



ENVIRONMENTAL ASSESSMENT

OF A PHOTOVOLTAIC DEVELOPMENT FOR
HOLLOMAN AIR FORCE BASE

NOVEMBER 2015

Holloman Air Force Base
49 Civil Engineer Squadron
Holloman AFB, NM 88330

FHOE-10-001-14-204

EXECUTIVE SUMMARY

BACKGROUND

The following Environmental Assessment (EA) addresses a proposal by the United States Air Force (USAF) to develop a photovoltaic (PV) solar energy project on open military land in the northeast portion of Holloman Air Force Base (HAFB), Otero County, New Mexico (NM). The land was intermittently used by Native Americans until the late 1800s, served as European American livestock range until 1942, and since has been managed by the Air Force. Native American camp sites, grazing and an old livestock windmill and tank, the Atlas electrical power substation, power lines and a now removed water storage tower, are the known previous uses of this land.

The proposed action was originated by the 49th Civil Engineer Squadron (49 CES) Energy Manager in 2009 in response to new national and Air Force (AF) energy policies. The project is supported locally by the 49th Wing (49 WG) and at higher levels by Headquarters Air Combat Command (ACC).

PURPOSE & NEED

Recent Federal law and policy statements lay out the purpose of the proposed action. The Energy Policy Act (EPA) of 2005 (Public Law [PL] 109-58); Executive Order (EO) 13423, “Strengthening Federal Environmental, Energy and Transportation Management”; and EO 13514, “Federal Leadership in Environment, Energy, and Economic Performance” include requirements to address the nation’s growing energy needs. The 2008 United States Air Force Infrastructure Energy Strategic Plan defines the need to increase the use of renewable energy and innovative technologies. The USAF goal is to produce 7.5 percent of its energy use from renewable sources by fiscal year (FY) 2015 and 25 percent by FY 2025.

The HAFB Energy Manager researched the reasonability of various technologies and locations and prepared an Air Force Form AF-813 “Request for Environmental Impact Analysis” (AF-813) for the project specifying PV technology and a general location within base constraints to meet the need. Use of the existing Atlas Power Substation is proposed in the AF-813 because it is an existing utility that would eliminate construction of a new substation to serve the alternative energy project, if the environmental impacts of the proposed undertaking are not significant.

That AF-813 is the basis for this EA. To address the environmental impacts of PV electrical power development, this EA has been prepared in accordance with the National Environmental Policy Act (NEPA) of 1969, as amended (42 United States Code [USC] 4321-4347), following Council on Environmental Quality (CEQ) regulations (40 Code of Federal Regulations [CFR] 1500-1508) and the Environmental Impact Analysis Process (EIAP) as defined in Air Force Instruction (AFI) 32-7061 and published in the Code of Federal Regulations at 32 CFR 989.

PROPOSED ACTION

The proposed action is to develop a PV energy production facility on HAFB by means of a Power Purchase Agreement between the AF, a public utility and/or a private power producer to develop, operate and maintain the electrical generation facility with HAFB as the customer. A Power Purchase Agreement will also require environmental documentation known as an Environmental Baseline Survey (EBS). Although previous base wide research has found no indications of hazardous concerns associated with the proposed development location an EBS is being prepared prior to initiation of the proposed action.

The development would require adequate acreage, ease of interconnection with existing utility infrastructure and long term access for operations and maintenance. Such a proposed action would result in relatively complete disturbance of the development area.

Solar PV technology captures energy directly from sunlight and converts it to electricity. There is a wide variety of PV panels available and a variety of ways they can be mounted. The details depend upon manufacturer, array design and the setting where the panels are to be placed. Photograph 1 illustrates one design of an array. The choice of panels, mounting design and array configuration for HAFB will depend upon the developer's design, cost and panel efficiency decisions. Depending upon configuration of the PV panels and the desired power output, the project would require clearing, grading, cable trenching and foundation excavations throughout the PV development site addressed by this analysis.



*Photograph 1. Large solar panel array
requiring extensive surface disturbance
(Inhabit.com 2011)*

DESCRIPTION OF ALTERNATIVES

Technology

The PV technology proposed for development was the chosen result of extensive research, consultation and coordination by the HAFB Energy Manager, the HAFB Engineering Flight and ACC Engineers and Energy Managers. HAFB typically has over 300 days a year of sunshine providing about 80% of the average annually possible sunshine (NOAA 2004). HAFB is also in the United States highest zone of insolation, receiving >6.5 kWh/m²/Day (NREL 2012) making it an ideal location for development of solar power to meet the need and achieve the purpose.

Alternative Technologies Not Carried Forward

Development of a parabolic solar trough array was considered not reasonable due to a requirement for high quality water and the possibility of reflected glare affecting flying operations. A central tower heliostat would also entail reflectivity and water issues as well as possible air space obstruction. Biomass fueled power generation is not reasonable due to the lack of fuel stock in this low population desert location and the distances to potential fuel stock, as well as a similar requirement for high quality water. While ground level site impacts would be essentially similar to PV development, providing the water quantity and desalination processes required by the other technologies would cause environmental impacts beyond the site and add substantial costs to the development of alternate energy production. Wind generation is not a reasonable alternative as the rotating blades disrupt radar signals and typical tower heights are not compatible with air traffic. Photovoltaic panel power generation is the Preferred Technology.

LOCATION

The general location proposed on the AF-813 was selected in coordination with the 49 CES Natural and Cultural Resources staff, Engineering staff and Base Comprehensive Planner, the 49th Wing Safety Office, the 49th Security Forces Squadron and the 49th Operations Group Airfield and Air Space staff. It is the only location that satisfies requirements of air and ground safety, security, accessibility, land ownership, flood plain/wetlands avoidance, physical size and economic reasonability while causing relatively minimal environmental impacts. No other locations meet these selection standards. Alternative siting within the general location is addressed in this EA.

SITE ALTERNATIVES

The Preferred Alternative Site (see Figure 1 and Table 1) for the construction of the PV array is 400 acres including the Atlas Power Substation. The Preferred Site is immediately south, southwest, west and northwest of the Atlas Substation. This Preferred Site is within the general location that satisfied selection standards, within the acreage intensively surveyed for cultural and natural resources and provides a balance between site size, site engineering, site construction effort and environmental impacts. Combined, a photovoltaic array on this site is the Preferred Alternative addressed in this EA.

