DRAFT

ENVIRONMENTAL ASSESSMENT FOR SOLAR PHOTOVOLTAIC RENEWABLE ENERGY DEVELOPMENT AT CANNON AIR FORCE BASE, NEW MEXICO

Prepared for

Cannon Air Force Base, New Mexico

United States Air Force

September 2019

Privacy Notice: Letters or other written comments provided may be published in the Final Environmental Assessment (EA). As required by law, substantive comments will be addressed in the Final EA and made available to the public. Any personal information provided will be kept confidential. 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 their specific comments will be disclosed. Personal home addresses and phone numbers will not be published in the Final EA.

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FINDING OF NO SIGNIFICANT IMPACT (FONSI)
SOLAR PHOTOVOLTAIC RENEWABLE ENERGY DEVELOPMENT AT CANNON AIR FORCE BASE, NEW MEXICO

Pursuant to provisions of the National Environmental Policy Act (NEPA), Title 42 United States Code (USC) Sections 4321 to 4347, implemented by Council on Environmental Quality (CEQ) Regulations, Title 40, Code of Federal Regulations (CFR) Part 1500-1508, and 32 CFR Section 989, *Environmental Impact Analysis Process*, the U.S. Air Force (Air Force) assessed the potential environmental consequences associated with developing solar photovoltaic (PV) arrays to produce renewable energy at Cannon Air Force Base (AFB), New Mexico, through an Energy Savings Performance Contract.

The purpose of the proposed action is to offset the environmental footprint of activities at Cannon AFB while improving energy security and resiliency. The need for the proposed action is to support compliance with federal, Department of Defense (DoD), and state renewable energy and greenhouse gas (GHG) emissions mandates. This project also supports the goals of the 2017-2036 *Air Force Energy Flight Plan* by supplying the majority of Cannon AFB's electricity demand with renewable energy generated on the installation. It would also allow Cannon AFB to contribute to the DoD's long-range goals for installation renewable energy performance as set forth in 10 USC § 2911.

The Environmental Assessment (EA), incorporated by reference into this finding, evaluates the potential impacts of the Proposed Action and the No Action Alternative on the natural and human environment. The EA also considers cumulative environmental impacts with other projects in the Region of Influence.

PROPOSED ACTION

The proposed action is to develop ground-based solar PV arrays on one or more of three sites at Cannon AFB, which are referred to as Sites 1 to 3. The sites for the proposed solar PV arrays are described as follows:

- Site 1 is a 6.8-acre parcel in the northern portion of the installation that would be capable of producing approximately 2 megawatts (MW) of power.
- Site 2 is a 6.35-acre parcel in the northern portion of the installation that would be capable of producing approximately 2 MW of power.
- Site 3 is an 8.88-acre parcel in the southern portion of the installation that would be capable of producing approximately 3 MW of power.

The Air Force considered another site (Site 4), but it was eliminated from further consideration because it was in a floodplain and thus did not meet the selection standards established to identify reasonable alternatives.

NO ACTION ALTERNATIVE

Under the No Action Alternative, the proposed development of a solar PV array at Cannon AFB would not proceed. The Air Force would fail to meet federal and State of New Mexico standards and requirements for renewable energy development. Although the No Action Alternative would

not meet the purpose of and need for the proposed action, it was carried forward for detailed analysis in accordance with the requirements of the CEQ's implementing regulations for NEPA.

SUMMARY OF FINDINGS

The Air Force has concluded that no significant adverse effects would result from the proposed action. The proposed action would result in potentially less-than-significant adverse impacts on air quality (short-term), biological resources, earth resources, hazardous materials and waste, infrastructure and utilities, safety and occupational health, and water resources. The proposed action would also result in beneficial impacts on air quality, infrastructure and utilities, and socioeconomics. No or negligible adverse impacts on airspace, cultural resources, environmental justice, land use, noise, and socioeconomics are anticipated from implementing the proposed action.

The cumulative effects of the proposed action in combination with other past, present, and reasonably foreseeable actions on- and off-base would not result in significant adverse impacts. Cumulative net beneficial effects on air quality and infrastructure would be realized by constructing solar PV arrays at Cannon AFB when combined with the net beneficial effects on air quality and infrastructure that would be realized through New Mexico's renewable energy initiatives.

MITIGATION MEASURES AND BEST MANAGEMENT PRACTICES

No mitigation measures would be necessary under the proposed action to reduce adverse impacts to below significant levels. Best management practices specified in the EA would be implemented to manage potential impacts.

STAKEHOLDER INVOLVEMENT

Coordination with appropriate federal, state, and local agencies and consultation with federally recognized Tribes, the U.S. Fish and Wildlife Service, and the New Mexico State Historic Preservation Officer was conducted as part of the NEPA process for this EA. Following the scoping period, the EA and draft FONSI were made available to the public, agencies, and Tribal representatives for a 30-day review period. All comments received during the NEPA process were addressed as part of the analysis of potential environmental effects.

FINDING OF NO SIGNIFICANT IMPACT (FONSI):

Based on the information and analysis presented in the EA, which was prepared in accordance with the requirements of NEPA, the CEQ regulations for implementing NEPA, USAF regulations for implementing NEPA set forth in 32 CFR § 989, and based on the results of the various consultations and review of the public and agency comments submitted during the 30-day public comment period, I conclude that the environmental effects of implementing the proposed action at Cannon AFB are not significant, preparation of an Environmental Impact Statement is unnecessary, and a FONSI is appropriate.

_____ _____

ROBERT A. MASAITIS, Colonel, USAF
27 Special Operations Wing, Commander

Date

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ACRONYMS AND ABBREVIATIONS

AFB	Air Force Base
AFI	Air Force Instruction
Air Force	United States Air Force
AOC	Area of Concern
AT/FP	Antiterrorism/force protection
BASH	Bird Aircraft Strike Hazard
BMP	Best management practice
CAA	Clean Air Act
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CWA	Clean Water Act
DoD	Department of Defense
EA	Environmental Assessment
EIAP	Environmental Impact Analysis Process
EIS	Environmental Impact Statement
EO	Executive Order
EPA	Environmental Protection Agency
ERP	Environmental Restoration Program
ESA	Endangered Species Act
ESPC	Energy Savings Performance Contract
ESQD	Explosives safety quantity-distance
FAA	Federal Aviation Administration
FONSI	Finding of No Significant Impact
FY	Fiscal year
GHG	Greenhouse gas
IPaC	Information for Planning and Consultation
MBTA	Migratory Bird Treaty Act
MW	Megawatt
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NMED	New Mexico Environment Department
NOA	Notice of Availability
NPDES	National Pollutant Discharge Elimination System

OSHA	Occupational Safety and Health Administration
PV	Photovoltaic
RCRA	Resource Conservation and Recovery Act
SHPO	State Historic Preservation Officer
SWMU	Solid Waste Management Unit
SWPPP	Stormwater Pollution Prevention Plan
USC	United States Code
USFWS	United States Fish and Wildlife Service

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1. PURPOSE OF AND NEED FOR ACTION

1.1 INTRODUCTION

The United States Air Force (Air Force) proposes to develop solar photovoltaic (PV) arrays to produce renewable energy at Cannon Air Force Base (AFB), New Mexico, through an Energy Savings Performance Contract (ESPC). **Figure 1** shows Cannon AFB and **Figure 2** shows potential locations for the proposed solar PV arrays.

Cannon AFB is located in the high plains of eastern New Mexico, 8 miles west of Clovis, and occupies 3,789 acres of land. It was established in 1942 and has hosted a variety of missions and aircraft types throughout its history. Cannon AFB is currently home to the 27th Special Operations Wing.

This Environmental Assessment (EA) was prepared to evaluate the potential environmental impacts of this action, in compliance with the National Environmental Policy Act of 1969 (NEPA) (42 United States Code [USC] 4331 et seq.), the regulations of the President's Council on Environmental Quality (CEQ) that implement NEPA procedures (40 Code of Federal Regulations [CFR] Parts 1500-1508), the Air Force's Environmental Impact Assessment Process (EIAP) Regulations at 32 CFR Part 989, and Air Force Instruction (AFI) 32-7061.

The information presented in this document will serve as the basis for deciding whether the proposed action would result in a significant impact to the human environment, requiring the preparation of an environmental impact statement (EIS), or whether no significant impacts would occur, in which case a finding of no significant impact (FONSI) would be appropriate.

1.2 BACKGROUND

Most of the energy consumed in the United States, including by the U.S. military, is derived from fossil fuels like natural gas and petroleum, which are historically economical and plentiful energy resources. However, heavy reliance on fossil fuels exacerbates the United States' vulnerability to economic and security risks associated with energy supply interruptions and price fluctuations. The combustion of fossil fuels also produces pollutants, including the greenhouse gases (GHGs) such as carbon dioxide, which in increased atmospheric concentrations are implicated as a primary driver of climate change (IPCC 2013).

Renewable energy is energy derived not from finite sources like fossil fuels, but from diverse sources that are constantly renewed, such as sunlight, wind, tides, and even geothermal energy. The U.S. federal government and its agencies have identified as a high priority the diversification of the U.S. federal and military energy portfolio through the adoption of renewable energy resources, whose diversity and local production can help ameliorate price and supply vulnerabilities and which substantially reduce GHG emissions associated with energy production and consumption.

The *2017-2036 Air Force Energy Flight Plan* summarizes the Air Force's current energy goals. Among these are to improve resiliency by mitigating the risk that energy security vulnerabilities might impede the Air Force's ability to carry out its mission, to reduce its demand for energy, to assure energy supply by diversifying energy and fuel sources, and to foster a culture of energy awareness (Air Force 2017a).

Figure 1. Location of Cannon AFB

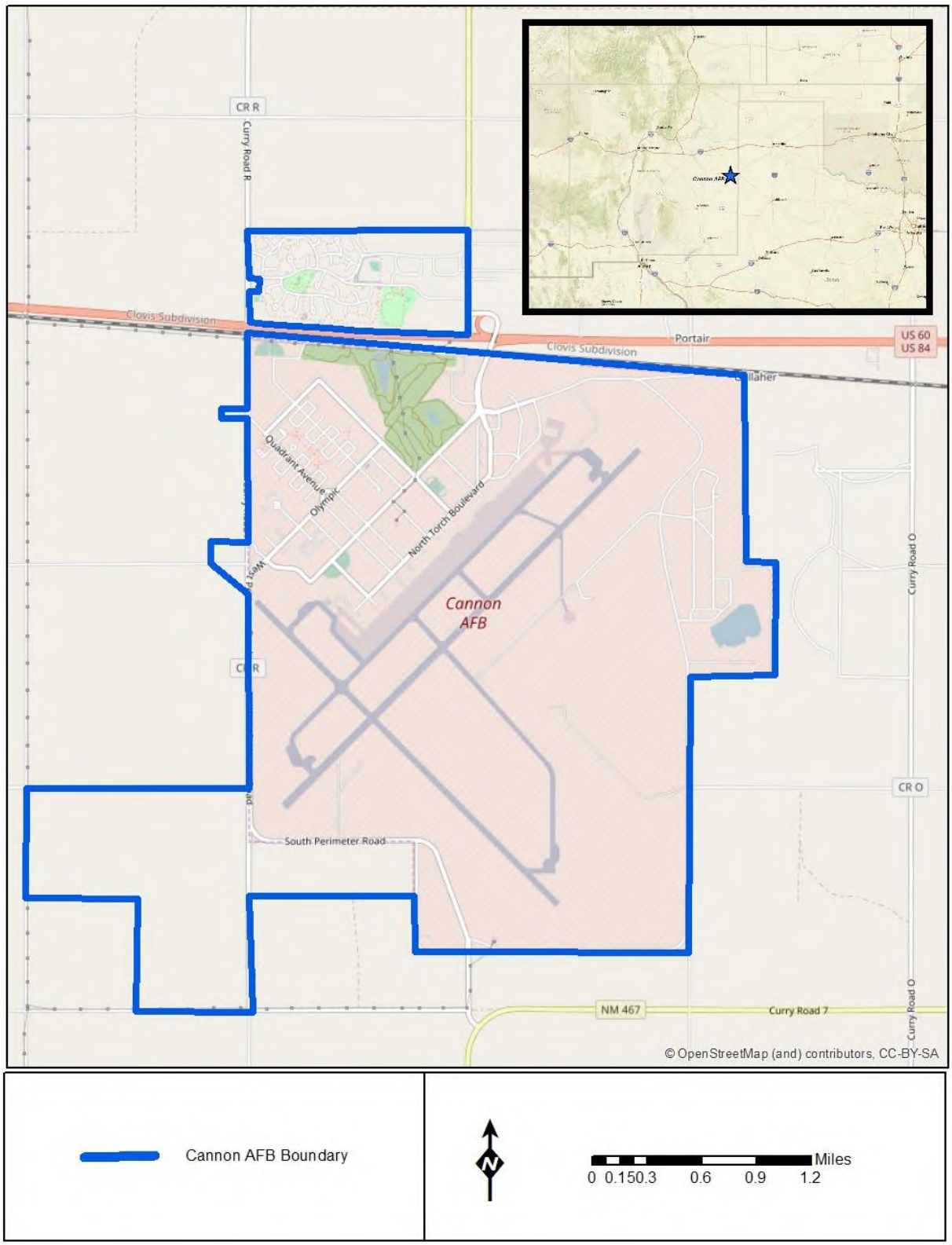
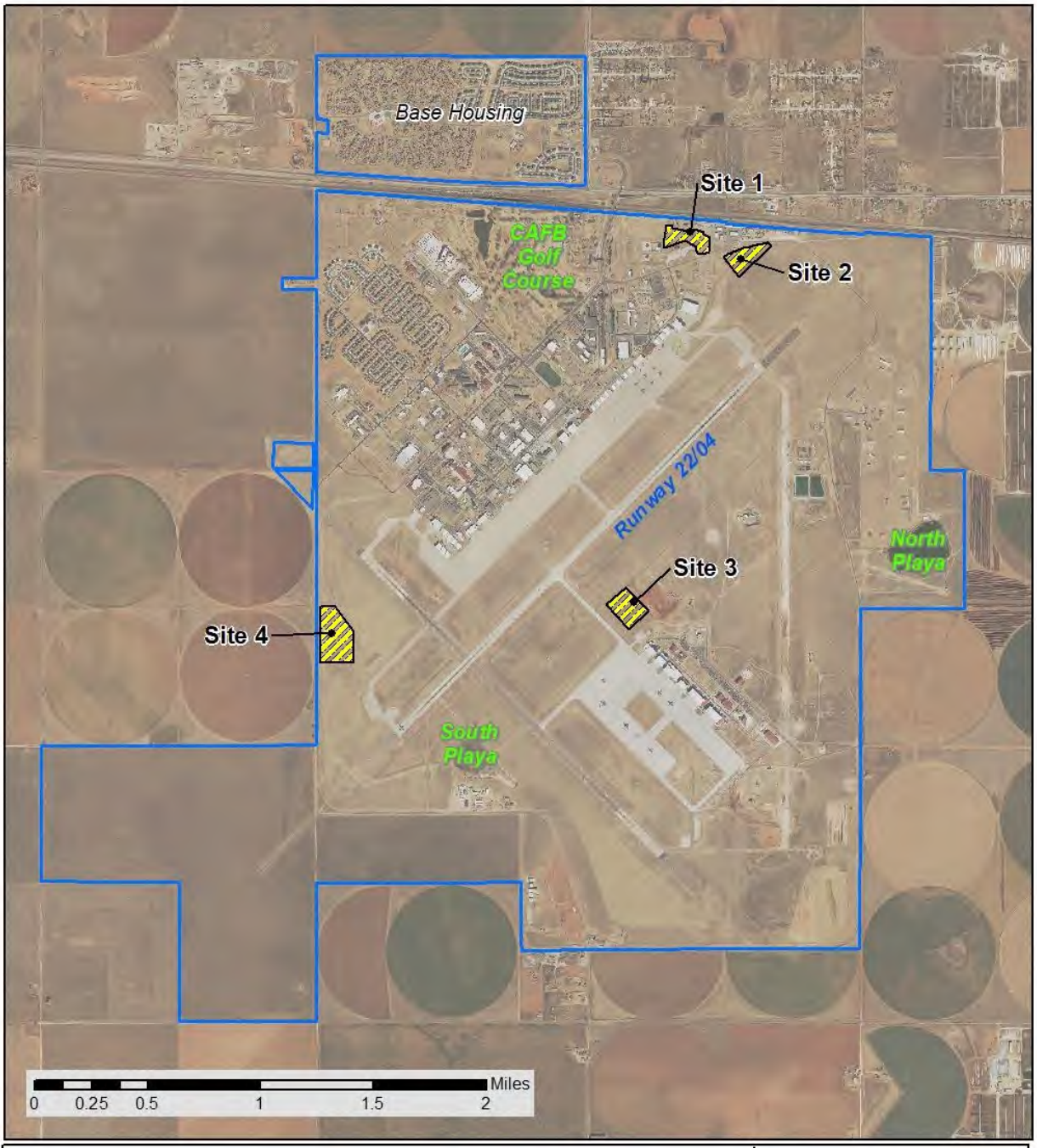


Figure 2. Potential Sites for the Proposed Solar PV Arrays



Legend

Installation Boundary

PV Array Site

PV Site	Size (Ac)	Production (MW)
Site 1	6.8	2
Site 2	6.35	2
Site 3	8.88	3
Site 4	19.27	7

N

2018 Aerial Image Cannon AFB

The Energy Policy Act of 2005 is the foundation of modern federal renewable energy policy and established initial energy efficiency and sustainability goals for federal government facilities. The objective of this act and subsequent legislation and policy is to promote energy security and independence and lessen the environmental impact of energy-related activities. Current federal renewable energy requirements are captured in Executive Order (EO) 13834, *Efficient Federal Operations*; 10 USC §2911, *Energy Performance Goals for the Department of Defense*; and Air Force and Department of Defense (DoD) plans and policies. While EO 13834 does not contain a numeric threshold for energy savings, 10 USC §2911 states that the DoD's goal is to produce or procure at least 25 percent of total energy consumed from renewable energy sources by 2025. This is not an exhaustive list of all federal mandates, but rather a compilation of the most relevant and current goals that affect current considerations of renewable energy procurement and generation at federal facilities, including Cannon AFB.

The State of New Mexico has also established its own renewable energy requirements. In March 2019, the governor signed into law the Energy Transition Act (Senate Bill 489) that requires carbon-free energy to supply 50 percent of New Mexico's electricity by 2030, with a goal of 100 percent by 2045. New Mexico's governor also issued EO 2019-003, *Executive Order on Addressing Climate Change and Energy Waste Prevention*, in January 2019, which set a statewide objective to reduce GHG emissions to 45 percent below 2005 levels by 2030.

Currently, Cannon AFB sources its electric power from Xcel Energy, the utility company that provides electrical power to the region. Xcel Energy produces 24 percent of its electric power from renewable sources (e.g., wind and solar) and the remaining 76 percent from non-renewable sources (e.g., coal and natural gas) (Xcel 2019). Cannon AFB's current renewable energy consumption is limited to the portion of Xcel Energy's electrical power that is from renewable sources.

1.3 PURPOSE OF THE ACTION

The purpose of the proposed action is to offset the environmental footprint of activities at Cannon AFB while improving energy security.

1.4 NEED FOR THE ACTION

The need to develop solar PV arrays to produce renewable energy at Cannon AFB is to support compliance with federal, DoD, and state renewable energy and GHG emissions mandates. This project also supports the goals of the *2017-2036 Air Force Energy Flight Plan* by supplying the majority of Cannon AFB's electricity demand with renewable energy generated on the installation. It would also allow Cannon AFB to contribute to the DoD's long-range goals for installation renewable energy performance as set forth in 10 USC §2911.

1.5 INTERAGENCY AND INTERGOVERNMENTAL COORDINATION AND CONSULTATIONS

1.5.1 Interagency Coordination and Consultations

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. Per the requirements of Intergovernmental Cooperation Act of 1968 (42 USC §4231(a)) and EO 12372, *Intergovernmental Review of Federal Programs*, federal, state, and local agencies with jurisdiction that could be affected by the proposed actions were notified during the development of this EA.

Section 6 contains the list of agencies consulted during this analysis and Appendix A contains copies of relevant correspondence.

1.5.2 Government to Government Consultations

EO 13175, *Consultation and Coordination with Indian Tribal Governments*, directs federal agencies to coordinate and consult with Native American tribal governments whose interests might be directly and substantially affected by activities on federally administered lands. Consistent with that executive order, 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 Cannon AFB geographic region 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 process, and it requires separate notification of all relevant tribes. The timelines for tribal consultation are also distinct from those of other consultations. The Cannon AFB point-of-contact for Native American tribes is the Installation Cultural Resources Manager.

The Native American tribal governments that have been invited to consult with the Air Force regarding the proposed action are listed in Section 6 and correspondence with the tribal governments is provided in Appendix A.

1.5.3 Other Agency Consultations

Per the requirements of Section 106 of the National Historic Preservation Act and implementing regulations (36 CFR Part 800) and Section 7 of the Endangered Species Act and implementing regulations, findings of effect and request for concurrence were transmitted to the New Mexico State Historic Preservation Officer (SHPO), within the New Mexico Historic Preservation Division, and the U.S. Fish and Wildlife Service (USFWS). The Air Force's finding of "no historic properties affected" was transmitted to the SHPO and their concurrence was received on 5 September 2019. The Air Force's finding of "no effect" was transmitted to the USFWS and their concurrence is pending. Correspondence with the SHPO and USFWS is included in Appendix A.

1.6 PUBLIC AND AGENCY REVIEW OF EA

A Notice of Availability (NOA) was published in *The Eastern New Mexico News* announcing the availability of the Draft EA and FONSI for a 30-day public review period. The NOA invites the public to review and comment on the Draft EA and FONSI.

Comments should be provided by mail to Ms. Crystal Chavez, NEPA Program Manager, 27th Special Operations Civil Engineer Squadron, 506 N. Air Commando Way, Cannon AFB, NM 88103, or by email to 27SOCES.CEIE.Assess@us.af.mil.

Letters or other written comments provided may be published in the Final EA. As required by law, substantive comments will be addressed in the Final EA and made available to the public. Any personal information provided will be kept confidential. 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 their specific comments will be disclosed. Personal home addresses and phone numbers will not be published in the Final EA.

During the public review period, the Draft EA and FONSI are available online under the heading *Reports & Docs* at: http://www.cannon.af.mil/News. A printed copy of the Draft EA and FONSI are available for review at the Clovis-Carver Public Library at 701 North Main Street, Clovis, NM 88101.

1.7 DECISION TO BE MADE

The EA evaluates whether the proposed action would result in significant impacts on the human environment. If significant impacts are identified, Cannon AFB would undertake mitigation to reduce impacts to below the level of significance, undertake the preparation of an EIS addressing the proposed action, or abandon the proposed action.

This EA is a planning and decision-making tool that will be used to guide Cannon AFB in implementing the proposed action in a manner consistent with Air Force standards for environmental stewardship. The analysis presented in this document, and feedback received from the public and from other agencies, will inform decisions regarding the proposed project.

2. DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

2.1 PROPOSED ACTION

The Air Force and Cannon AFB propose to develop solar PV arrays to produce renewable energy on installation property to satisfy the purpose of and need for the action described in Sections 1.3 and 1.4. Ground-based solar arrays would be constructed on one or more of the four sites shown on **Figure 2**, which are referred to herein as Sites 1 to 4. The following four alternatives are proposed for the solar PV arrays:

- **Construct and Operate Solar PV Array at Site 1**: Site 1 is a 6.8-acre parcel in the northern portion of the installation that would be capable of producing approximately 2 MW of power.
- **Construct and Operate Solar PV Array at Site 2**: Site 2 is a 6.35-acre parcel in the northern portion of the installation that would be capable of producing approximately 2 MW of power.
- **Construct and Operate Solar PV Array at Site 3**: Site 3 is an 8.88-acre parcel in the southern portion of the installation that would be capable of producing approximately 3 MW of power.
- **Construct and Operate Solar PV Array at Site 4**: Site 4 is a 19.27-acre parcel in the southern portion of the installation that would be capable of producing approximately 7 MW of power.

2.2 SELECTION STANDARDS

NEPA and the CEQ regulations mandate the consideration of reasonable alternatives for the proposed action. *Reasonable alternatives* are those that also could be used to meet the purpose of and need for the proposed action. Per the requirements of 32 CFR Part 989, the Air Force EIAP regulations, selection standards are used to identify alternatives for meeting the purpose of and need for the proposed action.

Any proposed renewable energy development on Air Force property must support the Purpose of and Need for the Action and meet the following baseline requirements:

- Be compatible with the existing, ongoing military mission and activities at Cannon AFB;
- Comply with Air Force and DoD planning and design manuals, design standards, and safety requirements for Air Force facilities and use market standards for development outside the Cannon AFB perimeter fence;
- Be compatible with existing infrastructure and development at Cannon AFB and its vicinity;
- Meet antiterrorism and force protection (AT/FP) requirements within the installation perimeter fence; and
- Be economically viable, cost effective, and financeable at reasonable market rates.

In selecting possible locations at Cannon AFB for solar PV energy development, the Air Force and Cannon AFB looked for sites that met the following selection standards:

- **Selection Standard A:** Offer at least 6 acres of contiguous land area, preferably with minimal development constraints (e.g., wetlands or explosive safety arcs).
- **Selection Standard B:** Consist of land that is generally flat, the majority of the site having a grade of 3 percent or less.
- **Selection Standard C:** Offer sufficient site access via existing paved and unpaved roads, either inside or outside the installation perimeter fence, to ensure that construction and operation of facilities and equipment, including interconnection to the existing electrical grid can proceed.
- **Selection Standard D:** Be free of substantial environmental constraints.

2.3 SCREENING OF THE ALTERNATIVES

Table 1 presents those alternatives that were identified as potentially meeting the purpose of and need for the proposed action and whether or not each one would meet the selection standards presented in Section 2.2.

Table 1. Screening of the Alternatives

Alternative	Selection Standard A: At least 6 contiguous acres of land	Selection Standard B: Grade is primarily 3 percent or less	Selection Standard C: Site offers sufficient access and ability to connect to electrical grid	Selection Standard D: Be free of substantial environmental constraints
Construct and Operate Solar PV Array at Site 1	Yes	Yes	Yes	Yes
Construct and Operate Solar PV Array at Site 2	Yes	Yes	Yes	Yes
Construct and Operate Solar PV Array at Site 3	Yes	Yes	Yes	Yes
Construct and Operate Solar PV Array at Site 4	Yes	Yes	Yes	No
No-Action Alternative	Not applicable	Not applicable	Not applicable	Not applicable

Sites 1 to 3 meet all of the selection standards. Therefore they, and the No-Action Alternative, are carried forward for detailed analysis in this EA.

Site 4 does not meet selection standard D because much of Site 4 is within a 100-year floodplain; it was therefore eliminated from further analysis.

2.4 DETAILED DESCRIPTION OF THE ALTERNATIVES

2.4.1 Proposed Action

The proposed action is to construct and operate solar PV arrays at Sites 1, 2, and 3; however, the Air Force may choose to construct and operate solar PV arrays at only one or two of the three sites.

Under the proposed action, the ESPC contract holder would construct, operate, and maintain the solar PV arrays. Because the solar PV arrays would be constructed and operated similarly regardless of which site(s) it was constructed on, their similar characteristics are discussed collectively in this section, followed by subsections with more information about each site. **Figures 3 to 5** depict the layout and design of the proposed solar array for each site. **Figure 6** shows all sites considered in relation to environmental constraints such as wetlands, 100-year floodplains, Environmental Restoration Program (ERP) sites, runway clear zones, and explosive safety quantity-distance (ESQD) arcs.

The PV panels would be oriented to the south to maximize solar exposure. The PV panels would be approximately 18 inches above grade at the base and positioned at a fixed tilt, 30-degree angle, resulting in a back-edge height of approximately 6 feet. Rows would be spaced 15 to 15.5 feet apart depending on the site. The PV panels would be anchored to the ground with appropriate anchors as determined by a geotechnical survey (e.g., helical screw or driven pier) and would meet applicable engineering design criteria, such as to withstand maximum anticipated winds. Inverters and transformers would be mounted on concrete pads.

Each solar PV array would be connected to existing electrical infrastructure. The point of connection would be within or near each site. Where the point of interconnection is outside the site boundary, some work outside the site boundary would occur. Trenching would be required to install duct banks between the inverters and the point of interconnection, as indicated on **Figures 3 to 5**.

The solar PV arrays would be surrounded by a 6-foot high chain-link fence, topped by 1 foot barbed wire, for a total height of 7 feet. The maximum height of any structure associated with the project would be 8.63 feet. There would be a minimum 10-foot setback between the PV panels and the perimeter fence and also between the perimeter fence and any existing roads.

Construction would likely begin in 2020 and last for approximately 18 months. If multiple sites were selected, construction could occur simultaneously at multiple sites. To comply with the Clean Water Act (CWA), National Pollutant Discharge Elimination System (NPDES) and any applicable permits held by Cannon AFB, the construction contractor would submit a Notice of Intent to the State of New Mexico for Construction General Permit coverage and prepare a Stormwater Pollution Prevention Plan (SWPPP) that would contain best management practices (BMPs) to manage stormwater runoff. BMPs to be implemented during construction would include but not be limited to the following:

- Installation of silt fences;
- Dust control;
- Soil stabilization using water, vegetation, and/or mulch; and
- Stabilized construction exit(s) to reduce the tracking of mud and dirt onto adjacent roads.

Construction equipment would include backhoes, concrete mixers, dump trucks, excavators, front-end loaders, generators, graders, and pneumatic tools. Construction staging areas, traffic entry and exit points, and haul routes will be approved by Cannon AFB and defined in the project SWPPP and will be amended as needed to accommodate mission schedules. Construction contractors would remove all materials from staging areas and restore them to pre-project conditions upon project completion.

