applicable TOY restrictions on the clearing of vegetation at Area 2 that could provide summer maternal roosting habitat for those species. If vegetation clearing is required within the TOY restriction period, species surveys would be conducted on the site, and clearing of any maternal roost trees documented during the surveys would be avoided until the TOY restriction period has ended. The contractor would adhere to any other applicable avoidance or mitigation measures developed through further consultation with the Army/Redstone Arsenal, USFWS, and/or other federal and state regulatory agencies. This would ensure that adverse effects on special-status species are minimized or avoided to the extent possible.

Any adverse effects to migratory birds would be avoided to the extent practical. The proposed site would be survey for any potential nesting migratory or conservation bird species, if any land clearing was to occur during April 1 through August 31 nesting period. This would avoid any inadvertent take of any migratory bird species that would be protected under the MTBA.

Interior renovations in Buildings 5201 and 5220 to accommodate USSPACECOM personnel would have no potential to affect common or special-status terrestrial and aquatic vegetation and wildlife species.

4.6.6.3 Permanent Site Alternative 1 (Area 5 and Building 5201)

Short-term and long-term impacts on common and special-status terrestrial and aquatic wildlife and vegetation species from implementation of the Proposed Action on the Area 5 component of Permanent Site Alternative 1, and applicable avoidance and mitigation measures, would be similar to those described above for Interim Site Alternative 1. There would be no or negligible impacts on common or migratory species, and adverse impacts on special-status species would be avoided or minimized.

Interior renovations in Building 5201 to accommodate USSPACECOM personnel would have no potential to affect common or special-status terrestrial and aquatic vegetation and wildlife species.

4.6.7 No Action Alternative

Under the No Action Alternative, the Proposed Action described in **Section 2.1** would not be implemented. Existing conditions on the Permanent and Interim site alternatives at each of the five DoD installations being considered would continue. This would have no effect on biological resources. The affected environment described in **Section 3.6** would continue to be influenced by ambient environmental conditions and other ongoing development projects on and near the candidate installations.

4.6.8 Summary of Impacts

Impacts on biological resources from the Proposed Action and No Action Alternative are summarized in **Table 4.6-1**.

Table 4.6-1
Summary of Biological Resources Impacts by Installation and Site Alternatives

Alternatives	Vegetation (Common and Special-status Species)	Wildlife (Common and Special-status Species)	Aquatic Species (Common and Special-status Species)
Buckley AFB			
Interim Site Alternative 1 (West End District)	Not significant, negligible or minor short-term and long-term impacts	Not significant, negligible or minor short-term and long-term impacts	Not significant, negligible or minor short-term and long-term impacts
Permanent Site Alternative 1 (North Corner Site 1)	Same as above	Same as above	Same as above
Permanent Site Alternative 2 (North Corner Site 2)	Same as above	Same as above	Same as above
Peterson AFB			
Interim Site Alternative 1 (Command Complex)	Not significant, negligible or minor short-term and long-term impacts	Not significant, negligible or minor short-term and long-term impacts	Not significant, negligible or minor short-term and long-term impacts
Permanent Site Alternative 1 (Command Complex)	No impacts	No impacts	No impacts

Table 4.6-1
Summary of Biological Resources Impacts by Installation and Site Alternatives

Alternatives	Vegetation (Common and Special-status Species)	Wildlife (Common and Special-status Species)	Aquatic Species (Common and Special-status Species)
Schriever AFB			
Interim Site Alternative 1 (Inside RA) (West Side of RA)	Not significant, negligible or minor short-term and long-term impacts	Not significant, negligible or minor short-term and long-term impacts	Not significant, negligible or minor short-term and long-term impacts
Interim Site Alternative 2 (Outside RA) (North of Building 24)	Not significant, negligible or minor short-term and long-term impacts	Not significant, negligible or minor short-term and long-term impacts	Not significant, negligible or minor short-term and long-term impacts
Permanent Site Alternative 1 (Inside RA) (West Side of RA)	Not significant, negligible or minor short-term and long-term impacts	Not significant, negligible or minor short-term and long-term impacts	Not significant, negligible or minor short-term and long-term impacts
Permanent Site 2 (Outside RA) (Northwest of Building 24)	Not significant, negligible or minor short-term and long-term impacts	Not significant, negligible or minor short-term and long-term impacts	Not significant, negligible or minor short-term and long-term impacts
Vandenberg AFB			
Interim Site Alternative 1 (Buildings 6523, 7525, and 10577)	Not significant, no or negligible short-term and long-term impacts	Not significant, no or negligible short-term and long-term impacts	Not significant, no or negligible short-term and long-term impacts
Permanent Site Alternative 1 (California South)	Not significant, no or negligible short-term and long-term impacts	Not significant, no or negligible short-term and long-term impacts	Not significant, no or negligible short-term and long-term impacts
Redstone Arsenal			
Interim Site Alternative 1 (Redstone Gateway, and Buildings 5201 and 5220	Not significant, no impacts	Not significant, no impacts	Not significant, no impacts
Interim Site Alternative 2 (Area 2, and Buildings 5201 and 5220	Not significant, no or negligible short-term and long-term impacts on common species No or minimal adverse effects on federally listed bat species	Not significant, no or negligible short-term and long-term impacts on common species No or minimal adverse effects on federally listed bat species	Not significant, no or negligible short-term and long-term impacts on common species No or minimal adverse effects on federally listed bat species

Table 4.6-1
Summary of Biological Resources Impacts by Installation and Site Alternatives

Alternatives	Vegetation (Common and Special-status Species)	Wildlife (Common and Special-status Species)	Aquatic Species (Common and Special-status Species)
Permanent Site Alternative 1 (Area 5 and Building 5201)	Not significant, no or negligible short-term and long-term impacts on common species No or minimal adverse effects on federally listed bat species	Not significant, no or negligible short-term and long-term impacts on common species No or minimal adverse effects on federally listed bat species	Not significant, no or negligible short-term and long-term impacts on common species No or minimal adverse effects on federally listed bat species
No Action	No impacts	No impacts	No impacts

4.6.9 Mitigation Measures

No mitigation measures would be required because there would be no significant impacts on biological resources.

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4.7 CULTURAL RESOURCES

The Proposed Action may directly or indirectly impact extant cultural resources at the five installations. Direct impacts can occur through site preparation, construction, or site restoration. Such activity can have severe and irrevocable effects on relatively fragile and non-renewable cultural resources. Indirect impacts may be atmospheric (dust), auditory (construction noise), or visual (introduction of multistory buildings in otherwise level terrain). Such impacts can be minimized, but may not be avoidable. Cumulative impacts are the combined, incremental effects that accumulate over time; they are the result of the compounding of the effects of all actions over time (EPA, 1999).

To determine potential significant adverse impacts on cultural resources, the criteria of adverse effect as specified in Section 106 of the National Historic Preservation Act are applied. Under the NHPA, an adverse effect is found when an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify it for inclusion in the NRHP in a manner that would diminish the integrity its location, design, setting, materials, workmanship, feeling, or association (36 CFR 800.5). Potential adverse impacts that may occur as a result of the Proposed Action include those that would:

- Physically destroy or damage a historic property;
- Alter the property in a way that is inconsistent with the Secretary of the Interior's Standards for Treatment of Historic Properties;
- Remove the property from its historic location;
- Change the character of the property's use or setting;
- Introduce an atmospheric, audible, or visual feature to the area that would diminish the integrity of the property's significant historic features.

The following indicators were used to describe impacts to archaeological resources, the historic built environment, and tribal concerns for the interim and permanent sites at each installation:

- Number of cultural resources directly affected;
- Number of cultural resources indirectly affected (sites and isolated finds within 0.25 mile); and
- Potential for previously undocumented cultural resources: low, moderate, or high.

4.7.1 Archaeological Resources

Archaeological resources at each installation differ in number and type. In addition, many of the resources often lie outside the footprint of the interim and permanent sites, and therefore are not directly affected. Indirect impacts must be considered for these outlying resources, and their influence is directly related to the nature and significance of the resource and whether it will be adversely impacted by the Proposed Action. Atmosphere and auditory impacts are usually not an issue for archaeological resources, but visual impacts could diminish those aspects of a resource for which integrity of setting is a key attribute to its significance.

Based on the analysis in **Section 3.7**, no known NRHP-eligible archaeological resources would be directly or indirectly affected by implementation of the project alternatives. Therefore, no significant impacts to archaeological resources are anticipated.

An inadvertent discovery of archaeological materials or human remains would be possible during construction of the Proposed Action. Given prior land-disturbing activities conducted on and around site

alternatives, however, unanticipated discoveries are not likely, and the potential for unearthing previously undocumented resources ranges from low to moderate (**Table 4.7-1**). Nonetheless, in the event of inadvertent discoveries of undocumented cultural resources, ground-disturbing work would stop immediately and policies in the selected installation's ICRMP would be implemented to preserve and document the discovery.

4.7.2 Historic Built Environment

The built environment encompasses buildings and structures that are 50 years or older and have been evaluated for NRHP eligibility, and other properties that have achieved significance in the last 50 years. As with archaeological resources, atmospheric and auditory influences are less likely to have adverse impacts on the built environment. However, visual impacts can diminish those aspects of a building or structure for which integrity of setting is a key attribute to its significance; perhaps more so than with archaeological resources. Based on the analysis presented in **Section 3.7**, no identified NRHP-eligible buildings would be directly affected by implementation of the project alternatives. Additionally, physical alterations proposed for unevaluated buildings at Vandenberg AFB would be limited to interior renovations. Therefore, no significant direct impacts to the historic built environment under any of the alternatives are anticipated.

No buildings at Buckley AFB, Schriever AFB, Peterson AFB, and Vandenberg AFB that were considered for potential visual or other indirect effects are eligible for the NRHP. Building 4381 at Redstone Arsenal is NRHP-eligible, but has been extensively modified and is separated from Interim Site Alternative 2 by a forested area. Therefore, Building 4381 would not be indirectly affected by implementation of Interim Site Alternative 2.

4.7.3 Tribal Concerns

As documented in the ICRMPs for each installation being considered, no Traditional Cultural Places, sacred sites, or items of cultural patrimony have been identified at any of the proposed interim and permanent sites (USAF, 2015c, 2017b, 2019c). However, consultation under Section 106 is ongoing with Native American tribes that may attach religious or cultural significance to historic properties potentially affected by the Proposed Action. Letters initiating consultation for the Proposed Action at Buckley AFB, Peterson AFB, and Schriever AFB were sent to tribal partners in June 2019. Also, in June 2019, tribes affiliated with Redstone Arsenal were notified of the project and invited to participate in consultation. Although to date no impacts on Traditional Cultural Properties, sacred sites, or items of cultural patrimony have been identified at any of the interim and permanent sites., such impacts may be identified during the consultation process.

4.7.4 Site-specific Impacts

Impacts for the alternative locations and their associated interim and permanent sites are provided in **Table 4.7-1** using impact indicators. The Proposed Action would have no or negligible site-specific impacts on archaeological or built-environment resources.