Three other possibly developable areas (Alternative Sites 2, 3 and 4) were within the constraints and opportunities of availability, air and ground safety, security, accessibility, land ownership, flood plain/wetlands avoidance, and physical size. These possible sites were considered based on existing field survey records, current resources and constraints knowledge, location and topography. The suitability of these sites is summarized in Table 1.

Alternative 5 is the No Action Alternative. Under the No Action Alternative, the area would remain in its current undeveloped status (Figure 1). There would be no ground disturbing activities and no consequent impacts to local natural and cultural resources. The Green Energy Initiative would not be implemented and AF goals would not be achieved.

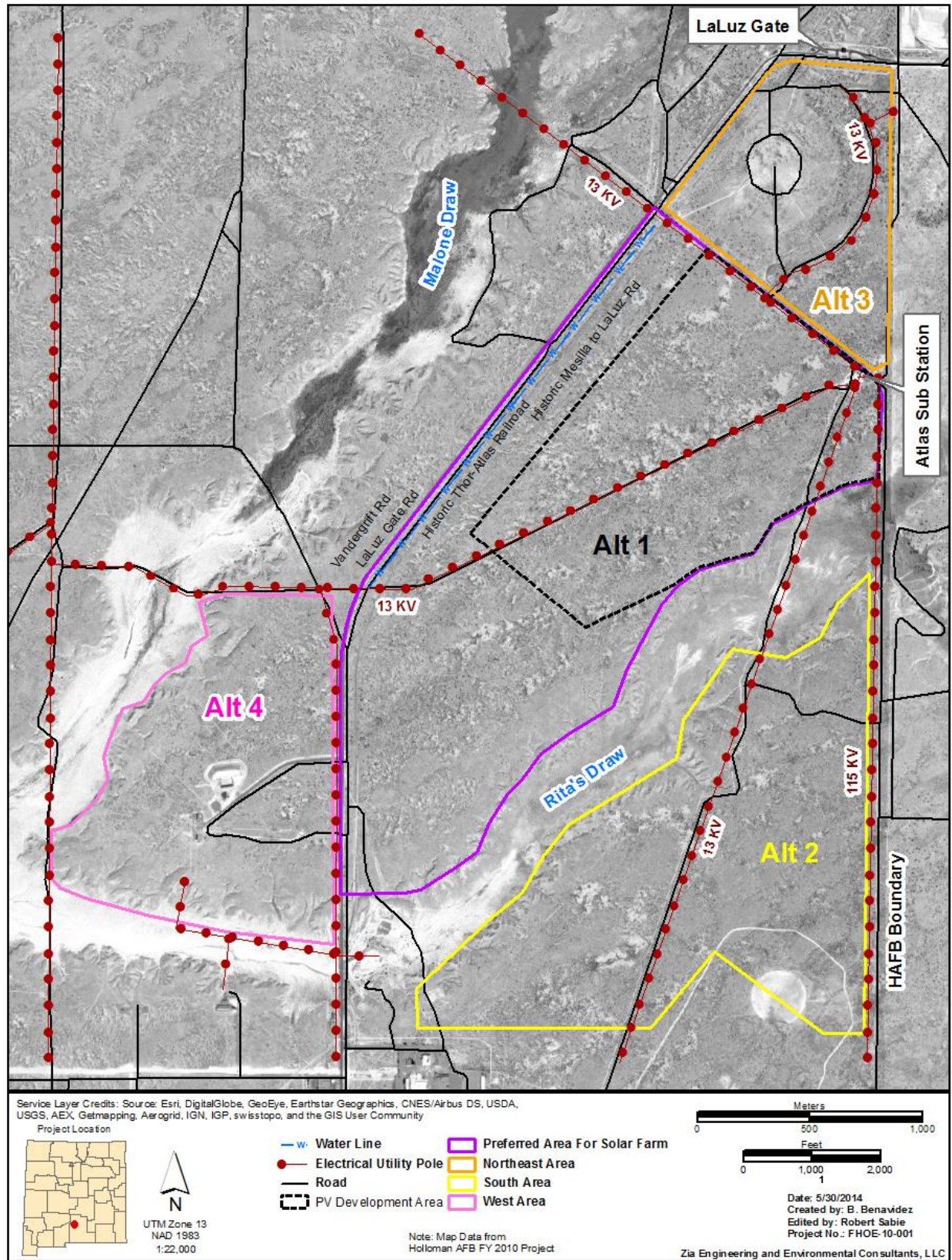


Figure 1. Alternative Locations

As the analysis progressed it became apparent that the Preferred Alternative Site had clear advantages as exemplified in Table 1. Scoring is expressed in a simple order of magnitude. Positive scores represent factors making a greater contribution to the purpose of the proposed action. Negative scores represent levels of impact complexity and lower suitability at the sites.

Table 1: Selection Standards Comparison

Category/Site	Preferred Alternative Site 1	Site 2	Site 3	Site 4	No Action Alternative 5
1. Cultural Res	-2	-4	-1	0	0
2. Plants (NR)	-1	-1	-1	-1	0
3. Animals (NR)	-1	-1	-1	-1	0
4. Activity Conflicts	0	0	Various -1	0	0
5. Grid Access	On +1	Distant -2	Near -0-	Distant -3	0
6. Build Feasibility	+1	0	+1	-1	0
7. 100s of Acres	+4	+3	+2	+2	0
Totals	+2	-5	-1	-5	0

1. Cultural resources, higher (-) or lower (+) disturbance/ impact;
2. Plant resources (NR), higher (-) or lower(+) disturbance/impact;
3. Animal resources (NR), higher (-) or lower (+) disturbance/impact
4. Current military activities affected adversely (-);
5. Access to grid at Atlas Substation, higher (-) or lower (+) distance; and
6. Topography, road access,
7. Suitable size, 100s of acres provided (+).