Figure 3. Proposed Solar PV Array at Site 1

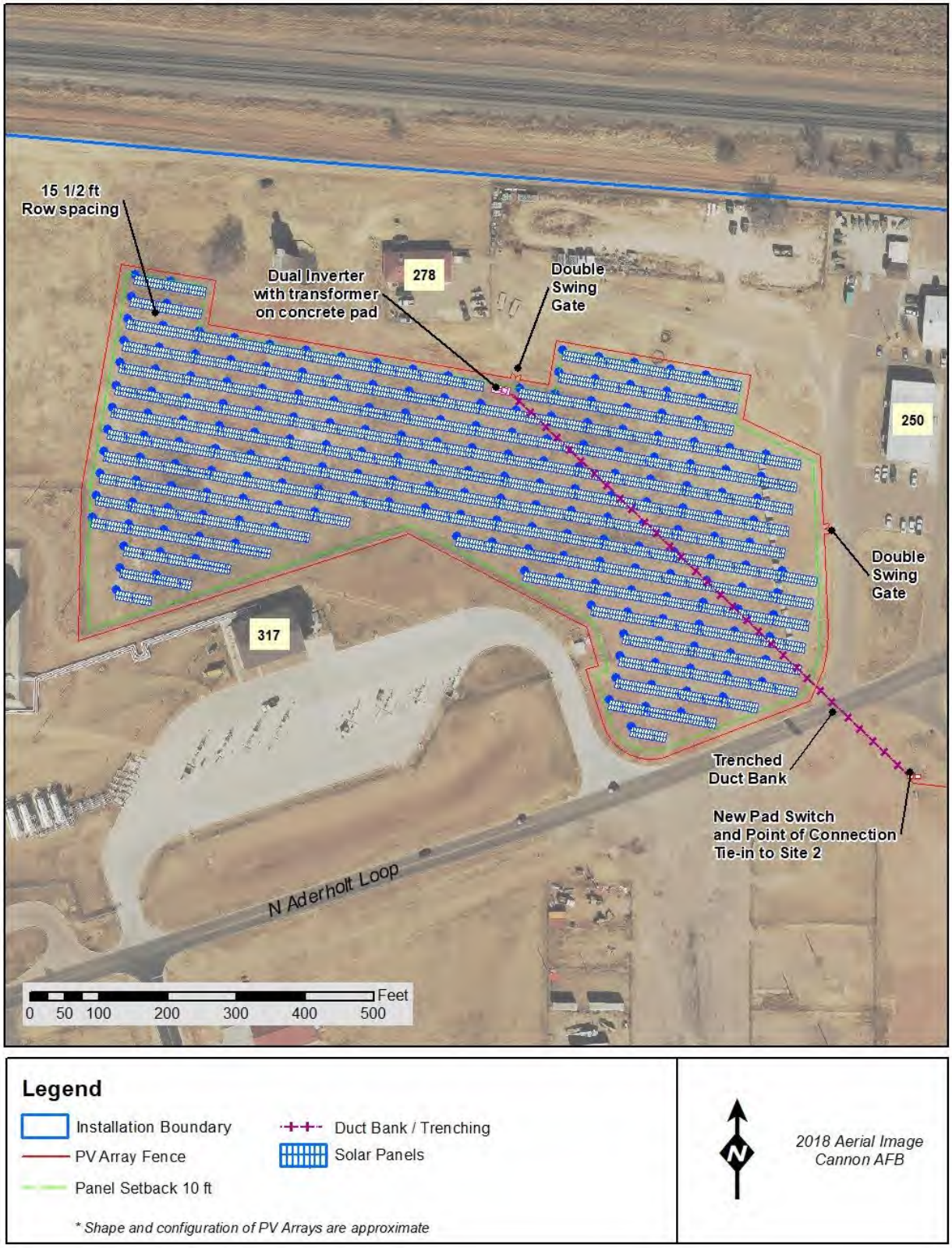


Figure 4. Proposed Solar PV Array at Site 2

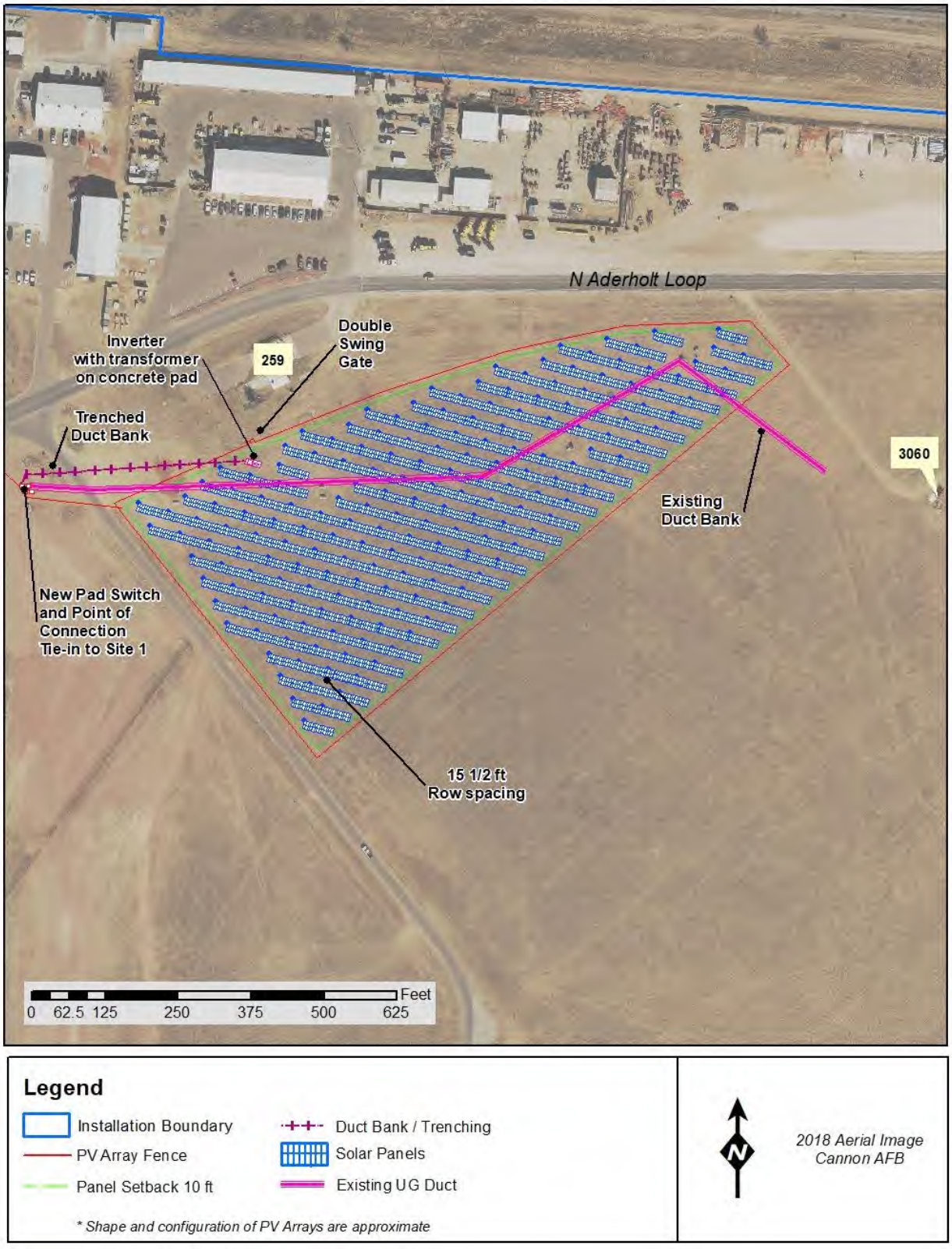


Figure 5. Proposed Solar PV Array at Site 3

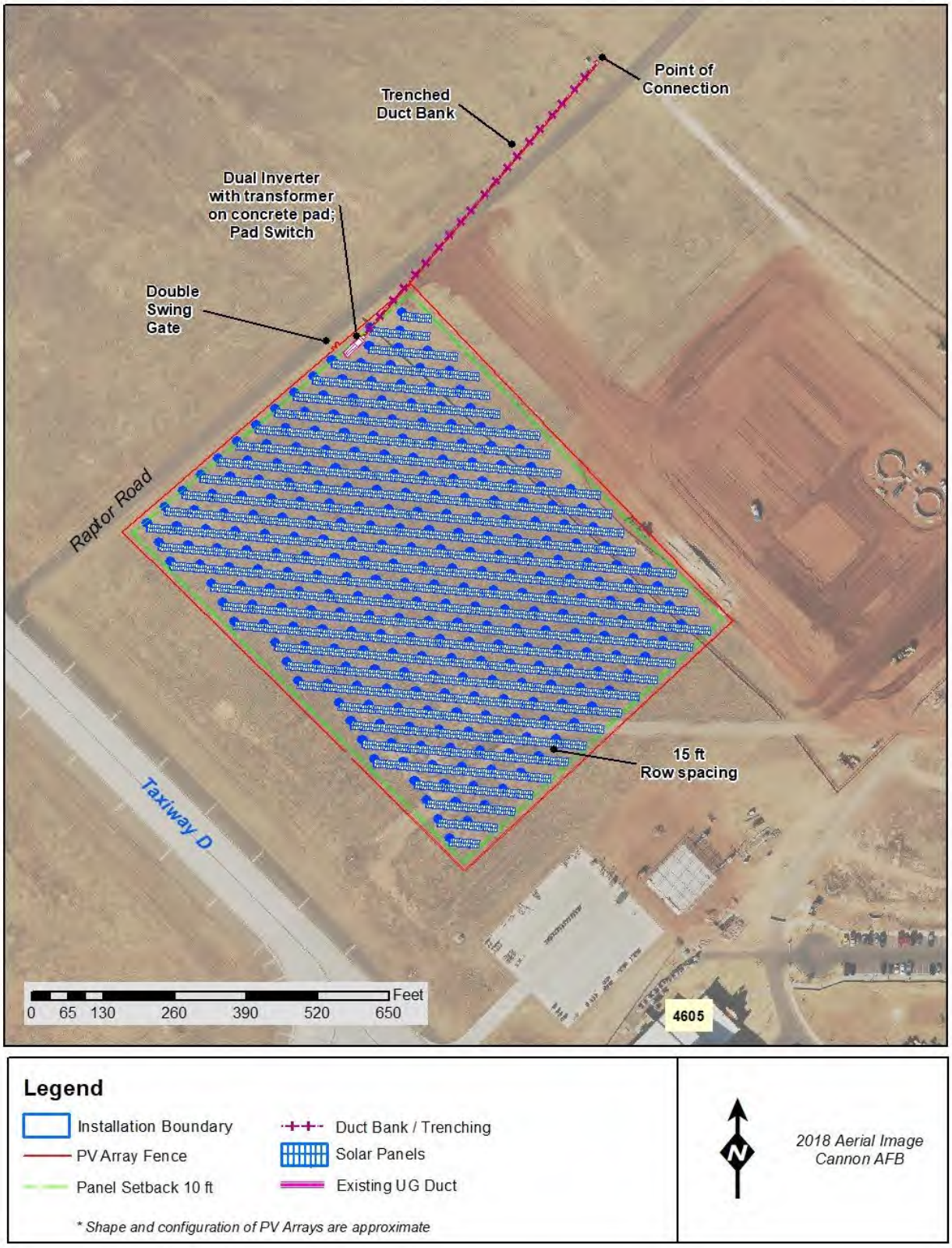
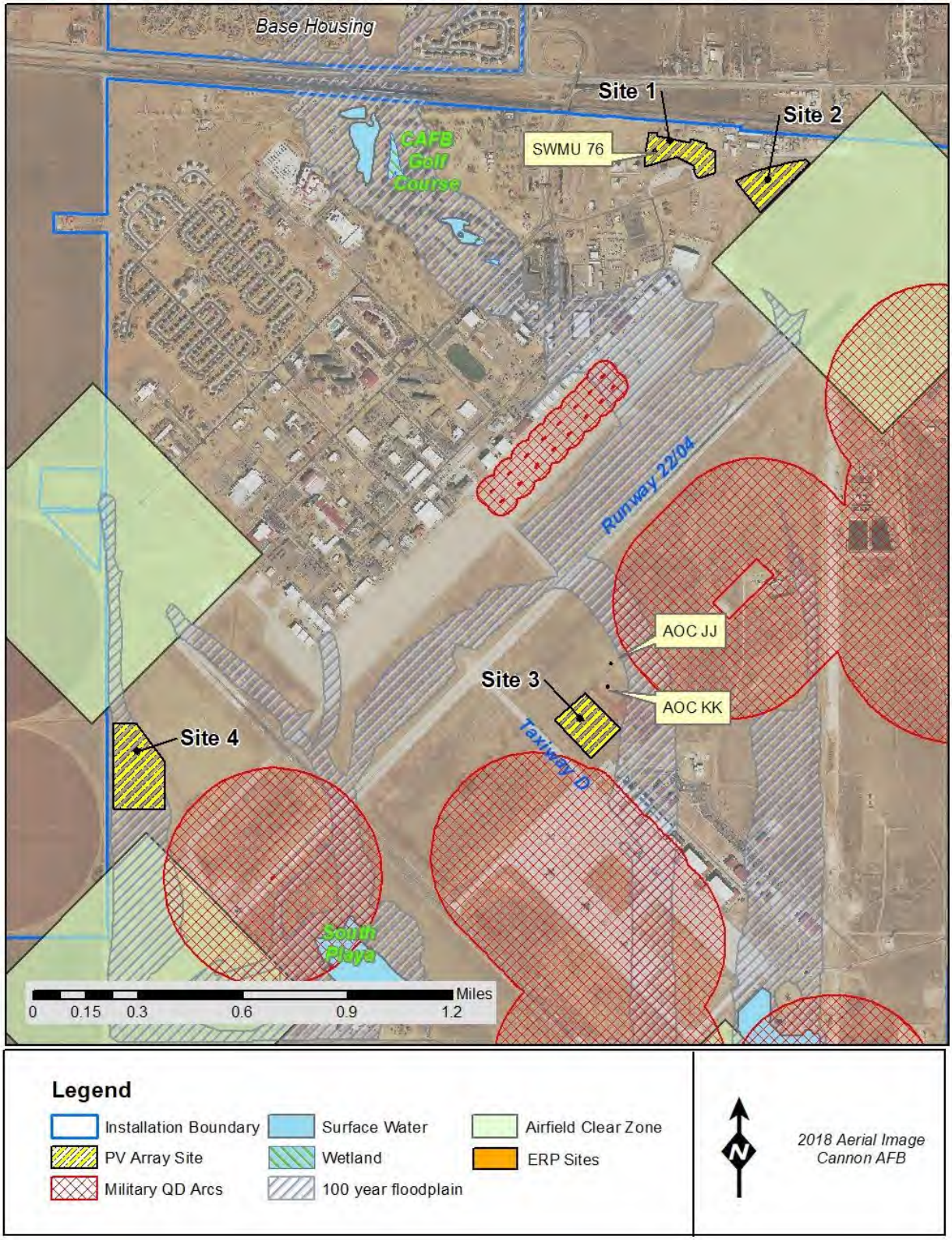


Figure 6. Environmental Constraints



Project construction would require excavation and earthwork to include trenching and backfill; minor grading and fill; and installation of utility lines, fencing, PV panel racking mounts, inverters, and panel foundations. Any fill brought to the site would be documented clean. Trenching for installation of the duct banks and installation of fencing would disturb soil up to 3 feet below grade, while mounts for the panel foundations would extend 7 feet below grade and inverter foundations would extend up to 2 feet below grade.

The PV panel racking foundation system uses I-beams (or helical screws) embedded 7 feet in the ground to secure them against high winds and other forces. This depth is necessary to ensure that the panels would be safely and securely installed and would withstand wind and other disturbances. Preliminary estimates of the number of panel foundations are 633 foundations at Site 1, 567 at Site 2, and 873 at Site 3. The foundation locations would be designed to avoid underground utilities and ERP sites. The panels would be designed to withstand winds up to 120 miles per hour.

Maintenance would include visually inspecting the panels approximately twice a year and repairing any damage that is identified and washing the panels approximately once a year to clear off dust and debris to support the panels' energy performance.

2.4.1.1 Construct PV Array at Site 1

Site 1 is a 6.8-acre parcel in the northern portion of the installation, to the east of Whispering Winds golf course. The solar PV array at this site would be capable of producing approximately 2 MW of power. The rows of panels would be spaced 15.5 feet apart. One inverter would be installed and approximately 1,700 feet of trenching would be required to install a duct bank that would connect the inverter to the point of interconnection, which would be about 150 feet east of the site. The fence plan would use existing chain-link fence as the site's southwestern boundary. Site 1 currently has no aboveground improvements on it; however, subsurface utilities are present.

2.4.1.2 Construct PV Array at Site 2

Site 2 is a 6.35-acre parcel in the northern portion of the installation along North Perimeter Road, to the east of Site 1, approximately 1,750 feet north of the runway's northern end and adjacent to the runway clear zone. The smallest of the sites, the solar PV array at this site would be capable of producing approximately 2 MW of power. The rows of panels would be spaced 15.5 feet apart. One inverter would be installed and approximately 500 feet of trenching would be required to install a duct bank between the inverter and the point of connection, which would be about 150 feet west of the site. Six transformers and an overhead electrical line are the only aboveground improvements on the site; underground utilities are also present.

2.4.1.3 Construct PV Array at Site 3

Site 3 is an 8.88-acre parcel in the southern portion of the installation, north of the aircraft parking apron and approximately 1,000 feet southeast of the runway. The solar PV array at this site would be capable of producing approximately 3 MW of power. The rows of panels would be spaced 15 feet apart. One inverter would be installed and approximately 750 feet of trenching would be required to install a duct bank between the inverter and the point of connection, which would be about 750 feet north of the site. Site 3 currently has no aboveground improvements other than a few unpaved roads; however, underground utilities are present.

2.4.2 No-Action Alternative

Under the No-Action Alternative, the proposed development of a solar PV array at Cannon AFB would not proceed. The Air Force would fail to meet the federal and State of New Mexico standards and requirements for renewable energy development as discussed in Section 1.2. The No-Action Alternative cannot be considered reasonable as it fails to address the purpose of and need for the action as described in Chapter 1; however, it has been carried forward for further analysis, consistent with CEQ regulations, to provide a baseline against which the impacts of the proposed action can be assessed.

2.5 ALTERNATIVES ELIMINATED FROM FURTHER CONSIDERATION

Site 4 was eliminated from further consideration based on the screening process. The proposed action and the No-Action Alternative have been carried forward for detailed analysis.

3. AFFECTED ENVIRONMENT

3.1 Resources Not Carried Forward for Detailed Analysis

Per CEQ regulations (40 CFR Part 1500), federal agencies may focus their NEPA analysis on those resource areas that could be affected and omit discussions of resource areas that would not be affected by a proposed action (see 40 CFR 1501.7[a][3]). The following resource areas have been reviewed and determined not to warrant further consideration because there would be no or negligible effects from implementing the proposed action: airspace, environmental justice, land use, noise, and socioeconomics. A brief description of each resource and the rationale for a determination of negligible or no effect is provided.

Airspace. The proposed action would not alter navigable airspace, flight patterns, air traffic, or air operations. The solar PV arrays would be placed outside the runway clear zones and accident potential zones. Therefore, the proposed action would not affect air traffic or air operations at Cannon AFB. Potential effects on the safety of pilots from placing new structures and construction equipment near the flight line and glint/glare associated with the PV panels are discussed under Safety and Occupational Health (Sections 3.7 and 4.7). Because the Air Force anticipates no short- or long-term adverse impacts on airspace, this resource area is not carried forward for detailed analysis.

Cultural Resources. The Air Force consulted with the SHPO and obtained concurrence with the determination of "no historic properties affected" by the proposed action. The Air Force also invited the five federally recognized tribes that have an expressed or potential interest in Cannon AFB cultural resources to consult on the proposed action. These tribes are the Comanche Tribe of Oklahoma, the Apache Tribe of Oklahoma, the Jicarilla Apache Tribe, the Mescalero Apache Tribe, and the Kiowa Tribe of Oklahoma. To date, no responses have been received from the Tribes. See Section 1.5.2, Section 6, and Appendix A for more information.

The areas where ground disturbance would be required are in areas that are already disturbed, do not contain documented archaeological resources, and are unlikely to contain undocumented archaeological resources, so no effects are anticipated. In the unlikely event that archaeological artifacts or human remains are uncovered during construction, the contractor would follow standard operating procedures for cultural discoveries as described in the Cannon AFB *Integrated Cultural Resources Management Plan*. This includes policies and procedures for *Unanticipated Discovery of Archaeological Deposits* and *Inadvertent Discovery of Native American Human Remains and Associated Funerary Objects, Sacred Objects, or Objects of Cultural Patrimony* (Air Force 2018a).

No effects on cultural resources—including archaeological resources, historic properties, and sites or resources important to federally-recognized Native American Tribes—are anticipated from implementing the proposed action.

Environmental Justice. EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* requires that federal agencies take into consideration disproportionately high and adverse environmental effects of governmental decisions, policies, projects, and programs on minority and low-income populations. The purpose of the EO is to ensure the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that no groups of people, including racial, ethnic, or socioeconomic groups, should bear a disproportionate share of a negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of federal policies.

Low-income and minority populations are present in Curry County; however, implementing the proposed action to construct and operate the solar PV arrays on Cannon AFB would not result in disproportionate adverse environmental or health effects on these communities. The proposed action does not have the potential to substantially adversely affect human health or the environment by excluding persons, denying persons benefits, or subjecting persons to discrimination. All activity associated with the proposed action would be on Cannon AFB, which is a secure, limited-access military base, and the proposed solar PV array site locations would not be near on- or off-post residential areas. The Air Force anticipates no short- or long-term adverse environmental justice impacts; therefore, this resource area is not carried forward for detailed analysis.

Land Use. Implementing the proposed action would not adversely affect land use. The proposed action would not conflict with established land uses on or off base or prevent access to existing facilities. Use of the project sites as solar PV arrays would be compatible with existing land use categories identified in Cannon AFB's Installation Development Plan. Land use at Sites 1 and 2 is categorized as Open Area: undeveloped land that is available for development. Sites 1 and 2 are bordered by other Open Area, Industrial Area, and Outdoor Recreation Area land uses. Land use at Site 3 is categorized as Airfield/Aircraft Operations and Maintenance land use, and it is bordered by other Airfield/Aircraft Operations and Maintenance and Open Area land uses (Air Force 2018b). Because the Air Force anticipates no short- or long-term adverse land use impacts, this resource area is not carried forward for detailed analysis.

Noise. The proposed action would not alter Cannon AFB's Air Installation Compatible Use Zones and would not result in any appreciable changes in the noise environment. The construction and installation of the solar arrays would require use of light and heavy equipment that would generate temporary short-term increases in noise during construction. Project activities would not be near any off-base sensitive receptors (e.g., schools, residences, hospitals). Noise levels in the construction areas would not exceed standards as determined by the federal, state, and/or local government. Contractors would limit construction to occur primarily during regular weekday business hours. Therefore, construction noise impacts would be negligible. Noise from the operation of the solar arrays would be negligible and would not be sufficient to change ambient noise levels; therefore, there would be no long-term changes in the noise environment. Because the Air Force anticipates short-term negligible adverse effects and no long-term effects on the noise environment, this resource area is not carried forward for detailed analysis.

Socioeconomics. Implementing the proposed action would not adversely affect socioeconomic resources. The proposed action would not include assigning new, permanent personnel from outside the region to Cannon AFB; therefore, implementing the actions would not change the population of Cannon AFB or the surrounding region, nor would it change the demand for housing or public services such as public schools, law enforcement, fire protection, healthcare, or social assistance. The proposed action would have a slight beneficial economic impact from hiring contractors to construct, operate, and maintain the solar PV arrays. That impact would be negligible relative to the size of the economy of Curry County and the economic impact of Cannon AFB (Cannon AFB's impact on the local economy in fiscal year (FY) 2017 was more than $711 million, and the base directly employed about 5,350 personnel [Mybaseguide 2019]). Because the Air Force anticipates no short- or long-term adverse socioeconomic impacts, this resource area is not carried forward for detailed analysis.

3.2 Air Quality

The Environmental Protection Agency (EPA) established National Ambient Air Quality Standards (NAAQS) under the Clean Air Act (CAA) Amendments of 1990. These standards represent the

maximum allowable atmospheric concentration of designated air pollutants that are considered protective of public health and welfare. NAAQS have been set for six criteria pollutants: carbon monoxide, ozone, nitrogen dioxide, sulfur dioxide, lead, and particulate matter. Based on measured ambient air pollutant concentrations, the EPA determines whether geographic areas are in compliance with the NAAQS. Areas in compliance with the NAAQS are designated as *attainment areas*; areas not in compliance are *nonattainment areas*.

Proposed actions that would result in direct or indirect emissions in a nonattainment or maintenance area are subject to a conformity evaluation under the General Conformity Rule (40 CFR Part 93) and the Air Force EIAP for air quality in 32 CFR 989.30. Cannon AFB is in Curry County, New Mexico, which is designated an attainment area for all criteria pollutants (EPA 2019a), so the General Conformity Rule does not apply.

The New Mexico Environment Department (NMED) issues air quality permits for stationary air pollution sources in the State of New Mexico. Cannon AFB is classified as a major source of emissions and holds a Title V Operating Permit. Title V of the CAA requires states and local agencies to permit major stationary sources. A major stationary source has the potential to emit criteria air pollutants and hazardous air pollutants at levels equal to or greater than Major Source thresholds. These thresholds vary depending on the attainment status of the region.

As required by NMED, annual criteria pollutant emissions are calculated for stationary sources at Cannon AFB. The annual air emissions inventories define pollution sources and estimate the total mass of emissions generated from each source annually. The stationary sources that emit criteria pollutants at Cannon AFB include fuel combustion sources for heating and emergency power generation and an aircraft paint booth (Air Force 2018b).

Table 2 presents Cannon AFB's annual air emissions inventory for the 2016 calendar year and the total allowable emissions specified in its Title V permit.

Table 2. 2016 Air Emissions Inventory for Cannon AFB

Pollutant	Actual Stationary Source Emissions for 2016 (tons per year)	Title V Stationary Source Permit Limits (tons per year)
Nitrogen oxides	15	140
Volatile organic compounds	16	97.6
Carbon monoxide	8	72.4
Sulfur dioxide	0	9.3
Particulate matter	2	7.3
Lead	0	Not applicable
Ozone (as carbon dioxide equivalent)	8,652	Not applicable

Sources: Air Force 2018b; NMED 2019

GHGs are components of the atmosphere (e.g., water vapor, carbon dioxide, methane, and nitrous oxide) that trap heat relatively near the surface of the earth, contributing to the greenhouse effect and climate change. GHGs are derived from natural sources such as volcanic activity and forest fires, and from man-made sources such as the use of aerosols and the burning of fossil fuels. The primary GHGs are carbon dioxide, methane, nitrous oxide, and fluorinated gases. In the United States, most GHG emissions are attributed to energy use. Such emissions result from

combustion of fossil fuels used for electricity generation, transportation, industry, heating, and other needs.

To address potential effects of climate change, EO 13834, *Efficient Federal Operations,* directs the federal government to enhance the resiliency of its infrastructure and operations. While EO 13834 does not require a formal planning process for evaluating and managing climate change, federal agencies are nonetheless directly involved in addressing climate resilience and adapting to its implications across their services, programs, and assets (FedCenter 2019). For example, DoD identifies climate change as a national security concern and reduced its GHG emissions by approximately 12 percent between FY08 and FY15 (DOE 2016).

3.3 Biological Resources

Biological resources include native, nonnative, and invasive plants and animals, sensitive and protected plant and animal species, and the habitats in which they exist. Habitat can be defined as the resources and conditions in an area that support a defined suite of organisms.

Federal regulations applicable to biological resources include the Endangered Species Act (ESA) (16 USC § 1531 *et seq.*) and Migratory Bird Treaty Act (MBTA) (16 USC § 703 *et seq.*). The ESA and MBTA make it illegal to kill or harm (i.e., "take") species that they protect except under the terms of a permit issued by the applicable federal agency. In accordance with AFI 32-7064, *Integrated Natural Resources Management,* installations should take actions to protect and conserve state-listed species when practicable.

In accordance with Section 7 of the ESA, Cannon AFB is required to determine if protected species might be present in the area of a proposed action and might be affected by that action. According to the USFWS Information for Planning and Consultation (IPaC), the interior least tern (*Sterna antillarum athalassos*) is the only federally-listed endangered species with the potential to occur at Cannon AFB (USFWS 2019). According to Cannon AFB's *Integrated Natural Resources Management Plan* (INRMP), the interior least tern has not been observed at Cannon AFB (Air Force 2017b). No critical habitat for federally protected species is on Cannon AFB (USFWS 2019).

The following bird species protected by the MBTA are known to occur at Cannon AFB: burrowing owl (*Athene cunicularia*), Cassin's sparrow (*Aimophilia cassinii*), lark bunting (*Calamospiza melanocorys*), long-billed curlew (*Numerius americanus*), mourning dove (*Zenaida macroura*), and prairie falcon (*Falco mexicanus*). One additional species, the willow flycatcher (*Empidonax traillii*), is listed in the IPaC report as potentially occurring at Cannon AFB but has not been observed on the installation (Air Force 2017b, 2018b; USFWS 2019). The MBTA protects over 1,000 species of birds, and other MBTA-listed species might also occur at Cannon AFB.

Burrowing owls are common at Cannon AFB and nest in the abandoned burrows of black-tailed prairie dogs (*Cynomys ludovicianus*), although they can nest in other species' burrows as well. Cassin's sparrow and lark bunting were observed during recent surveys and could be present during the summer breeding season. The long-billed curlew was not observed during recent surveys but has been observed at Cannon AFB and could be present during the summer. Mourning doves are common year-round at Cannon AFB. Prairie falcons were observed during recent surveys and could hunt at the project sites during the winter; however, there is no prairie falcon nesting habitat on Cannon AFB (Air Force 2018b).

Although some bird species are protected by the MBTA or state regulations, birds near the flight line can present a risk to air operations. Cannon AFB holds a depredation permit from the USFWS

to take MBTA-listed species in association with air operations, either by direct aircraft strikes or by the Bird Aircraft Strike Hazard (BASH) program. These permits specify each species and the maximum number that can be taken per year. Under the condition of the permit, Cannon AFB submits an annual report to the USFWS listing the number of each species taken (Air Force 2017c).

Black-tailed prairie dogs are year-round residents at Cannon AFB and a prairie dog colony is just northwest of Site 3. It is a federal species of concern, which means it is not protected by federal law but warrants monitoring or other conservation actions. It is a state species of greatest conservation need; however, they can attract birds of prey, presenting a risk to air operations. The Cannon AFB pest control program employs prairie dog control efforts that focus on areas near the flight line (Air Force 2017b, 2018b). Prairie dog burrows, which can be used by prairie dogs and by burrowing owls, may be present on the proposed project sites.