Table 4.7-1
Impact Indicators for the Alternative Location Sites

Alternatives/Sites	Impact Indicators			
	Number of Cultural Resources Directly Affected	Number of Cultural Resources Indirectly Affected	Number of Historic Properties Affected	Potential for Previously Undocumented Cultural Resources
Buckley AFB				
Interim Site Alternative 1 (West End District)	1	5	0	Low
Permanent Site Alternative 1 (North Corner Site 1)	0	0	0	Moderate
Permanent Site Alternative 2 (North Corner Site 2)	2	0	0	Moderate
Peterson AFB				
Interim Site Alternative 1 (Command Complex)	0	0	0	Low
Interim Site Alternative Parking	2	0	0	Moderate
Permanent Site Alternative 1 (Command Complex)	0	0	0	Low
Garage	0	0	0	Low
Garage	0	0	0	Low
Schriever AFB				
Interim Site Alternative 1 (Inside RA) (West Side of RA)	0	3	0	Low
Interim Site Alternative 2 (Outside RA) (North of Building 24)	0	1	0	Low
Permanent Site Alternative 1 (Inside RA) (West Side of RA)	0	3	0	Low
Permanent Site Alternative 2 (Outside RA) (Northwest of Building 24)	0	0	0	Low
Vandenberg AFB				
Interim Site Alternative 1 (Buildings 6523, 7525, and 10577)	0	0	0	Low
Permanent Site Alternative 1 (California South)	0	0	0	Low

Table 4.7-1
Impact Indicators for the Alternative Location Sites

Alternatives/Sites	Impact Indicators			
	Number of Cultural Resources Directly Affected	**Number of Cultural Resources Indirectly Affected**	**Number of Historic Properties Affected**	**Potential for Previously Undocumented Cultural Resources**
Redstone Arsenal				
Interim Site Alternative 1 (Redstone Gateway, and Buildings 5201 and 5220)	0	0	0	Low
Interim Site Alternative 2 (Area 2, and Buildings 5201 and 5220)	0	0	0	Low
Permanent Site Alternative 1 (Area 5 and Building 5201)	2	0	0	Low

4.7.5 No Action Alternative

Under the No Action Alternative, none of the proposed construction or operation activities would occur at any of the candidate installations. This would have no impacts on cultural resources. The affected environment described in **Section 3.7** would continue to be influenced by ambient environmental conditions and other ongoing development projects on the installations.

4.7.6 Mitigation Measures

No mitigation measures are required because there would be no significant impacts on cultural resources. If potentially significant cultural resources are inadvertently discovered during implementation of the Proposed Action, all ground-disturbing work would immediately stop, and the specific procedures developed by each installation for addressing inadvertent discoveries would be implemented.

4.8 GEOLOGICAL AND PALEONTOLOGICAL RESOURCES

Impacts on geological and paleontological resources resulting from the Proposed Action and No Action Alternative are described in this section. Impacts on these resources would be significant if the following were to occur:

- Geology and Paleontology. If the affected strata or formations are of special significance or worth (e.g., known to contain fossils) or subject to destabilization and/or substantial alteration from their current state or condition.
- Topography. If undisturbed terrain is altered such that a measurable function (e.g., drainage or slope stability) or aesthetic value is substantially compromised or lost.
- Soils. If an action results in measurable soils loss, contamination, substantial degradation, or loss of functional value.

4.8.1 General

4.8.1.1 Short-term Impacts

Construction of the proposed interim and permanent facilities would have the potential to alter topography on the selected sites, and involve soil disturbance including excavation, filling, compaction, grading, ditching/trenching, directional boring, and the alteration of soil layer structure. Ground-disturbing activities would remove vegetation and increase the potential for erosion of exposed soils by wind and water. Soils exposed for extended periods on the sites during construction would be revegetated to minimize the potential for continued erosion.

The extent of ground disturbance from site preparation associated with the proposed interim and permanent facilities would vary depending on the sites that are ultimately selected. Relative to ground disturbance required to construct the proposed permanent facility, ground disturbance from site preparation for interim sites involving the use of modular buildings would be minimal, and involve shallow surficial disturbance in limited areas of the selected site. With the exception of Redstone Arsenal Interim Site Alternative 1, which would only involve the use of vacant office space in existing facilities, all of the interim and permanent site alternatives consist of land that is previously disturbed or developed. No pristine or unique soils are present on any of the site alternatives where ground disturbance would occur, and none of the soils on such sites are considered Prime Farmland.

Clean fill soils would be imported to the selected sites as necessary to replace or supplement existing soils that are considered unsuitable for development. Temporary shoring would be used in accordance with established safety practices to minimize or eliminate risks to worker safety from potential collapses of excavations during construction of the permanent facility. Soils determined to contain concentrations of hazardous substances exceeding applicable regulatory thresholds (e.g., petroleum constituents) would be removed from the selected sites by licensed contractors, and disposed of at permitted facilities outside the selected installation(s).

Ground-disturbing activities on the selected interim and permanent site alternatives would alter existing topography to provide level construction surfaces. The extent of alteration would depend on the site(s) that are ultimately selected; however, all of the proposed interim and permanent sites where ground disturbance would occur are relatively flat; previously disturbed to varying degrees; and do not contain unique, pristine, or noteworthy topographic features. Generally, changes to existing topography from construction of the proposed facilities would be minimal and limited in scope. The selected interim and permanent sites would be regraded as necessary to achieve positive surface drainage post-construction, and direct stormwater off site, to prevent water accumulation.

Construction of the proposed permanent facility could affect geology if the selected site requires a deep foundation. The extent and nature of these effects would be determined by site-specific soil properties and depth to bedrock. Where soils lack sufficient load-bearing capacity to support development, a pile foundation emulating a rock platform or bedrock structural support may be required. Geotechnical studies would be conducted following selection of the permanent site, and as design of the facility continues, to determine the extent of foundation support required. Foundation elements of the proposed permanent facility would not be expected to penetrate unique or noteworthy geologic strata, because none are present under any of the permanent site alternatives. Excavation associated with construction of the proposed interim facility would be relatively shallow (i.e., no more than a few feet at most), and would have no potential to affect underlying geologic strata at any of the interim site alternatives.

All ground disturbance associated with the construction phase of the Proposed Action would be limited to the selected interim and permanent sites, and discrete areas of the respective installation(s), where infrastructure and/or road improvements would be made to support the proposed facilities. Ground disturbance would be proportionate to the scale of the facilities being constructed, and would not be particularly unusual in the context of facility construction projects of similar type and scale that occur with relative frequency at each of the candidate installations.

If an interim and/or permanent site alternative with a higher likelihood for paleontological resources to be present is selected for the Proposed Action, additional surveys for such resources would be conducted prior to ground-disturbing activities, as determined necessary through coordination between the Air Force and the selected installation(s). In the event of inadvertent discovery of previously undocumented paleontological resources during construction of the proposed facilities, all ground-disturbing work would immediately stop, and procedures specified in the selected installation's ICRMP would be implemented to preserve and document the discovery.

Therefore, short-term impacts on geological and paleontological resources from the Proposed Action would be negligible or minor, and not significant.

4.8.1.2 Long-term Impacts

Operation of the proposed interim and permanent facilities would not involve ongoing disturbance of geological or paleontological resources, or mineral extraction. Areas of the interim and permanent sites not built on or otherwise developed would be replanted, or maintained in an otherwise permeable condition to minimize or prevent continued erosion of exposed soils. The proposed permanent facility—and to the extent possible—the proposed interim facility would be built in accordance with seismic reinforcement requirements applicable to the selected locations.

Therefore, the Proposed Action would have no long-term impacts on geological or paleontological resources.

4.8.2 Buckley AFB

4.8.2.1 Interim Site Alternative 1 (West End District), Permanent Site Alternative 1 (North Corner Site 1), Permanent Site Alternative 2 (North Corner Site 2)

Implementation of the Proposed Action at Buckley AFB would have no short-term impacts on geological or paleontological resources beyond those described in **Section 4.8.1**, and no long-term impacts. Short-term impacts on geological resources at Buckley AFB from the Proposed Action would be negligible or minor, and would not be significant.

4.8.3 Peterson AFB

4.8.3.1 Interim Site Alternative 1 (Command Complex) and Permanent Site Alternative 1 (Command Complex) (including Garage 1 and Garage 2)

Construction and operation of the proposed interim and/or permanent facilities at Peterson AFB would have no short-term impacts on geological or paleontological resources beyond those described in **Section 4.8.1**, and no long-term impacts. Short-term impacts on geological and paleontological resources at Peterson AFB from the Proposed Action would be negligible or minor, and would not be significant.

4.8.4 Schriever AFB

4.8.4.1 Interim Site 1 (Inside RA) (West Side of RA), Interim Site 2 (Outside RA) (North of Building 24), Permanent Site 1 (Inside RA) (West Side of RA), Permanent Site 2 (Outside RA) (Northwest of Building 24)

Implementation of the Proposed Action at Schriever AFB would have no short-term impacts on geological and paleontological resources beyond those described in **Section 4.8.1**, and no long-term impacts. Short-term impacts on geological and paleontological resources at Schriever AFB from the Proposed Action would be negligible or minor, and would not be significant.

4.8.5 Vandenberg AFB

4.8.5.1 Interim Site Alternative 1 (Buildings 6523, 7525, and 10577)

Construction and operation of the proposed interim facility on Interim Site Alternative 1 at Vandenberg AFB would have no short-term impacts on geological or paleontological resources beyond those described in **Section 4.8.1**, because the alternative would primarily involve modernization and/or reconfiguration of interior office space in existing facilities. Land disturbance associated with the establishment of the temporary, approximately 28,000-square-foot (0.6-acre) gravel parking lot adjacent to Building 6523 as part of the alternative would involve no or shallow excavation and/or filling of soils to provide a level parking surface, and would have no potential to affect underlying geologic strata or paleontological resources.

Therefore, short-term impacts on geological and paleontological resources at Vandenberg AFB from construction and operation of the proposed interim facility on Interim Site Alternative 1 at Vandenberg AFB would be negligible, and would not be significant. There would be no long-term impacts.

4.8.5.2 Permanent Site Alternative 1 (California South)

Construction and operation of the proposed permanent facility on Permanent Site Alternative 1 at Vandenberg AFB would have no short-term impacts on geological and paleontological resources beyond those described in **Section 4.8.1**. If selected for implementation, additional paleontological resource surveys would be conducted on the site prior to construction if additional coordination between the Air Force and Vandenberg AFB determines that a higher likelihood of encountering paleontological resources exists on the site. In the event that paleontological resources are inadvertently discovered during construction, all ground-disturbing activities would stop immediately, and procedures in the installation's INRMP would be implemented to preserve and document such resources.

Therefore, short-term impacts on geological and paleontological resources at Vandenberg AFB from construction of the proposed permanent facility on Permanent Site Alternative 1 would be minor, and would not be significant. There would be no long-term impacts.

4.8.6 Redstone Arsenal

4.8.6.1 Interim Site Alternative 1 (Redstone Gateway, and Buildings 5201 and 5220)

NEPA documentation prepared for the development of the Redstone Gateway complex (USACE, 2008) identified no significant impacts on geological resources.

The modernization and/or reconfiguration of existing interior office space at Buildings 5201 and 5220 as part of this alternative would have no potential to affect geological resources on or near Redstone Arsenal. There would be no impacts.

4.8.6.2 Interim Site Alternative 2 (Area 2, and Buildings 5201 and 5220)

Construction and operation of modular facilities and a temporary gravel parking area at the Area 2 component of Interim Site Alternative 2 at Redstone Arsenal would have no short-term impacts on geological or paleontological resources beyond those described in **Section 4.8.1**, and no long-term impacts. There would be no impacts on geological or paleontological resources from the modernization and/or reconfiguration of existing interior office space at Buildings 5201 and 5220 as part of this alternative.

Therefore, short-term impacts on geological and paleontological resources from construction and operation of the proposed interim facility at Interim Site Alternative 2 at Redstone Arsenal would be negligible, and would not be significant.

4.8.6.3 Permanent Site Alternative 1 (Area 5 and Building 5201)

Construction and operation of the proposed permanent facility on the Area 5 component of Permanent Site Alternative 1 at Redstone Arsenal would have no short-term impacts on geological or paleontological resources beyond those described in **Section 4.8.1**, and no long-term impacts. There would be no impacts on geological and paleontological resources from the modernization and/or reconfiguration of existing interior office space at Buildings 5201 as part of this alternative.

Therefore, short-term impacts on geological and paleontological resources at Redstone Arsenal from construction and operation of the proposed permanent facility on Permanent Site Alternative 1 would be negligible or minor, and would not be significant.

4.8.7 No Action Alternative

Under the No Action Alternative, the proposed interim and permanent USSPACECOM facilities would not be built. This would have no impact on geological and paleontological resources at the five candidate DoD installations discussed in this EA. The affected environment described in **Section 3.8** would continue to be influenced by ambient environmental conditions and other ongoing development projects on and near the candidate installations.