ENVIRONMENTAL IMPACT ANALYSIS

The categories to be analyzed were based on the nature of the location and the character of the proposed action in light of identified constraints and opportunities. Environmental categories considered possibly subject to impacts include geology, seismicity, soils, air quality, aesthetics, noise, surface and ground water resources, biological resources, cultural resources, land use, socioeconomics, environmental justice, health and safety, solid wastes, hazardous and toxic substances. Extant environmental documents such as base cultural and natural resources survey data, Installation Restoration Program reports and maps and Military Munitions Remediation Program reports and maps were used in the analysis of this proposed action.

Field surveys to evaluate and record the cultural and natural resources present were conducted by archaeologists and biologists from September 21 to October 5, 2010. The proposed action would cause adverse effects on cultural resources, but would avoid impacts to species of concern. Further field work was conducted in 2013-14 with similar results. Consultation with the New Mexico State Historic Preservation Officer has been conducted and archaeological work as required will be completed prior to development. The proposed action does not entail direct impacts on traditional resources of importance to Native Americans, nor on species of concern or Threatened and Endangered Species. The U.S. Fish and Wildlife Service, the New Mexico Department of Game and Fish and the Mescalero Apache Tribe have been provided an initial opportunity to comment and will receive this public draft EA soliciting further comment.

SUMMARY OF ENVIRONMENTAL IMPACTS

Evaluation of the proposed action has determined the following:

- Implementation of the action would not significantly impact geology, seismicity, ground water, land use, socioeconomic and environmental justice concerns, human health and safety, nor would there be hazardous or toxic waste or materials concerns .
- Negligible or brief transient impacts would occur in the local air quality, soils, aesthetics, noise, wildlife and solid waste categories.
- Construction and operation of the proposed facility would have some potential to cause adverse impacts to surface water resources, vegetation, species of concern and cultural resources (archaeological sites). The proposed action is sited to avoid major impacts to vegetation and species of concern, design measures will prevent surface water impacts, and measures to mitigate adverse effects on historic properties are being addressed through a Memorandum of Agreement with the NM State Historic Preservation Officer.
- Long-term beneficial cumulative impacts would include lower stress on regional air quality through reduced HAFB load on carbon-fueled generators, reduced load on the regional service network, creation of a few high-tech jobs, possible energy cost savings as carbon-fuel prices escalate; and, a degree of energy self-sufficiency for the base.

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ACRONYMS AND ABBREVIATIONS

AAAF	Alamogordo Army Airfield
ABGR	Alamogordo Bombing and Gunnery Range
AC	alternating current
AFI	Air Force Instruction
AF-813	Air Force Form 813 “Request for Environmental Analysis”
APE	Area of Potential Effects
BSC	biological soil crusts
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CWA	Clean Water Act
dB	decibel
DC	direct current
DoD	Department of Defense
E	Endangered
EA	Environmental Assessment
EBS	Environmental Baseline Survey
EIAP	Environmental Impact Analysis Process
EO	Executive Order
EPA	Environmental Protection Agency
EPAct	Energy Policy Act
FCC	Federal Communications Commission
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FY	fiscal year
Gwh	Gigawatt hours
HAFB	Holloman Air Force Base
HTF	Heat Transfer Fluid
INRMP	Integrated Natural Resources Management Plan
IPAC	Information, Planning and Conservation System
kV	Kilovolts
kwh	kilowatt hours
LA	Laboratory of Anthropology
LLC	Limited Liability Company
MCE	Maximum Considered Earthquake
mps	Meters per Second
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act

NMAC	New Mexico Administrative Code
NMDA	New Mexico Department of Agriculture
NMDGF	New Mexico Department of Game and Fish
NMED	New Mexico Environment Department
NMNHP	New Mexico Natural Heritage Program
NMHPD	New Mexico Historic Preservation Division
NMRPTC	New Mexico Rare Plant Technical Council
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NREL	National Renewable Energy Laboratory
NRHP	National Register of Historic Places
OSHA	Occupational Safety and Health Administration
PAS	Preferred Alternative Site
PL	Public Law
PM	particulate matter
ppm	parts per million
psf	pounds per square foot
PV	photovoltaic
RDT&E	Research, Development, Test and Evaluation
S	Sensitive
SEZ	Solar Energy Zone
SHPO	State Historic Preservation Officer
SOC	Species of Concern
sq. ft.	square feet
T	Threatened
TDS	total dissolved solids
TES	Threatened, Endangered, and Sensitive
UFC	Unified Facilities Criteria
U.S.	United States
USACE	United States Army Corps of Engineers
USAF	United States Air Force
USC	United States Code
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
UXO	Unexploded Ordinances
WSMR	White Sands Missile Range
WSPG	White Sands Proving Ground
WUS	Waters of the United States

1.0 INTRODUCTION

The following Environmental Assessment (EA) addresses a proposal by the United States Air Force (USAF), Air Combat Command (ACC), Holloman Air Force Base (HAFB), 49th Civil Engineer Squadron (49 CES) to build a photovoltaic (PV) solar electrical power project on military land in the northeast portion, HAFB, Otero County, New Mexico (Figure 2). New Mexico typically has over 300 days a year of sunshine and HAFB receives near 80% of total possible annual sunshine (NOAA 2004). HAFB is also in the United States highest zone of insolation, >6.5 kWh/m²/Day (NREL 2012), making it an ideal location for development of solar power.

This EA has been prepared in accordance with the National Environmental Policy Act (NEPA) of 1969 as amended (42 United States Code [USC] 4321-4347) and the Council on Environmental Quality (CEQ) regulations (40 Code of Federal Regulations [CFR] 1500-1508). It follows the Environmental Impact Analysis Process (EIAP) guidance in Air Force Instruction (AFI) 32-7061 as published in the Code of Federal Regulations at 32 CFR 989.

Solar PV technology captures energy directly from sunlight and converts it to electricity. A wide variety of solar PV panels are available and there are many ways they can be mounted. The details depend upon manufacturer, array design goals and the topography where the panels are to be placed. Photographs 2 and 3 demonstrate two of the many ways solar panels may be arrayed in open settings with mild terrain. Photograph 2 looks quite like HAFB terrain.