The habitat at Sites 1, 2, and 3 is similar and consists of disturbed grassland characterized by multiple species of annual grasses and forbs that are regularly mowed and maintained at a height of less than 14 inches. Although the sites are undeveloped except for some transformers on Site 2, they are in relatively disturbed areas and habitat quality is low. Vegetation include a variety of native and nonnative grasses and forbs, none of which are protected.

The BASH program dictates maximum grass height and water levels in drainage ditches on the airfield and adjacent fields to deter bird activity (Air Force 2017c). However, during times of low airfield activity, some common bird species may be observed at the project sites, such as: mourning dove, Eurasian collared dove (*Streptopelia decaocto*), great-tailed grackle (*Quiscalus mexicanus*), European starling (*Sturnus vulgaris*), house sparrow (*Passer domesticus*), and American robin (*Turdus migratorius*). Common mammal species found in the disturbed grassland habitat include the harvest mouse (*Micromys minutus*), coyote (*Canis latrans*), raccoon (*Procyron lotor*), thirteen-lined ground squirrel (*Ictidomys tridecemlineatus*), and other small mammals (Air Force 2017b, 2018b).

3.4 Earth Resources

Earth resources refers to the soil types, geologic features and processes, and topography of an area. Soils are the unconsolidated materials overlying bedrock or other parent material. Differences among soil types in terms of their structure, strength, shrink-swell potential, and erosion potential affect their abilities to support certain applications or uses such as their compatibility with specific construction activities or types of land use. Geologic features may include caves, rock outcroppings, canyons, or other unique features. Relevant geologic processes include slides, erosion, and sinkholes. Topography refers to the earth's surface features, such as mountains, hills, valleys, and canyons which result in elevation changes.

The dominant soil type across Cannon AFB is Amarillo Fine Sandy Loam, which comprises more than 95 percent of the installation and 100 percent of the proposed project sites (NRCS 2019). Soils of this type are deep well-drained sandy loams, found on nearly level or gently sloping plains. This soil type is generally considered stable for most construction activities and not known for severe limitations but are erodible if exposed and/or wet. Small pockets of Estocado loam, Ranco clay, Randall clay, and Amarillo loamy fine sand also are found on the installation but not within the proposed project sites.

Unique or surface geologic features are generally lacking at Cannon AFB. The topography of the installation is relatively flat with a slight overall slope to the southeast with a total drop in elevation of approximately 70 feet across the base. The topography of the installation includes many micro-

topographic elements such as road grades, ditches, fences, structural foundations, and other grade changes. These micro-topographic features affect the movement of soil, wind, and water across the land surface.

3.5 Hazardous Materials and Waste

In general, hazardous materials and wastes include substances that, because of their quantity, concentration, physical or chemical characteristics, might present substantial danger to public health and welfare or the environment when released or otherwise improperly managed.

Federal regulations governing hazardous materials and wastes include the Comprehensive Environmental Response, Compensation, and Liability Act, as amended by the Superfund Amendments and Reauthorization Act and the Toxic Substances Control Act and the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act (RCRA), which was further amended by the Hazardous and Solid Waste Amendments. State and local regulations also apply. The primary regulatory agencies for hazardous materials and waste are the EPA and NMED.

Cannon AFB uses hazardous materials and petroleum products such as fuels, solvents, paints, oils, lubricants, adhesives, pesticides, refrigerants, and cleaners in the course of normal operations. Cannon AFB manages hazardous materials as required by applicable federal, state, and local laws and regulations and AFI 32-7086, *Hazardous Material Management.* Similarly, hazardous wastes at Cannon AFB are managed as required by applicable laws and regulations and AFI 32-7042, *Waste Management*. In addition, Cannon AFB's Contractor's Environmental Guide specifies procedures contractors must follow when bringing hazardous materials onto the base or generating waste on Cannon AFB.

The ERP was established by Section 211 of the Superfund Amendments and Reauthorization Act of 1986 (10 USC §§ 2701–2707) to facilitate thorough investigation and cleanup of contaminated sites on military installations. The ERP provides a uniform methodology to evaluate contaminated sites, control the migration of contaminants, minimize potential hazards to human health and the environment, clean up contamination through a series of stages until it is decided that no further remedial action is warranted, and provide for long-term monitoring of sites as warranted.

As shown on **Figure 6**, none of the proposed project sites are within Military Munitions Response Program sites or ESQD arcs. As shown on **Figures 7 and 8**, the nearest ERP sites are Solid Waste Management Unit (SWMU) 76, which is within Site 1, and Areas of Concern (AOCs) JJ and KK, which are near the duct bank for Site 3. An AOC is an area to be investigated for potential releases. Depending on the type and extent of contamination found at the site, an AOC may subsequently be designated as a SWMU. No other ERP sites are near enough to affect or be affected by the proposed action.

SWMU 76 is a 200-square foot former sludge weathering pit where sludge from fuel tanks was placed for weathering prior to be removing and disposed in a landfill. The quantities of sludge weathered and the frequency of use of the pit are not known, but are estimated to be small based upon conversations with base personnel. Field investigations conducted in the 1980s and early 1990s suggest the possible presence of residual sludge at 4 to 6 feet below ground and petroleum constituents including mercury, ethylbenzene, and xylenes in soil. A risk assessment performed in the 1990s indicated there is a low potential for human exposure to contaminants at SWMU 76, and the Air Force, in consultation with NMED, decided that no further action is needed at the site (Harza 1997; Woodward-Clyde 1992).

Figure 7. Environmental Restoration Program Sites Near Site 1

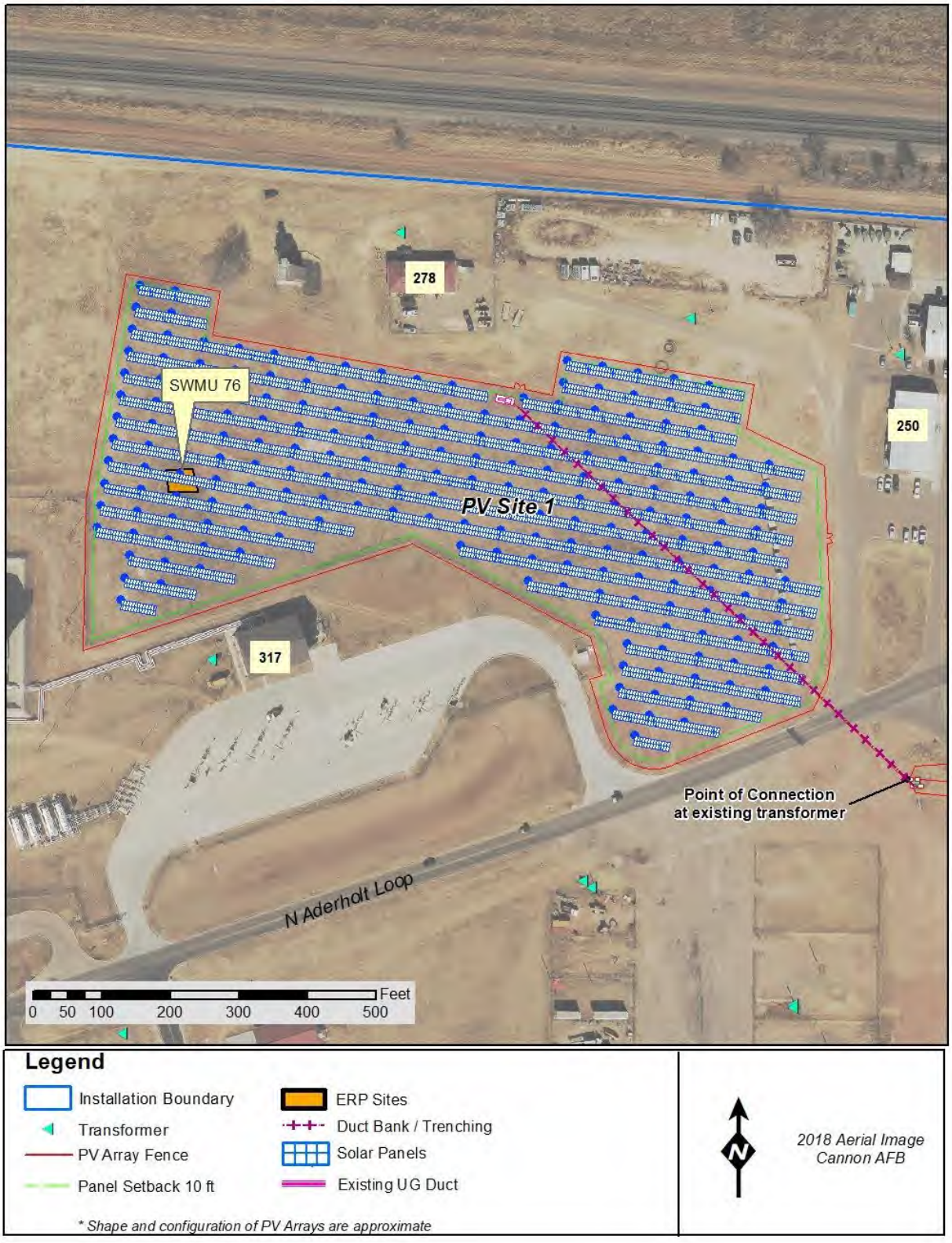
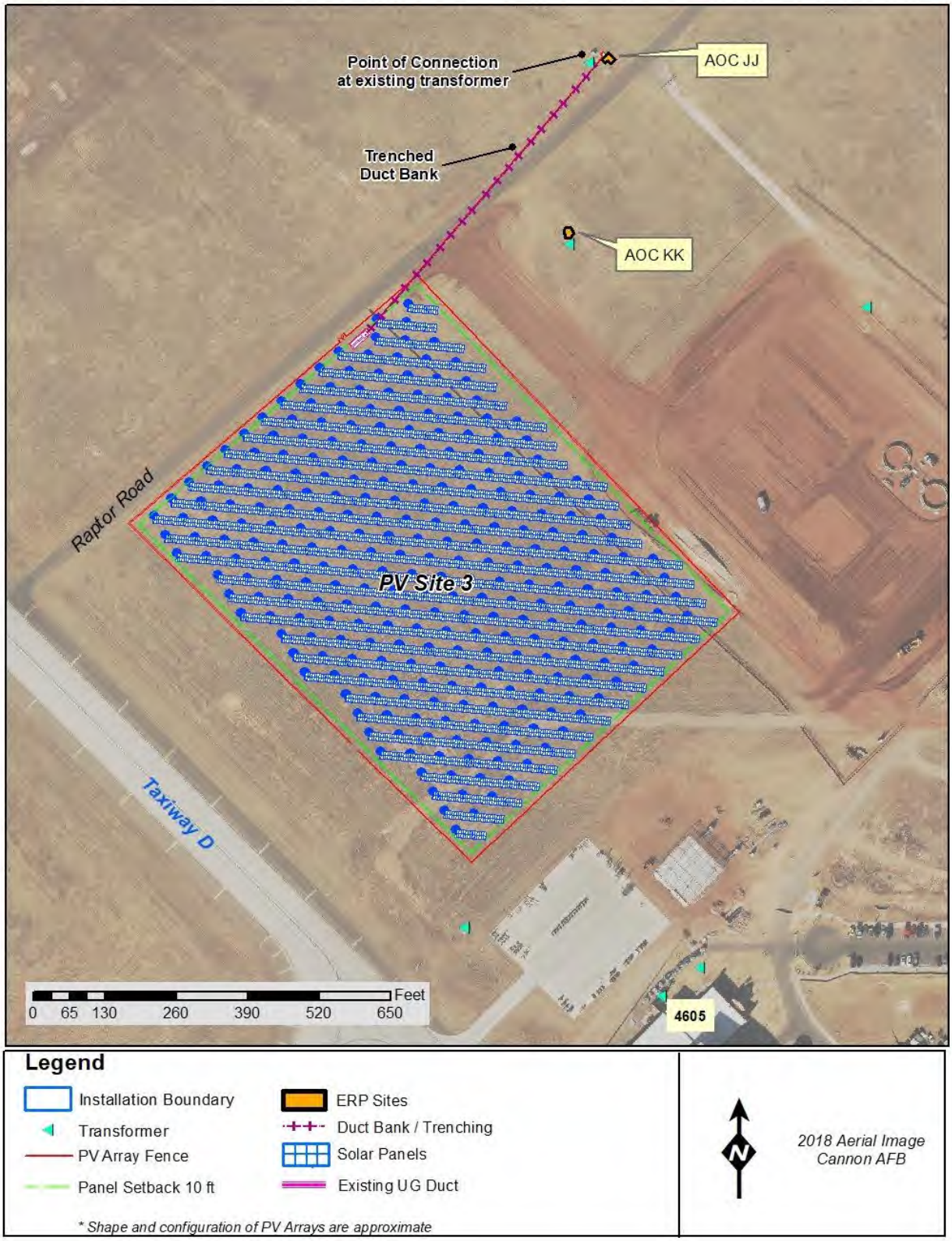


Figure 8. Environmental Restoration Program Sites Near Site 3



AOC JJ and KK are petroleum storage tanks, numbers 2276 and 2280, respectively. These tanks are listed as *closed without controls* in the base's RCRA permit, meaning the tanks themselves and any associated leaks or spills have been removed or cleaned to the satisfaction of NMED, and there are no restrictions on the future use of the sites (Mark Fuchs, Cannon AFB Environmental Division, personal communication, July 8, 2019).

3.6 Infrastructure and Utilities

Infrastructure consists of utilities, transportation, buildings and other structures, and waste management. Utilities include electrical, natural gas, liquid fuel, water supply, sanitary sewage/wastewater, stormwater and communications systems. Transportation is defined as the system of roads, sidewalks, trails, and transit services that are on or serve the installation. Buildings and other structures refer to the structures comprising the built environment such as office buildings, dorms, industrial facilities, fences, and walls. Waste management primarily relates to the availability of landfills to support waste disposal needs.

Utilities at the proposed project sites are shown on **Figures 9, 10, and 11**. As shown, existing underground utilities expected at Site 1 include a potable water line, sewer line, fiber optic communications line, and two fuel pipelines, one of which is abandoned. At Site 2 there are two potable water lines, a sewer line, and one overhead electric line that terminates just inside the northwest corner of Site 2 at an aboveground transformer. This transformer begins an underground conduit or duct bank that ties together five aboveground transformers across Site 2 and terminates outside of the site, to the east at an airfield generator. The only existing utility at Site 3 is an underground fiber optic line.

Cannon AFB currently purchases electricity from Xcel Energy. Xcel Energy produces 24 percent of its electric power from renewable sources (e.g., wind and solar) and the remaining 76 percent from non-renewable sources (e.g., coal and natural gas) (Xcel 2019). Electrical infrastructure at Cannon AFB includes overhead and underground transmission and distribution lines and a centrally located substation.

Natural gas is delivered to Cannon AFB through a Public Service Company of New Mexico underground pipeline system (Air Force 2017b). The main pipeline enters the base near the North Gate where natural gas storage areas are located and is distributed by underground lines. Cannon AFB's liquid fuel system is located east of the Main Gate, at the north end of the flight line and industrial area and includes storage tanks for aviation fuel, diesel, and gasoline.

Cannon AFB owns and operates its own water treatment and distribution system. Nine production wells supply the base with groundwater from the Ogallala Aquifer. Six of these wells are dedicated to providing potable water, one is dedicated to providing non-potable water, and the other two can be used for either potable or non-potable water. Cannon AFB's annual permitted use from the aquifer was 884.8 million gallons, and it used 182.8 million gallons in 2016 (Air Force 2018b). Potable water is pumped to one of two treatment plants where it is treated with hypochlorite and fluoride and then to any one of seven primary storage tanks located throughout the installation. Numerous additional storage tanks contain water for fire suppression. Distribution lines from the storage tanks are underground and follow the road network.

Municipal and industrial sewage is collected via underground piping and gravity-fed to the Cannon AFB-owned and operated wastewater treatment plant located west of the flight line. Treated wastewater is discharged to the North Playa Lake and the golf course ponds where the reclaimed water is used for irrigation (Air Force 2018b). The base also has several septic tanks and drain fields, most of which are located south of the airfield where sewer lines do not exist.

Figure 9. Existing Utilities at Site 1

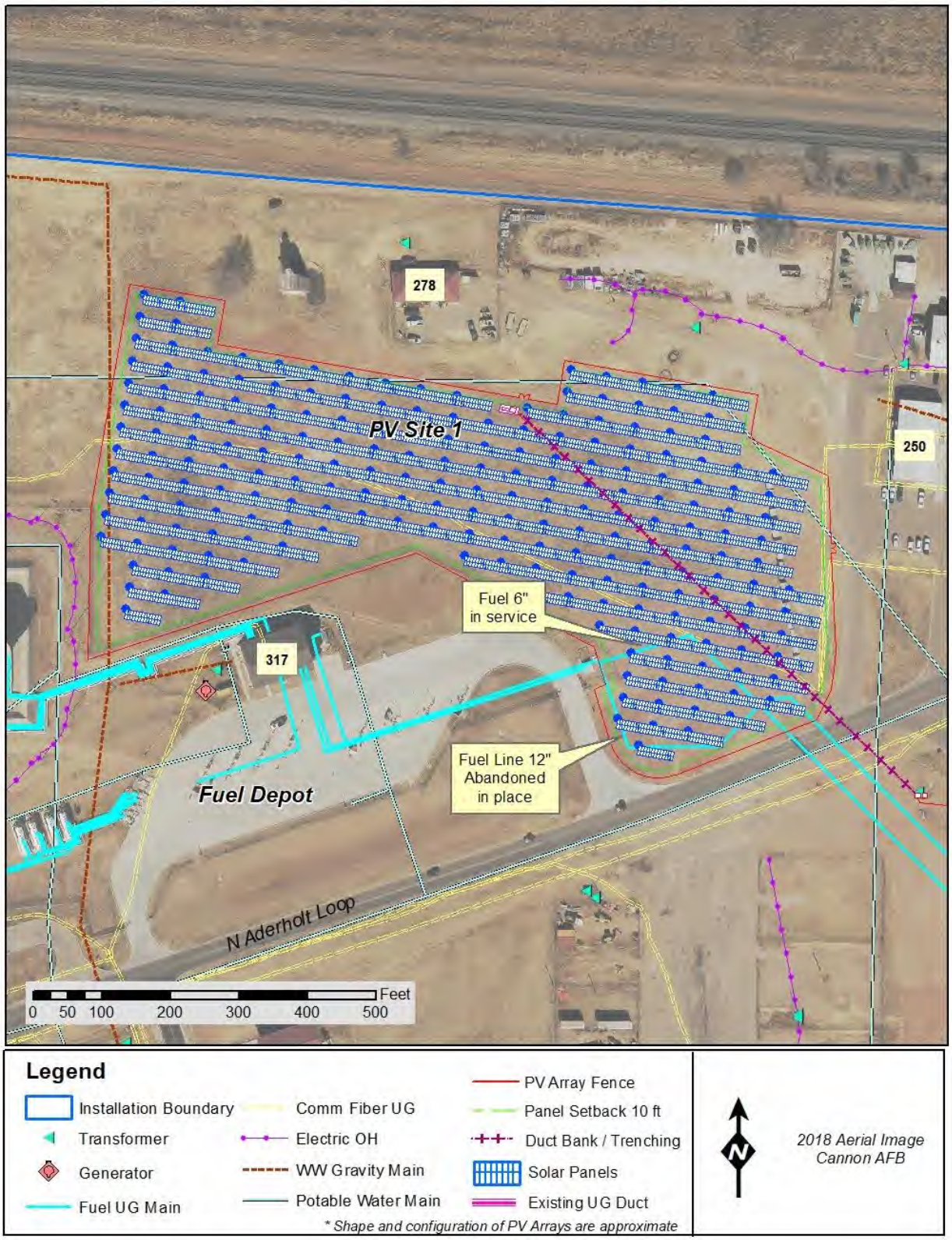


Figure 10. Existing Utilities at Site 2

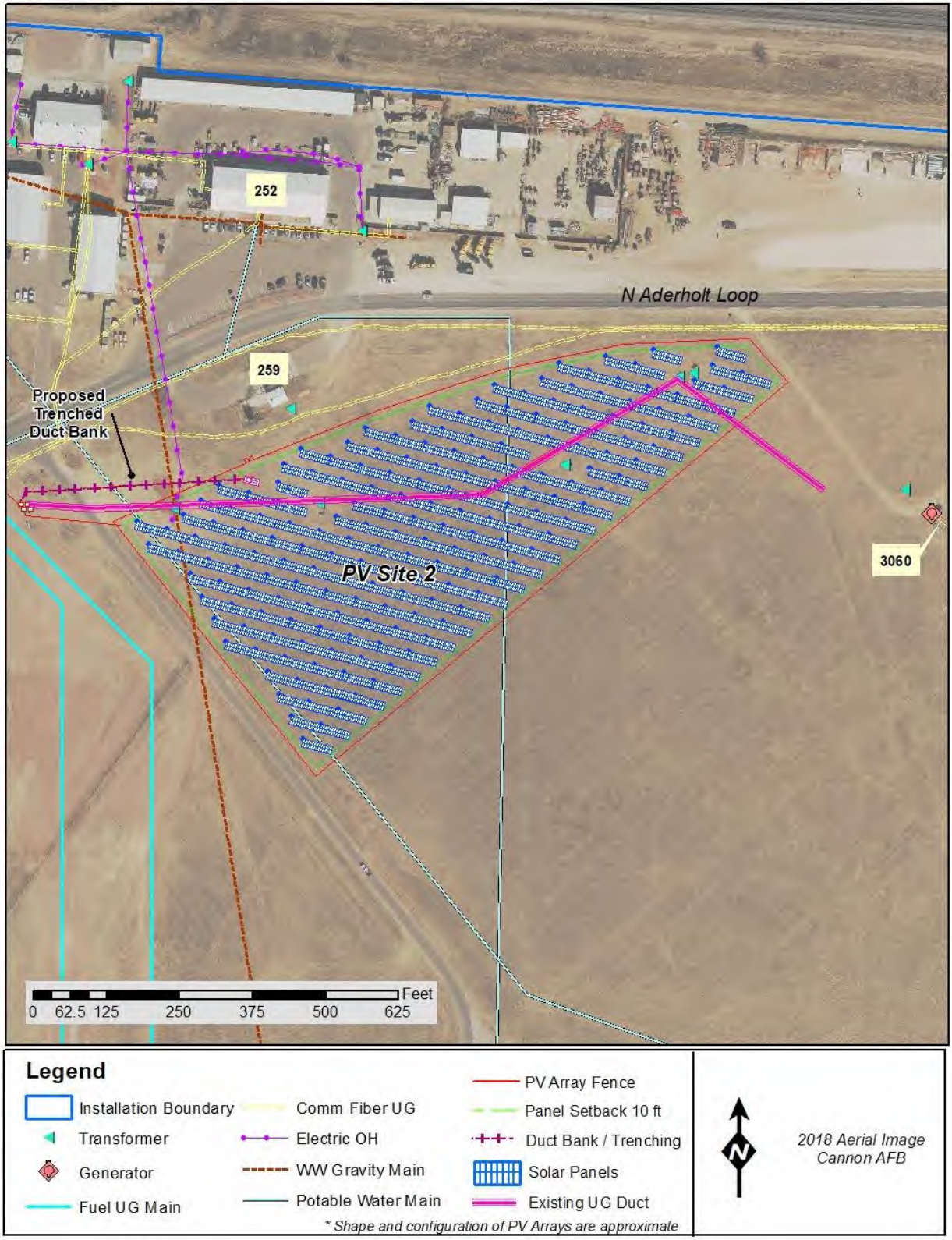
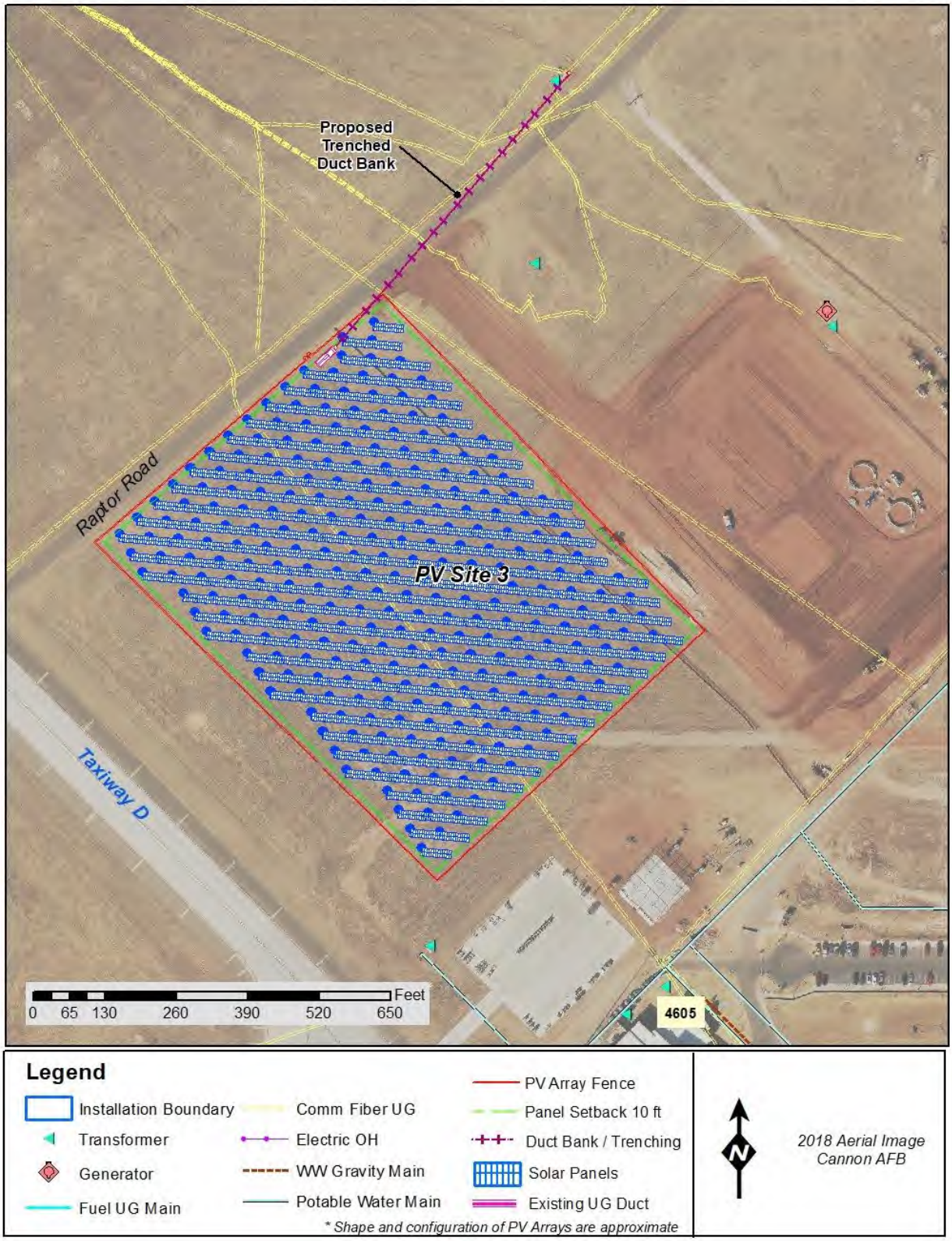


Figure 11. Existing Utilities at Site 3



Stormwater piping is generally underground, opening at storm drain inlets, catch basins, and culvert ends where drainage is diverted or directed to the playa lakes, swales, ditches and other stormwater retention areas. Under normal circumstances, most stormwater runoff is retained within the installation and is used for irrigation or habitat sustainment or evaporates naturally.

Communication at Cannon AFB is supported through an underground fiber optic cable system, accessible through vaults. Cannon AFB has expanded communications for voice, video, and data over fiber to meet the Air Force's Unified Communications objective.

Cannon AFB's transportation system is comprised of the roads, sidewalks, and airfield surfaces at Cannon AFB. The major vehicle roads are paved with asphalt, minor access roads are unpaved. Pedestrian access is not well developed on the installation, but where sidewalks and curbings occur, they are of concrete or aggregate construction. There is over 10 million ft^2 of airfield surface which includes two main runways, two parking aprons, overruns, and taxiways. Most of the airfield surfaces are constructed of Portland cement concrete, and a lesser portion of asphalt concrete (Air Force 2018b).

Buildings at Cannon AFB include offices, utility buildings, operations, administration, aviation, and other support structures such as fences, gates, and parking. Buildings and other structures are connected to utility and transportation infrastructure.

3.7 Safety and Occupational Health

Safety and occupational health includes risks to the public and workers from conducting daily activities and exposure to unsafe or unhealthful environments. Although many routine activities involve some degree of risk, this risk can be minimized through adherence to regulatory requirements that specify operational practices to reduce risks of illness, injury, death, and property damage. The health and safety of onsite military and civilian workers, the public, and the environment are safeguarded by numerous DoD and Air Force regulations designed to comply with standards issued by the Occupational Safety and Health Administration (OSHA) and EPA. These standards specify the amount and type of training required for workers, the use of protective equipment and clothing, engineering controls, maximum exposure limits for workplace stressors such as noise and chemicals, construction site safety such as fencing to prevent unauthorized entry, and controls to prevent release of contaminants to the environment. All personnel working at Cannon AFB are required to follow applicable regulations and standards to ensure the safety of themselves, others, the environment, and property.

To eliminate or reduce risks associated with construction and operation and maintenance activities, contractors are required to prepare project specific health and safety plans that analyze the risks or hazards associated with projects and how to mitigate or control those risks. Reduction or control of risks can include wearing protective clothing and equipment, implementing engineering controls, and ensuring personnel are properly trained. The successful control of risks can be assessed by monitoring employee exposure to workplace chemicals and ensuring personnel who could be subject chemical exposures are enrolled in a medical surveillance program.

As discussed in Section 3.5, three ERP sites are on or near the proposed project sites. Hazardous materials may be stored at these sites and, at sites where contaminants have been released to the environment, contaminants may be present in soil. Activities at sites could require additional safety measures or special management to avoid risks to human health or the environment.