4.8.8 Impact Summary

Impacts on geological and paleontological impacts from the Proposed Action and No Action Alternative are summarized in **Table 4.8-1**.

Table 4.8-1
Summary of Geological and Paleontological Resources Impacts

Site Alternative	Geological Resources	Paleontological Resources
Buckley AFB		
Interim Site Alternative 1 (West End District)	Not significant, negligible short-term impacts, no long-term impacts	No impacts
Permanent Site Alternative 1 (North Corner Site 1)	Not significant, minor short-term impacts, no long-term impacts	Not significant, no or negligible short-term impacts, no long-term impacts
Permanent Site Alternative 2 (North Corner Site 2)	Same as above	Same as above
Peterson AFB		
Interim Site Alternative 1 (Command Complex)	Not significant, negligible short-term impacts, no long-term impacts	No impacts
Permanent Site Alternative 1 (Command Complex)	Not significant, minor short-term impacts, no long-term impacts	Not significant, no or negligible short-term impacts, no long-term impacts
Schriever AFB		
Interim Site Alternative 1 (Inside RA) (West Side of RA)	Not significant, negligible short-term impacts, no long-term impacts	No impacts
Interim Site Alternative 2 (Outside RA) (North of Building 24)	Same as above	Same as above
Permanent Site Alternative 1 (Inside RA) (West Side of RA)	Not significant, minor short-term impacts, no long-term impacts	Not significant, no or negligible short-term impacts, no long-term impacts
Permanent Site Alternative 2 (Outside RA) (Northwest of Building 24)	Same as above	Same as above
Vandenberg AFB		
Interim Site Alternative 1 (Buildings 6523, 7525, and 10577)	Not significant, negligible short-term impacts, no long-term impacts	No impacts
Permanent Site Alternative 1 (California South)	Not significant, minor short-term impacts, no long-term impacts	Not significant, no or negligible short-term impacts, no long-term impacts
Redstone Arsenal		
Interim Site Alternative 1 (Redstone Gateway, and Buildings 5201 and 5220)	No impacts	No impacts
Interim Site Alternative 2 (Area 2, and Buildings 5201 and 5220)	Not significant, negligible short-term impacts, no long-term impacts	No impacts
Permanent Site Alternative 1 (Area 5 and Building 5201)	Not significant, minor short-term impacts, no long-term impacts	Not significant, no or negligible short-term impacts, no long-term impacts
No Action Alternative	No impacts	No impacts

4.8.9 Mitigation Measures

No mitigation measures would be required because there would be no significant impacts on geological and paleontological resources.

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4.9 WATER RESOURCES

Potential short-term and long-term effects on water resources from the Proposed Action are presented in this section. Impacts on surface water, stormwater, groundwater, and floodplains are discussed. Impacts on water resources would be significant if any of the following occur:

- Degradation of water quality in surface water or groundwater from stormwater input or direct contamination from construction activities;
- Modification of stream channel configuration due to instream disturbance that alters stream flow from current conditions;
- Withdrawal of water from new surface water or groundwater sources;
- Project construction results in permanent disturbance or loss of more than 1 acre; and
- Project construction results in disturbance to a floodplain that affects its value and function.

4.9.1 General

4.9.1.1 Surface Water

Short-term Impacts

Construction activities associated with the Proposed Action would not involve redirecting, channeling, damming, draining, spanning, or withdrawals from surface waterbodies. There would be no short-term impacts on surface waterbodies from these activities under the Proposed Action.

In the short term, ground disturbance associated with construction of the proposed interim and permanent facilities would expose soils and increase the potential for erosion by wind and water. In turn, soil erosion on the project sites would have the potential to increase concentrations of sediments and pollutants in stormwater generated on and discharged from the sites, and lead to a corresponding increase in the sedimentation and pollution of receiving waterbodies. To minimize or prevent soil erosion on the sites, construction contractors would prepare and adhere to site-specific E&SC plans and SWPPPs in accordance with applicable federal, state, and local regulatory requirements, including the applicable requirements of the NPDES Construction General Permit. Contractors also would adhere to the requirements of the SWPPP to prevent or minimize the potential for accidental spills or releases of hazardous substances (e.g., petroleum products spilled during refueling of construction equipment) on the project sites. Adherence to BMPs specified in the SWPPP, and routine inspection and maintenance of BMPs, would ensure that adverse short-term impacts from sedimentation and pollutants on surface water during construction associated with the proposed interim and permanent facilities would remain negligible or minor, and would not be significant.

Long-term Impacts

Operation of the proposed interim and permanent facilities would not involve redirecting, channeling, damming, draining, spanning, or withdrawals from surface waterbodies. There would be no long-term impacts on surface waterbodies from these activities under the Proposed Action.

On the completion of construction activities associated with the proposed interim and permanent facilities, all areas of the sites not built on, paved, or otherwise developed would be revegetated in accordance with the SWPPP and the selected installation's landscape design and planting guidelines, or would be

stabilized to meet Construction General Permit Notice of Termination requirements. This would minimize or eliminate the potential for further impacts from erosion of exposed soils.

Construction of the proposed permanent facility would have the potential to increase impervious surface area on the selected installation in the long term, resulting in a corresponding increase in stormwater volume generated on the installation. Increases in stormwater volume on an interim site consisting of modular buildings and temporary gravel parking areas (i.e., Buckley, Peterson, and Schriever AFB Interim Site Alternatives, Redstone Arsenal Interim Site Alternative 2), if selected, would be substantially less because much of the site would remain in a permeable condition.

Construction of the proposed permanent facility and modular interim facilities (if selected) would disturb more than 5,000 square feet of land. Therefore, their design would incorporate LID measures to maintain the pre-development hydrology of the site to the maximum extent technically feasible, in accordance with Section 438 of the EISA. In accordance with the Vandenberg AFB Post-Construction Storm Water Standard, a Storm Water Control Plan would be prepared during design for approval by the installation's storm water specialist. Stormwater management infrastructure on or near the selected permanent and interim modular site alternatives would be installed or upgraded as necessary to account for any additional stormwater volume generated by the proposed facility. Stormwater generated by and discharged from the proposed interim and permanent facilities would be managed in accordance with the policies and requirements of the selected installation's SWMP and other applicable policy documents, thereby ensuring that runoff from the proposed facilities would have no potential to contribute to exceedances of water quality thresholds in receiving waterbodies. Hazardous materials used, and hazardous waste generated at the proposed facilities, would consist of small quantities that would be used, handled, stored, managed, and disposed of in accordance with label directions and the selected installation's applicable policies, including those specified in its AFI 32-7086, HWMP and SPCC Plan. Solid wastes would be managed in accordance with applicable Federal, state, local, and Air Force regulatory requirements. Managing hazardous materials, hazardous waste, and solid waste in accordance with applicable requirements would minimize or prevent the migration of hazardous substances and solid wastes to receiving waterbodies.

Therefore, long-term impacts on surface waterbodies from the Proposed Action would be negligible or minor, and would not be significant.

4.9.1.2 Groundwater

Short-term Impacts

Construction of the proposed interim and permanent facilities would not involve withdrawals or intentional releases or injections of pollutants to groundwater formations underlying the selected installation(s). Accidental releases of pollutants to groundwater during construction activities would be prevented or minimized through adherence to the SWPPP and site-specific SPCC Plans. Any accidental releases to groundwater would be small in the context of the underlying groundwater formation's geographic area, and would have no potential to render potable groundwater sources unusable. Existing groundwater monitoring wells on the selected site(s), if any, would be identified and relocated; or closed in accordance with applicable federal, state, and local regulatory requirements prior to beginning construction activities.

Therefore, the Proposed Action would have no, or negligible, short-term impacts on groundwater; and adverse impacts would not be significant.

Long-term Impacts

The operation of the proposed interim and permanent facilities would not involve withdrawals or intentional releases or injections of pollutants to groundwater underlying the selected installation(s). The Proposed Action would have no long-term impacts on groundwater.

4.9.1.3 Floodplains

Construction and operation of the proposed interim and permanent facilities would not involve disturbance, alteration, or occupation of the 100-year floodplain. Therefore, the Proposed Action would have no short-term or long-term impacts on floodplains.

4.9.2 Buckley AFB

4.9.2.1 Interim Site Alternative 1 (West End District), Permanent Site Alternative 1 (North Corner Site 1), Permanent Site Alternative 2 (North Corner Site 2)

Implementation of the Proposed Action at Buckley AFB would have no impacts on water resources beyond those described in **Section 4.9.1**. Impacts on water resources at Buckley AFB from the Proposed Action would be negligible or minor, and would not be significant.

4.9.3 Peterson AFB

4.9.3.1 Interim Site Alternative 1 (Command Complex)

Construction and operation of the proposed interim facilities on Interim Site Alternative 1 at Peterson AFB would have no impacts on water resources beyond those described in **Section 4.9.1**. Impacts on water resources at Peterson AFB from construction and operation of the proposed interim facilities on Interim Site Alternative 1 at Peterson AFB would be negligible or minor, and would not be significant.

4.9.3.2 Permanent Site Alternative 1 (Command Complex) (including Garage 1 and Garage 2 sites)

Construction and operation of the proposed permanent facility on Permanent Site Alternative 1 at Peterson AFB would have no impacts on water resources beyond those described in **Section 4.9.1**. There would likely be no, or negligible, net changes in the volume of stormwater generated on the installation as a result of this alternative, because most of the site consists of impervious surface. Construction of the proposed permanent facility on this site, and incorporation of LID measures in accordance with Section 438 of the EISA could have a small beneficial impact on stormwater management on the installation. Otherwise, impacts on water resources at Peterson AFB from construction and operation of the proposed permanent facility on Permanent Site Alternative 1 at Peterson AFB would be negligible or minor, and would not be significant.

4.9.4 Schriever AFB

4.9.4.1 Interim Site 1 (Inside RA) (West Side of RA), Interim Site 2 (Outside RA) (North of Building 24), Permanent Site 1 (Inside RA) (West Side of RA), Permanent Site 2 (Outside RA) (Northwest of Building 24)

Implementation of the Proposed Action at Schriever AFB would have no impacts on water resources beyond those described in **Section 4.9.1**. Impacts on water resources at Schriever AFB from the Proposed Action would be negligible or minor, and would not be significant.

4.9.5 Vandenberg AFB

4.9.5.1 Interim Site Alternative 1 (Buildings 6523, 7525, and 10577)

Construction and operation of the proposed permanent facility on Permanent Site Alternative 1 at Vandenberg AFB would have no impacts on water resources beyond those described in **Section 4.9.1**, because the alternative would primarily involve modernization and/or reconfiguration of interior office space in existing facilities. Land disturbance and construction stormwater management associated with the establishment of the temporary, approximately 28,000-square-foot (0.6-acre) gravel parking lot adjacent to Building 6523 as part of the alternative would be conducted in accordance with the installation's NPDES, SWPPP, and other applicable stormwater management and permitting requirements. Impacts on water resources at Vandenberg AFB from construction and operation of the proposed interim facility on Interim Site Alternative 1 at Vandenberg AFB would be negligible or minor, and would not be significant.

4.9.5.2 Permanent Site Alternative 1 (California South)

Construction and operation of the proposed permanent facility on Permanent Site Alternative 1 at Vandenberg AFB would have no impacts on water resources beyond those described in **Section 4.9.1**. Impacts on water resources at Vandenberg AFB from construction and operation of the proposed permanent facility on Permanent Site Alternative 1 would be negligible or minor, and would not be significant.

4.9.6 Redstone Arsenal

4.9.6.1 Interim Site Alternative 1 (Redstone Gateway, and Buildings 5201 and 5220)

NEPA documentation prepared for the development of the Redstone Gateway complex (USACE, 2008) determined that impacts on water resources would not be significant with the implementation of mitigation measures to prevent or minimize impacts on the federally endangered Alabama cave shrimp (*Palaemonias alabamae*). The Redstone Gateway complex is currently under construction.