The final PV array configuration for HAFB will depend upon decisions of the parties building and operating the array, their selection of PV panel types and modalities, and decisions resulting from this EA regarding placement of panels to avoid unnecessary impacts. Regardless of the configuration and type of PV panels used, the project would require clearing, grading, trenching, foundation excavations and surfacing of trafficked areas within the development site.



Photograph 2. Solar Panel Array located in Desert Environment (Joho 2010)



Photograph 3. Solar Panel Array located in Pasture Area (Solar Power House 2011)

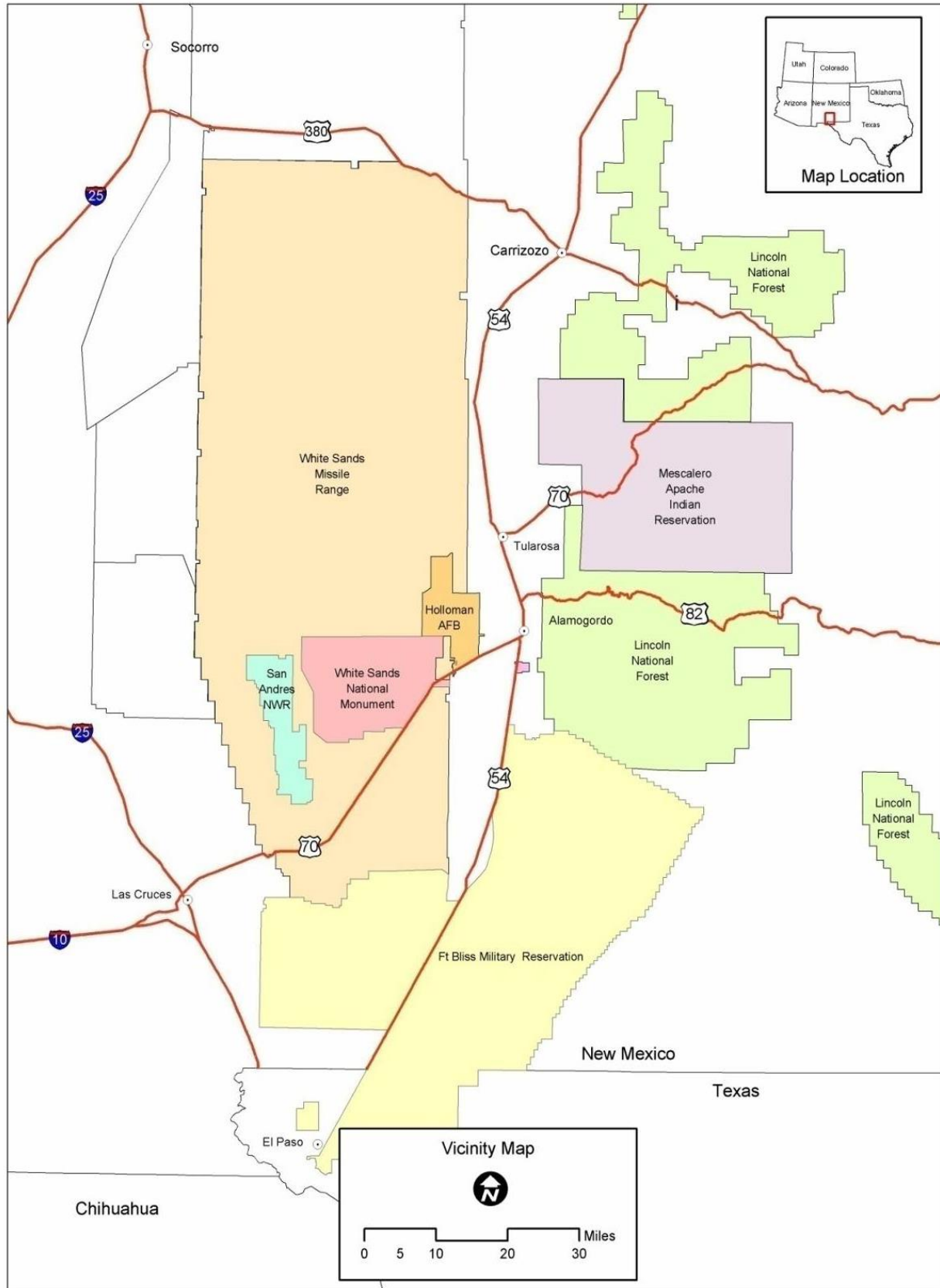


Figure 2. Map of Holloman AFB (orange) in southern New Mexico

1.1 BACKGROUND

The 52,000 acres of main base HAFB are located in the large relatively level eastern floor of the Tularosa Basin between the Sacramento and San Andres Mountains, near 4030 feet above sea level. This is in the northern reach of the Chihuahuan Desert with land forms, vegetation and animals common to other closed basin scrublands in northern Mexico, far west Texas and southern New Mexico. The soils are relatively stable when not disturbed by human activity but are very calcic and gypsic. Predominant plant cover is four wing saltbush, mesquite brush and creosote bush over alkali sacaton, grama, muhly, dropseed and tobosa grasses.

The base land surface is level to very slightly rolling, with the exception of seven large dry drainage courses that cross the base from northeast to southwest. These drainages lead from the Sacramento Mountains toward the gypsum sand dune field along the western margin of the base and occasionally carry flood events during summer thunderstorms. Mountain precipitation averages as high as 15 inches per year at upper elevations. The drainage catchment of the Tularosa Basin includes enough of those higher elevations to gather considerably more water to the basin than would result from the average lower elevation precipitation of 10 inches per year.

Although much of the surface runoff and potable ground water migration from the Sacramento Mountains is captured for irrigation or municipal use by residents of Three Rivers, Tularosa, La Luz, Alamogordo and HAFB, the deep sediments filling the basin are generally saturated. The typical depth to ground water is from quite near surface to less than 50 feet. Due to high levels of salts (especially calcium and sulfur), ground water out in most of the basin is not potable and not suitable for agricultural or industrial use. Fortunately wells and streams at the foot slope of the mountains provide usable water for the local population.