To mitigate the effects of glint/glare from solar arrays, the Federal Aviation Administration (FAA) has established guidelines and tolerances from experience gained from solar energy systems installed on airports (FAA 2018). In accordance with 14 CFR Part 77, the FAA must be notified of the intention to construct a solar PV array near an airfield by filing FAA Form 7460-1, *Notice of Proposed Construction or Alteration*. The project proponent cannot make or permit any changes or alterations in the airport or any of its facilities that are not in conformity with the airport layout plan that might, in the opinion of the FAA, adversely affect the safety, utility, or efficiency of the airport. This includes glint/glare and obstructions to navigable airspace, such as construction equipment and project facilities. The maximum height of the proposed project facilities is 8.63 feet (Johann Niehaus, Ameresco, personal communication, July 17, 2019). The FAA published *Technical Guidance for Evaluating Selected Solar Technologies on Airports* in 2018 as a reference for FAA technical staff who review proposed airport solar projects and for airport sponsors that might be considering a solar installation (FAA 2018). Based on new information and field experience, the FAA reviewed multiple sections of the technical guidance, particularly with respect to compatibility and glint/glare. As a result of the review, FAA issued *Interim Policy, FAA Review of Solar Energy System Projects on Federally Obligated Airports* in 2013 (78 FR 63276, October 23, 2013).

3.8 Water Resources

Water resources include surface water and wetlands, groundwater, stormwater, and floodplains. Water resources are vulnerable to contamination and quality degradation and are protected federally by the Clean Water Act (33 USC §1251 eq seq.) and the state-administered NPDES.

No naturally-occurring streams or other permanent surface waters exist on or near Cannon AFB; however, there are three small man-made ponds on the golf course. The nearest naturally-occurring stream is approximately 10 miles north of the base. Two large playas—the North and South Playa lakes—at Cannon AFB are periodically inundated. Although Cannon AFB receives minimal precipitation, much of the base's stormwater runoff is conveyed by ephemeral channels, drainage ditches, storm sewers, or sheet flow to two playa lakes, where it infiltrates or evaporates. The North Playa Lake also receives treated wastewater from the installation's treatment plant (Air Force 2017b, 2018b).

As shown in **Figure 6**, Sites 1 to 3 are not within or adjacent to floodplains or wetlands. The 100-year floodplain is approximately one-quarter mile from Sites 1 and 2 and approximately 200 feet from Site 3. The closest wetlands are within the 100-year floodplain about one-half mile west of Sites 1 and 2. No wetlands are near Site 3. According to the Federal Emergency Management Agency Flood Insurance Rate Map No. 35009C0575E, the proposed project sites are not within the 500-year floodplain (FEMA 2013).

Cannon AFB obtains all domestic and industrial water from groundwater, specifically the Southern High Plains Aquifer of the Ogallala Formation, known as the Ogallala Aquifer. The Ogallala Aquifer is approximately 270 feet below ground surface and covers an area of approximately 174,000 square miles, spanning eight states. Recharge of the Ogallala Aquifer is primarily through precipitation, and recharge rates are very low in this arid region, resulting in declining aquifer levels as water in the aquifer is used by multiple parties for drinking, irrigation, and industrial processes. (Air Force 2018b).

4. ENVIRONMENTAL CONSEQUENCES

4.1 Introduction

This section presents the effects of implementing the proposed action or No-Action Alternative. Where appropriate, effects are addressed collectively, assuming solar arrays would be constructed on all three sites. Unique effects at a specific site are presented where applicable.

Impacts are characterized as short or long term; short-term impacts would occur for a limited amount of time and long-term impacts would likely be persistent. The magnitude or intensity of impacts is characterized as negligible, minor, moderate, or significant. Negligible impacts are those that would be barely perceptible. A minor effect would be detectable but slight or otherwise limited. A moderate effect would be readily apparent but less than significant. Significant effects are those that have the potential to meet or exceed the thresholds for significance presented in each resource section.

4.2 Air Quality

4.2.1 Significance Criteria

An alternative would have a significant adverse impact on air quality if it would (1) produce emissions within a nonattainment or maintenance area that exceed the General Conformity Rule *de minimis* (of minimal importance) threshold values, (2) lead to a violation of a federal, state, or local air regulation or permit, or (3) substantially increase GHG emissions.

4.2.2 Proposed Action

The proposed action would have short-term minor adverse and long-term minor beneficial impacts on air quality at all three sites. Short-term impacts would be the result of air emissions generated during construction, and long-term beneficial impacts would be the result of a reduction in emissions due to the generation of electricity from the solar arrays. The proposed action would not include any new stationary sources of air emissions. The solar arrays would have no air emissions and would not require an air permit to construct or operate. The project would be accomplished in full compliance with applicable regulatory requirements.

Short-term emissions of criteria pollutants and GHGs would occur during construction activities associated with implementation of the proposed action. Short-term emissions would result from on-road (e.g., employee vehicles and vendor/delivery trucks) and off-road (e.g., backhoes, dozers, portable generators, and cranes) vehicles or equipment during site preparation, grading, and construction of the solar arrays. Short-term emissions would end once construction is complete.

General Conformity under the CAA Section 176 (40 CFR Part 93 subpart B) is not applicable because the proposed action would be located in an area designated by EPA to be in attainment for all criteria pollutants. Construction emissions would be well below the General Conformity Rule's *de minimis* (of minimal importance) threshold values of 100 tons per year for each criteria pollutant. There is currently no numeric threshold of significance for GHG emissions; however, 25,000 metric tons has been used in the past and construction emissions would be well below this amount. Therefore, short-term adverse impacts on air quality would be minor. Following standard BMPs for dust control during construction would further minimize air quality impacts during construction.

Once the solar arrays become operational, they would not generate criteria pollutants or GHGs. The power generated by the arrays would reduce annual Cannon AFB's GHG emissions by up to

9.9 tons per year. This includes emissions of sulfur dioxide, nitrogen oxides, carbon dioxide, and fine particulate matter. This was calculated using the AVERT Web Edition tool which converts reductions of kilowatt hours into avoided units of carbon dioxide emissions (EPA 2019b). Therefore, the long-term effects would be beneficial.

4.2.3 No-Action Alternative

Under the No-Action Alternative, the project would not occur. Emissions of criteria pollutants and GHGs would remain similar to current conditions, so there would be no effect on air quality.

4.3 Biological Resources

4.3.1 Significance Criteria

An alternative would have a significant adverse impact on biological resources if it would (1) result in an unpermitted take under the ESA, MBTA, or other applicable regulation or permit or (2) have a high probability of increasing the spread of an invasive species.

4.3.2 Proposed Action

Under the proposed action, short-term minor adverse effects and long-term minor adverse effects on biological resources would occur at all three sites. Short-term impacts would be from vegetation removal and potential disturbance of nesting birds due to construction and potential introduction of invasive species from ground disturbance. Long-term impacts would be from minor loss of vegetation during operation of the project.

No adverse effects on federally protected species are anticipated. The only federally protected species USFWS lists as potentially occurring on Cannon AFB is the interior least tern, which nests along sand and gravel bars within braided streams and rivers. The interior least tern has not been observed at Cannon AFB (Air Force 2017b) and the only potential habitat for the species on Cannon AFB is the golf course lakes and the North Playa basin, neither of which are within or adjacent to the project sites. Therefore, the Air Force has determined that the proposed action would have *no effect* on federally listed species. The Air Force will provide the USFWS with an informal consultation letter stating its conclusion and ask that the USFWS concur with this conclusion.

During construction, some vegetation would be disturbed by activities such as driving construction vehicles and equipment off-road, grading, trenching, and back-filling portions of the sites, and installing inverter foundations, fencing, and duct banks. The construction plan calls for minimal clearing, which would not disturb unique species or habitats. Upon completion of construction, the ESPC contractor would revegetate the site using native plant species approved by Cannon AFB.

Prompt revegetation would help to limit the potential for invasive species to establish on the finished site. Vegetation would not reestablish in the small areas occupied by the inverter, panel footings, fenceposts, and other site equipment. The panels would also provide additional shade at the site, potentially altering vegetation species and growth patterns at the sites. These impacts would be localized and would not affect unique habitats or protected plant species so long-term adverse impacts would be minor.

Construction equipment would be cleaned prior to being brought onsite to minimize the potential spread of invasive species. If unwanted or invasive species were found at the project site, they

would be hand-pulled and/or treated with an approved herbicide in accordance with Cannon AFB's established protocols for pest management to prevent spread.

The control measures employed by Cannon AFB's BASH program include the use of pyrotechnic sound cannons and other deterrents to minimize bird-aircraft strikes. These measures are designed to make the areas of the airfield undesirable to most birds, especially those roosting and nesting (Air Force 2017c). Even with these measures in place, it is possible that MBTA-protected birds (such as burrowing owls or other ground-nesting species) might use the project sites for roosting or nesting. If an active nest of an MBTA species was encountered during project construction, and during the breeding season (10 May to 31 August), protective measures and monitoring by a qualified biologist would be implemented to comply with the MBTA. No work, vegetation clearing, or soil excavation would occur within 150 feet of the nest(s) until the young have fledged and the nest deemed abandoned. Therefore, no adverse effects on MBTA species are expected.

In addition to BASH program control measures, the Cannon AFB pest management program implements measures on the airfield to reduce the number of prairie dog burrows, which also has a positive effect on burrowing owl control. Prior to construction, and in accordance with the Cannon AFB Integrated Pest Management Plan, prairie dog burrows observed on or adjacent to the project sites would be confirmed to be free of burrowing owls and prairie dogs and then filled in with dirt to prevent it being occupied by either species (Air Force 2017b). Control of prairie dogs at Cannon AFB is a long-standing practice in support of air operations and Cannon AFB's BASH program and supports compliance with FAA regulations and Cannon AFB's MBTA depredation take permits. These activities would not be affected by the proposed action.

Prairie dogs have been known to damage softer structures associated with solar arrays, such as wiring, although they generally have no interest in and do not damage solar panels (CEC 2015). The wiring for the solar PV arrays would be encased in metal conduit, so prairie dogs would not be likely to damage the wiring. The solar arrays would be inspected periodically and, if any damage to the wiring was noted, appropriate actions would be taken so the damage would not recur.

A theory known as "lake-effect", where birds may confuse closely-spaced PV panels with bodies of water and be attracted to them, resulting in death or injury, has been cited in studies of large-scale solar arrays in Southern California and Arizona (Kagan et al. 2014, Upton 2014). This "lake effect" has been observed at sites adjacent to existing permanent water bodies where large populations of roosting birds and migratory flocks have returned over many years. Cannon AFB does not have large permanent water bodies that attract large flocks of birds. In addition, the installation's BASH program includes measures to deter bird activity near the flight line. The solar panels would have a low reflectivity, which would aid in minimizing the arrays' potential to have a lake-like appearance. For these reasons, lake-effect and bird mortality due to implementing the proposed action are not anticipated.

As a BMP, any evidence of bird or wildlife mortality observed during PV array inspections would be promptly reported to the Cannon AFB Environmental Division. If bird mortality potentially attributable to the solar arrays is observed, Cannon AFB would coordinate with the USFWS Migratory Bird Program and implement a bird mortality monitoring program using the U.S. Geological Survey solar mortality monitoring document (Huso et al. 2016) or other appropriate guidance.

Although the habitat at the proposed project sites is near developed areas and of relatively low quality, constructing solar arrays would introduce new development and might deter some common wildlife species from using the site. Given the habitat's relatively low quality and proximity to the flight line, where wildlife can pose a risk to air operations, this long-term adverse impact would be minor.

4.3.3 No-Action Alternative

Under the No-Action Alternative, the proposed action would not be implemented. There would be no change to the baseline at the project sites, so there would be no effect on biological resources.

4.4 Earth Resources

4.4.1 Significance Criteria

An alternative would have a significant adverse impact on earth resources if it would (1) cause substantial erosion, (2) substantially increase the risk of erosion, or (3) modify unique geologic features, major topographic elements, or large areas of native soils.

4.4.2 Proposed Action

Short- and long-term minor adverse impacts would result from soil disturbance and erosion during and after construction of the PV arrays at all three sites. There would be no effect on unique geologic features or major topographic elements.

During construction, activities such as site preparation, placement of fill, trenching to install duct banks, and installation of equipment foundations would disturb soils. As described in Section 2.4.1, trenching for the duct banks and fence installation would disturb soil up to 3 feet below grade and installation of equipment foundations would disturb soil up to 7 feet below grade. These actions would impact only localized soils and would not significantly change the native soil profile. Construction would be done in accordance with the erosion and sedimentation control measures in the project SWPPP (Zia 2019). Therefore, soil disturbance during construction would not adversely affect large areas of native soils, cause substantial erosion, or substantially increase the risk of erosion, so adverse impacts would be short-term and minor.

The completed project would introduce new impervious surfaces (PV panels, racking and inverter foundations) where none currently exist, resulting in a change in stormwater runoff patterns and erosion potential. Vegetation growth could be adversely impacted by shade from the PV panels and could result in minor erosion where soil is exposed. The engineering design—which includes more than 14 feet of space between PV panel rows—is anticipated to help offset the effects of shade, minimizing exposed soil and the potential for erosion. The ESPC contractor would maintain vegetation at the site, using shade tolerant plant species approved by Cannon AFB. As a BMP, each time the project sites' maintenance personnel conduct a visual inspection of the site, they would check for signs of erosion. If erosion occurs, the contractor would implement erosion and sedimentation control measures to address it. Therefore, operation of the solar PV arrays would not cause or substantially increase the risk of erosion, so long-term adverse impacts would be minor.

4.4.3 No-Action Alternative

Under the No-Action Alternative, the project would not be constructed, and earth resources would be expected to remain similar to current conditions. Therefore, there would be no effect on earth resources.

4.5 Hazardous Materials and Waste

4.5.1 Significance Criteria

An alternative would have a significant adverse impact on hazardous materials and waste if it would (1) substantially increase the risk of release of a hazardous material or waste (e.g., from spills or other releases) through improper management or (2) result in noncompliance with applicable installation, local, state, or federal regulations.

4.5.2 Proposed Action

No adverse effects would be expected from implementing the proposed action. Hazardous substances used and waste generated during construction and operation of the proposed project would be minimal and would include petroleum, oil, and lubricants. These materials would be handled and disposed of in accordance with Cannon AFB's Contractor's Environmental Guide; local, state, and federal regulations; and with established Air Force and DoD hazardous materials management procedures, as applicable. The contractor would be responsible for preventing spills or leaks from construction and maintenance equipment by implementing proper storage and handling procedures and following base procedures and responding to any spills that occurred.

The solar panels would be constructed of materials such as aluminum and other metals, silicone, glass, plastics, and silicon (Hanwha 2019). The panels do not contain any liquids that could leak into soil. If a panel was damaged, the contractor would remove any debris on the ground and dispose of it. Due to the concentration of silver and lead in the panels, panels that were no longer useable might require disposal as hazardous waste. The contractor would test the panels prior to disposal using toxicity characteristic leaching procedure or another applicable method to determine the appropriate disposal method.

Ground clearing and digging operations would require prior coordination with base environmental personnel and approved dig permits prior to commencing work. Engineering drawings and construction plans would avoid disturbing existing underground and aboveground utilities at the sites, as shown in **Figures 7 and 8**. Fill dirt brought onsite would be accompanied by documentation certifying that it is clean.

Engineering drawings and construction plans would avoid excavation or other ground-disturbing activities within the 200-square foot area occupied by SWMU 76. If soil disturbance within SWMU 76 was necessary, the contractor would be required to coordinate with Cannon AFB Environmental Division and NMED prior to disturbance. Any soils disturbed within SWMU 76 would be removed from the site, characterized for disposal, and disposed at an appropriate off-site disposal facility. As described in Section 3.5, there are no restrictions on future activities at AOCs JJ and KK, so no special precautions would be needed for work in these areas. Therefore, implementing the proposed action would have no adverse effects on hazardous materials or waste.

4.5.3 No-Action Alternative

Under the No-Action Alternative, the proposed action would not be implemented. There would be no change to the baseline at the project sites, so there would be no effect on hazardous materials or waste.

4.6 Infrastructure and Utilities

4.6.1 Significance Criteria

An alternative would have a significant adverse impact on infrastructure and utilities if it would (1) result in a prolonged utility service disruption, (2) substantially increase traffic on area roads, or (3) require significant alteration of existing utility lines.

4.6.2 Proposed Action

Under the proposed action, there would be short-term minor adverse effects and long-term minor beneficial effects on utilities and infrastructure at all three sites. Short-term impacts would be due to localized service interruptions and increased vehicle traffic during construction. Long-term beneficial impacts would result from renewable energy production, lower peak electrical demand, utility cost savings, and an overall reduction in Cannon AFB's environmental footprint.

Existing underground utilities are present at each of the three sites as described in Section 3.6. The existing utilities are at varying depths and careful planning would be necessary to ensure they were avoided during installation of the duct banks and panel and inverter foundations. Appropriate planning to avoid disturbing underground utilities would include (1) designing the project layout to avoid existing utilities, (2) using utility location services to mark underground utilities prior to construction, and (3) obtaining an Air Force dig permit prior to conducting any ground-disturbing activities.

The contractor would coordinate with Cannon AFB staff to ensure that damage to existing lines and piping is avoided, or that steps are taken to modify the existing construction design. Utilities would be marked by a utility location service that would identify and verify the location of all underground obstructions, including items that might not show up on maps of the site's utilities. The final engineering design would then be modified to avoid any obstructions.

In addition, prior to any excavation or trenching, the contractor will submit a dig permit to the AF requesting authorization to proceed with digging activity at the locations specified. With all avoidance measures implemented, no adverse impacts on existing utility infrastructure are expected.

All of the proposed project sites are outside the runway clear zones and accident potential zones; however, Sites 2 and 3 are relatively near the runway and the approach and departure path for aircraft. To ensure that construction and operation of the solar PV arrays would not conflict with air operations, the contractor would coordinate with the FAA and Cannon AFB Flight Control prior to construction. Coordination with the FAA by filing FAA Form 7460-1 prior to implementing the project is required to ensure that the height of construction equipment (e.g., cranes) and operational equipment (e.g., solar panels and fencing) would not interfere with air operations (see Section 3.7).

Because of their proximity to the aircraft approach and departure path, panels at Sites 2 and 3 would potentially be exposed to downwash from aircraft. As stated in Section 2.4.1, the panels would be designed to withstand winds up to 120 miles per hour. The downwash the panels would be exposed to is not anticipated to exceed 104 to115 miles per hour, so no adverse impacts on the panels from aircraft downwash are anticipated.

Construction vehicles, including construction equipment and worker vehicles, would pass through Cannon AFB entry gates and use area roads to travel to and from the site. During construction, the additional traffic might cause temporary delays (such as cars queued behind a slow-moving

construction vehicle), and short detours might be necessary to route traffic around work areas. Traffic impacts would only occur during the limited duration of the construction period and would add only a small number of additional vehicle trips through entry gates and to area roads, so adverse impacts would be short-term and minor. Over the long-term, a few maintenance vehicles would access the sites intermittently; however, this would have no perceptible impact on traffic.

After the PV arrays have been constructed and established, periodic washing of the panels would be required as maintenance to ensure optimum performance. This activity would require the use of groundwater drawn from Cannon AFB water supplies. Washing would occur infrequently and would not cause Cannon AFB to exceed its allowable water usage from the Ogalalla Aquifer (Cannon AFB currently uses around 21 percent of its allowable reserves). Therefore, this long-term adverse impact would be minor.

4.6.3 No-Action Alternative

Under the No-Action Alternative, the project would not occur and there would be no effects on infrastructure and utilities.

4.7 Safety and Occupational Health

4.7.1 Significance Criteria

An alternative would have a significant adverse impact on safety and occupational health if it would (1) substantially increase risks to human health or the environment or (2) result in noncompliance with applicable installation, local, state, or federal regulations governing occupational health and safety.

4.7.2 Proposed Action

Short- and long-term minor adverse effects would be expected from implementing the proposed action. Short-term effects would be associated with risks from construction activities and long-term risks would be associated with maintenance activities once the project was operational.

Workers would be exposed to risks comparable to those associated with other construction projects and maintenance activities. To manage these risks, the contractor would be required to prepare site-specific health and safety plans for construction and maintenance prior to commencing the work. The health and safety plans would address site-specific safety concerns such as watching for prairie dog burrows that might cause a worker to trip and fall, being careful not to disturb soil at SWMU 76, protecting workers from electrical shock, and inspecting electrical contacts regularly to ensure they are in good condition and would not start a fire. The health and safety plans would be protective of workers, the public, and the environment and would be prepared in accordance with DoD and Air Force regulations and would comply with OSHA standards. Therefore, short- and long-term adverse effects would be minor.

An analysis of the potential effects of glint/glare from proposed solar PV arrays was performed in conformance with the FAA Interim Policy. The findings from this analysis are presented in Appendix B. The analysis was conducted using a Solar Glare Hazard Analysis Tool that predicts energy production and the potential for solar glare and ocular impacts from a PV array. The Solar Glare Hazard Analysis Tool conforms to the FAA Interim Policy and uses an interactive Google Maps interface together with user-specified parameters such as orientation and tilt of the PV panels to calculate the occurrence, intensity, and size of the potential glare throughout the year. The analysis performed for this effort resulted in no glare impacts to aviation operations from implementing the proposed action at any of the sites (ForgeSolar 2019).

4.7.3 No-Action Alternative

Under the No-Action Alternative, the proposed action would not be implemented. There would be no change to the baseline at the project sites, so there would be no effect on safety and occupational health.

4.8 Water Resources

4.8.1 Significance Criteria

An alternative would have a significant adverse impact on water resources if it would (1) result in an unpermitted impact on waters of the United States, as defined by the CWA, including wetlands or (2) lead to a violation of the CWA, NPDES, or other applicable regulation or permit.

4.8.2 Proposed Action

Short- and long-term minor adverse effects on groundwater would result from implementing the proposed action. Short-term minor effects would result from water usage during construction for dust control as indicated in the project SWPPP (Zia 2019). Long-term minor effects would result from water usage to perform annual panel washing. These activities would place a new minor demand on the Ogallala Aquifer, Cannon AFB's source of domestic and industrial water and would not be expected to cause Cannon AFB to exceed their allowed water use from the Ogallala Aquifer.

Man-made stormwater conveyances are located near or adjacent to each proposed PV array site. These open ditches divert overland runoff from roads, airfield pavement, and open fields to the seasonal playa lakes. A SWPPP has been prepared for the project that identifies the erosion and stormwater controls that would be implemented during construction to prevent soil erosion and pollution of downstream surface waters such as the playa lakes (Zia 2019). The SWPPP also provides for site restoration when the project is complete. Therefore, there would be no short-term impacts on stormwater.

Once construction was complete, stormwater runoff patterns would not be substantially changed. Stormwater would run off the panels and percolate into the ground or follow existing topography into conveyance channels. The solar arrays would not add contaminants to stormwater. Therefore, there would be no long-term impacts on stormwater.

No direct effects on natural surface waters or wetlands would be expected from implementing the proposed action as none are found within the ROI of the project sites. All proposed PV array sites are also sufficiently distant from the 100-year floodplain that adverse effects would not be expected.

4.8.3 No-Action Alternative

Under the No-Action Alternative, the proposed action would not be implemented. There would be no change to the baseline at the project sites, so there would be no effect on water resources.

4.9 Other NEPA Considerations

4.9.1 Unavoidable Adverse Effects

This EA identifies any unavoidable adverse impacts that would be required to implement the proposed action and the significance of the potential impacts to resources and issues. Title 40 CFR Part 1508.27 specifies that a determination of significance requires consideration of context and intensity. Implementation of the proposed action or alternatives would impact the site-specific

project areas on Cannon AFB. The severity of potential impacts would be limited by regulatory compliance for the protection of the human and natural environment.

Unavoidable short-term adverse impacts associated with implementing the proposed action or alternatives would include vegetation removal, soil disturbance, fugitive dust and air emissions during construction, minor utility service interruptions, and minor alterations to local traffic during construction. There would be no unavoidable long-term adverse impacts associated with implementing the proposed action or alternatives. These effects are considered less than significant. Use of environmental controls and implementing controls required in plans, permits and approvals obtained, and by following Cannon AFB's standard operating procedures, would minimize these potential impacts.

The proposed action would help to offset the environmental footprint of activities at Cannon AFB while improving its energy security and resiliency and supporting compliance with federal renewable energy and GHG emissions mandates. The proposed action also would support the goals of the *2017-2036 Air Force Energy Flight Plan* and contribute to DoD's long-range goals for installation renewable energy performance as set forth in 10 USC §2911.

4.9.2 Relationship of Short-term Uses and Long-term Productivity

The relationship between short-term uses and enhancement of long-term productivity from implementation of the proposed action or alternatives is evaluated from the standpoint of short-term effects and long-term effects. Short-term effects would be those associated with construction activities to implement the proposed action or alternatives. The long-term enhancement of productivity would be those effects associated with the installation's improved renewable energy performance after implementation of the proposed action or alternatives.

The proposed action and alternatives represent an enhancement of Cannon AFB's long-term productivity for renewable energy performance, enhancement of air quality through reduction of the use of conventionally-sourced energy, and an improvement in the installation's energy security and resiliency. The negative environmental effects from short-term ground disturbance during construction activities would be minor compared to these long-term positive environmental benefits.

4.9.3 Irreversible and Irretrievable Commitments of Resources

This EA identifies any irreversible and irretrievable commitments of resources that would result from implementing the proposed action or alternatives. An irreversible effect results from the use or destruction of resources (e.g., energy) that cannot be replaced within a reasonable time. An irretrievable effect results from loss of resources (e.g., endangered species) that cannot be restored as a result of the proposed action. Irreversible commitments of resources that would occur would include planning and engineering costs, building materials and supplies and their cost, use of fuel and energy resources during construction, labor, generation of fugitive dust emissions, and creation of temporary construction noise. No long-term irreversible or irretrievable commitments of resources would result.

4.10 Cumulative Effects

In accordance with NEPA, a discussion of cumulative effects is required. Cumulative effects on environmental resources result from the incremental effects of an action when combined with other past, present, and reasonably foreseeable future projects in an area (40 CFR Part 1508.7). Cumulative effects can result from individually minor but collectively substantial actions taken over a period of time.

4.10.1 Projects in the Vicinity

Military operations at Cannon AFB go back more than 75 years. Cannon AFB was established in 1942 after the United States entered World War II. The base has hosted a variety of missions and aircraft types throughout its history and has been redeveloped over the years to meet evolving mission requirements (Air Force 2018b).

The transfer of Cannon AFB to the Air Force Special Operations Command in 2006 resulted in an estimated $1.29 billion in spending at the base by 2018. The transition at Cannon AFB to accommodate the new mission and incoming personnel includes new and renovated housing, training buildings, and facilities (Garrecht Gassen 2015). Examples of recent past, present, and future projects occurring at Cannon AFB include:

- Construction to upgrade the Chavez Manor gate;
- Construction of a new fire house;
- Construction of a new fitness center;
- Construction and renovation of family housing;
- Construction of a new dormitory for unaccompanied Airmen;
- Renovation of community facilities including a community center, dining facility, and library;
- Construction of a new medical/dental clinic and new medical group building;
- Proposed construction of mission support facilities including a cargo pad, Squadron Operations Facility, hangar, simulation facility, and refueler maintenance facility; and
- Demolition of 39 facilities that no longer meet mission requirements, are no longer in use, or do not meet AT/FP criteria (Air Force 2018b, Cannon AFB 2019).

The area around Cannon AFB is rural and mostly agricultural, with the nearest city being the City of Clovis in Curry County. The city and county are expected to maintain steady population growth over the next two decades (Consensus Planning 2018). The City of Clovis' population and economy is closely tied to Cannon AFB, and the city supports controlling development that would encroach on Cannon AFB (Garrecht Gassen 2015, Watkins 2018).

The Air Force conducted a review of actions in the vicinity of Cannon AFB by reviewing the City of Clovis *Comprehensive Plan* (2018), the city and county websites, the *Stronger Economies Together (SET) Plan Southeastern New Mexico* (COG 2018), and the New Mexico Department of Transportation website (NMDOT 2019). Notable projects or activities include the following:

- Implementing the City of Clovis' 2018 *Comprehensive Plan* for the city's growth over the next 20 years, with economic development goals focusing on the aviation/aerospace and defense, manufacturing, renewable energy, and value-added agriculture industries (Consensus Planning 2018);
- A Joint Land Use Study was conducted in 2011, with recommendation from Cannon AFB to work with the city and county developers to prevent wind farm development from interfering with flight paths (Consensus Planning 2018);

- New Mexico Department of Transportation projects in Curry County include a recently completed mill and overlay project on U.S. 60 from Clovis city limits to Cannon AFB, pavement rehabilitation on New Mexico Route 209, and bridge rehabilitation on U.S. 70 (Consensus Planning 2018, NMDOT 2019);
- Development and implementation of a Capital Improvement Plan for the City of Clovis water system (Consensus Planning 2018);
- Continued work on the Eastern New Mexico Water Utility Authority Ute Pipeline and water treatment facility in Curry County to provide a new domestic water supply for the county (Consensus Planning 2018, Kamana 2019);
- Continued development of the Clovis Industrial Development Park infrastructure and promotion of the park to attract new businesses (Consensus Planning 2018);
- Expansion of the Southwest Cheese Plant (Consensus Planning 2018).
- Opening of the Broadview Wind Power Facility (COG 2018, PEGI 2017);
- Start of construction of the Grady Wind Facility (Consensus Planning 2018); and
- Planning for the Tres Amigas Electrical Super Station (Consensus Planning 2018, Tres Amigas 2019).

4.10.2 Cumulative Effects of the Proposed Action

The proposed action would result in the impacts described in Section 4, including potential *less-than-significant* adverse impacts on air quality (short term), biological resources, earth resources, hazardous materials and waste, infrastructure and utilities, safety and occupational health, and water resources. The proposed action would also result in beneficial impacts on air quality, infrastructure and utilities, and socioeconomics. No or negligible adverse impacts on airspace, cultural resources, environmental justice, land use, noise, and socioeconomics are anticipated from implementing the proposed action.

The cumulative effects of the proposed action in combination with other past, present, and reasonably foreseeable actions on- and off-base would not result in significant adverse impacts. Cumulative net beneficial effects on air quality and infrastructure would be realized by constructing solar arrays at Cannon AFB in combination with the net beneficial effects on air quality and infrastructure realized through implementation of the *2018 Comprehensive Plan* of the City of Clovis, which also focuses on airspace and renewable energy initiatives. Resource areas on which cumulative effects would be anticipated are addressed below.