The modernization and/or reconfiguration of existing interior office space at Buildings 5201 and 5220 as part of this alternative would have no potential to affect water resources on or near Redstone Arsenal. There would be no impacts.

4.9.6.2 Interim Site Alternative 2 (Area 2, and Buildings 5201 and 5220)

Construction and operation of modular facilities and a temporary gravel parking area at the Area 2 component of Interim Site Alternative 2 at Redstone Arsenal would have no impacts on water resources beyond those described in **Section 4.9.1**. There would be no impacts on water resources from the modernization and/or reconfiguration of existing interior office space at Buildings 5201 and 5220 as part of this alternative.

Therefore, impacts on water resources from construction and operation of the proposed interim facility at Interim Site Alternative 2 at Redstone Arsenal would be negligible or minor, and would not be significant.

4.9.6.3 Permanent Site Alternative 1 (Area 5 and Building 5201)

Construction and operation of the proposed permanent facility on the Area 5 component of Permanent Site Alternative 1 at Redstone Arsenal would have no impacts on water resources beyond

those described in **Section 4.9.1**. There would be no impacts on water resources from the modernization and/or reconfiguration of existing interior office space at Buildings 5201 as part of this alternative.

Therefore, impacts on water resources at Redstone Arsenal from construction and operation of the proposed permanent facility on Permanent Site Alternative 1 would be negligible or minor, and would not be significant.

4.9.7 No Action Alternative

Under the No Action Alternative, the proposed interim and permanent USSPACECOM facilities would not be built. This would have no impact on water resources at the five candidate DoD installations discussed in this EA. The affected environment described in **Section 3.9** would continue to be influenced by ambient environmental conditions and other ongoing development projects on and near the candidate installations.

4.9.8 Impact Summary

Impacts on water resources from the Proposed Action and No Action Alternative are summarized in **Table 4.9-1**.

Table 4.9-1
Summary of Water Resources Impacts

Site Alternative	Surface Water / Stormwater	Groundwater	Floodplains
Buckley AFB			
Interim Site Alternative 1 (West End District)	Not significant, negligible or minor short-term and long-term impacts	Not significant, negligible or minor short-term impacts, no long-term impacts	No impacts
Permanent Site Alternative 1 (North Corner Site 1)	Same as above	Same as above	Same as above
Permanent Site Alternative 2 (North Corner Site 2)	Same as above	Same as above	Same as above
Peterson AFB			
Interim Site Alternative 1 (Command Complex)	Not significant, negligible or minor short-term and long-term impacts	Not significant, negligible or minor short-term impacts, no long-term impacts	No impacts
Permanent Site Alternative 1 (Command Complex)	Not significant, negligible or minor short-term and long-term impacts on surface waterbodies, no or negligible short-term and long-term impacts on stormwater, small beneficial long-term impact on stormwater management	Same as above	Same as above

Table 4.9-1
Summary of Water Resources Impacts

Site Alternative	Surface Water / Stormwater	Groundwater	Floodplains
Schriever AFB			
Interim Site Alternative 1 (Inside RA) (West Side of RA)	Not significant, negligible or minor short-term and long-term impacts	Not significant, negligible or minor short-term impacts, no long-term impacts	No impacts
Interim Site Alternative 2 (Outside RA) (North of Building 24)	Same as above	Same as above	Same as above
Permanent Site Alternative 1 (Inside RA) (West Side of RA)	Same as above	Same as above	Same as above
Permanent Site Alternative 2 (Outside RA) (Northwest of Building 24)	Same as above	Same as above	Same as above
Vandenberg AFB			
Interim Site Alternative 1 (Buildings 6523, 7525, and 10577)	Not significant, negligible or minor short-term and long-term impacts	Not significant, negligible or minor short-term impacts, no long-term impacts	No impacts
Permanent Site Alternative 1 (California South)	Same as above	Same as above	Same as above
Redstone Arsenal			
Interim Site Alternative 1 (Redstone Gateway, and Buildings 5201 and 5220)	No impacts	No impacts	No impacts
Interim Site Alternative 2 (Area 2, and Buildings 5201 and 5220)	Not significant, negligible or minor short-term and long-term impacts	Not significant, negligible or minor short-term impacts, no long-term impacts	No impacts
Permanent Site Alternative 1 (Area 5 and Building 5201)	Same as above	Same as above	Same as above
No Action Alternative	No impacts	No impacts	No impacts

4.9.9 Mitigation Measures

No mitigation measures would be required because impacts on water resources would not be significant.

4.10 COMPATIBILITY OF THE PROPOSED ACTION WITH OBJECTIVES OF FEDERAL, STATE, AND LOCAL LAND USE PLANS AND POLICIES

The Proposed Action would not adversely affect federal, state, regional, or local land use plans and policies, and are compatible with adjacent land uses. The Proposed Action would engage and cooperate with communities and other federal agencies, whenever possible, during development of federal property to ensure compatibility.

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4.11 RELATIONSHIP BETWEEN SHORT-TERM USES OF THE ENVIRONMENT AND LONG-TERM PRODUCTIVITY

The Proposed Action and alternatives would not affect the long-term productivity of the environment because no significant environmental impacts are anticipated, provided mitigation measures and BMPs identified in this EA are implemented. Any short-term uses of the environment are expected to yield long-term beneficial results, fulfilling the need for the Proposed Action to develop suitable permanent USSPACECOM facilities to enable FOC by 2025.

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4.12 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Irreversible and irretrievable resource commitment refers to the use of nonrenewable sources and the effects these resources would have on future generations. Irreversible effects would result primarily from the consumption or destruction of a resource that could not be reversed. Irretrievable resource commitments would involve a loss or gain in the value of an affected resource that could not be reversed.

The Proposed Action and alternatives would not result in a significant irreversible or irretrievable commitment of resources. Each site alternative would represent a change in the commitment of resources, including labor, fuel, and building materials used and discarded.

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4.13 CUMULATIVE ENVIRONMENTAL CONSEQUENCES

4.13.1 Introduction

This section analyzes the potential cumulative effects of the Proposed Action in combination with other past, present, and reasonably foreseeable actions within the same ROI. A cumulative effects analysis determines if a proposed action would be likely to result in adverse impacts when combined with other projects in the study area.

4.13.2 Applicable Guidance

As defined by CEQ Regulations in 40 CFR §1508.7, a cumulative impact is that which "results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions." NEPA requires the lead federal agency to consider the cumulative impact of a proposed action. Cumulative impacts can result from individually minor but collectively significant actions expected to occur in a similar location and during a similar time period. Therefore, a cumulative impacts analysis must identify and define other actions and their spatial or temporal overlap with a proposed action. CEQ advises that an agency should relate the scope of its analysis to the magnitude of the environmental impacts of a proposed action. Therefore, the analysis of cumulative effects involves defining the scope of other actions and their interrelationship with a proposed action to determine if they overlap in space and time. Cumulative effects may be accrued over time and/or in conjunction with other pre-existing effects from other activities in the ROI (40 CFR § 1508.25). Therefore, previous impacts and multiple smaller impacts also should be considered.

4.13.3 Past, Present, and Reasonably Foreseeable Future Projects

The cumulative analysis identifies projects with the potential to contribute to cumulative effects or the Proposed Action's incremental impact when combined with the potential impact of a past, present, or future project. These projects occur within the ROI, and may affect some or all of the resources that would be affected by the Proposed Action. The ROI for the cumulative analysis primarily encompasses the five DoD installations being considered and nearby areas, because Proposed Action impacts would be localized, and occur primarily from construction activities. For certain resources, the cumulative effects analysis examines impacts that could occur over a larger area, such as the regional airshed for air quality effects. The temporal scope spans the 6-year timeline of the Proposed Action (2019 to 2025) to encompass construction activities associated with the proposed interim and permanent facilities.

The Air Force collected available data on recently completed, ongoing, and reasonably foreseeable future projects through a review of various online sources, including news articles, local master plans, local planning documents, and redevelopment plans; IDPs for Buckley, Peterson, Schriever, and Vandenberg AFBs; Real Property Master Plan for Redstone Arsenal; and input provided by the DoD installations being considered.

Given the number of past, present, and reasonably foreseeable future projects occurring across the five installations, the cumulative projects were grouped and summarized based on project type to facilitate analysis. Projects were grouped into the following categories:

- New Recreational Facilities and Improvements
- Transportation Improvements
- Airfield Improvements

- Administrative and Operational Facility Development
- Commercial and Mixed-Use Development
- Residential Development
- Development of Community Services
- Facility Development Projects
- Spacelift Development Projects
- Utility and Energy Improvements

Additional information on past, present, and reasonably foreseeable future projects is presented in **Appendix C**.

The impacts of past projects have been incorporated into the description of the environmental baseline presented in **Chapter 3.0**, and are already considered in the impact analysis (**Chapter 4.0**); therefore, this cumulative analysis focuses on present and reasonably foreseeable future projects. Past projects are only addressed if their long-term and operational impacts would affect similar resource areas at the same time as the Proposed Action, contributing to cumulative impacts. This analysis uses the term "past, present, and reasonably foreseeable future projects" to refer to all projects evaluated for cumulative impacts.

4.13.3.1 Impacts of Past, Present, and Reasonably Foreseeable Future Projects

The collective short-term impacts of past, present, and reasonably foreseeable future projects would be similar to the impacts of the Proposed Action. Construction and demolition activities would be expected to cause physical disturbance of surrounding soils, and generate air emissions, fugitive dust, noise, potential hazardous materials and waste, and stormwater runoff. Construction activities also are likely to cause short-term interruptions to traffic conditions, particularly due to road closures, detours, and construction-related vehicles traveling to and from the project sites.

Impacts on biological resources are expected to be minor, because the ROI for the installations include previously disturbed land cover; and many of the cumulative projects, such as road improvements and facility developments, would occur on previously disturbed or developed land. The quality of wildlife habitat is considered low to moderate, based on previous disturbance and the general lack of diverse habitat.

Similarly, the risk of disturbing undocumented cultural discoveries is low, because much of the ROI is developed or previously disturbed; particularly in the areas surrounding past, present, and future projects. The likelihood of encountering undocumented cultural resources is dependent on where past, present, and future projects are located (e.g., near potable water sources, food resources, or toolstone sources). The majority of past, present, and reasonably foreseeable future projects, such as repaving efforts, lane expansions, and facility renovations, would occur in previously developed areas.

These types of construction-related effects would occur regardless of project location, and are not considered to be constraints to development. Effects would be minor and temporary, only lasting for the duration of the construction period. Further, this cumulative analysis assumes that federal and non-federal project proponents of past, present, and reasonably foreseeable future projects are responsible for adherence to federal, state, and local regulations, and would minimize project-specific impacts to the greatest extent practicable through implementation of mitigation measures, and adherence to customary construction BMPs and safety standards.

Construction and operation of past, present, and reasonably foreseeable future projects would result in positive impacts on the local economy from temporary and permanent jobs. New local workforces would purchase goods from local merchants, and generate sales and use taxes at local and state levels. Although these effects would be minimal for smaller projects with smaller workforces; larger projects, such as the Space Based Infrared System (SBIRS) facility at Buckley AFB or the Hays Farm project and Redstone Gateway project in Huntsville, would provide notable benefits to employment, income, housing, and taxes and revenue in the ROI. There also would be positive impacts on transportation and utility infrastructure from various road and utility improvements.

4.13.4 Assessment of Cumulative Impacts

The factors considered in determining whether the Proposed Action would have adverse cumulative effects are the same as the indicators for each resource area, as described in **Chapter 3.0**. Cumulative impacts are considered to be potentially significant if the Proposed Action's additional adverse impact to the effects of past, present, and reasonably foreseeable future projects is substantial enough to measurably affect the resource area. As discussed above, it is expected that adverse effects of past, present, and reasonably foreseeable future projects are no more than minor. The term "measurably" is defined as being noticeable or detectable to a reasonable person.