Lack of good water and low agricultural potential of the soils likely caused the apparent low density of past human activity in the basin. HAFB was used by prehistoric Native Americans as early as 8000 years ago and there appears to have been discontinuous use up to historic times as illustrated by artifacts and Carbon 14 dates found on base (HAFB 2010). There are 13 small archaeological sites representative of those brief intermittent occupations within the proposed PV development site; seven of those have been determined to be historic properties and merit excavation to preserve information important to regional prehistory (Graves, 2014; Gomolak 2014).

The arrival time of Apaches in the region is uncertain, but they were resident by the 1500s and defended their territory until forced onto reservations in the late 1800s. The Mescalero Apache reside near HAFB and have not identified any traditional cultural properties on base. The Tularosa Basin was claimed by Spain from 1540 to 1821, Mexico from 1821 to 1848, and the United States since 1848. The basin was seldom visited by European-Americans until the mid-1850s when Tularosa and La Luz were settled as small farming communities on reliable streams, 6+ miles to the east of HAFB.

In 1899 Alamogordo was built as a railroad town. Immigrant settlers attempted homesteads and livestock grazing in the basin with little long term success. Ruins of one homestead remain in an area that is now a northeast corner of HAFB, one range camp was at Bradford Spring on the west edge of base, one windmill and corrals are west of the current cantonment and one other old windmill and range camp is in the area proposed for PV development. No other non-military European-American development is known on HAFB. With the onset of the Second World War, much of the Tularosa Basin was withdrawn from private use to establish the Alamogordo Army Air Field now known as HAFB and the Alamogordo Bombing and Gunnery Range.

On 10 June 1942 Alamogordo Army Air Field (AAAF), six miles west of Alamogordo, New Mexico, was officially opened for the British Royal Air Force Overseas Training program. Construction had begun on 5 February 1942 and forces began to move in on 14 May 1942. However, the British discontinued their overseas pilot training due to the press of war at home and the United States kept AAAF for heavy bomber crew training. In 1948 the base was named in honor of Col. George Holloman, a rocket and aircraft instrumentation pioneer. HAFB was a rocket, missile and space biology research center until 1970 when aircrew training returned to prominence. HAFB is now the home of the 49th Wing and host to USAF F-16 flying training, the MQ-1 and MQ-9 Remotely Piloted Aircraft, the German Air Force Flying Training Center and the 96th Test Group's research, development, test and evaluation (RDT&E) mission.

With the exception of the Atlas electrical substation, a previously adjacent but now removed Atlas water tower and pump station and three local service 13kV power lines with maintenance trails that cross the area; no industrial, chemical, construction or maintenance activities are known to have taken place on the proposed PV site. Likewise, the intensive pedestrian biological and archaeological surveys found no evidence of such activities. There is no reason to expect hazardous or toxic materials or wastes in the PV development area.

1.2 PURPOSE AND NEED FOR THE ACTION

1.2.1 Purpose

The purpose of the proposed action is to increase the use of renewable energy and decrease energy consumption from non-renewable sources at HAFB.

1.2.2 Need

This action to provide power to HAFB through the use of renewable energy sources meets the need to comply with Federal energy law and regulations, New Mexico Public Regulatory Commission requirements and the need defined by USAF energy management goals. Three recent Federal actions lay out requirements to address the growing energy problems of the nation: the Energy Policy Act (EPAcT) of 2005 (Public Law [PL] 109-58); Executive Order (EO) 13423, "Strengthening Federal Environmental, Energy, and Transportation Management"; and EO 13514, "Federal Leadership in Environment, Energy, and Economic Performance". The EPAcT directs the Federal government to increase its renewable energy use twenty five percent by 2025. The 2008 USAF "Infrastructure Energy Strategic Plan" set a goal of seven and a half percent of energy use from renewable sources by fiscal year (FY) 2015.

Development of a PV facility on about 100 acres of HAFB property might produce up to 25 Gigawatt hours (Gwh) per year and constitute about 30% of the current annual electrical use at HAFB (Krivokapich 2010). Long term development of up to 400 acres could meet or exceed annual base energy needs that totaled 78.126 Gwh as of 2014 (Thurman 2015) and could possibly result in some revenue to the Federal government.

1.3 SCOPING AND PUBLIC INFORMATION

This EA is in response to the AF-813 prepared by the 49 CES. Because the location of the proposed action is entirely within HAFB, because any impacts would be only slightly, if at all, perceptible to anyone outside the base, and because extensive prior research combined with base constraints and opportunities defined the proposed technology and general location as a preferred alternative; the question to be answered in this EA is which location to choose and whether the environmental impacts of the proposed PV development would be significant.

Public input on the proposal has been solicited by presentations at meetings of the City of Alamogordo Planning and Zoning Commission, Alamogordo City Council, Otero County Commission and Otero County Planning Commission. External scoping also consisted of requests for input mailed to all adjacent land owners and heads of local City, Village and County governments. Interagency and Intergovernmental Coordination for Environmental Planning (IICEP), letters were sent to local, Tribal, New Mexico State and Federal agencies on 25 March 2013 (see Table 12). Responses to date indicate no controversy and no public or agency disagreement with the proposed action (Gomolak 2015).

A brief summary of the PV proposal and a request for public comment on the development of this EA is posted on the HAFB website. Public Service Announcements soliciting input have aired 42 times on three local radio stations. Notice of Availability press releases will be published to initiate the public comment period contemporary with release of this Draft EA.

The Mescalero Apache Tribe and the New Mexico State Historic Preservation Office (SHPO) have been consulted. The Tribe identified no concerns. The SHPO has responded and archaeological work as required will be complete prior to development.

The scoping of the proposed action included the development of selection standards and alternatives, and identified several primary concerns included or added to the analysis categories specified on the AF-813. These concerns are:

- Potential impact to species of concern,
- Potential impact to cultural resources,
- Conflicts with on-going base activities,
- Suitability of site soils, drainage and size,
- Impacts on or of geology and topography,
- Proximity to existing utilities, and
- Potential impact to flight or other HAFB operations.

Multiple scenarios were examined to maximize the value of this analysis effort. Adequate acreage to support multiple combinations of array sizes and layouts was analyzed. The array sizes first considered for the Environmental Impact Analysis Process (EIAP) included 5 acres providing up to 1.09 Gwh hours, 43 acres providing up to 4.4 Gwh and 200 acres providing up to 46 Gwh per year; all of which were subsumed into provisions and analysis for long term development of PV power generation on up to 400 acres.