Air Quality. The region around Canon AFB is largely agricultural and transportation and industrial activities generate most emissions. Emissions from construction of the proposed action would combine with those from other construction at Cannon AFB and projects in the area; however, emissions associated with the project would represent a small fraction of total emissions in the region, so cumulative adverse effects would be minor. Once construction was complete, the proposed action would cause an incremental reduction in emissions of GHGs in the region. The proposed action, combined with two additional renewable energy facilities in the region, would result in an overall moderate beneficial cumulative effect on air quality due to reduced emissions from the combustion of fossil fuels for years to come.

Biological Resources. The proposed action would have a minor adverse effect from limited vegetation removal. Compliance with laws, permits, regulations and use of BMPs would ensure that the project would not adversely affect protected species or critical or otherwise important habitat. Other development projects in the region would likely result in a loss of vegetation and habitat and displacement of wildlife; however, the project's contribution to this cumulative effect would be negligible.

Earth Resources. The proposed action and other projects in the region would involve temporary soil disturbance during construction and could alter stormwater runoff patterns, increasing the potential for erosion. Once each project is constructed and/or installed, the sites would be stabilized and revegetated in accordance with applicable laws, permit requirements, and BMPs to ensure erosion and sedimentation is prevented. Therefore, there would be no cumulative effect on earth resources.

Hazardous Materials and Waste. The proposed action and other projects in the region would use hazardous materials and generate hazardous waste. These activities are highly regulated by a variety of laws and permit requirements. Compliance with applicable laws and permits held by Cannon AFB or other entities would ensure proper management of hazardous materials and disposal of hazardous waste and prompt response to any spills or releases that did occur. Therefore, there would be no cumulative effect on hazardous materials and waste.

Infrastructure and Utilities. The proposed action and other utility and infrastructure projects in the region could cause short-term adverse impacts due to disruptions such as traffic delays, minor utility service interruptions, or airfield usage downtime in the vicinity of a construction site or transportation project. The long-term cumulative impacts on infrastructure would be beneficial as infrastructure is improved over time to provide better service and functionality and demand on regional utilities is decreased with the implementation of renewable energy systems.

Safety and Occupational Health. Risks associated with the proposed action and other projects in the region would be addressed through compliance with OSHA and FAA regulations. Specifically, FAA and Air Force regulations require glint/glare analyses specific to PV arrays and height/distance requirements related to all projects near airports and low flight paths to protect pilots and flight control support. Construction and industrial projects require implementation of site-specific health and safety plans that would be protective of workers, the public and the environment. Therefore, there would be no cumulative effect on safety and occupational health.

Water Resources. Implementing the proposed action would have a minor adverse impact due to the use of groundwater. Other projects in the area could also place increased demand on groundwater or otherwise affect water resources indirectly; however, the project's contribution to this cumulative effect would be negligible.

4.10.3 Cumulative Effects of the No-Action Alternative

Under the No-Action Alternative, Cannon AFB would not construct solar PV arrays on Sites 1, 2, or 3. Cannon AFB would continue to rely on the public electrical grid as it does today. The projects and trends described in Section 4.10.1 would continue; however, the No-Action Alternative would not contribute to these effects, so there would be no cumulative effects.

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6. PERSONS AND AGENCIES CONSULTED OR COORDINATED WITH

The persons and agencies shown in **Table 3** were contacted in the preparation of this EA.

Table 3. Persons and Agencies Consulted or Coordinated With

Federal Agencies	
The Honorable Martin Heinrich US Senator, New Mexico 303 Hart Senate Office Building Washington, DC 20510	Bruce D'Llaynn, District Conservationist Natural Resources Conservation Service, Curry County Clovis Service Center 918 Parkland Drive Clovis, NM 88101-4432
The Honorable Tom Udall US Senator, New Mexico 531 Hart Senate Office Building Washington, DC 20510	Linda Dreeland, Chief Environmental and SRM Section US Army Corps of Engineers, Albuquerque District 4101 Jefferson Plaza NE Albuquerque, NM 87109
Congresswoman Xochitl Torres Small US House of Representatives New Mexico, District 2 430 Cannon HOB Washington, DC 20515	Tim Spisak, State Director Bureau of Land Management 301 Dinosaur Trail Santa Fe, NM 87508
Congressman Ben Lujan US House of Representatives New Mexico, District 3 2323 Rayburn HOB Washington, DC 20515	David Gray, Regional Administrator US Environmental Protection Agency, Region 6 Renaissance Tower 1201 Elm Street, Suite 500 Dallas, TX 75270-2102
Patricia Mattingly, Acting Regional Director Bureau of Indian Affairs, Southwest Region 1001 Indian School Rd NW Albuquerque, NM 87104	Amy Lueders, Regional Director USFWS Southwest Region PO Box 1306 Albuquerque, NM 87103-1306
State Agencies	
Governor Michelle Lujan Grisham Office of the Governor of New Mexico 490 Old Santa Fe Trail Room 400 Santa Fe, NM 87501	John Rhoderick, Manager District I Main Office New Mexico Environment Department 121 Tijeras Ave NE, Suite 1000 Albuquerque, NM 87102-3400
Representative Randal Crowder New Mexico House of Representatives 509 Playa Drive Clovis, NM 88101	Lynn Trujillo, Cabinet Secretary New Mexico Indian Affairs Department Wendell Chino Building, 2nd Floor 1220 South St. Francis Drive Santa Fe, NM 87505

Jeff Papas, PhD State Historic Preservation Officer New Mexico State Historic Preservation Division Bataan Memorial Building 407 Galisteo Street, Suite 236 Santa Fe, NM 87501	Greg Myers, Director New Mexico Office of Military Base Planning New Mexico Economic Development Department PO Box 20003 Santa Fe, NM 87504
Erik Nelson, Resource Manager Clovis District New Mexico State Land Office 105 East 6th Street Clovis, NM 88101	Jeff Witte, Director/Secretary New Mexico Department of Agriculture MSC 3189 PO Box 30005 Las Cruces, NM 88003-8005
Senator Stuart Ingle New Mexico Senate 2106 West University Drive Portales, NM 88130	Southeast District Office New Mexico Game and Fish 1912 W Second Street Roswell, NM 88201
Municipal Agencies	
Mayor David Lansford City of Clovis PO Box 760 Clovis, NM 88101-0760	Mayor R. Jackson City of Portales 100 West 1st Street Portales, NM 88130
Justin Howalt, City Manager City of Clovis 321 North Connelly Street Clovis, NM 88101	Chet Spear, Commissioner, District 3 Curry County 15 Jill Street Clovis, NM 88101
Native American Tribes	
Bobby Komardley Apache Tribe of Oklahoma 511 East Colorado Anadarko, OK 73005	Matthew Komalty Kiowa Tribe of Oklahoma PO Box 369 Carnegie, OK 73015
John Wahnee Comanche Nation of Oklahoma PO Box 908 Lawton, OK 73502	Arthur Blazer Mescalero Apache Tribe PO Box 227 Mescalero, NM 88340
Darrell Paiz Jicarilla Apache Nation PO Box 507 Dulce, NM 87528	

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Appendix A

Interagency and Intergovernmental Coordination and Consultation

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Correspondence with Native American Tribes

1. Tribal Letters
2. Letter Attachment - Maps

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DEPARTMENT OF THE AIR FORCE
27TH SPECIAL OPERATIONS WING (AFSOC)
CANNON AIR FORCE BASE, NEW MEXICO

AUG 2 2 2019

Colonel Robert A. Masaitis
Commander
27th Special Operations Wing
1 Air Commando Way
Cannon Air Force Base NM 88103

The Honorable Arthur Blazer
President, Mescalero Apache Tribe
PO Box 227
Mescalero NM 88340

Dear Mr. Blazer

The United States Air Force (Air Force) is preparing an Environmental Assessment (EA) in accordance with the National Environmental Policy Act (NEPA). The EA will evaluate the potential environmental and socioeconomic impacts of developing ground-based solar photovoltaic (PV) arrays to produce up to seven megawatts of renewable energy on up to three sites at Cannon Air Force Base (AFB), Clovis, Curry County, New Mexico. Maps of the proposed sites and preliminary layouts of the solar arrays are attached.

In accordance with Executive Order 12372, *Intergovernmental Review of Federal Programs*, we are writing this letter to advise you of this proposal and request your assistance in identifying any potential issues related to the proposal. We would greatly appreciate your comments within 30 days of this letter; however, comments received at any time throughout the EIAP process will be considered to the extent possible in the preparation of the EA.

The Air Force intends to maximize the use of electronic transmittals during subsequent coordination phases of this project. If you would prefer to receive a hard copy of any documents, please indicate this in your response; if not, the draft EA will be provided in an electronic format when it becomes available.

Comments should be provided by mail to Dr. Linda Tello, NEPA Program Manager, SOCES/CEIE Cannon AFB & MAFR, 402 S. Chindit Boulevard, Building 102, Cannon AFB, NM 88103, or by email to 27SOCES.CEIE.Assess@us.af.mil. Should you need to contact Dr. Tello directly, she can be reached at (575) 904-6732.

Sincerely

ROBERT A. MASAITIS, Colonel, USAF
Commander

Attachment:
Maps of Proposed Solar PV Array Sites and Layout

DEPARTMENT OF THE AIR FORCE
27TH SPECIAL OPERATIONS WING (AFSOC)
CANNON AIR FORCE BASE, NEW MEXICO

AUG 2 2 2019

Colonel Robert A. Masaitis
Commander
27th Special Operations Wing
1 Air Commando Way
Cannon Air Force Base NM 88103

The Honorable John Wahnee
Tribal Administrator
Comanche Nation of Oklahoma
PO Box 908
Lawton OK 73502

Dear Mr. Wahnee

The United States Air Force (Air Force) is preparing an Environmental Assessment (EA) in accordance with the National Environmental Policy Act (NEPA). The EA will evaluate the potential environmental and socioeconomic impacts of developing ground-based solar photovoltaic (PV) arrays to produce up to seven megawatts of renewable energy on up to three sites at Cannon Air Force Base (AFB), Clovis, Curry County, New Mexico. Maps of the proposed sites and preliminary layouts of the solar arrays are attached.

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27TH SPECIAL OPERATIONS WING (AFSOC)
CANNON AIR FORCE BASE, NEW MEXICO

AUG 2 2 2019

Colonel Robert A. Masaitis
Commander
27th Special Operations Wing
1 Air Commando Way
Cannon Air Force Base NM 88103

The Honorable Matthew Komalty
Chairman, Kiowa Tribe of Oklahoma
100 Kiowa Way
Carnegie OK 73015

Dear Mr. Komalty

The United States Air Force (Air Force) is preparing an Environmental Assessment (EA) in accordance with the National Environmental Policy Act (NEPA). The EA will evaluate the potential environmental and socioeconomic impacts of developing ground-based solar photovoltaic (PV) arrays to produce up to seven megawatts of renewable energy on up to three sites at Cannon Air Force Base (AFB), Clovis, Curry County, New Mexico. Maps of the proposed sites and preliminary layouts of the solar arrays are attached.

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27TH SPECIAL OPERATIONS WING (AFSOC)
CANNON AIR FORCE BASE, NEW MEXICO

AUG 2 2 2019

Colonel Robert A. Masaitis
Commander
27th Special Operations Wing
1 Air Commando Way
Cannon Air Force Base NM 88103

The Honorable Bobby Komardley
Chairman, Apache Tribe of Oklahoma
511 East Colorado
Anadarko OK 73005

Dear Mr. Komardley

The United States Air Force (Air Force) is preparing an Environmental Assessment (EA) in accordance with the National Environmental Policy Act (NEPA). The EA will evaluate the potential environmental and socioeconomic impacts of developing ground-based solar photovoltaic (PV) arrays to produce up to seven megawatts of renewable energy on up to three sites at Cannon Air Force Base (AFB), Clovis, Curry County, New Mexico. Maps of the proposed sites and preliminary layouts of the solar arrays are attached.

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DEPARTMENT OF THE AIR FORCE
27TH SPECIAL OPERATIONS WING (AFSOC)
CANNON AIR FORCE BASE, NEW MEXICO

AUG 2 2 2019

Colonel Robert A. Masaitis
Commander
27th Special Operations Wing
1 Air Commando Way
Cannon Air Force Base NM 88103

The Honorable Darrell Paiz
President, Jicarilla Apache Nation
PO Box 507
Dulce NM 87528

Dear Mr. Paiz

The United States Air Force (Air Force) is preparing an Environmental Assessment (EA) in accordance with the National Environmental Policy Act (NEPA). The EA will evaluate the potential environmental and socioeconomic impacts of developing ground-based solar photovoltaic (PV) arrays to produce up to seven megawatts of renewable energy on up to three sites at Cannon Air Force Base (AFB), Clovis, Curry County, New Mexico. Maps of the proposed sites and preliminary layouts of the solar arrays are attached.

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Sincerely

ROBERT A. MASAITIS, Colonel, USAF
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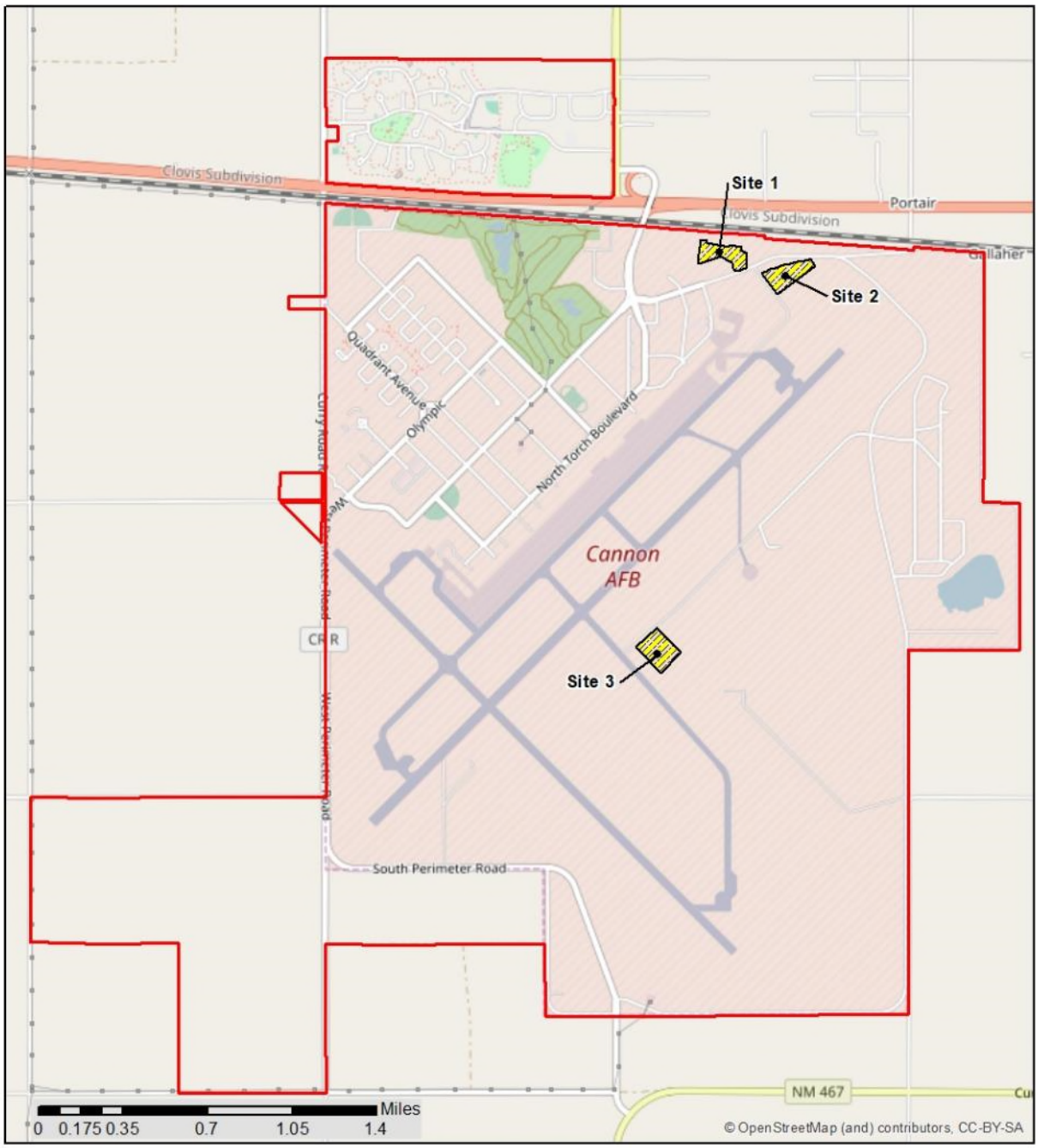
Attachment:
Maps of Proposed Solar PV Array Sites and Layout

Figure 1: Map of Proposed Solar PV Array Sites at Cannon AFB

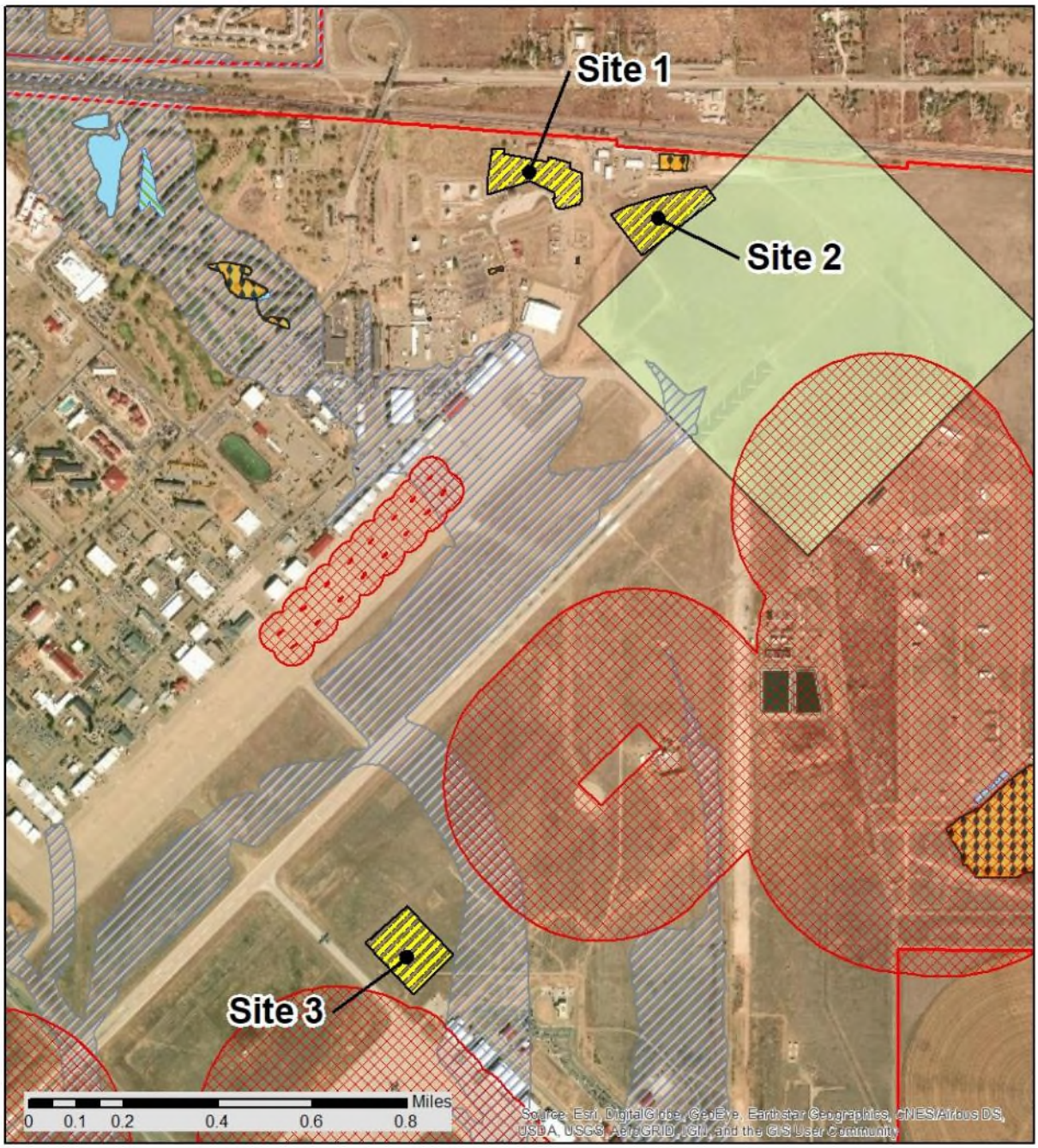


Legend

- Installation Boundary
- PV Array Site

PV Site	Size (Ac)	Production (MW)
Site 1	6.8	2
Site 2	6.35	2
Site 3	8.88	3

Figure 2: Environmental Constraints Near Proposed Solar PV Array Sites



PV Site	Size (Ac)	Production (MW)
Site 1	6.8	2
Site 2	6.35	2
Site 3	8.88	3

Figure 3: Proposed Layout of Solar PV Array at Site 1

Figure 4: Proposed Layout of Solar PV Array at Site 2

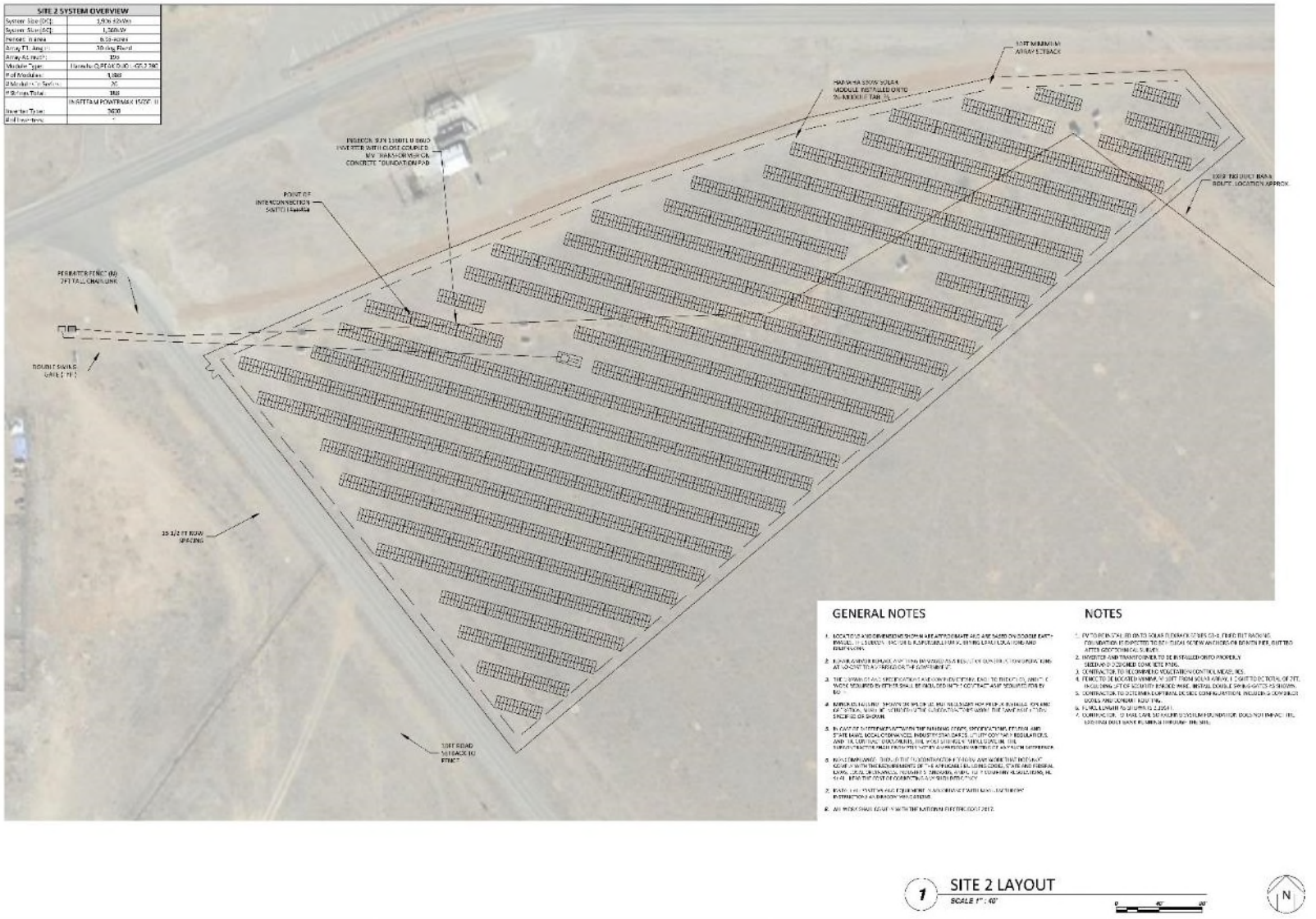
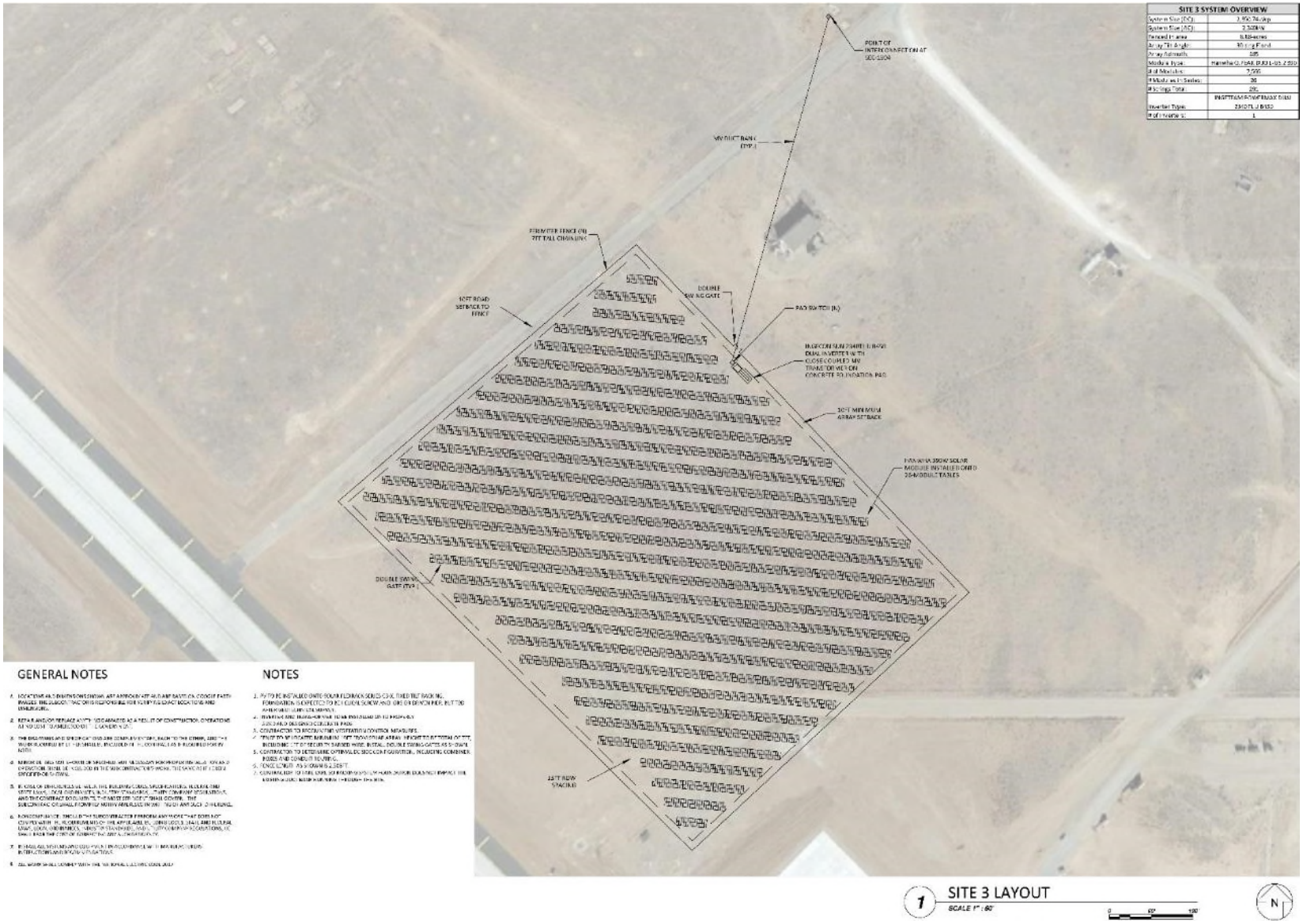


Figure 5: Proposed Layout of Solar PV Array at Site 3



Correspondence with SHPO

HATTEN, TIMOTHY D GS-12 USAF AFSOC 27 SOCES/CEIE

From: Estes, Bob, DCA <Bob.Estes@state.nm.us>
Sent: Thursday, September 5, 2019 9:20 AM
To: 27 SOCES/CEIE Assess
Cc: HATTEN, TIMOTHY D GS-12 USAF AFSOC 27 SOCES/CEIE
Subject: [Non-DoD Source] PV EA

Mornin' Dr. Tello,

On behalf of the New Mexico State Historic Preservation Officer (SHPO), I have completed a review of the information on the photo-voltaic (PV) arrays proposed for Cannon Air Force Base (CAFB).

To the best of my knowledge, the CAFB cantonment has been surveyed for cultural resources. It is the SHPOs' opinion that the proposed locations for the PV arrays are unlikely to affect historic properties. In recent years, however, there have been subsurface discoveries of historic archaeological materials on the base. This potential for post-review discoveries should be considered when developing the environmental assessment (EA).

Last, we would appreciate the opportunity to review an electronic copy of the draft EA, when it is available.

If you have any questions or comments, please feel free to call me directly at 505-827-4225 or email me.