4.13.4.1 Cumulative Effects under the No Action Alternative

Under the No Action Alternative, the interim and permanent USSPACECOM headquarters facilities would not be constructed at one or more of the five installations being considered. There would be no construction or occupancy of interim facilities, and no construction or operation of a permanent facility; therefore, the No Action Alternative would not result in any incremental effects. In conjunction with past, present, and reasonably foreseeable future projects, the No Action Alternative would result in no cumulative impacts.

4.13.4.2 Cumulative Effects under the Proposed Action Alternatives

As discussed in **Section 3.1**, the Proposed Action would have no potential for impacts on land use and aesthetics, safety and occupational health, utilities and infrastructure, and noise. Therefore, these resources are not evaluated in the cumulative analysis because the Proposed Action would not contribute to cumulative impacts on those resources.

A summary of cumulative impacts is presented in **Table 4.13-1,** and further discussed below. Overall, there would be negligible or minor adverse cumulative impacts on all resource areas evaluated, with the exception of Socioeconomics and Environmental Justice (EJ). Taken into consideration with the effects of past, present, and reasonably foreseeable future projects, the Proposed Action would result in cumulative positive impacts on employment, taxes, and revenue; however, implementation of the Proposed Action at Vandenberg AFB would result in potentially significant adverse cumulative impacts on housing availability and EJ communities at and near the installation.

Table 4.13-1
Summary of Cumulative Effects

Resource Area	Buckley	Peterson	Schriever	Vandenberg	Redstone
Transportation and Infrastructure	♦	♦	♦	♦	♦
Hazardous Materials and Waste	♦	♦	♦	♦	♦
Socioeconomics and Environmental Justice	■	■	■	●	■
Air Quality	♦	♦	♦	♦	♦
Biological Resources	♦	♦	♦	♦	♦
Cultural Resources	♦	♦	♦	■	♦
Geological and Paleontological Resources	♦	♦	♦	♦	♦
Water Resources	♦	♦	♦	♦	♦

Key: ■ – not affected or positive impacts, ♦- affected but not significant, ● – significant impacts.

4.13.4.3 Transportation

Incremental effects of constructing and operating the proposed interim and permanent facilities at Buckley AFB, Peterson AFB, Schriever AFB, Vandenberg AFB, and Redstone Arsenal, in conjunction with effects of past, present, and reasonably foreseeable future projects, would result in ***short- and long-term, negligible or minor adverse cumulative impacts*** on traffic and transportation from temporary construction congestion, and an increase in personnel on the selected installation(s). Cumulative impacts would not be significant.

Buckley AFB

Construction of the Proposed Action at Buckley AFB, and past, present, and reasonably foreseeable future projects would result in short-term, negligible or minor adverse cumulative impacts on traffic and transportation in the ROI. Construction-related vehicles traveling to and from the project sites would generate an increase in traffic, as would temporary road closures and detours from road improvement projects. These impacts would cease once construction of the interim and permanent facilities have been completed. Further, implementation of BMPs during construction, such as traffic coordination (e.g., flaggers, notifications, signage) would minimize local traffic impacts.

In the long term, the collective increase in installation personnel from the addition of 1,870 USSPACECOM personnel under the Proposed Action and other personnel changes from past, present, and reasonably foreseeable future projects, would cause a cumulative increase in traffic. Additional traffic congestion at the two access control points (ACPs) at Buckley AFB would create a long-term, minor adverse cumulative impact. Nearby communities would experience an increase in congestion as well. Present and planned road improvements, however, such as lane expansions, additional parking capacity, and the new 6th Avenue ACP, would help to alleviate local congestion; therefore, long-term adverse cumulative impacts on traffic would be minor. Given the extensive roadway network on and off the installation, traffic and transportation impacts are expected to be highly localized. It is anticipated that the existing capacity of the road network on and off the installation would have sufficient capacity to handle the additional traffic.

Peterson AFB

Cumulative impacts on traffic and transportation under the Proposed Action at Peterson AFB, and past, present, and reasonably foreseeable future projects would be similar to cumulative impacts described for Buckley AFB. There would be short-term, negligible or minor adverse cumulative impacts during construction of the permanent facility from temporary road closures and detours, and a temporary increase in traffic near the three ACPs into Peterson AFB. Congestion would spill over into on-base neighborhoods and Peterson Boulevard. Construction BMPs would be implemented to reduce the Proposed Action's cumulative contribution on traffic effects. Long-term, minor congestion also would be likely from a collective increase in personnel commuting to and from the base.

Schriever AFB

Incremental effects of the Proposed Action at Schriever AFB, when combined with impacts on traffic and transportation from past, present, and reasonably foreseeable future projects, would result in similar short-term, negligible or minor adverse cumulative impacts as described for Buckley and Peterson AFBs. Construction of the Proposed Action and other development on the installation would result in a temporary increase in traffic congestion, particularly near the ACPs into Schriever AFB. Because the area surrounding Schriever AFB is rural, there would not be any significant traffic impacts to nearby communities. Long-term, minor adverse cumulative impacts on congestion from an increase in personnel would occur as well. Transportation improvements at the base, including a new roundabout and road resurfacing projects, would help to alleviate local cumulative congestion in the long term.

Vandenberg AFB

Cumulative impacts on traffic and transportation under the Proposed Action at Vandenberg AFB and past, present, and reasonably foreseeable future projects would be similar to cumulative impacts described above for Buckley, Peterson, and Schriever AFBs. There would be short-term, negligible or minor adverse cumulative impacts during construction from temporary road closures and detours as well as a temporary increase in traffic from construction vehicles and equipment. Cumulative congestion would most likely occur near the four ACPs onto the installation and nearby intersections. Long-term congestion also would be likely from an increase in personnel under the Proposed Action, and other past, present, and reasonably foreseeable future projects. However, the four ACPs at the base, direct highway access to the main ACP, and an extensive roadway network on base would allow for more suitable accommodation of a collective increase in personnel and vehicles in the long term, compared to the other installations. Eleven transportation improvement projects planned at the installation also would optimize traffic flow; therefore, long-term cumulative impacts on traffic and transportation would be minor.

Redstone Arsenal

Under the Proposed Action at Redstone Arsenal, there would be short- and long-term, negligible or minor adverse cumulative impacts on traffic and transportation, similar to Buckley AFB and the other installation alternatives. Construction-related vehicle use, in addition to temporary road closures and detours, would generate an increase in traffic. These impacts would be temporary, however, and cease once construction of the Interim and/or Permanent facilities has been completed. In the long term, a collective increase in personnel commuting to and from the site would create additional traffic congestion, particularly at installation access points and nearby intersections. The existing roadway network at Redstone Arsenal has sufficient capacity to accommodate large volumes of traffic. The installation has six ACPs, a designated truck entrance, and direct highway access, which would aid in distributing and relieving cumulative congestion. Therefore, any increases in congestion from increased personnel and associated impacts would be minimal; cumulative impacts would be minor.

4.13.4.4 Hazardous Materials and Waste

Incremental effects of developing the interim and permanent sites at the five installations, when combined with effects from past, present, and reasonably foreseeable future projects, would result in overall ***short- and long-term, negligible or minor adverse cumulative impacts*** on hazardous materials and waste from use and generation. Cumulative impacts would not be significant.

Buckley AFB

The Proposed Action at Buckley AFB in conjunction with past, present, and future projects would result in short-term, negligible or minor adverse cumulative impacts on hazardous materials and waste. Construction activities would require the use of hazardous materials, such as fuel, oils, and lubricants. The use of these materials could result in accidental spills, and potentially contaminate runoff, soils, and groundwater in the ROI; however, all hazardous materials would be handled in accordance with applicable health and safety regulations and procedures. Precautions would be taken to minimize the risk of spills. Similarly, the long-term use, storage, and disposal of hazardous substances during implementation of the Proposed Action and other actions (e.g., operation of new airfield developments and operational facilities) would be conducted in compliance with applicable federal, state, and local laws and regulations, and in accordance with the Air Force's established policies.

Although construction activities may pose a risk for accidental spills and associated contamination, specifically potential lead contamination at the Buckley AFB permanent site alternatives, it is expected soil sampling and any necessary remediation of contaminated media would be conducted prior to construction of the Proposed Action and past, present, and reasonably foreseeable future actions. Therefore, direct cumulative effects on hazardous materials and waste are not anticipated.

Peterson AFB

Implementation of the Proposed Action at Peterson AFB in conjunction with past, present, and reasonably foreseeable future projects would result in similar cumulative impacts on hazardous materials and waste, as described for Buckley AFB. Hazardous materials may be present at Permanent Site Alternative 1, and would require soil sampling prior to construction to determine necessary remediation or avoidance measures, if any. Construction and operation of the new facilities would use and generate hazardous materials and waste. Adherence to applicable federal, state, Air Force, and local laws and regulations would ensure that the Proposed Action would result in short- and long-term, negligible or minor cumulative adverse impacts on hazardous materials and waste when considered with past, present, and reasonably foreseeable future projects.

Schriever AFB

Cumulative impacts on hazardous materials and waste from construction and operation of the Proposed Action at Schriever AFB would be similar to cumulative impacts described above for Buckley and Peterson AFBs. Construction and operation of the proposed facilities would involve the use of hazardous materials, and may generate hazardous wastes. No potential contamination is present at the alternative sites. Adherence to applicable federal, state, Army, and local laws and regulations would minimize the Proposed Action's adverse contribution to cumulative effects on hazardous materials and waste, and ensure that such effects remain negligible or minor.

Vandenberg AFB

Construction of the Proposed Action at Vandenberg AFB, in conjunction with construction of past, present, and reasonably foreseeable future projects, would result in similar cumulative impacts on hazardous materials and waste, as described above for the other installations. Although asbestos-containing materials and lead-based paint may be present at Permanent Site Alternative 1 and Interim Site Alternative 1, it is expected that the Proposed Action and nearby past, present, and reasonably foreseeable future actions would conduct soil sampling and further examination of the project sites prior to construction to avoid impacting hazardous materials as applicable. Therefore, direct adverse cumulative effects on hazardous materials and waste are not anticipated. Construction and operation of the new facilities would use and generate hazardous materials and waste. With adherence to applicable federal, state, Air Force, and local laws and regulations, the Proposed Action would result in short- and long-term, negligible or minor cumulative adverse impacts on hazardous materials and waste when considered with past, present, and reasonably foreseeable future projects.

Redstone Arsenal

Construction of the Proposed Action at Redstone Arsenal, in conjunction with construction of past, present, and reasonably foreseeable future projects, would result in similar cumulative impacts on hazardous materials and waste, as described above for the other installations being considered. There is little or no potential for hazardous materials to be present on the Interim and Permanent Site Alternatives. Construction and operation of the new facilities would use and generate small amounts hazardous materials and waste, as would other past, present, and future projects to varying degrees. Adherence to applicable federal, state, Army, and local laws and regulations would minimize the Proposed Action's adverse contribution to cumulative effects on hazardous materials and waste to negligible or minor levels.

4.13.4.5 Socioeconomics

The Proposed Action would have ***short-term, beneficial*** cumulative impacts on socioeconomic conditions at the selected installation(s) from temporary employment and construction spending. The Proposed Action at Vandenberg AFB also would result in ***long-term, potentially significant adverse cumulative impacts*** on housing availability and EJ communities.

Buckley AFB

The Proposed Action at Buckley AFB would contribute to positive impacts on socioeconomic conditions resulting from construction of past, present, and reasonably foreseeable future projects by bringing new temporary workers (ranging from 5 to 60 at any given time) to the area who would make purchases at local businesses. Cumulative expenditures by construction workforces would benefit local accommodation, food, and retail industries in Arapahoe County, as well as local fiscal benefits from associated sales tax revenues. There is sufficient local lodging to accommodate the collective increase of temporary workers throughout the proposed construction stages of the Proposed Action, and past, present, and reasonably foreseeable future projects. Construction of the Proposed Action would last for approximately 1 year.