The overall decision to be made is whether to proceed with the PV development in consideration of the level of impacts brought to light by this EA, as well as in light of impacts identified during the public comment process.

1.4 ENVIRONMENTAL IMPACT ANALYSIS

This EA addresses potential impacts that could occur as a consequence of developing up to 400 acres of PV energy production facility at HAFB. It is based on information specifically obtained for this proposed action as well as existing environmental documentation. Archaeologists and biologists conducted field surveys and evaluations, and their reports (Hyre 2010, Gibbs 2010, Condon 2013, Graves 2014) inform this EA. Relevant existing Installation Restoration Program data and Military Munitions Remediation Program data on base-wide research into past military and industrial activity are relied upon to characterize the lack of hazardous site conditions, although an EBS will be conducted in support of the Power Purchase Agreement. Base planning constraints and opportunities and geographic information system data layers also informed this EA. Based on identified concerns, potential environmental impacts, and the nature of the project, the following resources/impacts have been assessed: geology, seismicity, soils, air quality, aesthetics, noise, land use, water resources, biological resources, cultural resources, socioeconomics, environmental justice, solid wastes and hazardous and toxic substances.

2.0 PROPOSED ACTION AND ALTERNATIVES

2.1 PROPOSED ACTION

The proposed action is to establish up to 400 acres of PV energy production on HAFB.

The development would require adequate acreage, ease of interconnection with existing utility infrastructure and long term access for operations and maintenance. Use of the existing Atlas Power Substation would be a primary component of the proposed undertaking. New pavement is not anticipated, but additional graveled service roads would likely be required. Perimeter fencing or other security measures may also be desired or required.

Depending upon configuration of the PV panels and the desired power output, the project could require clearing, grading, cable trenching and foundation excavations throughout the 400 acre PV location and would result in relatively complete surface and partial subsurface disturbance of the development site.

2.2 ALTERNATIVES

The alternatives described below were assessed for resultant environmental impacts as well as sufficiency in meeting the need for alternative energy production.

2.2.1 Alternative Technologies

The solar technology proposed on the AF-813 was the chosen result of extensive research, consultation and coordination by the HAFB Energy Manager, the HAFB Engineering Flight and ACC Engineers and Energy Managers. HAFB typically has over 300 days a year of sunshine providing about 80% of the average annually possible sunshine (NOAA 2004). HAFB is also in the United States highest zone of insolation, receiving >6.5 kWh/m²/Day (NREL 2012) making it an ideal location for development of solar power to meet the need and achieve the purpose. Three solar energy collection technologies and two other technologies were considered.

Development of a parabolic solar trough array would require high quality water and use high intensity reflected glare likely to affect flying operations. A central tower heliostat would also entail reflectivity and water quality issues as well as possibly be an air space obstruction. Biomass fueled power generation requires massive fuel stocks, generates flue gasses and requires high quality water. PV solar panels absorb rather than reflect light, require no fuel and only small quantities of cleaning water for operation. Above and beyond the lack of adequate air movement at HAFB, wind generation is not a reasonable alternative as the rotating blades disrupt radar signals and typical tower heights are not compatible with the low level air traffic common to an airbase. PV arrays do not entail or cause such conflicts.

Ground level site impacts (site preparation, roads, cable and foundation trenches) would be similar for any of these alternatives. However, providing the water quantity, quality and desalination processes required by the biomass and other solar technologies would cause environmental impacts beyond the site and add substantial costs to the development of alternative energy production. Photovoltaic panel power generation is the Preferred Technology. (see 2.2.3 Alternatives Not Carried Forward)

2.2.2.1 Alternative Site 1, the Preferred Alternative Site

The Preferred Alternative is to construct a PV array near the Atlas Power Substation, with adequate research and analysis done to develop a total of 400 acres. The preferred general area lies to the southwest and northwest of the substation and is bounded by Rita's Draw, Vandergrift Road (also known as La Luz Gate Road), Atlas Road, and an existing 115 thousand volt (kV) transmission line along the eastern boundary of HAFB (Figures 4 - 5). The preferred alternative was originally projected to include approximately 595 acres within these boundaries. Subsequent to the biological and archaeological surveys, and in consideration of economic factors elaborated by higher echelon AF parties, the proposed Preferred Alternative Site (PAS) is limited to 400 acres, bounded 1000 feet southeast of Vandergrift Road, at the Atlas Road and Substation, and northwest of Rita's Draw (see Figures 3 and 4).