Sincerely,

Bob Estes Ph.D.
NM HPD Staff archaeologist
407 Galisteo St., Suite 236
Santa Fe, NM 87501
505-827-4225

DEPARTMENT OF THE AIR FORCE
27TH SPECIAL OPERATIONS WING (AFSOC)
CANNON AIR FORCE BASE, NEW MEXICO

AUG 2 2 2019

Colonel Robert A. Masaitis
Commander
27th Special Operations Wing
1 Air Commando Way
Cannon Air Force Base NM 88103

The Honorable Jeff Papas
State Historic Preservation Officer
New Mexico State Historic Preservation Division
Bataan Memorial Building
407 Galisteo Street, Suite 236
Santa Fe NM 87501

Dear Dr. Papas

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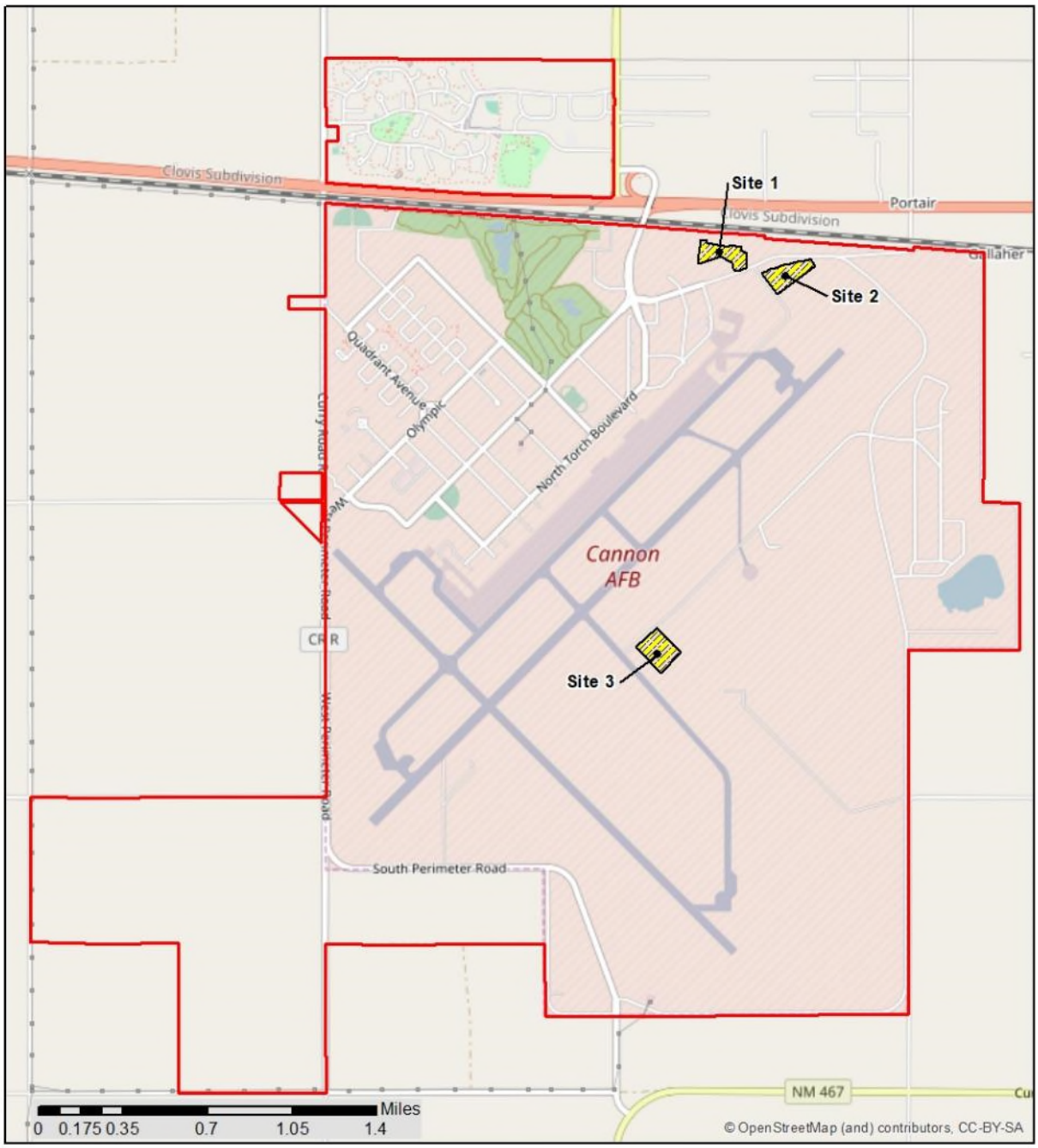

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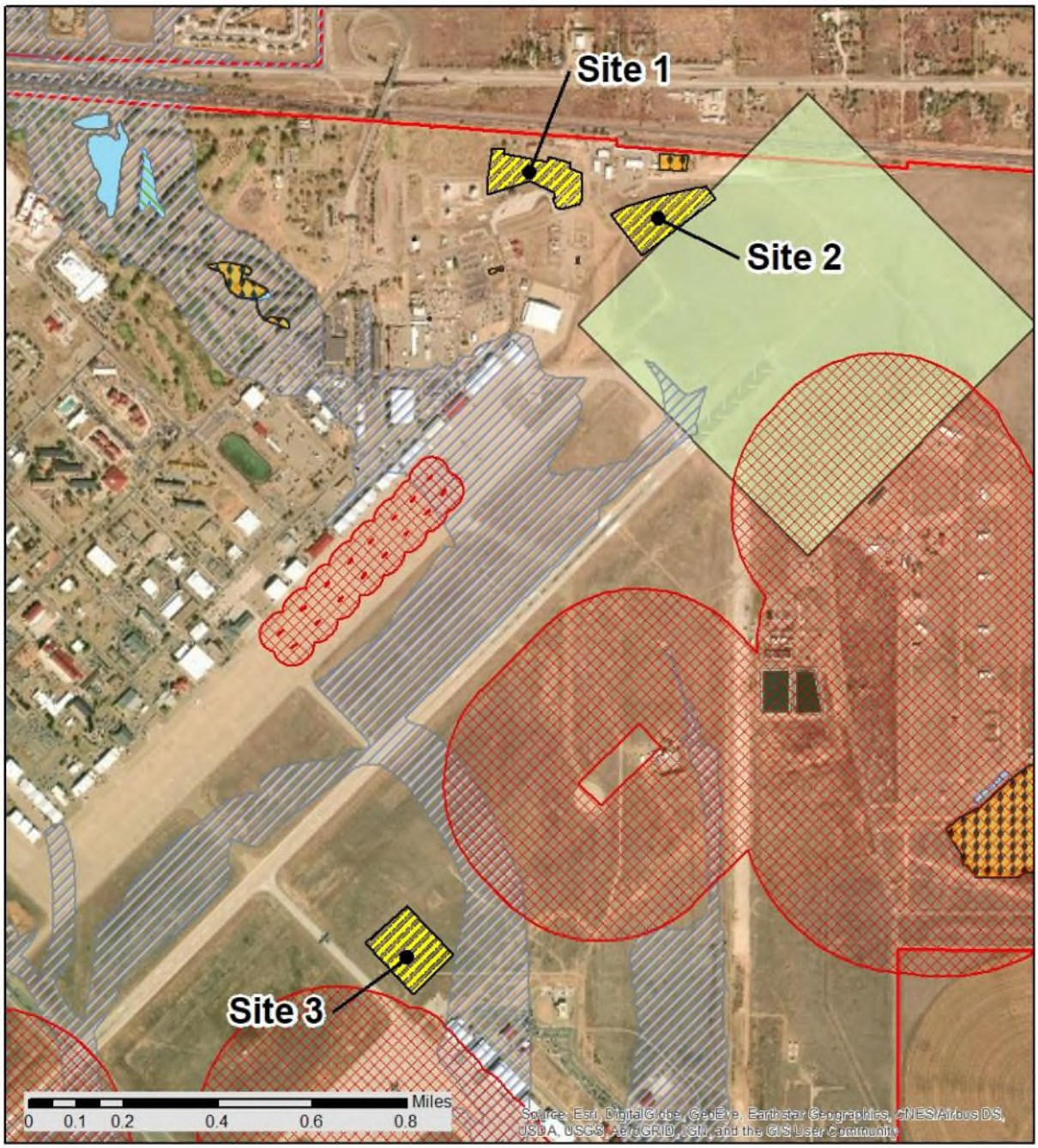


PV Site	Size (Ac)	Production (MW)
Site 1	6.8	2
Site 2	6.35	2
Site 3	8.88	3

Figure 3: Proposed Layout of Solar PV Array at Site 1

GENERAL NOTES

1. LOCATIONS AND DIMENSIONS SHOWN ARE APPROXIMATE AND ARE BASED ON EXISTING EARTH IMAGES. IT IS SUBCONTRACTOR'S RESPONSIBILITY FOR VERIFYING EXACT LOCATIONS AND DIMENSIONS.
2. REFER AND/OR REFER AS NOTED SHOWN TO AS A PART OF CONSTRUCTION DIRECTIONS AT NO COST TO AMENDED OR TO CONVENIENT.
3. THE DRAWINGS AND SPECIFICATIONS ARE CLOSELY RELATED, EACH TO THE OTHER, AND WORK REQUIRED BY ONE SHALL BE INCLUDED AS PART OF THE CONTRACT AS IF SHOWN AND NOTED BOTH.
4. SMALL DETAILS NOT SHOWN OR SPECIFIED, BUT NECESSARY FOR PROPER INSTALLATION AND OPERATION SHALL BE INCLUDED IN THE REQUIREMENTS OF THE WORK, IN THE SAME MANNER AS IF SPECIFICALLY SHOWN OR NOTED.
5. IN CASE OF DIFFERENCES BETWEEN THE BUILDING CODES, SPECIFICATIONS, FEDERAL AND STATE LAWS, LOCAL ORDINANCES, THE MOST STRINGENT SHALL GOVERN. THE SUBCONTRACTOR SHALL PROMPTLY NOTIFY THE OWNER IN WRITING OF ANY SUCH DIFFERENCE.
6. NON-CONFORMANCE: SHOULD THE SUBCONTRACTOR PERFORM ANY WORK THAT DOES NOT COMPLY WITH THE REQUIREMENTS OF THE APPLICABLE BUILDING CODES, STATE AND FEDERAL LAWS, LOCAL ORDINANCES, AND/OR ANY STANDARDS, AS IT SHOULD HAVE DONE SO, THE SUBCONTRACTOR SHALL BEAR THE COST OF CORRECTING ANY SUCH DEFICIENCY.
7. INSTALL ALL SYSTEMS AND EQUIPMENT IN ACCORDANCE WITH MANUFACTURERS' INSTRUCTIONS AND RECOMMENDATIONS.
8. ALL WORK SHALL COMPLY WITH THE NATIONAL ELECTRIC CODE 2017.

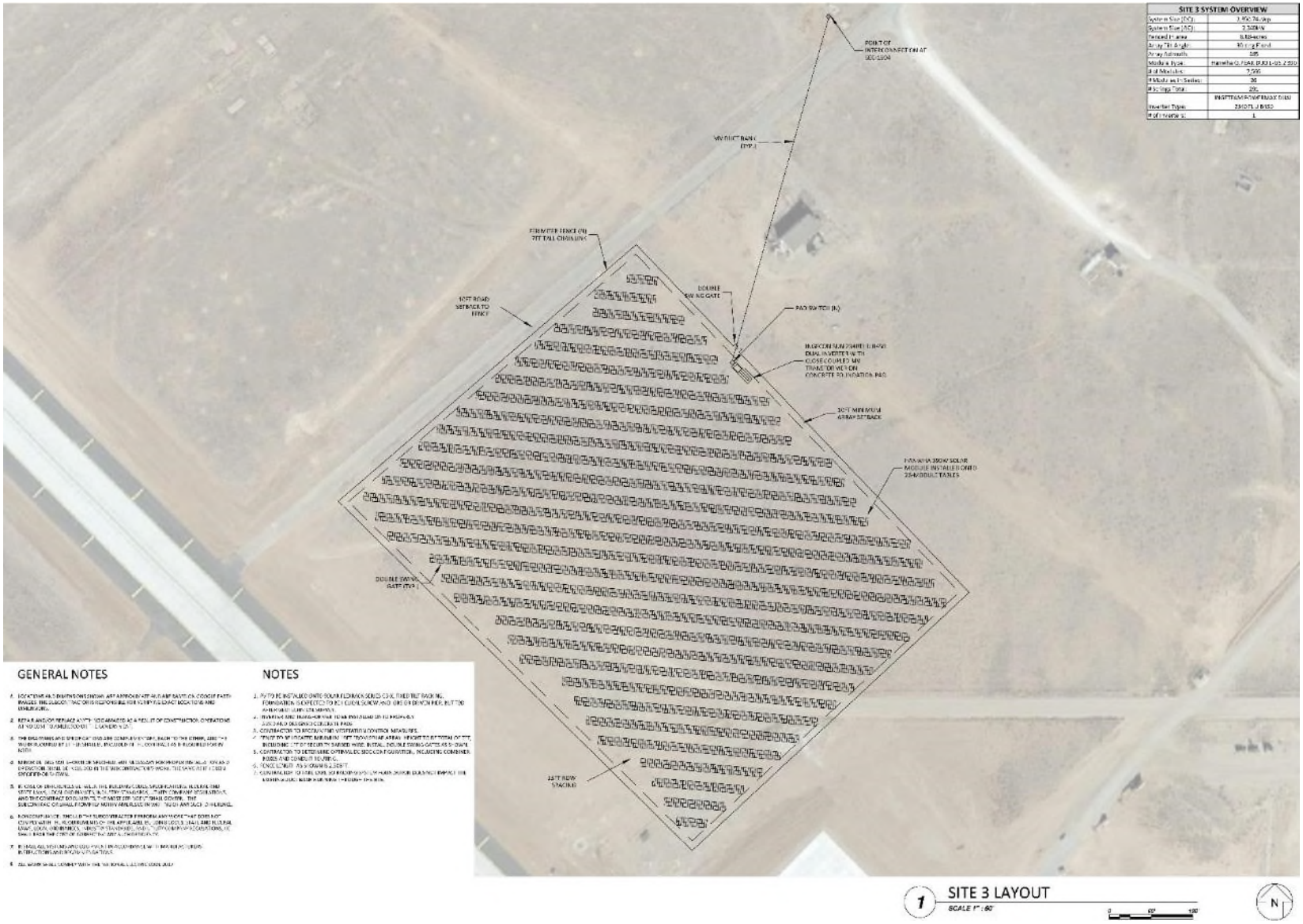
NOTES

1. PV TO BE INSTALLED ONTO SOLAR FLEXRACK SERIES GS-X, TILTED TILT RACKING FOUNDATION: 1.5 EXPECTED TO BE H-PILE OR SCREW ANCHOR OR DRIVEN PIER, BUT TBD BY GEOTECHNICAL SURVEY.
2. INVERTERS, TRANSFORMERS AND PAD SWITCH TO BE INSTALLED ONTO PROPERLY SIZED AND DESIGNED CONCRETE PADS.
3. FOR LOCATION TO BE DETERMINED BY GEOTECHNICAL EVALUATION.
4. PER CO. TO BE LOCATED APPROXIMATELY 20FT FROM SOLAR ARRAY. 7 SHALL TO BE TOTAL OF 7FT, INCLUDING 1FT OF SECURITY BARBED WIRE. INSTALL DOUBLE SWING GATES AS SHOWN.
5. CONTRACTOR TO DETERMINE OPTIMAL DC SIDE CONFIGURATION, INCLUDING COMBINER BOXES AND STRINGING PERMITTED.
6. PER GEOMETRY AS SHOWN TO 2 BUFFT. IT HE DOES NOT INCLUDE THE EXISTING FENCE LINE ON THE SOUTH PERIMETER OF THE SITE.
7. CONTRACTOR TO TAKE CARE NOT RACKING SYSTEM FOUNDATION DOES NOT IMPACT ANY KNOWN UNDERGROUND UTILITIES.

1 SITE 1 LAYOUT
SCALE 1" : 70'
0 70 140
N

Figure 4: Proposed Layout of Solar PV Array at Site 2

Figure 5: Proposed Layout of Solar PV Array at Site 3



Correspondence with USFWS

DEPARTMENT OF THE AIR FORCE
27TH SPECIAL OPERATIONS CIVIL ENGINEER SQUADRON (AFSOC)
CANNON AIR FORCE BASE, NEW MEXICO

27 August 2019

Colonel Robert A. Masaitis
Commander, 27th Special Operations Wing
1 Air Commando Way
Cannon Air Force Base NM 88103

Jodie Smithem
Supervisor, Fish and Wildlife
U.S. Fish and Wildlife Service
New Mexico Ecological Services Field Office
2105 Osuna Road NE
Albuquerque, NM 87113-1001

Dear Ms. Smithem:

The United States Air Force (Air Force) is preparing an Environmental Assessment (EA) to evaluate the potential environmental impacts associated with installing and operating solar photovoltaic (PV) renewable energy systems at Cannon Air Force Base (AFB), New Mexico. Pursuant to Section 7 of the Endangered Species Act of 1973 (16 United States Code § 1531-1544), the Air Force has determined that this proposed action *will have no effect on* federally listed species.

Under the proposed action, the Air Force would install and operate solar PV arrays on up to three sites on Cannon AFB, referred to as Sites 1, 2, and 3. Sites 1 and 2 are 6.8-acre and 6.35-acre parcels, respectively, in the northern portion of the installation. Site 1 is east of the golf course and Site 2 is east of Site 1. Site 3 is an 8.88-acre parcel in the central portion of the installation (Attachment 1).

The PV panels would be oriented to the south to maximize solar exposure; installed approximately 18 inches above grade at the base; positioned at a fixed tilt, 30-degree angle; spaced 14–15.5 feet apart; anchored to the ground with appropriate anchors; and meet all applicable engineering design criteria, such as to withstand maximum anticipated winds. Inverters and transformers would be mounted on concrete pads. Each solar PV array would be connected to existing electrical infrastructure. Where the point of interconnection is outside the site boundary, some work outside the site boundary would occur. Trenching would be required to install duct banks between the inverters and the point of interconnection. Each solar PV array would be up to 8.63 feet high and surrounded by a 6-foot high chain-link fence, topped by 1 foot of barbed wire, for a total height of 7 feet. A minimum 10-foot setback would be established between the solar PV panels and the perimeter fence and between the perimeter fence and any existing roads. Construction would likely begin in 2020 and last for approximately 18 months.

The habitat at Sites 1, 2, and 3 is similar and consists of disturbed grassland characterized by multiple species of annual grasses and forbs that are regularly mowed and maintained at a height of less than 14 inches. Although the sites are undeveloped except for some transformers on Site 2, they are in relatively disturbed areas and habitat quality is low. Vegetation include a variety of native and nonnative grasses and forbs, none of which are protected.

The U.S. Fish and Wildlife Service (USFWS) Information for Planning and Consultation (IPaC) system (Attachment 2) was reviewed to determine if any federally listed species potentially occur in the vicinity of the proposed action. An official species list was requested and is pending receipt, so the

interim species list was used. The only federally protected species USFWS lists as potentially occurring on Cannon AFB is the interior least tern (*Sterna antillarum athalassos*), which nests along sand and gravel bars within braided streams and rivers. The only potential habitat for the species on Cannon AFB is the golf course lakes and the North Playa basin, neither of which are within or adjacent to the project sites. Site 1 is approximately 0.5 mile east of the nearest golf course lake and Site 3 is approximately 1 mile west of the North Playa basin. According to Cannon AFB's 2017 *Integrated Natural Resources Management Plan*, the interior least tern has not been observed at Cannon AFB to date. No critical habitat for federally protected species is on Cannon AFB.

Therefore, the Air Force has determined the installation and operation of solar PV arrays on Cannon AFB *will have no effect on* federally listed species. We request written concurrence with our determination as part of the informal consultation process. If you have any questions or concerns, please contact Ms. Crystal Chavez, NEPA Program Manager, SOCES/CEIE Cannon AFB & MAFR, at 402 S. Chindit Boulevard, Building 102, Cannon AFB, NM 88103, or by email to 27SOCES.CEIE.Assess@us.af.mil. Should you need to contact Ms. Chavez directly, she can be reached at (575) 904-6736. Thank you in advance for your assistance in this effort.

Sincerely,

ROBERT A. MASAITIS, Colonel, USAF
Commander

Attachments:
1. Maps of Proposed Action Areas and Site Layouts
2. USFWS IPaC List (interim list generated July 9, 2019; official list requested and pending receipt)