In the long term, the Proposed Action would accommodate up to 1,870 personnel by 2025 at the permanent facility. Although the exact number of additional personnel from past, present, and reasonably foreseeable future projects is not known, continued development and growth of the installation and surrounding city is anticipated; therefore, a collective increase in on-base personnel is assumed. The collective increase in personnel at Buckley AFB would not result in a significant cumulative impact on socioeconomic conditions, because the City of Aurora, and other nearby municipalities, have an existing

supply of housing, schools, and other public services sufficient to meet the needs of new personnel, with the exception of General Officer Housing. The Proposed Action at Buckley AFB would require construction on the installation of thirteen General Officer Homes, each with a minimum of 2,600 square feet of interior space. Although there is no initial concept or final design at this time, the environmental consequences of constructing 351 Privatized Housing units were previously analyzed in the "Environmental Assessment for Housing Privatization at Buckley AFB, Colorado" (USAF, 2002), and its cumulative impacts were described in the "Environmental Assessment for Capital Improvement Projects" (USAF, 2006). In addition, a new 20-acre mixed-use development is proposed to bring new residential units to the ROI that would provide additional housing availability.

The Proposed Action would have no impacts on EJ communities near Buckley AFB; therefore, it would not contribute to cumulative EJ impacts.

Peterson AFB

Implementation of the Proposed Action at Peterson AFB would result in short-term positive cumulative impacts on socioeconomics similar to those described for Buckley AFB. Cumulative expenditures by temporary construction workforces would benefit local accommodation, food, and retail industries, and local fiscal benefits from associated sales tax revenues. In the long term, additional personnel under the Proposed Action and other actions at Peterson AFB would be sufficiently accommodated by local housing, schools, and other public services. Because no impacts on EJ communities would occur under the Proposed Action at Peterson AFB, no cumulative EJ impacts would result.

Schriever AFB

Cumulative impacts on socioeconomic conditions from the Proposed Action at Schriever AFB would be similar to cumulative impacts described above for Buckley and Peterson AFBs. There would be short-term, positive cumulative impacts from construction employment and workforce spending in the ROI. In the long term, additional personnel under the Proposed Action and other projects at Schriever AFB would be sufficiently accommodated by local housing, schools, and other public services in the greater Colorado Springs area. Because no impacts on EJ communities would occur under the Proposed Action at Schriever AFB, no cumulative impacts would result.

Vandenberg AFB

Short-term positive cumulative impacts from the Proposed Action at Vandenberg AFB, in conjunction with past, present, and reasonably foreseeable future projects in the ROI, would be similar to the positive cumulative impacts described above for the other installations. In the long term, however, there would be potentially significant adverse cumulative impacts on housing availability in the municipalities surrounding Vandenberg AFB. Current housing availability at the installation and surrounding cities is not sufficient to accommodate the additional personnel anticipated under the Proposed Action, much less accommodate the additional personnel anticipated from past, present, and future actions. Although new residential developments are proposed in the ROI, as listed in **Appendix C**, and would provide at least 730 new housing units, it is unlikely that this rate of development would keep pace with forecasted population changes and household growth. Therefore, long-term, potentially significant adverse cumulative impacts would occur on housing demand.

Housing shortages from the collective increase in new residents from the Proposed Action, and past, present, and reasonably foreseeable future projects, may drive personnel to seek housing options in neighboring municipalities, such as northern Santa Barbara County or southern San Luis Obispo County. Housing constraints due to low supply are present in these communities as well. Therefore, there may be

a potentially significant adverse cumulative impact on EJ communities from increased competition for housing. Low-income populations may face disproportionate impacts from cumulative adverse effects on housing demand. Mitigation measures, such as increasing housing production and relevant public and private services on or near the base, would minimize the Proposed Action's adverse contribution to cumulative impacts.

Redstone Arsenal

Cumulative impacts on socioeconomic conditions under the Proposed Action at Redstone Arsenal would be similar to those described for Buckley, Peterson, and Schriever AFBs. There would be short-term, positive cumulative impacts from construction employment and workforce spending in the ROI, because construction of the Proposed Action, and past, present, and reasonably foreseeable future projects, would bring new temporary workers to the area who would frequent local businesses. In the long term, additional personnel under the Proposed Action and other actions at Redstone Arsenal would be sufficiently accommodated by local housing, schools, and other public services. The City of Huntsville has several mixed-use and housing developments proposed in the near future, including the Hays Farm project, which would provide over 1,000 new housing units. Existing and planned housing availability would be sufficient for long-term cumulative increases in personnel at Redstone Arsenal. Because no impacts on EJ communities would occur under the Proposed Action at Redstone Arsenal, no cumulative impacts would result.

4.13.4.6 Air Quality

Incremental effects of the Proposed Action at the interim and permanent site alternatives, when combined with effects from past, present, and reasonably foreseeable future projects, would have ***short- and long-term, negligible or minor adverse cumulative impacts*** on air quality. Cumulative impacts would not be significant. The cumulative analysis for climate change is framed differently than the other resource area analyses given the global nature of climate change and describes how each of the Proposed Action alternatives would cumulatively affect and be affected by global climate change.

Buckley AFB

Construction and operation of the Proposed Action at Buckley AFB would contribute to collective air pollutant emissions associated with past, present, and future projects in the same area. However, this contribution is expected to be well within what is typical of a project of similar size and would be below the applicable *de minimis* threshold at DoD installations. Therefore, the Proposed Action is not expected to result in a significant cumulative degradation of air quality in the region, even when taken into consideration with emissions from past, present, and reasonably foreseeable future projects. A minor cumulative increase in criteria air pollutant and/or HAP emissions during construction and operation is not expected to contribute adverse effects on overall air quality in the regional airshed, especially because Buckley AFB is in a region in attainment for all criteria pollutants except for ozone. Therefore, no significant cumulative adverse impacts on air quality would occur from the Proposed Action, when considered along with past, present, and reasonably foreseeable future projects.

Although the Proposed Action would generate GHG emissions and contribute to climate change, its contribution would be negligible given the global context and magnitude of climate change. Taken into consideration with past, present, and reasonably foreseeable future projects of similar scale and scope that also would result in minimal GHG emission increases, the Proposed Action would result in negligible adverse cumulative impacts on global climate change. While the cumulative effect would be negligible, regional effects of global climate change would continue, resulting in incremental damages from increased flooding, sea level rise, and temperature changes. These effects would result in cumulative

inundation and damage to the ROI over time. Given the gradual nature of climate change, however, the installation would be able to adjust its practices accordingly to accommodate for long-term global climate change threats.

Peterson AFB

Cumulative impacts on air quality from the Proposed Action at Peterson AFB, and past, present, and reasonably foreseeable future projects, would be similar to cumulative impacts described for Buckley AFB. Although construction of the parking structures at Peterson AFB for the permanent site alternative would result in additional construction emissions relative to the permanent site alternatives at other installations being considered, emissions would still be within *de minimis* thresholds, resulting in only a negligible or minor cumulative increase in emissions when combined with emissions from past, present, and future projects. In addition, cumulative impacts on GHG emissions would be negligible. Because Peterson AFB is in a maintenance area for CO, while all other criteria pollutants are in attainment, cumulative emissions would not threaten the attainment status of the region or lead to a violation of any federal, state, or local air regulations. Further, the Proposed Action's contribution to climate change from GHG emissions would be negligible given the global context of climate change. Taken into consideration with past, present, and reasonably foreseeable future projects of similar scale and scope that also would result in minimal GHG emission increases, the Proposed Action would result in negligible adverse cumulative impacts on global climate change. However, regional effects of global climate change would continue, leading to adverse cumulative effects on the ROI in the long term from precipitation and temperature extremes, as well as sea level rise. Given the gradual nature of climate change, however, the installation would be able to adjust its practices accordingly to accommodate for long-term and cumulative global climate change threats.

Schriever AFB

Cumulative impacts on air quality from the Proposed Action at Schriever AFB, and past, present, and reasonably foreseeable future projects, would be similar to cumulative impacts described for Buckley and Peterson AFBs. An increase in cumulative emissions from construction would be negligible or minor, and within *de minimis* thresholds. This cumulative increase would not contribute significant adverse effects on overall air quality in the regional airshed. Further, cumulative emissions would not affect the attainment status of El Paso County, which is a maintenance area for CO, and in attainment for all other criteria pollutants. Therefore, no significant cumulative adverse impacts on air quality would occur from the Proposed Action. In addition, cumulative impacts on climate change would be negligible as the Proposed Action would generate only minimal GHG emissions, which would not be a significant contribution given the global context and magnitude of climate change. Although the cumulative effect would be negligible, regional effects of global climate change, such as increased flooding and temperature extremes, would continue and result in cumulative inundation and damage to the ROI over time. Given the gradual nature of climate change, however, the installation would be able to adjust its practices accordingly to accommodate for long-term, incremental global climate change threats.

Vandenberg AFB

Construction and operation of the Proposed Action at Vandenberg AFB would result in cumulative impacts on air quality similar to those described above for Buckley, Peterson, and Schriever AFBs. Overall, an increase in cumulative emissions from construction and operation of the Proposed Action and past, present, and reasonably foreseeable future projects would be negligible or minor, and within *de minimis* thresholds. Vandenberg AFB is in an attainment region for all criteria pollutants. Therefore, no significant cumulative adverse impacts on air quality would occur from the Proposed Action. Although the Proposed Action would generate GHG emissions and contribute to climate change, its contribution would

be negligible when taken into consideration with past, present, and reasonably foreseeable future projects of similar scale and scope, given the global context and greater magnitude of climate change. In the long term, global climate change would continue and cause increased sea level rise, temperature changes, and precipitation extremes, contributing to cumulative climate changes to the ROI over time. In particular, sea level rise is expected to effect Vandenberg AFB. However, because the proposed facility is not expected to be near the coast, it would experience only negligible cumulative effects from climate change. In response to other climate change threats, the installation would be able to adjust its practices accordingly.

Redstone Arsenal

Construction and operation of the Proposed Action at Redstone Arsenal would result in cumulative impacts on air quality similar to those described above for the other installations. The collective increase of criteria pollutant and hazardous air pollutant emissions from construction and operation of the Proposed Action, and past, present, and reasonably foreseeable future projects, would be negligible or minor and within *de minimis* thresholds. Therefore, no significant cumulative adverse impacts on air quality would occur from the Proposed Action. In addition, cumulative impacts from GHG emissions would be negligible. Because Redstone Arsenal is in attainment for all criteria pollutants, minimal emissions from the Proposed Action at Redstone Arsenal and past, present, and reasonably foreseeable future projects, would not affect the attainment status of the region; have a noticeable GHG impact; or lead to a violation of any federal, state, or local air regulation. In the long term, global climate change would cause increased sea level rise, temperature changes, and precipitation extremes, contributing to cumulative damage to the ROI over time. Given the gradual nature of climate change, however, the installation would be able to adjust its practices accordingly to accommodate for long-term global climate change threats.

4.13.4.7 Biological Resources

Incremental effects of the proposed interim and permanent facilities at the five installations on biological resources, when combined with effects from past, present, and reasonably foreseeable future projects, would result in overall ***short- and long-term, negligible or minor adverse cumulative impacts*** on vegetation, wildlife and habitat, including special-status species, and aquatic species and habitat. Cumulative impacts would not be significant.

Buckley AFB

The Proposed Action at Buckley AFB, and past, present, and reasonably foreseeable future projects, would result in short- and long-term, negligible or minor cumulative impacts on vegetation from clearing and disturbance to accommodate the new permanent site. Approximately 23 acres of disturbance would be required for the permanent facility, in addition to new development projected on and around Buckley AFB. However, most of the disturbance would mostly occur in previously disturbed areas, such as existing roads and pavements, that do not provide diverse or high-quality habitat; therefore, impacts would be minimal. Further, the installation would revegetate areas that would remain undeveloped in accordance with its INRMP and/or other applicable policy documents, which would minimize its contribution to cumulative effects.