Attachment 1
Maps of Proposed Action Areas and Site Layouts

Figure 1. Location of Cannon AFB

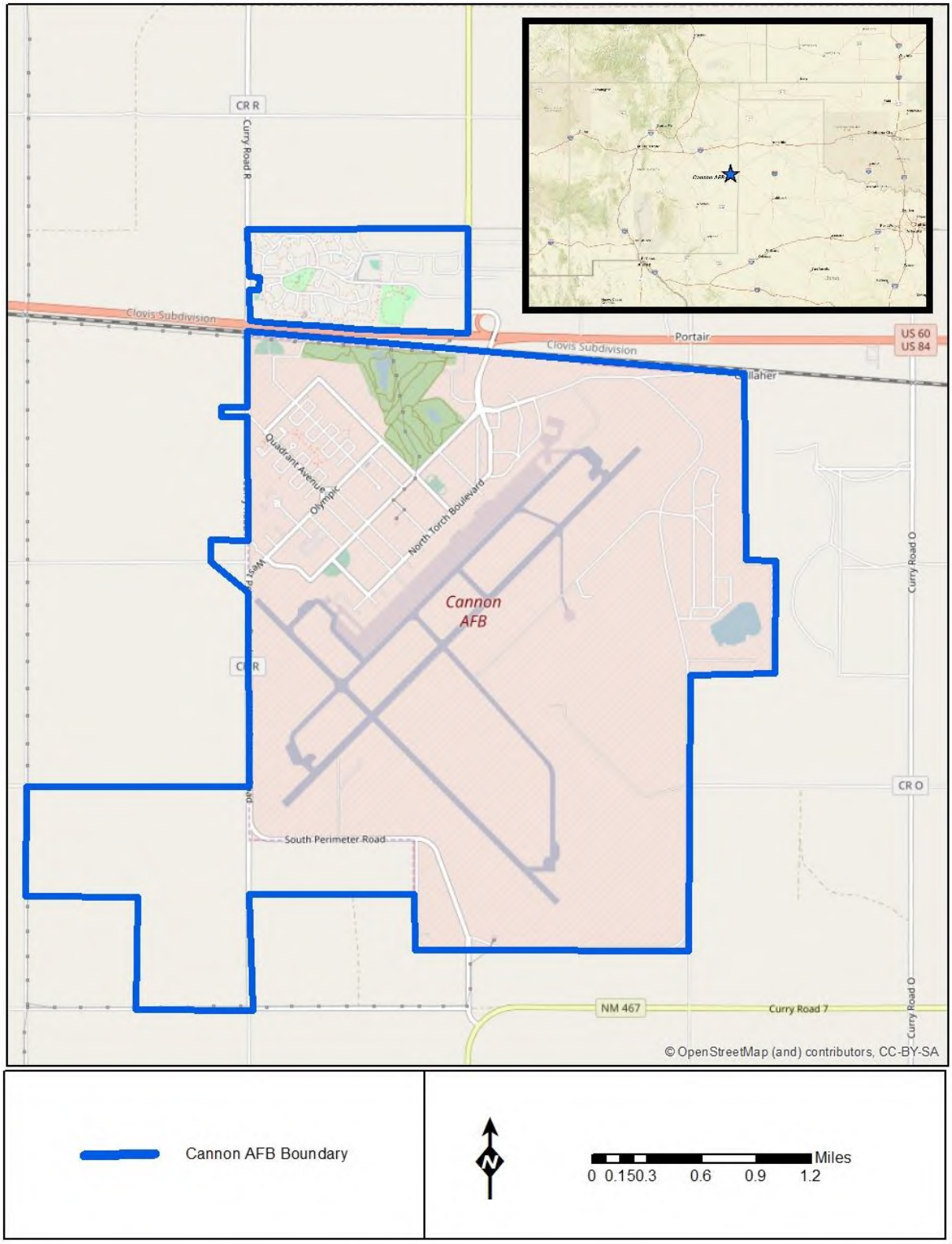


Figure 2. Potential Sites for the Proposed Solar PV Arrays

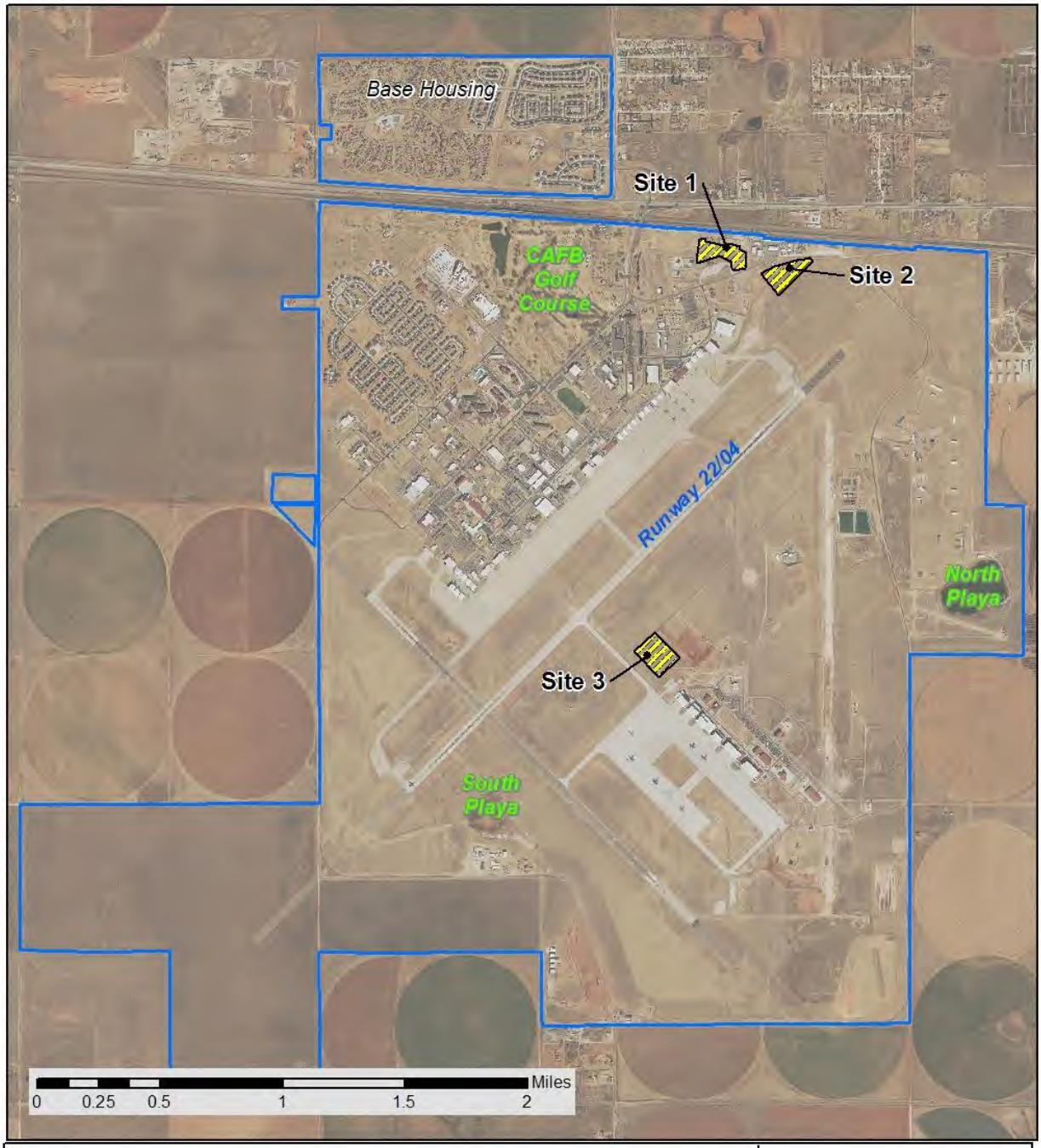


Figure 3. Proposed Solar PV Array at Site 1

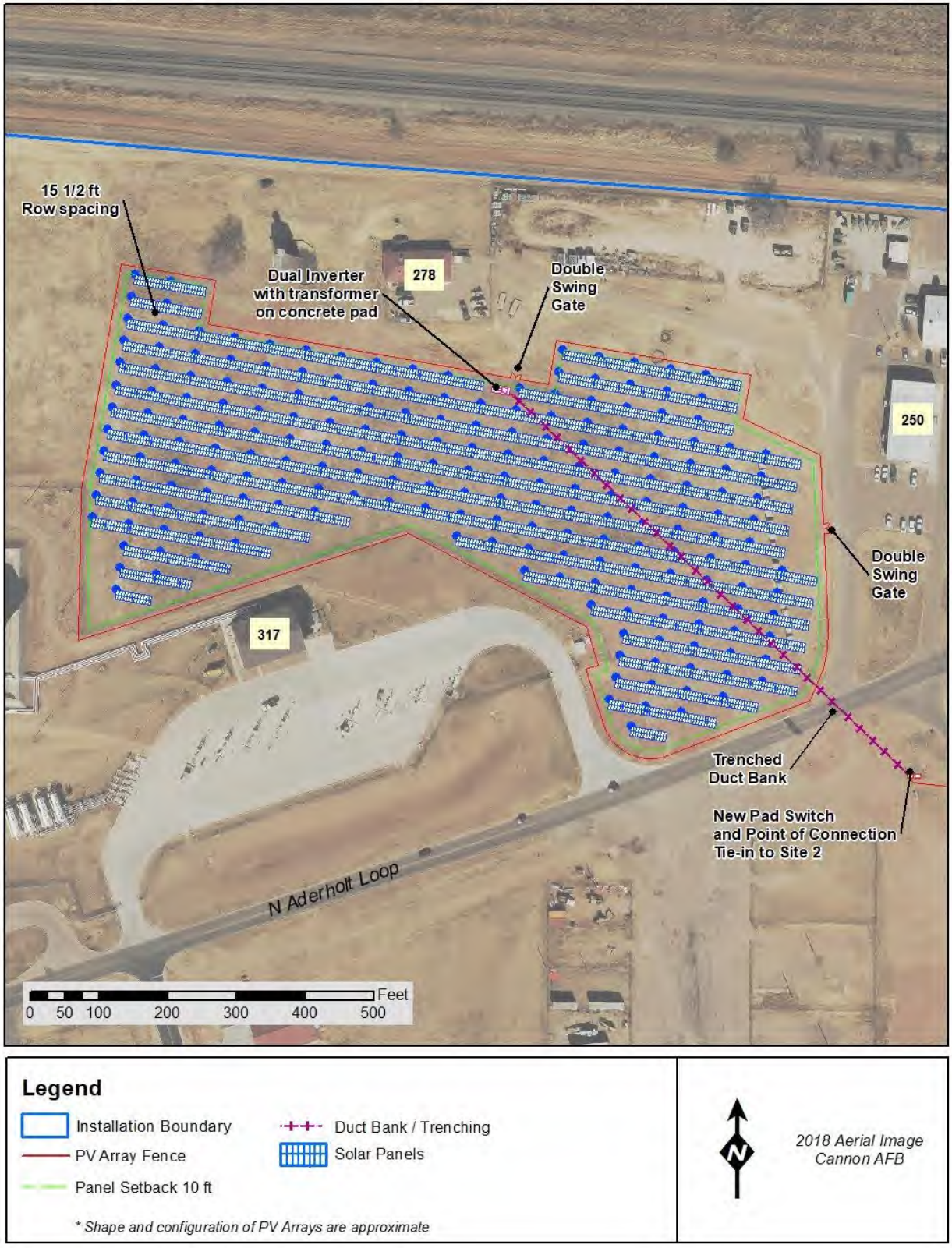


Figure 4. Proposed Solar PV Array at Site 2

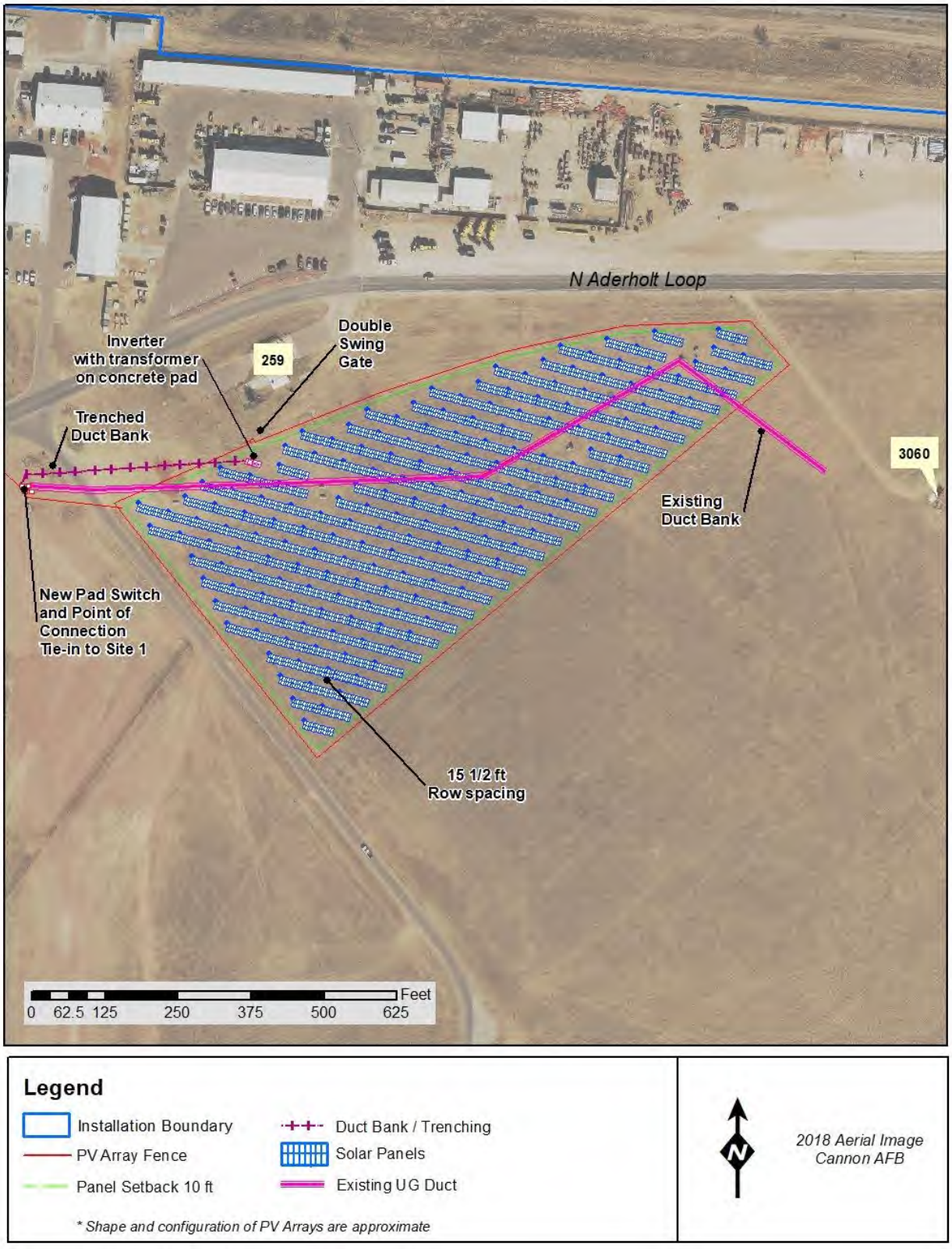
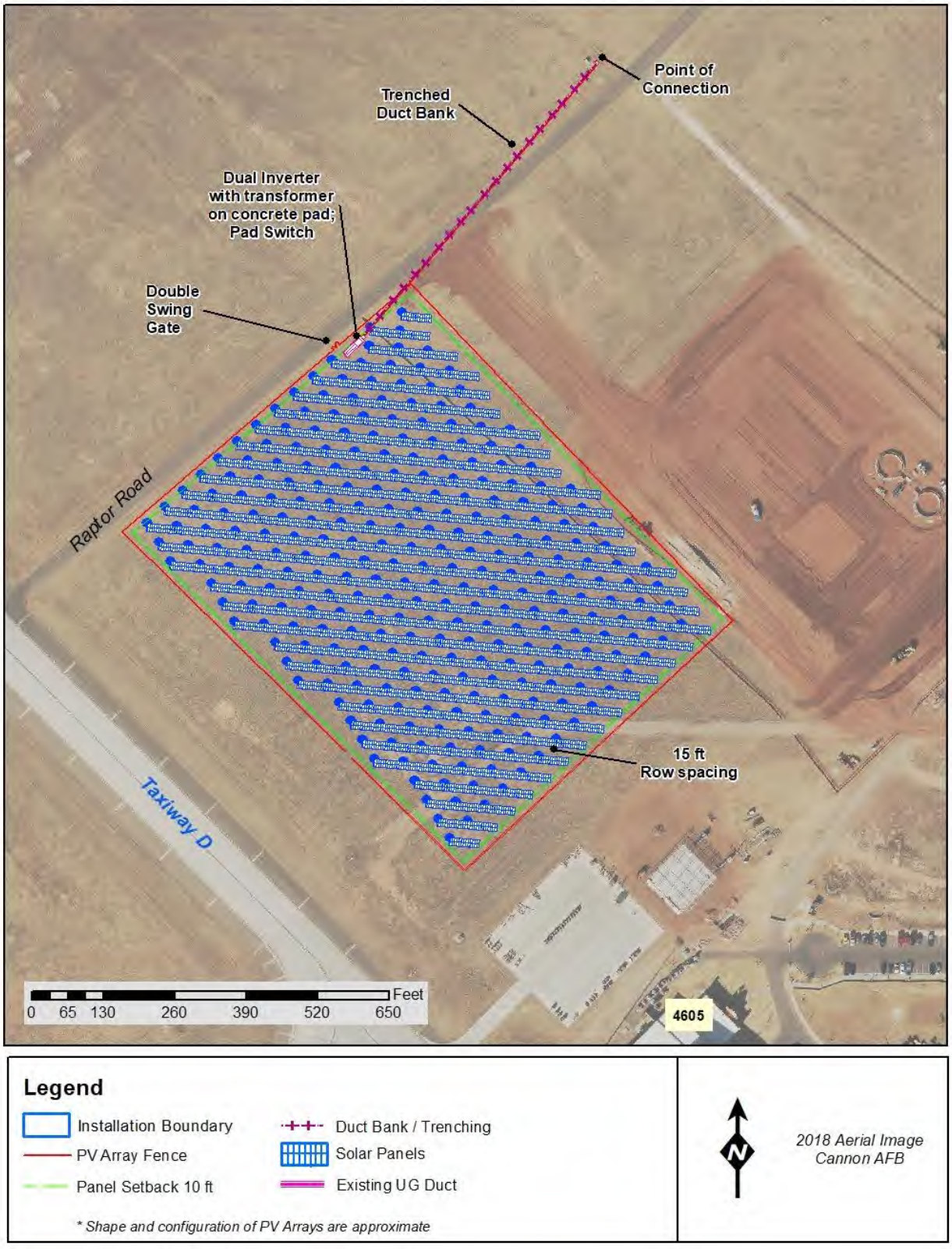


Figure 5. Proposed Solar PV Array at Site 3



Attachment 2
USFWS IPaC List

(interim list generated July 9, 2019; official list requested July 9, 2019 and pending receipt)

IPaC Information for Planning and Consultation **U.S. Fish & Wildlife Service**

IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

Location

Curry County, New Mexico

Local office

New Mexico Ecological Services Field Office

(505) 346-2525
(505) 346-2542

2105 Osuna Road Ne
Albuquerque, NM 87113-1001

http://www.fws.gov/southwest/es/NewMexico/

http://www.fws.gov/southwest/es/ES_Lists_Main2.html

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population, even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Draw the project location and click CONTINUE.
2. Click DEFINE PROJECT.
3. Log in (if directed to do so).
4. Provide a name and description for your project.
5. Click REQUEST SPECIES LIST.

Listed species

[1] and their critical habitats are managed by the Ecological Services Program of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries[2]).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact NOAA Fisheries for species under their jurisdiction.

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1. Species listed under the Endangered Species Act are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the listing status page for more information.
2. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

The following species are potentially affected by activities in this location:

Birds

NAME	STATUS
Least Tern Sterna antillarum No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/8505	Endangered

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

THERE ARE NO CRITICAL HABITATS AT THIS LOCATION.

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.

Additional information can be found using the following links:

- Birds of Conservation Concern http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php
- Measures for avoiding and minimizing impacts to birds http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php
- Nationwide conservation measures for birds http://www.fws.gov/migratorybirds/pdf/management/nationwidestandardconservationmeasures.pdf

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your

location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON (IF A BREEDING SEASON IS INDICATED FOR A BIRD ON YOUR LIST, THE BIRD MAY BREED IN YOUR PROJECT AREA SOMETIME WITHIN THE TIMEFRAME SPECIFIED, WHICH IS A VERY LIBERAL ESTIMATE OF THE DATES INSIDE WHICH THE BIRD BREEDS ACROSS ITS ENTIRE RANGE. "BREEDS ELSEWHERE" INDICATES THAT THE BIRD DOES NOT LIKELY BREED IN YOUR PROJECT AREA.)
Lark Bunting Calamospiza melanocorys This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds May 10 to Aug 15
Willow Flycatcher Empidonax traillii This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/3482	Breeds May 20 to Aug 31

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ “Proper Interpretation and Use of Your Migratory Bird Report” before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

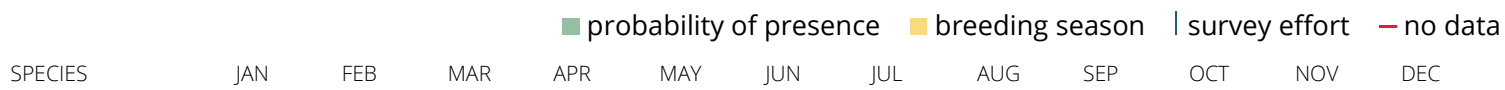
Breeding Season (▪)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

To see a bar's survey effort range, simply hover your mouse cursor over the bar.

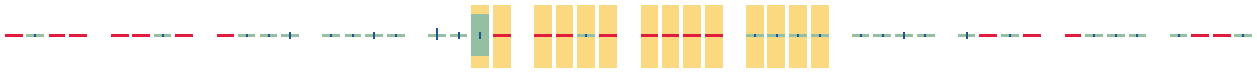
No Data (–)
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.



Lark Bunting
BCC - BCR (This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA)

Willow Flycatcher
BCC - BCR (This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA)



Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures and/or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the migratory birds potentially occurring in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the AKN Phenology Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets .

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: The Cornell Lab of Ornithology All About Birds Bird Guide, or (if you are unsuccessful in locating the bird of interest there), the Cornell Lab of Ornithology Neotropical Birds guide. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ “What does IPaC use to generate the migratory birds potentially occurring in my specified location”. Please be aware this report provides the “probability of presence” of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the “no data” indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and,

therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

Facilities

National Wildlife Refuge lands

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS AT THIS LOCATION.

Fish hatcheries

THERE ARE NO FISH HATCHERIES AT THIS LOCATION.

Wetlands in the National Wetlands Inventory

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

This location overlaps the following wetlands:

FRESHWATER EMERGENT WETLAND

- PEM1Ax
- PEM1A

FRESHWATER POND

PUBFx
PUBHx
PUSC

OTHER
Pf

A full description for each wetland code can be found at the National Wetlands Inventory website

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

Agency Scoping Letters

1. Agency Letters
2. Letter Attachment - Maps

DEPARTMENT OF THE AIR FORCE
27TH SPECIAL OPERATIONS MISSION SUPPORT GROUP (AFSOC)
CANNON AIR FORCE BASE, NEW MEXICO

Colonel John P. Boudreaux
Commander
27 Special Operations Mission Support Group
100 Air Commando Way Suite 100
Cannon AFB NM 88103-5214

Patricia Mattingly, Acting Regional Director
Bureau of Indian Affairs, Southwest Region
1001 Indian School Rd NW
Albuquerque NM 87104

Dear Ms. Mattingly

The United States Air Force (Air Force) is preparing an Environmental Assessment (EA) in accordance with the National Environmental Policy Act (NEPA). The EA will evaluate the potential environmental and socioeconomic impacts of developing ground-based solar photovoltaic (PV) arrays to produce up to seven megawatts of renewable energy on up to three sites at Cannon Air Force Base (AFB), Clovis, Curry County, New Mexico. Maps of the proposed sites and preliminary layouts of the solar arrays are attached.

In accordance with Executive Order 12372, *Intergovernmental Review of Federal Programs*, we are writing this letter to advise you of this proposal and request your assistance in identifying any potential issues related to the proposal. We would greatly appreciate your comments within 30 days of this letter; however, comments received at any time throughout the EIAP process will be considered to the extent possible in the preparation of the EA.

The Air Force intends to maximize the use of electronic transmittals during subsequent coordination phases of this project. If you would prefer to receive a hard copy of any documents, please indicate this in your response; if not, the draft EA will be provided in an electronic format when it becomes available.

Comments should be provided by mail to Dr. Linda Tello, NEPA Program Manager, SOCES/CEIE Cannon AFB & MAFR, 402 S. Chindit Boulevard, Building 102, Cannon AFB, NM 88103, or by email to 27SOCES.CEIE.Assess@us.af.mil. Should you need to contact Dr. Tello directly, she can be reached at (575) 904-6732.

Sincerely

JOHN P. BOUDREAUX, Colonel, USAF
Commander

Attachment:
Maps of Proposed Solar PV Array Sites and Layout

DEPARTMENT OF THE AIR FORCE
27TH SPECIAL OPERATIONS MISSION SUPPORT GROUP (AFSOC)
CANNON AIR FORCE BASE, NEW MEXICO

Colonel John P. Boudreaux
Commander
27 Special Operations Mission Support Group
100 Air Commando Way Suite 100
Cannon AFB NM 88103-5214

Tim Spisak, State Director
Bureau of Land Management
301 Dinosaur Trail
Santa Fe NM 87508

Dear Mr. Spisak

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Sincerely

JOHN P. BOUDREAUX, Colonel, USAF
Commander

Attachment:
Maps of Proposed Solar PV Array Sites and Layout

DEPARTMENT OF THE AIR FORCE
27TH SPECIAL OPERATIONS MISSION SUPPORT GROUP (AFSOC)
CANNON AIR FORCE BASE, NEW MEXICO

Colonel John P. Boudreaux
Commander
27 Special Operations Mission Support Group
100 Air Commando Way Suite 100
Cannon AFB NM 88103-5214

Justin Howalt, City Manager
City of Clovis
321 North Connelly Street
Clovis NM 88101

Dear Mr. Howalt

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Colonel John P. Boudreaux
Commander
27 Special Operations Mission Support Group
100 Air Commando Way Suite 100
Cannon AFB NM 88103-5214

John Rhoderick, Manager
District I Main Office
New Mexico Environment Department
121 Tijeras Avenue NE, Suite 1000
Albuquerque NM 87102-3400

Dear Mr. Rhoderick

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27TH SPECIAL OPERATIONS MISSION SUPPORT GROUP (AFSOC)
CANNON AIR FORCE BASE, NEW MEXICO

Colonel John P. Boudreaux
Commander
27 Special Operations Mission Support Group
100 Air Commando Way Suite 100
Cannon AFB NM 88103-5214

Greg Myers, Director
New Mexico Office of Military Base Planning
New Mexico Economic Development Department
PO Box 20003
Santa Fe NM 87504

Dear Mr. Myers

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CANNON AIR FORCE BASE, NEW MEXICO

Colonel John P. Boudreaux
Commander
27 Special Operations Mission Support Group
100 Air Commando Way Suite 100
Cannon AFB NM 88103-5214

Jeff Witte, Director/Secretary
New Mexico Department of Agriculture
MSC 3189
PO Box 30005
Las Cruces NM 88003-8005

Dear Mr. Witte

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CANNON AIR FORCE BASE, NEW MEXICO

Colonel John P. Boudreaux
Commander
27 Special Operations Mission Support Group
100 Air Commando Way Suite 100
Cannon AFB NM 88103-5214

The Honorable Michelle Lujan Grisham
Governor of New Mexico
490 Old Santa Fe Trail
Room 400
Santa Fe NM 87501

Dear Governor Lujan Grisham

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CANNON AIR FORCE BASE, NEW MEXICO

Colonel John P. Boudreaux
Commander
27 Special Operations Mission Support Group
100 Air Commando Way Suite 100
Cannon AFB NM 88103-5214

David Gray, Regional Administrator
EPA Region 6
Renaissance Tower
1201 Elm Street, Suite 500
Dallas TX 75270-2102

Dear Mr. Gray

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Colonel John P. Boudreaux
Commander
27 Special Operations Mission Support Group
100 Air Commando Way Suite 100
Cannon AFB NM 88103-5214

Chet Spear, Commissioner, District 3
Curry County
15 Jill Street
Clovis NM 88101

Dear Mr. Spear

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Colonel John P. Boudreaux
Commander
27 Special Operations Mission Support Group
100 Air Commando Way Suite 100
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The Honorable David Lansford
Mayor of Clovis
PO Box 760
Clovis NM 88101-0760

Dear Mayor Lansford

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Commander
27 Special Operations Mission Support Group
100 Air Commando Way Suite 100
Cannon AFB NM 88103-5214

Amy Lueders, Regional Director
U.S. Fish and Wildlife Service, Southwest Region
PO Box 1306
Albuquerque NM 87103-1306

Dear Ms. Lueders

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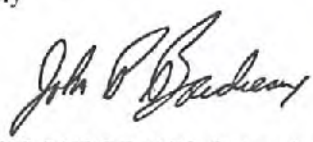

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Commander
27 Special Operations Mission Support Group
100 Air Commando Way Suite 100
Cannon AFB NM 88103-5214

Linda Dreeland, Chief
Environmental and SRM Section
U.S. Army Corps of Engineers, Albuquerque District
4101 Jefferson Plaza NE
Albuquerque NM 87109

Dear Ms. Dreeland

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27 Special Operations Mission Support Group
100 Air Commando Way Suite 100
Cannon AFB NM 88103-5214

The Honorable Tom Udall
U.S. Senator, New Mexico
531 Hart Senate Office Building
Washington DC 20510

Dear Senator Udall

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Commander
27 Special Operations Mission Support Group
100 Air Commando Way Suite 100
Cannon AFB NM 88103-5214

The Honorable Stuart Ingle
New Mexico Senate
2106 West University Drive
Portales NM 88130

Dear Senator Ingle

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Colonel John P. Boudreaux
Commander
27 Special Operations Mission Support Group
100 Air Commando Way Suite 100
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The Honorable Martin Heinrich
U.S. Senator, New Mexico
303 Hart Senate Office Building
Washington DC 20510

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Colonel John P. Boudreaux
Commander
27 Special Operations Mission Support Group
100 Air Commando Way Suite 100
Cannon AFB NM 88103-5214

Congresswoman Xochitl Torres Small
U.S. House of Representatives
New Mexico, District 2
430 Cannon House Office Building
Washington, DC 20515

Dear Representative Small

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27 Special Operations Mission Support Group
100 Air Commando Way Suite 100
Cannon AFB NM 88103-5214

Congressman Ben Lujan
U.S. House of Representatives
New Mexico, District 3
2323 Rayburn HOB
Washington DC 20515

Dear Representative Lujan

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Sincerely

JOHN P. BOUDREAUX, Colonel, USAF
Commander

Attachment:
Maps of Proposed Solar PV Array Sites and Layout

DEPARTMENT OF THE AIR FORCE
27TH SPECIAL OPERATIONS MISSION SUPPORT GROUP (AFSOC)
CANNON AIR FORCE BASE, NEW MEXICO

Colonel John P. Boudreaux
Commander
27 Special Operations Mission Support Group
100 Air Commando Way Suite 100
Cannon AFB NM 88103-5214

The Honorable Randal Crowder
New Mexico House of Representatives
509 Playa Drive
Clovis NM 88101

Dear Representative Crowder

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Colonel John P. Boudreaux
Commander
27 Special Operations Mission Support Group
100 Air Commando Way Suite 100
Cannon AFB NM 88103-5214

The Honorable R. Jackson
City of Portales
100 West 1st Street
Portales NM 88130

Dear Mayor Jackson

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CANNON AIR FORCE BASE, NEW MEXICO

Colonel John P. Boudreaux
Commander
27 Special Operations Mission Support Group
100 Air Commando Way Suite 100
Cannon AFB NM 88103-5214

Bruce D'Llaynn, District Conservationist
National Resources Conservation Service, Curry County
Clovis Service Center
918 Parkland Drive
Clovis NM 88101-4432

Dear Mr. D'Llaynn

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Colonel John P. Boudreaux
Commander
27 Special Operations Mission Support Group
100 Air Commando Way Suite 100
Cannon AFB NM 88103-5214

Erik Nelson, Resource Manager
Clovis District
New Mexico State Land Office
105 East 6th Street
Clovis NM 88101

Dear Mr. Nelson

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Colonel John P. Boudreaux
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100 Air Commando Way Suite 100
Cannon AFB NM 88103-5214

Lynn Trujillo, Cabinet Secretary
New Mexico Indian Affairs Department
Wendell Chino Building, 2nd Floor
1220 South St. Francis Drive
Santa Fe NM 87505

Dear Ms. Trujillo

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Commander
27 Special Operations Mission Support Group
100 Air Commando Way Suite 100
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Southeast District Office
New Mexico Game and Fish
1912 West Second Street
Roswell NM 88201

Dear Sir or Ma'am

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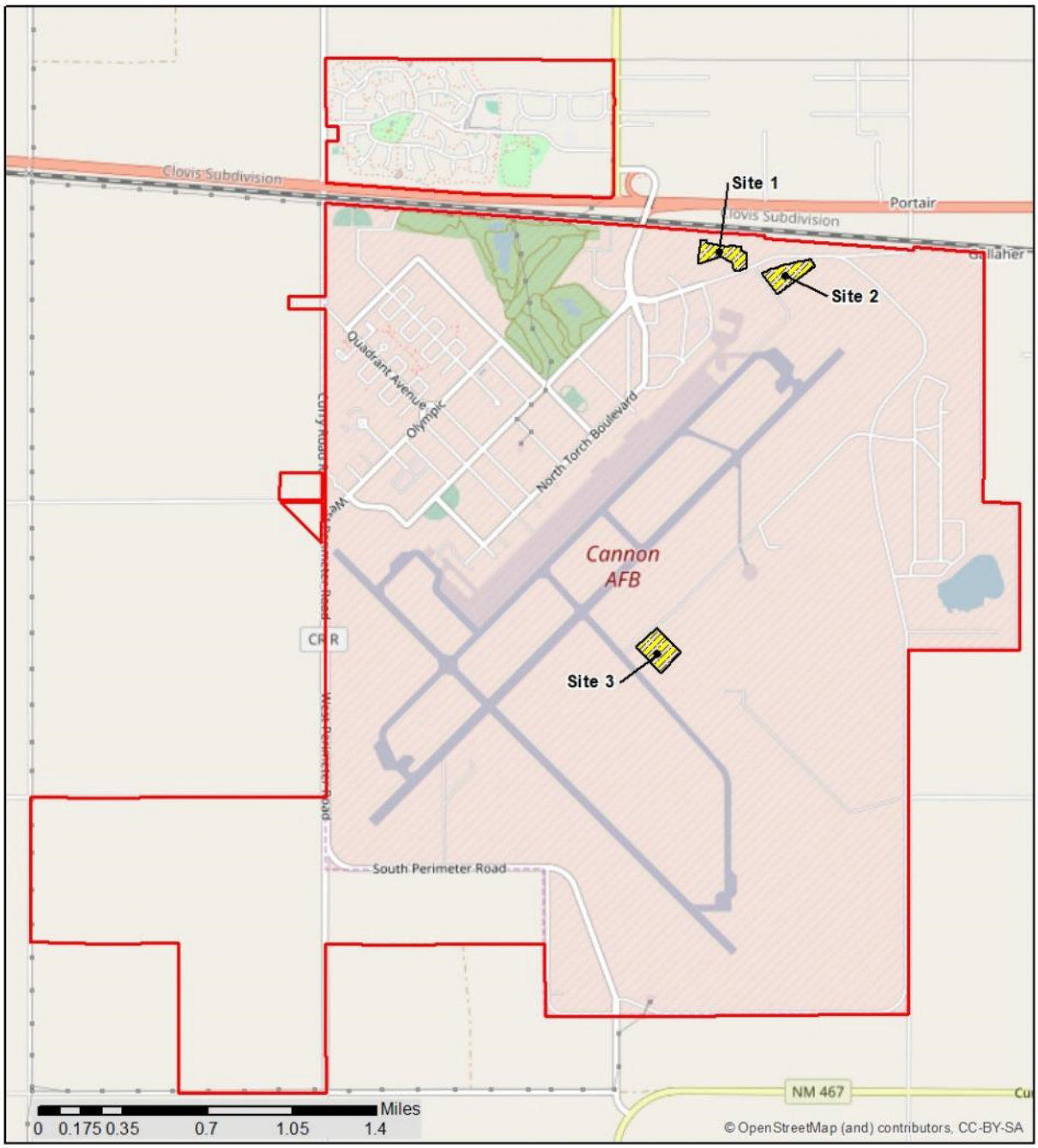
Figure 1: Map of Proposed Solar PV Array Sites at Cannon AFB