There also would be short-term, negligible or minor adverse cumulative impacts on wildlife from habitat removal and degradation. Construction of other actions in the ROI, in addition to the Proposed Action, would cause cumulative disturbances associated with noise, vibration, and human activity. Although larger and more mobile wildlife such as mammals, birds, and some reptiles would be able to avoid the construction area, smaller or less-mobile species may not. However, other individuals are expected to re-colonize the area after construction, as along with temporarily displaced individuals. No federally listed

species are present at Buckley AFB; therefore, no cumulative impacts on federally listed threatened and endangered species would occur. Special-status species, including state-listed species, may occur. Adherence to seasonal restrictions from project proponents would reduce cumulative impacts on special-status species (e.g., Western burrowing owl and ferruginous hawk).

Because no in-water work would occur under the Proposed Action at Buckley AFB, or past, present, and future projects, and no waterbodies are in the footprint of interim and permanent site alternatives, no direct impacts on aquatic species and habitats would result. However, construction activities would have a short-term, negligible adverse cumulative effect on downstream waterways from soil erosion causing increased concentrations of sediments and/or pollutants in runoff. Changes in water quality could adversely affect fish species. Adherence to SWPPP, E&SC, and SWMPs under the Proposed Action, and as expected for other projects, would reduce the extent of cumulative impacts.

Peterson AFB

Cumulative impacts on biological resources at Peterson AFB under the Proposed Action and past, present, and reasonably foreseeable future projects would be similar to those described for Buckley AFB. Because the majority of land on and near Peterson AFB has been disturbed and modified by existing development, adverse cumulative impacts on vegetation would be short- and long-term and negligible or minor from construction disturbance and clearing. There also would be short-term, negligible or minor adverse cumulative impacts on wildlife and their habitat, including special-status species (e.g., Western burrowing owl and ferruginous hawk), from construction activities. Short-term, negligible adverse cumulative impacts would occur on aquatic species and habitat from changes in water quality during construction of the Proposed Action, and past, present, and reasonably foreseeable future projects. Adherence to BMPs, seasonal restrictions, and policies of the installation's INRMP and other policy documents as applicable would further minimize the Proposed Action's contribution to cumulative effects.

Schriever AFB

Cumulative impacts on biological resources at Schriever AFB under the Proposed Action, and past, present, and reasonably foreseeable future projects, would be similar to those impacts described above for Buckley and Peterson AFBs. Negligible or minor adverse cumulative impacts on vegetation would occur from construction clearing, while cumulative construction noise, vibrations, and dust would adversely impact wildlife and their habitat, including special-status species (e.g., Western burrowing owl and ferruginous hawk). Short-term, negligible adverse cumulative impacts would occur on aquatic species and habitat from changes in water quality during construction of the Proposed Action and past, present, and reasonably foreseeable future projects. Adherence to BMPs, seasonal restrictions, and the installation's INRMP would further minimize the Proposed Action's contribution to cumulative effects.

Vandenberg AFB

Cumulative impacts on biological resources at Vandenberg AFB under the Proposed Action, and past, present, and reasonably foreseeable future projects, would be similar to those impacts described above for Buckley, Peterson, and Schriever AFBs. Land disturbance from the Proposed Action and other proposed development in the vicinity would result in negligible or minor, short-term adverse cumulative construction impacts (e.g., noise, dust, and vibrations) on wildlife species (terrestrial and aquatic), as well as collective clearing of vegetation and habitat. No special-status species would be affected, because none have been documented at or near the interim and permanent sites. Short-term, negligible adverse cumulative impacts would occur on aquatic species and habitat from changes in water quality during construction of the Proposed Action, and past, present, and reasonably foreseeable future projects.

Adherence to BMPs, seasonal restrictions, and policies of the installation's INRMP and other policy documents as applicable would further minimize the Proposed Action's contribution to cumulative effects.

Redstone Arsenal

Cumulative impacts on biological resources at Redstone Arsenal under the Proposed Action, and past, present, and reasonably foreseeable future projects, would be similar to those impacts described above at Buckley AFB, Peterson, Schriever, and Vandenberg AFBs, with the exception of cumulative impacts on threatened and endangered species. Suitable habitat is potentially present at Redstone Arsenal for the federally listed gray bat, Indiana bat, and Northern long-eared bat. The Proposed Action would minimize its contribution to adverse cumulative effects on threatened and endangered species during construction by implementing TOY restrictions; adverse cumulative impacts would be short-term and minor.

4.13.4.8 Cultural Resources

Incremental effects of the Proposed Action on cultural resources, when combined with effects from past, present, and reasonably foreseeable future projects, would result in overall ***no or negligible adverse cumulative impacts*** on archaeological and architectural resources. Cumulative impacts would not be significant.

Buckley AFB

Short-term, negligible or minor cumulative effects may occur to architectural resources within the APE from implementation of the Proposed Action at Buckley AFB and nearby past, present, and reasonably foreseeable future projects. The Proposed Action would directly and indirectly affect three and five cultural resources, respectively. In conjunction with adverse effects from construction of past, present, and future projects, the Proposed Action would result in cumulative minor effects from visual and auditory interruptions, as well as dust. However, these potential adverse effects would be minimized by factors such as distance from the resource, and the duration and timing of construction activities. Federal activities that are required to comply with Section 106 (e.g., DoD projects and federally funded transportation projects) would include a construction monitoring plan and other mitigation measures designed to avoid or minimize impacts on archaeological and historic resources. If impacts are unavoidable, recovery of the resources would occur prior to construction. Proposed non-federal projects would consult with local authorities to ensure compliance with local regulations and minimal impact on cultural and historic resources. As no archaeological resources are present within the APE, none would be affected by the Proposed Action; therefore, no cumulative impacts on archaeological resources would occur.

Although the potential for discovering previously undocumented cultural resources is moderate at the two permanent site alternatives, the likelihood of encountering unanticipated cultural discoveries during construction of past, present, and reasonably foreseeable future projects is low because much of the ROI is developed or previously disturbed. Therefore, any cumulative risk to disturbing previously undocumented resources would be minimal. Adherence to cultural management plans at the installation would further minimize the risk and ensure preservation of the discovery.

Peterson AFB

Cumulative impacts on cultural resources under the Proposed Action at Peterson AFB would be similar to cumulative impacts described for Buckley AFB. No cumulative impacts on archaeological resources would occur. Two cultural resources would be directly affected from the Interim Site Alternative Parking Lot, and the potential for previously undocumented cultural resources at the site is moderate. Taken into

consideration with construction of past, present, and reasonably foreseeable future projects, there would be short-term, negligible adverse cumulative effects from construction disturbance on nearby historic properties and no or negligible cumulative effects on archaeological resources.

Schriever AFB

Cumulative impacts on cultural resources under the Proposed Action at Schriever AFB would be similar to cumulative impacts described for Buckley and Peterson AFBs. A total of seven cultural resources may be potentially indirectly affected by construction of the Interim Site Alternative 1, Interim Site Alternative 2, and Permanent Site Alternative 1; the potential for previously undocumented cultural resources at these sites is low. Taken into consideration with construction of past, present, and reasonably foreseeable future projects, there would be short-term, negligible adverse cumulative effects from visual, auditory, and atmospheric impacts on nearby historic properties. Because the cumulative likelihood of discovering previously undocumented cultural resources in the ROI is low, impacts on undocumented cultural discoveries would be negligible. Adherence to cultural management plans and BMPs at the installation would further minimize the Proposed Action's contribution to cumulative effects on cultural resources. No cumulative impacts on archaeological resources would occur.

Vandenberg AFB

No cultural resources would be directly or indirectly affected by development of the interim or permanent sites at Vandenberg AFB; therefore, no cumulative effects would result (**Section 4.3.7**). The cumulative risk of encountering unanticipated cultural discoveries during construction of the Proposed Action and past, present, and reasonably foreseeable future activities is low. Adherence to the unanticipated discovery process in the installation's ICRMP would further minimize the Proposed Action's contribution to negligible adverse cumulative effects on unanticipated cultural discoveries.

Redstone Arsenal

Cumulative impacts on cultural resources under the Proposed Action at Redstone Arsenal would be similar to cumulative impacts described for Buckley, Peterson, and Schriever AFBs. There would be short-term, negligible adverse cumulative impacts on two cultural resources near Permanent Site Alternative 1 from temporary construction disturbance (e.g., noise, dust, and visual impairments). No cumulative impacts on archaeological resources would occur. The potential for encountering previously undocumented cultural resources at this site is low. Taken into consideration with past, present, and reasonably foreseeable future projects, the cumulative risk to disturbing previously undocumented resources would be minimal.

4.13.4.9 Geology and Paleontological Resources

Incremental effects of the Proposed Action, when considered with effects of past, present, and reasonably foreseeable future actions, would result in ***short-term, negligible or minor adverse cumulative impacts*** on geological and paleontological resources from construction activities at all installations. Cumulative impacts would not be significant. No long-term cumulative impacts would occur, because operation of the Proposed Action would not disturb geological or paleontological resources.

Buckley AFB

Construction of the Proposed Action, in conjunction with construction of past, present, and reasonably foreseeable future activities, would result in short-term, negligible or minor adverse cumulative impacts on soils and geologic conditions. Ground-disturbing activities (e.g., excavation, grading, filling, compaction,

and boring) required for preparation of the interim and permanent facilities would alter existing topography to level construction surfaces, and potentially affect geology if the facilities require deep foundations. In addition, the collective trenching, filling, and compaction of soils would result in cumulative adverse impacts on soil conditions. Combined with the removal of vegetation for clearing and grading, there would be a cumulative increase in the potential for erosion of exposed soils by wind and water.

As previously discussed, however, the majority of the ROI contains disturbed land that has been developed to varying degrees. No pristine or unique soils are present. Ground disturbance would be minimal, and involve shallow surficial disturbance in limited areas. Collective changes to existing topography from the Proposed Action at Buckley, and nearby past, present, and reasonably foreseeable future projects, would likely be minimal as well. Excavation is expected to be relatively shallow, and the Proposed Action would conduct geotechnical studies to determine the extent of foundation support required, thereby minimizing the Proposed Action's contribution to cumulative effects on the underlying geologic strata.

Although sensitivity for paleontological resources varies in the region, the likelihood of encountering previously undocumented paleontological resources during construction of the Proposed Action, and past, present, and reasonably foreseeable future projects, is low because much of the ROI is developed or previously disturbed. Therefore, any cumulative risk to disturbing previously undocumented resources would be minimal. Adherence to cultural management plans at the installation would further minimize the risk, and ensure preservation of the discovery.

Peterson AFB

Cumulative effects on soils and geology at Peterson AFB would be similar to those described for Buckley AFB. Short-term, negligible, or minor adverse cumulative impacts on soils, topography, and geology would occur during construction of the Proposed Action, and past, present, and reasonably foreseeable future projects. Combined site grading, excavation, filling, and other ground-disturbing activities would result in cumulative disturbance, although this disturbance is expected to be minimal, and alleviated through standard minimization measures and pre-construction surveys. The sensitivity for paleontological resources is moderate; however, the potential for encountering undocumented paleontological resources in the ROI is low, given the disturbed nature of the area. Taken into consideration with past, present, and reasonably foreseeable future projects, the cumulative risk to disturbing previously undocumented resources would be minimal, and any resulting cumulative disturbance would be negligible. In the event of inadvertent discovery of previously undocumented paleontological resources during construction of the proposed facilities, all ground-disturbing work would immediately stop, and procedures specified in the selected installation's ICRMP would be implemented to preserve and document the discovery, thereby reducing the Proposed Action's cumulative potential to disturb paleontological resources.