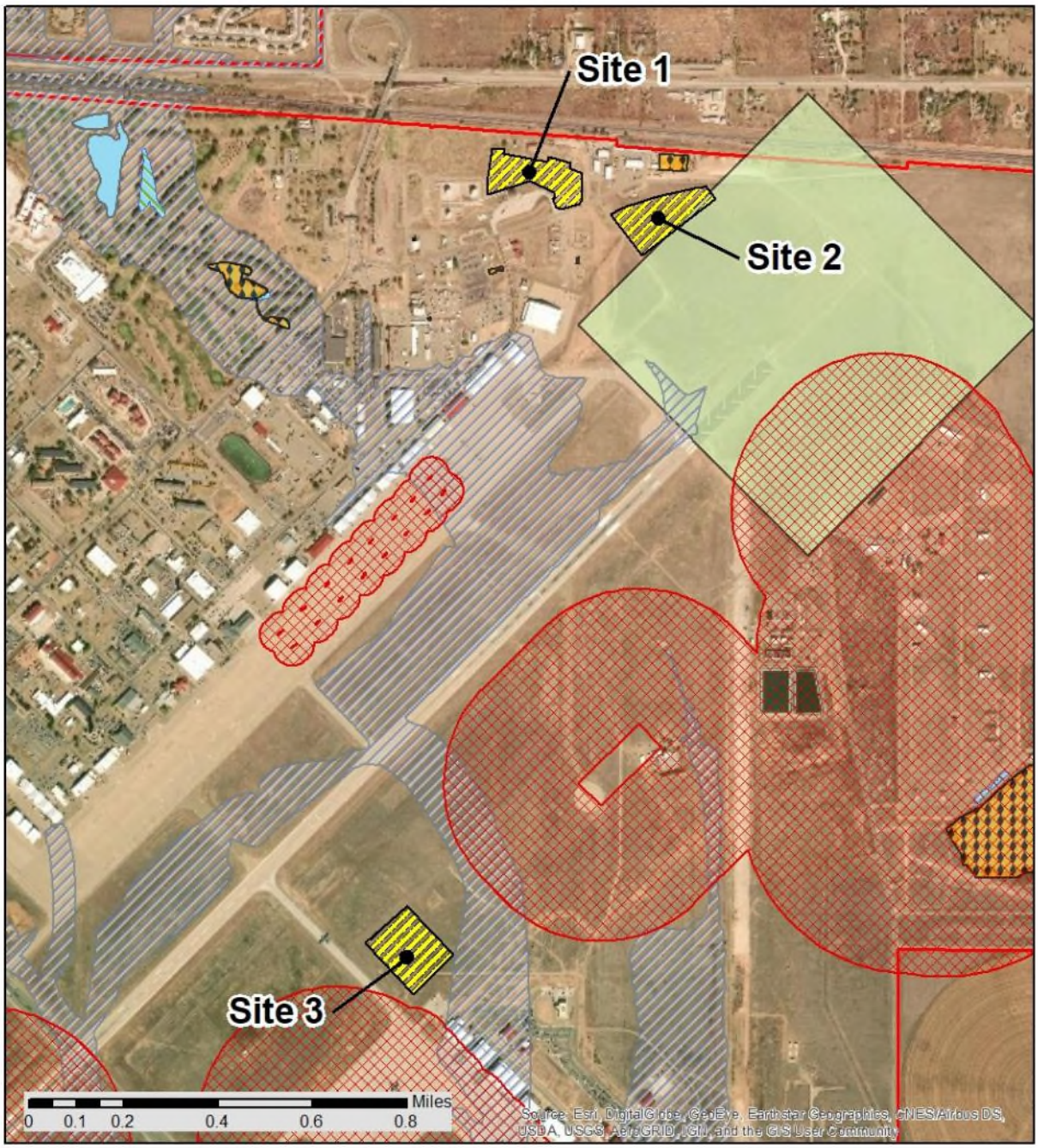


Legend

- Installation Boundary
- PV Array Site

PV Site	Size (Ac)	Production (MW)
Site 1	6.8	2
Site 2	6.35	2
Site 3	8.88	3

Figure 2: Environmental Constraints Near Proposed Solar PV Array Sites



PV Site	Size (Ac)	Production (MW)
Site 1	6.8	2
Site 2	6.35	2
Site 3	8.88	3

Figure 3: Proposed Layout of Solar PV Array at Site 1

Figure 4: Proposed Layout of Solar PV Array at Site 2

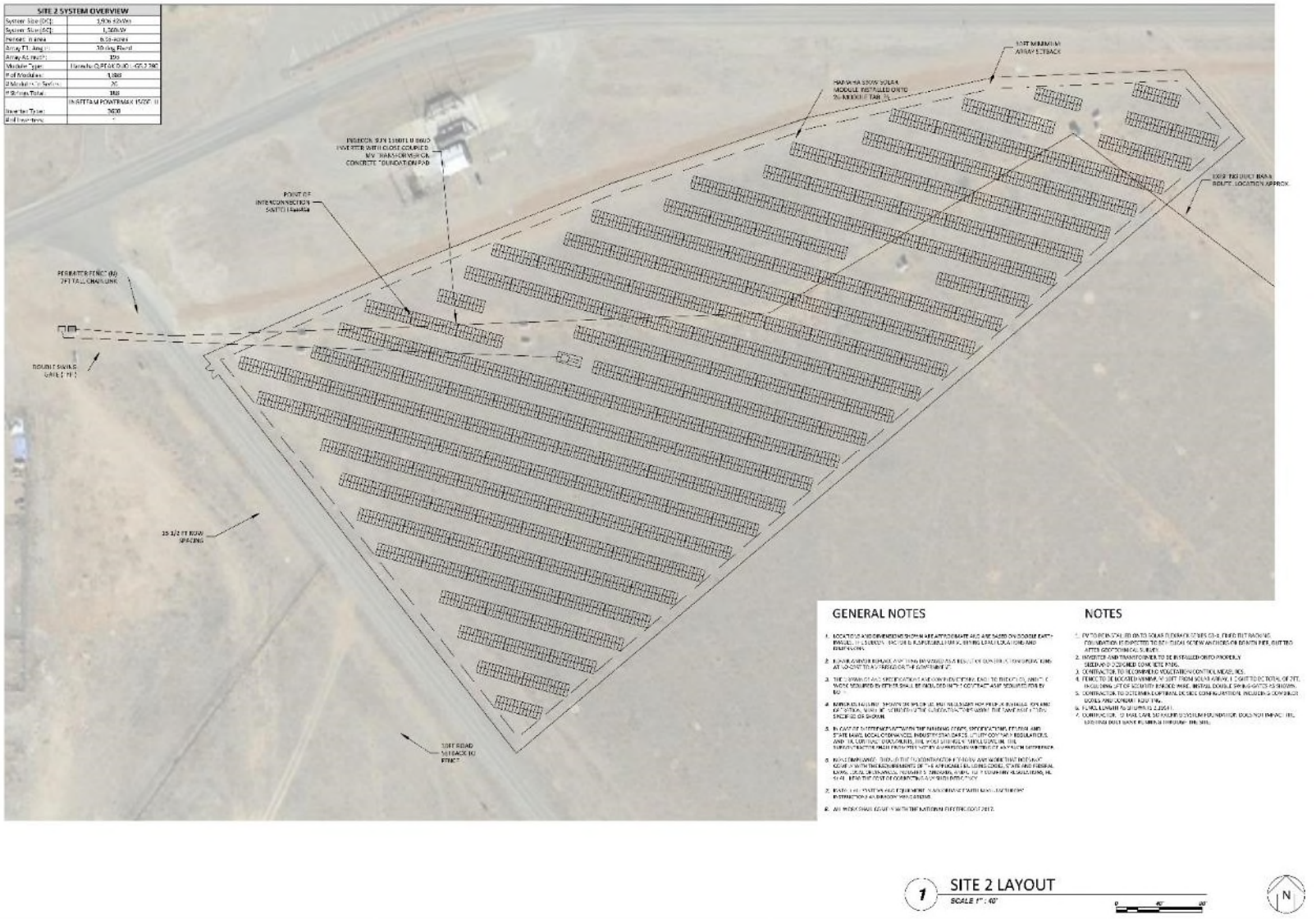
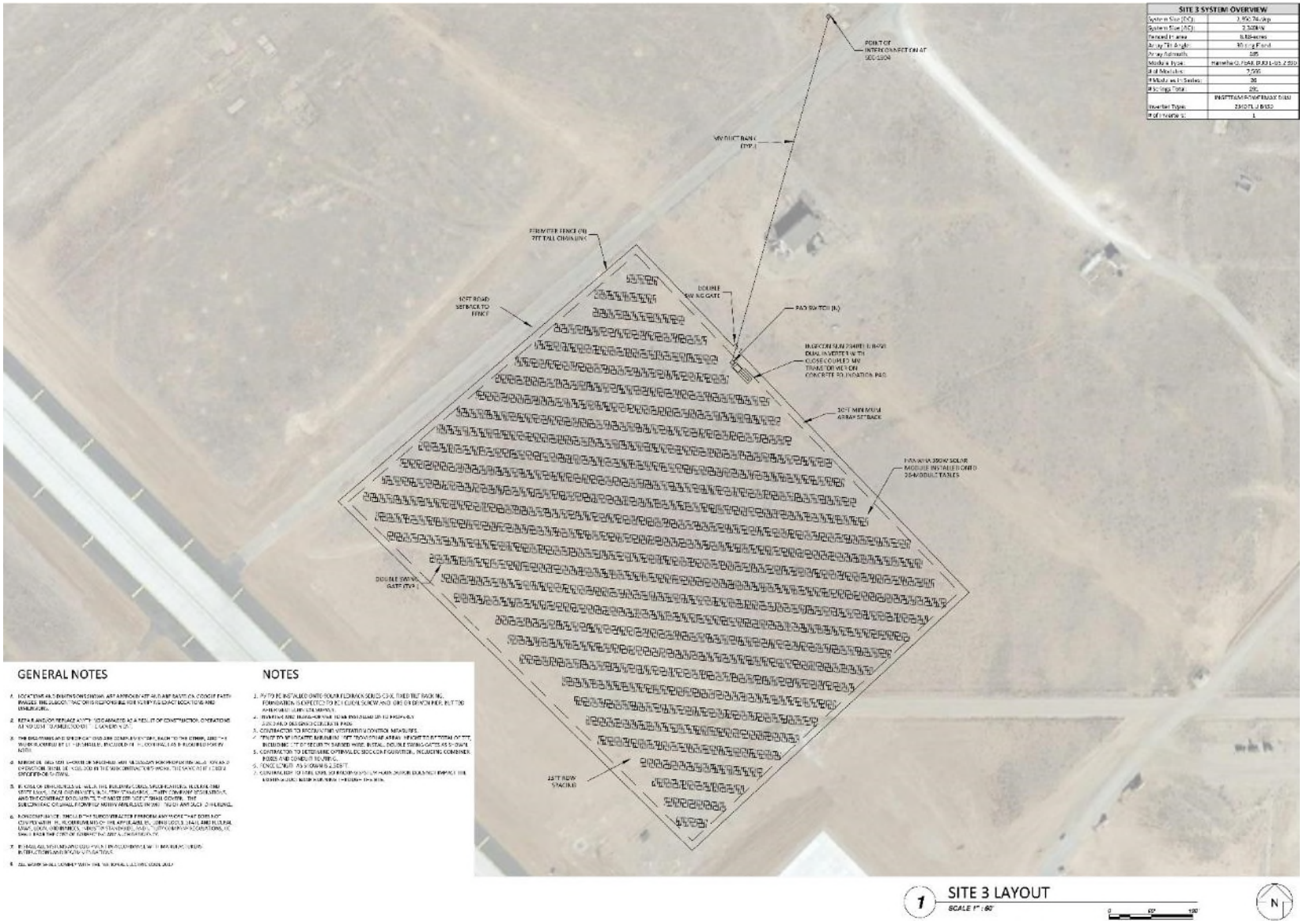


Figure 5: Proposed Layout of Solar PV Array at Site 3



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Appendix B
Glare Analysis

FORGESOLAR GLARE ANALYSIS

Project: **Cannon AFB**
Ground mounted PV

Site configuration: **Cannon AFB**
Analysis conducted by Johann Niehaus (info@liveoaksys.com) at 16:12 on 01 Apr, 2019.

U.S. FAA 2013 Policy Adherence

The following table summarizes the policy adherence of the glare analysis based on the 2013 U.S. Federal Aviation Administration Interim Policy 78 FR 63276. This policy requires the following criteria be met for solar energy systems on airport property:

- No "yellow" glare (potential for after-image) for any flight path from threshold to 2 miles
- No glare of any kind for Air Traffic Control Tower(s) ("ATCT") at cab height.
- Default analysis and observer characteristics (see list below)

ForgeSolar does not represent or speak officially for the FAA and cannot approve or deny projects. Results are informational only.

COMPONENT	STATUS	DESCRIPTION
Analysis parameters	PASS	Analysis time interval and eye characteristics used are acceptable
Flight path(s)	PASS	Flight path receptor(s) do not receive yellow glare
ATCT(s)	PASS	Receptor(s) marked as ATCT do not receive glare

Default glare analysis parameters and observer eye characteristics (for reference only):

- Analysis time interval: 1 minute
- Ocular transmission coefficient: 0.5
- Pupil diameter: 0.002 meters
- Eye focal length: 0.017 meters
- Sun subtended angle: 9.3 milliradians

FAA Policy 78 FR 63276 can be read at https://www.federalregister.gov/d/2013-24729

SITE CONFIGURATION

Analysis Parameters

DNI: peaks at 1,000.0 W/m^2
Time interval: 1 min
Ocular transmission coefficient: 0.5
Pupil diameter: 0.002 m
Eye focal length: 0.017 m
Sun subtended angle: 9.3 mrad
Site Config ID: 26446.4655

PV Array(s)

Name: PV array 1
Axis tracking: Fixed (no rotation)
Tilt: 30.0°
Orientation: 190.0°
Rated power: 4750.0 kW
Panel material: Light textured glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	34.404115	-103.317488	4322.32	0.00	4322.32
2	34.403924	-103.314671	4321.56	0.00	4321.56
3	34.403482	-103.314682	4321.24	0.00	4321.24
4	34.403336	-103.313271	4319.01	0.00	4319.01
5	34.403043	-103.312209	4320.65	0.00	4320.65
6	34.402760	-103.311759	4321.42	0.00	4321.42
7	34.402269	-103.311812	4319.21	0.00	4319.21
8	34.402025	-103.312434	4319.22	0.00	4319.22
9	34.402459	-103.312692	4320.07	0.00	4320.07
10	34.402800	-103.313481	4318.72	0.00	4318.72
11	34.402468	-103.314709	4320.60	0.00	4320.60
12	34.402955	-103.314704	4320.24	0.00	4320.24
13	34.402959	-103.316506	4320.12	0.00	4320.12
14	34.403212	-103.316839	4316.82	0.00	4316.82
15	34.403221	-103.317595	4323.41	0.00	4323.41

Name: PV array 2
Axis tracking: Fixed (no rotation)
Tilt: 30.0°
Orientation: 195.0°
Rated power: 1780.0 kW
Panel material: Light textured glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	34.401888	-103.311080	4322.02	0.00	4322.02
2	34.402702	-103.309106	4325.32	0.00	4325.32
3	34.402697	-103.308092	4326.39	0.00	4326.39
4	34.402569	-103.307963	4326.93	0.00	4326.93
5	34.401042	-103.310275	4321.65	0.00	4321.65

Name: PV array 3
Axis tracking: Fixed (no rotation)
Tilt: 30.0°
Orientation: 185.0°
Rated power: 2660.0 kW
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	34.381968	-103.316953	4272.08	0.00	4272.08
2	34.383429	-103.318723	4274.69	0.00	4274.69
3	34.384332	-103.317425	4274.20	0.00	4274.20
4	34.383075	-103.315740	4273.90	0.00	4273.90

Name: PV array 4
Axis tracking: Fixed (no rotation)
Tilt: 30.0°
Orientation: 180.0°
Rated power: 7430.0 kW
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	34.380250	-103.334316	4281.69	0.00	4281.69
2	34.382003	-103.334230	4283.70	0.00	4283.70
3	34.383951	-103.336333	4291.25	0.00	4291.25
4	34.383986	-103.336890	4291.96	0.00	4291.96
5	34.380232	-103.336976	4281.29	0.00	4281.29

Flight Path Receptor(s)

Name: FP 1
Description:
Threshold height: 50 ft
Direction: 44.8°
Glide slope: 5.0°
Pilot view restricted? Yes
Vertical view: 30.0°
Azimuthal view: 50.0°

Point	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
Threshold	34.376964	-103.331659	4273.44	50.00	4323.44
Two-mile	34.356434	-103.356354	4271.87	975.50	5247.37

Name: FP 2
Description:
Threshold height: 50 ft
Direction: 225.5°
Glide slope: 5.0°
Pilot view restricted? Yes
Vertical view: 30.0°
Azimuthal view: 50.0°

Point	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
Threshold	34.395947	-103.308785	4291.46	50.00	4341.47
Two-mile	34.416205	-103.283755	4346.46	918.93	5265.39

Name: FP 3
Description:
Threshold height: 50 ft
Direction: 135.8°
Glide slope: 5.0°
Pilot view restricted? Yes
Vertical view: 30.0°
Azimuthal view: 50.0°

Point	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
Threshold	34.386047	-103.333901	4299.07	50.00	4349.07
Two-mile	34.406757	-103.358376	4350.20	922.80	5273.00

Name: FP 4
Description:
Threshold height: 50 ft
Direction: 315.3°
Glide slope: 5.0°
Pilot view restricted? Yes
Vertical view: 30.0°
Azimuthal view: 50.0°

Point	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
Threshold	34.370614	-103.315253	4267.30	50.00	4317.31
Two-mile	34.350070	-103.290577	4256.82	984.41	5241.23

Discrete Observation Receptors

Name	ID	Latitude (°)	Longitude (°)	Elevation (ft)	Height (ft)
1-ATCT	1	34.388744	-103.326974	4302.12	100.00

Map image of 1-ATCT

GLARE ANALYSIS RESULTS

Summary of Glare

PV Array Name	Tilt (°)	Orient (°)	"Green" Glare min	"Yellow" Glare min	Energy kWh
PV array 1	30.0	190.0	573	0	11,360,000.0
PV array 2	30.0	195.0	255	0	4,246,000.0
PV array 3	30.0	185.0	620	0	6,377,000.0
PV array 4	30.0	180.0	9	0	17,820,000.0

Total annual glare received by each receptor

Receptor	Annual Green Glare (min)	Annual Yellow Glare (min)
FP 1	580	0
FP 2	0	0
FP 3	868	0
FP 4	9	0
1-ATCT	0	0

Results for: PV array 1

Receptor	Green Glare (min)	Yellow Glare (min)
FP 1	0	0
FP 2	0	0
FP 3	573	0
FP 4	0	0
1-ATCT	0	0

Flight Path: FP 1

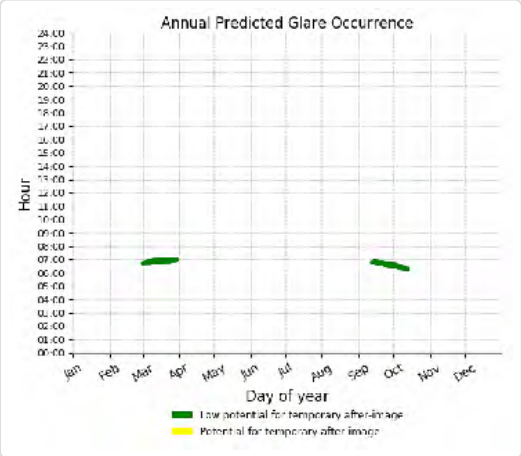
0 minutes of yellow glare
0 minutes of green glare

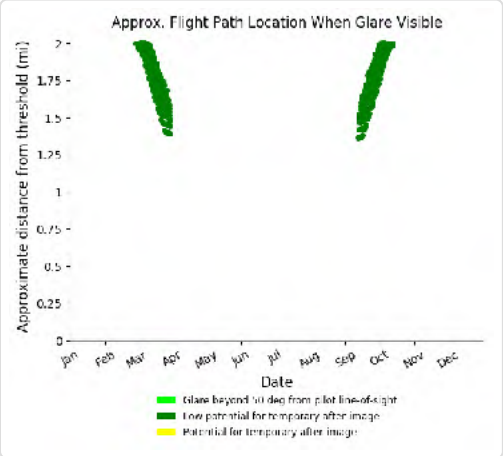
Flight Path: FP 2

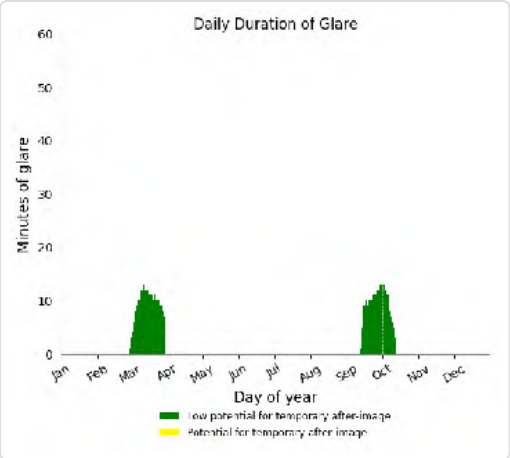
0 minutes of yellow glare
0 minutes of green glare

Flight Path: FP 3

0 minutes of yellow glare
573 minutes of green glare







Flight Path: FP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: 1-ATCT

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 2

Receptor	Green Glare (min)	Yellow Glare (min)
FP 1	0	0
FP 2	0	0
FP 3	255	0
FP 4	0	0
1-ATCT	0	0

Flight Path: FP 1

0 minutes of yellow glare
0 minutes of green glare

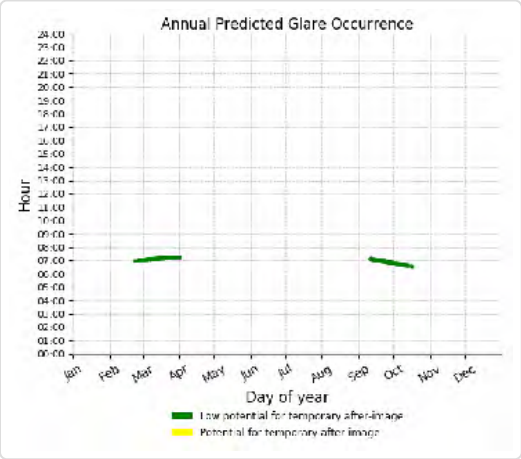
Flight Path: FP 2

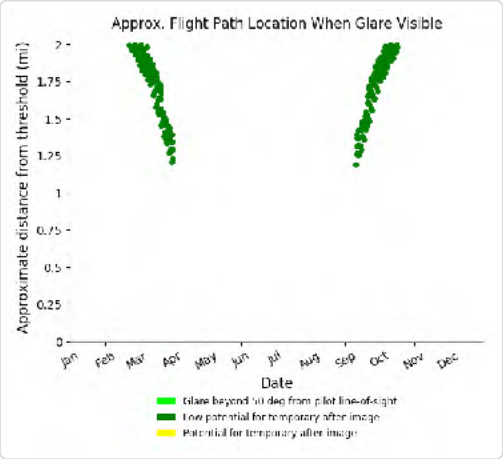
0 minutes of yellow glare
0 minutes of green glare

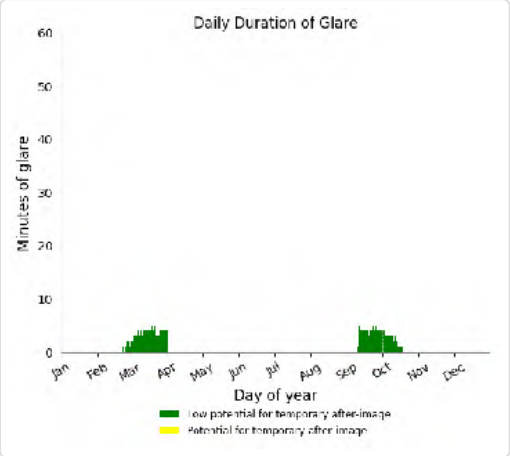
Flight Path: FP 3

0 minutes of yellow glare

255 minutes of green glare







Flight Path: FP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: 1-ATCT

0 minutes of yellow glare
0 minutes of green glare

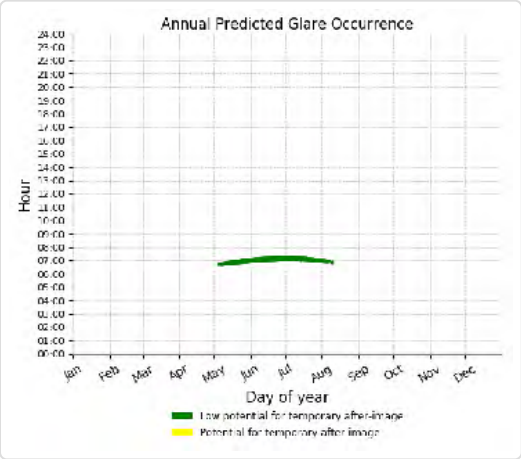
Results for: PV array 3

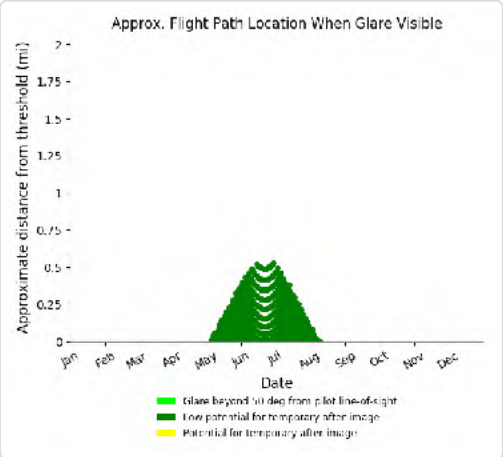
Receptor	Green Glare (min)	Yellow Glare (min)
FP 1	580	0
FP 2	0	0
FP 3	40	0
FP 4	0	0

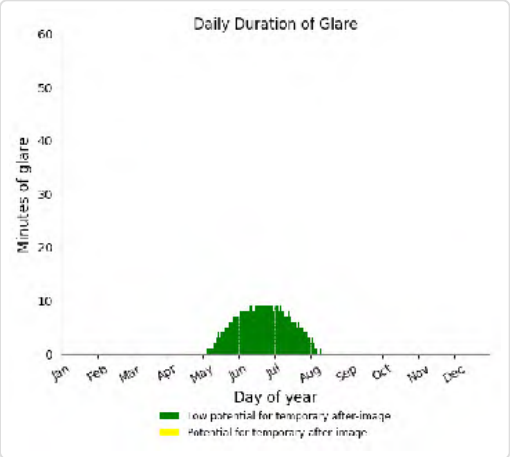
Receptor	Green Glare (min)	Yellow Glare (min)
1-ATCT	0	0

Flight Path: FP 1

0 minutes of yellow glare
580 minutes of green glare





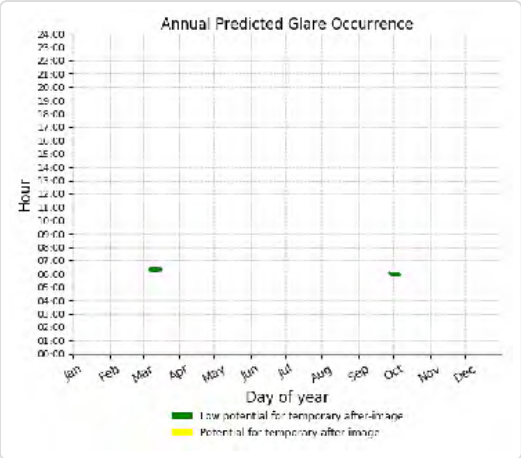


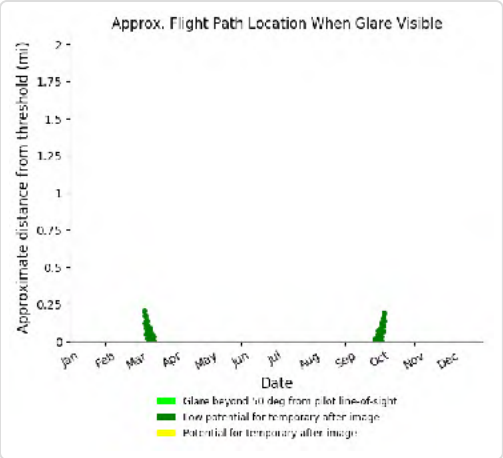
Flight Path: FP 2

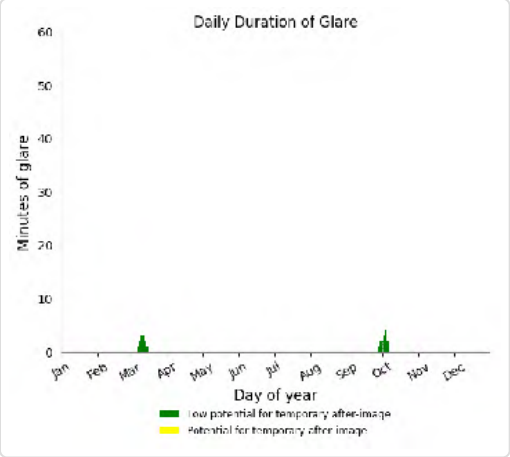
0 minutes of yellow glare
0 minutes of green glare

Flight Path: FP 3

0 minutes of yellow glare
40 minutes of green glare







Flight Path: FP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: 1-ATCT

0 minutes of yellow glare
0 minutes of green glare

Results for: PV array 4

Receptor	Green Glare (min)	Yellow Glare (min)
FP 1	0	0
FP 2	0	0
FP 3	0	0
FP 4	9	0
1-ATCT	0	0

Flight Path: FP 1

0 minutes of yellow glare
0 minutes of green glare

Flight Path: FP 2

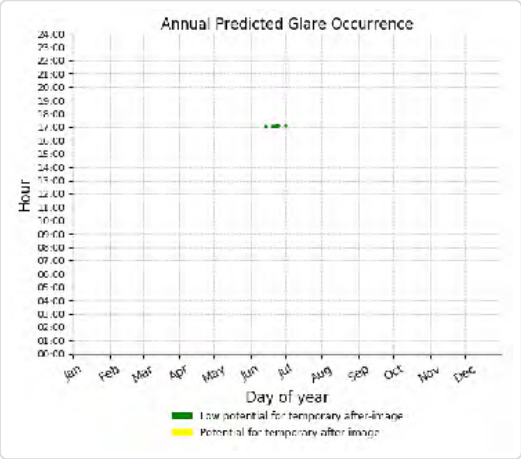
0 minutes of yellow glare
0 minutes of green glare

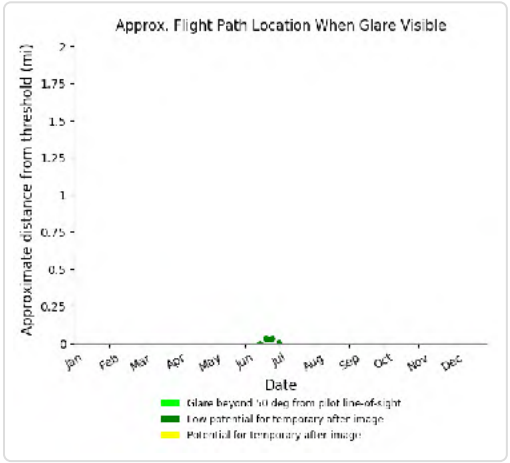
Flight Path: FP 3

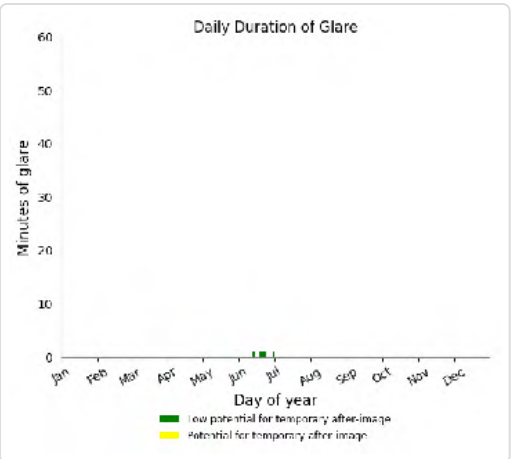
0 minutes of yellow glare
0 minutes of green glare

Flight Path: FP 4

0 minutes of yellow glare
9 minutes of green glare







Point Receptor: 1-ATCT

0 minutes of yellow glare
0 minutes of green glare

Assumptions

"Green" glare is glare with low potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
"Yellow" glare is glare with potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
Times associated with glare are denoted in Standard time. For Daylight Savings, add one hour.
Glare analyses do not account for physical obstructions between reflectors and receptors. This includes buildings, tree cover and geographic obstructions.
Several calculations utilize the PV array centroid, rather than the actual glare spot location, due to algorithm limitations. This may affect results for large PV footprints. Additional analyses of array sub-sections can provide additional information on expected glare.
The subtended source angle (glare spot size) is constrained by the PV array footprint size. Partitioning large arrays into smaller sections will reduce the maximum potential subtended angle, potentially impacting results if actual glare spots are larger than the sub-array size. Additional analyses of the combined area of adjacent sub-arrays can provide more information on potential glare hazards. (See previous point on related limitations.)
Glare locations displayed on receptor plots are approximate. Actual glare-spot locations may differ.
Glare vector plots are simplified representations of analysis data. Actual glare emanations and results may differ.
The glare hazard determination relies on several approximations including observer eye characteristics, angle of view, and typical blink response time. Actual results and glare occurrence may differ.
Hazard zone boundaries shown in the Glare Hazard plot are an approximation and visual aid based on aggregated research data. Actual ocular impact outcomes encompass a continuous, not discrete, spectrum.

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