Schriever AFB

Construction of the interim and permanent facilities at Schriever AFB would result in cumulative impacts on soils, topography, and geology similar to those described for Buckley and Peterson AFBs. Short-term, negligible, or minor adverse cumulative impacts would occur during construction of the Proposed Action, and past, present, and reasonably foreseeable future projects. Collective disturbance from site grading, excavation, and filling could potentially increase erosion, and impact topographic conditions and the underlying geological strata. This disturbance is expected to be minimal, and alleviated through standard minimization measures and pre-construction surveys. Further, the potential for encountering undocumented paleontological resources in the ROI is low, given the disturbed nature of the area and precautions that would be implemented by the Proposed Action.

Vandenberg AFB

Cumulative effects on soils and geology at Vandenberg AFB would be similar to those described for Buckley, Peterson, and Schriever AFBs. Short-term, negligible, or minor adverse cumulative impacts on soils, topography, and geology would occur during construction of the Permanent Site, and past, present, and reasonably foreseeable future projects. The sensitivity for paleontological resources is high at the installation. The Proposed Action would conduct additional paleontological resource surveys to minimize its potential contribution toward cumulative risk of discovering paleontological resources. In the event that paleontological resources are inadvertently discovered during construction, all ground-disturbing activities would stop immediately, and procedures in the installation's INRMP would be implemented to preserve and document such resources.

For development of the interim facility, cumulative effects on soils and geology at Vandenberg AFB would be negligible, because actions at this installation would primarily involve modernization and/or reconfiguration of interior office space in existing facilities. Land disturbance associated with the interim parking lot would involve no or shallow excavation and/or filling of soils. Therefore, the Proposed Action at Vandenberg AFB would have no potential to affect underlying geologic strata or paleontological resources. Taken into consideration with past, present, and reasonably foreseeable future projects requiring construction and ground disturbance in the ROI, the Proposed Action would contribute negligible adverse cumulative impacts.

Redstone Arsenal

Construction of the interim and permanent facilities at Redstone Arsenal would result in cumulative impacts on soils, topography, and geology similar to those described for Buckley, Peterson, Schriever, and Vandenberg AFBs. Short-term, negligible, or minor adverse cumulative impacts would occur during construction of the Proposed Action, and past, present, and reasonably foreseeable future projects. Cumulative disturbance from site grading, excavation, and filling could potentially increase erosion, and impact topographic conditions and the underlying geological strata. The resulting disturbance would be minimal, however, and alleviated through project-specific minimization measures. Further, the potential for encountering undocumented paleontological resources in the ROI is low, given the disturbed nature of the area and precautions that would be implemented by the Proposed Action. Any cumulative impact on undocumented paleontological resources would be negligible.

4.13.4.10 Water Resources

Overall, cumulative impacts on water resources from implementation of the Proposed Action and past, present, and reasonably foreseeable future actions would be short-term and minor. Specifically, there would be ***short- and long-term, negligible or minor adverse cumulative effects*** on surface water and groundwater. Because none of the proposed alternatives would be built in the 100-year floodplain, no incremental effects on floodplains would occur; therefore, there would be no cumulative effects on floodplains.

Buckley AFB

The Proposed Action at Buckley AFB, in conjunction with past, present, and reasonably foreseeable future projects, would result in short-term, negligible or minor adverse cumulative impacts on surface water quality. Ground disturbance during construction would result in sediment input to downstream water sources. There are three streams within 3 miles of the proposed interim and permanent sites at Buckley AFB. All ground-disturbing activities would be subject to applicable requirements of a Construction Site Storm Water NPDES permit and SWPPP to minimize soil erosion, resulting in no or minimal pollution and

sedimentation of downstream watercourses, and minimizing contributions to cumulative impacts on water quality.

The Proposed Action and other projects would increase the amount of impervious surface area in the ROI. The Proposed Action would add 11.5 acres of new impervious surface for the permanent facility, while airfield improvements at Buckley AFB would add over 16 acres (735,704 square feet) of impervious surface. Collectively, this amount of new impervious surface would likely have a cumulative effect on stormwater runoff, although it is not expected to alter hydrology significantly, especially in a previously developed setting. Existing stormwater controls at Buckley AFB would treat and slow down the velocity of stormwater runoff, prior to being discharged into receiving waterbodies near the installation. Although an overall cumulative increase in the amount of stormwater runoff at the base is unavoidable, these measures and continued compliance with Buckley AFB's installation-wide SWPPP would ensure that the Proposed Action does not contribute more than minor cumulative effects on water quality.

Although the use and generation of hazardous materials and waste would occur during construction of the Proposed Action, the risk of accidental release and groundwater contamination would be minimal with implementation of BMPs, and adherence to applicable regulations and guidelines. In conjunction with construction of past, present, and reasonably foreseeable future projects, the Proposed Action would result in short-term, negligible adverse cumulative effects on groundwater.

Peterson AFB

Implementation of the Proposed Action at Peterson AFB would result in cumulative impacts on water resources similar to those described for Buckley AFB. Ground disturbance during construction would temporarily and adversely affect surface water quality in downstream waterbodies from increased sedimentation and runoff. There are two streams within 3 miles of the proposed interim and permanent sites at Peterson AFB. The 11.5 acres of new impervious surface for the permanent site also would have a negligible or minor cumulative effect on stormwater runoff when considered with new impervious surface proposed under future developments. The use of hazardous materials and generation of hazardous waste during construction of the Proposed Action, and past, present, and reasonably foreseeable future projects, would increase the risk of accidental releases of contaminants to groundwater. However, with implementation of BMPs and compliance with the installation's base-wide SWPPP, adverse cumulative impacts on surface waters and groundwater would be short-term and minor.

Schriever AFB

Because there are no surface waters within the interim and permanent site boundaries on Schriever AFB or within 3 miles of the sites, cumulative effects on surface water would be negligible or minor during construction. Cumulative impacts on groundwater would be the same as those described above for Buckley and Peterson AFBs.

Vandenberg AFB

Implementation of the Proposed Action at Vandenberg AFB would result in cumulative impacts on water resources similar to those described for Buckley, Peterson, and Schriever AFBs. Ground disturbance during construction of the Proposed Action, and past, present, and reasonably foreseeable future projects, could collectively adversely affect water quality in one stream, located within 3 miles downstream of Permanent Site Alternative 1, due to sedimentation and runoff. An increase in impervious surface also would likely have a cumulative effect on stormwater runoff. The use of hazardous materials and generation of hazardous waste during construction of the Proposed Action, and past, present, and reasonably foreseeable future projects, would present a minimal risk of accidental release of

contaminants to groundwater. With implementation of BMPs and compliance with the installation's SWPPP, adverse cumulative impacts on surface waters and groundwater would be negligible or minor.

Redstone Arsenal

Implementation of the Proposed Action at Redstone Arsenal would result in cumulative impacts on water resources similar to those described above for Buckley, Peterson, Schriever, and Vandenberg AFBs; however, there would be greater cumulative impacts on surface waters, because there are more streams within 3 miles downstream of the alternative sites at Redstone Arsenal than at other installations. Ground disturbance during construction of the Proposed Action, and past, present, and reasonably foreseeable future projects, could collectively adversely affect water quality from increased sedimentation. Further, an increase in impervious surface from the Proposed Action and other projects, such as development of new administrative facilities totaling over 20 acres (890,000 square feet), would increase stormwater runoff and discharge. The use of hazardous materials and generation of hazardous waste during construction of the Proposed Action and past, present, and reasonably foreseeable future projects also would increase the risk of accidental releases of contaminants to groundwater. With implementation of BMPs and compliance with the installation's SWPPP, adverse cumulative impacts on surface waters and groundwater would be short-term and negligible or minor.

5.0 CONSULTATION AND COORDINATION

The federal, state, local, DoD, and other agencies/organizations/individuals contacted during the preparation of this EA are listed below:

Federal

Advisory Council on Historic Preservation
National Park Service
National Oceanic and Atmospheric Administration (NOAA)
U.S. Army Corps of Engineers
U.S. Coast Guard
U.S. Department of Transportation
U.S. EPA – Alabama, Region 4
U.S. EPA – California, Region 9
U.S. EPA – Colorado, Region 8
U.S. Fish and Wildlife Service

State

Alabama

Alabama Department of Conservation and Natural Resources
Alabama Department of Environmental Management
Alabama State Historic Preservation Office

California

California Coastal Commission – Energy, Ocean Resources and Federal Consistency Division
California Department of Fish & Wildlife
California Environmental Protection Agency
Central Coast Regional Water Quality Control Board
Central Coast Regional Water Quality Control Board – Central Coast Ambient Monitoring Program (CCAMP)
Office of the Governor – Office of Planning and Research
Santa Barbara County Air Pollution Control District

Colorado

Colorado Department of Public Health & Environment – Air Pollution Control Division
Colorado Department of Public Health & Environment – Federal Facilities
Colorado Department of Public Health & Environment – Water Quality Control Division
Colorado Department of Transportation
Colorado Division of Wildlife
Colorado Office of Archaeology and Historic Preservation
State Historic Preservation Officer

Local

California

City of Lompoc
Santa Barbara County Board of Supervisors

Santa Barbara County Planning & Development

Colorado

Board of Arapahoe County Commissioners
Cheyenne Mountain State Park
City of Aurora
City of Colorado Springs Land Use Review Board
El Paso County Board of County Commissioners
Plains Conservation Center

Department of Defense

AFCEC/CZN

Tribes

Absentee Shawnee Tribe of Oklahoma
Alabama-Coushatta Tribe of Texas
Alabama-Quassarte Tribal Town
Apache Tribe of Oklahoma
Assiniboine and Sioux Tribes of the Fort Peck Indian Reservation
Cherokee Nation
Cheyenne River Sioux Tribe
Cheyenne-Arapaho Tribes of Oklahoma
Chickasaw Nation of Oklahoma
Comanche Nation
Comanche Nation of Oklahoma
Coushatta Tribe of Louisiana
Crow Creek Sioux Tribe
Crow Nation
Crow Tribe of Indians
Eastern Band of Cherokee Indians
Eastern Shawnee Tribe of Oklahoma
Eastern Shoshone Tribe of Wind River Indian Reservation
Eastern Shoshone Tribe of Wind River Reservation
Flandreau Santee Sioux Tribe
Flandreau Santee Sioux Tribe of South Dakota
Fort Belknap Indian Community
Fort Peck Tribes of the Assiniboine and Sioux
Fort Sill Apache Tribe
Fort Still Apache of Oklahoma
Jicarilla Apache Nation
Jicarilla Apache Tribe
Kialegee Tribal Town
Kiowa Tribe of Oklahoma
Lower Brule Sioux Tribe
Lower Brule Sioux Tribe of the Lower Brule Reservation, South Dakota
Mescalero Apache Tribe
Muskogee (Creek) Nation of Oklahoma
Northern Arapaho Tribe
Northern Cheyenne Tribe
Northern Cheyenne Tribe of the Northern Cheyenne Indian Reservation

Northern Ute Indian Tribe of the Uintah and Ouray Ute Reservation
Oglala Sioux Tribe
Pawnee Nation of Oklahoma
Poarch Band of Creek Indians
Pueblo of Taos
Pueblo of Zuni
Rosebud Sioux Tribe
Santa Ynez Band of Chumash Indians
Santee Sioux Nation
Seminole Nation of Oklahoma
Shawnee Tribe
Southern Ute Indian Tribe
Southern Ute Tribal Council
Spirit Lake Nation
Standing Rock Sioux Tribe
Thlopthlocco Tribal Town
Three Affiliated Tribes of the Mandan, Hidatsa & Arikara Nation
Tunica-Biloxi Indian Tribe
United Keetoowah Band of Cherokee
Upper Sioux Indian Community
Ute Indian Tribe of the Uintah & Ouray Reservation
Ute Mountain Ute Tribe
Wichita and Affiliated Tribes
Yankton Sioux Tribe

Other

California Native Plant Society – Channel Islands Chapter
California Trout
Environmental Defense Center
La Purisima Audubon Society
Santa Barbara Museum of Natural History

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