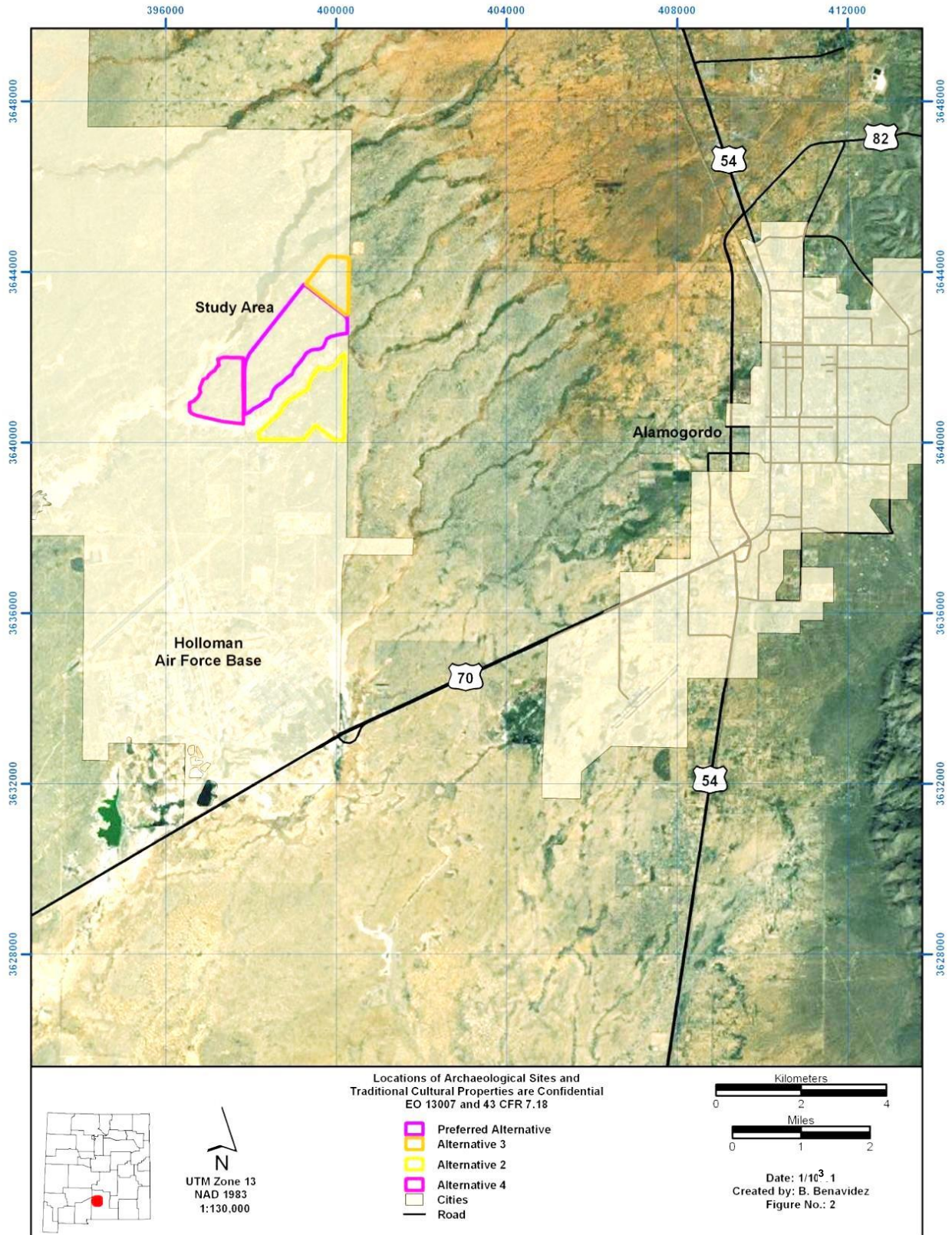


Figure 3. General Project Area Locator Map

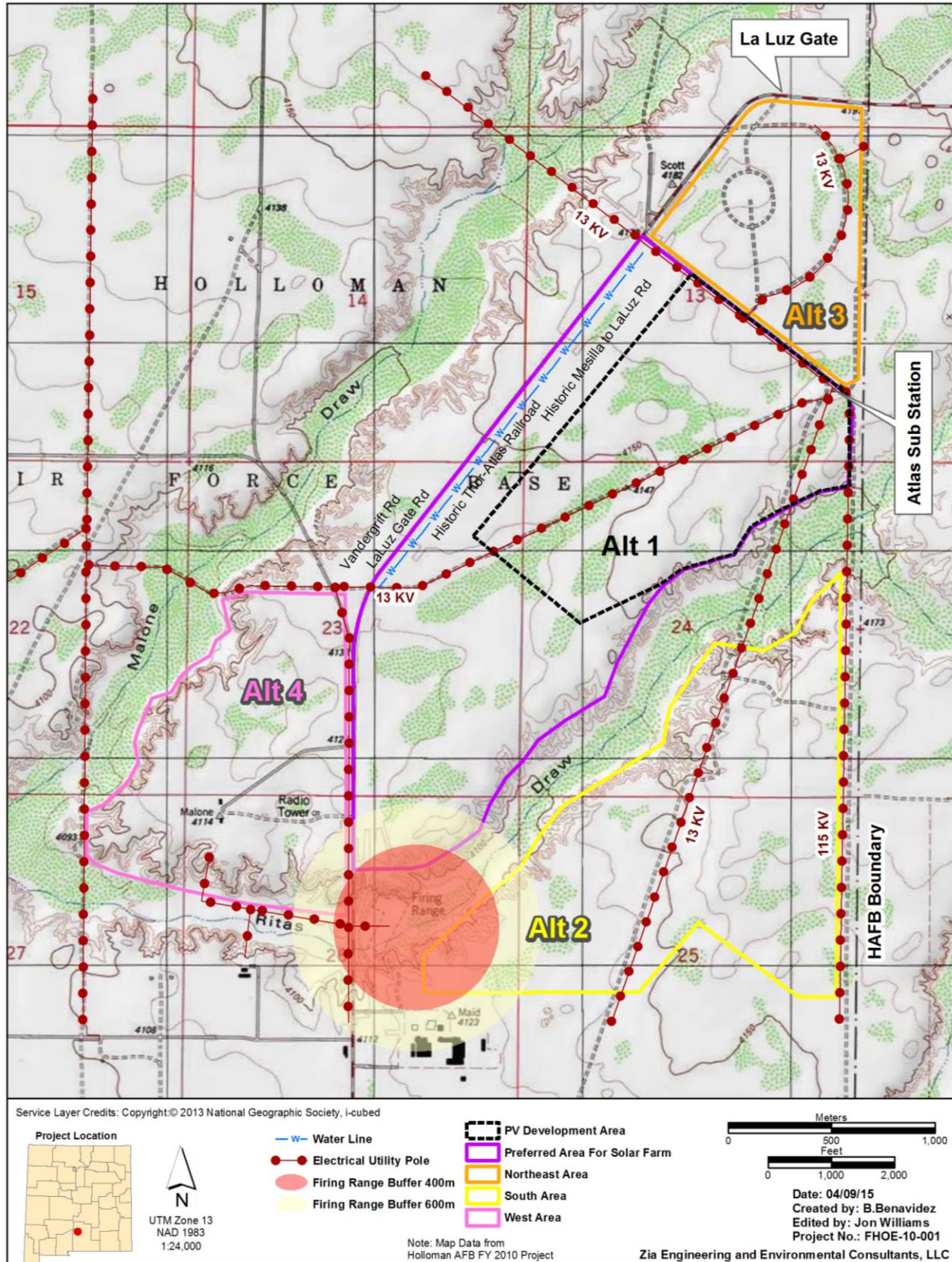


Figure 4. Map of Preferred Area Site and Alternatives

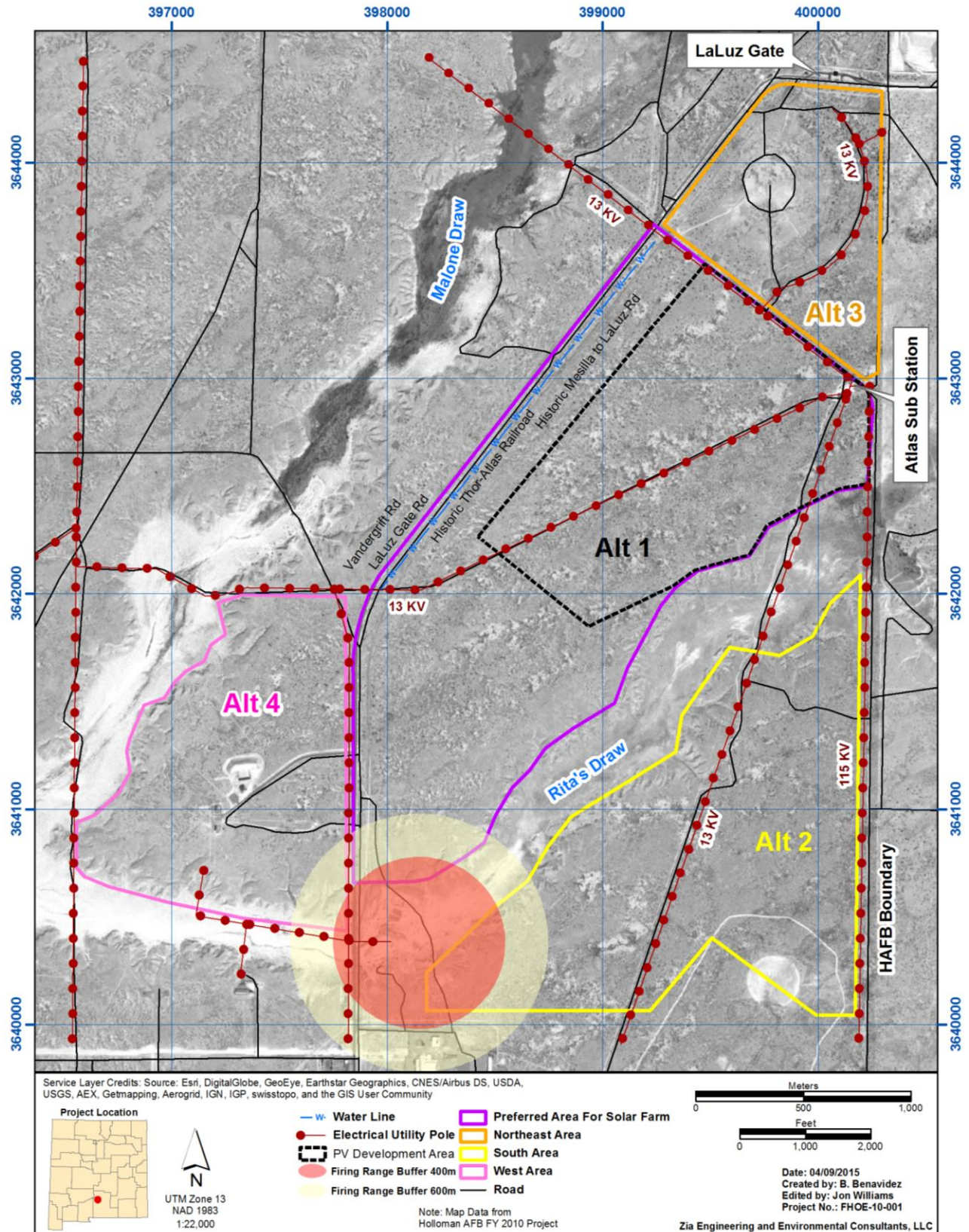


Figure 5. Aerial of Preferred Area Site and Alternatives

The PAS is not located near runway approach and departure zones, but is occasionally overflowed by aircraft in the circulation pattern near the airfield. Potential impacts to and from overflights and potential conflicts with air operations are considered minimal based on experience at other airfields. Much of the entire surveyed area was formerly designated as the down-range safety zone for an early small arms firing range. That range has been closed and replaced by a new facility, range and safety zone to the west of Vandergrift Road. In addition to the large safety zone west of Vandergrift Road, there is a small safety zone at Rita's Draw about one mile southwest of the southern edge of the proposed development.

Land disturbance and cost-saving factors also were assessed for each alternative within the general location defined on the AF-813. At the PAS, projected land form disturbance would be minimal due to existing road access, low topographic relief and proximity to the Atlas Power Substation and a 115kV transmission line. A slightly higher elevation low rise separates much of the proposed development area from direct drainage into Rita's Draw and the terrain minimizes the need to make major changes in surface contours for erosion control and construction.

The PAS does pose some concerns. Development would require completed cultural resources SHPO consultation and resolution of potential adverse effects on archaeological historic properties. It would also require informal consultation with the United States Fish and Wildlife Service (USFWS) to determine whether it may effect, but is unlikely to adversely effect, burrowing owls that are a Species of Concern (SOC). Grama grass cactus, a HAFB sensitive species and New Mexico State species of interest as well as the burrowing owls (neither is a threatened or endangered species) were found in the larger surveyed area, but are not within the 400 acre Preferred Alternative Site.

2.2.2.2 Alternative Site 2: Use of an Area South of the Preferred Alternative

Analysis of Alternative Site 2 considered an area of approximately 531 acres located immediately to the south of Rita's Draw (Figures 3 and 4). Reasonably buildable terrain in Alternative 2 would allow development of a smaller PV array compared to the PAS, as there is greater topographic relief and more erosion toward Rita's Draw than in the PAS. Alternative 2 has multiple concerns that make it a less reasonable location for the proposed action:

- Very high known abundance of cultural resources which would result in extensive and expensive mitigation (Sale et al 1996a, HAFB Cultural Resource Records 2014),
- The southwest corner of the area is within an old Rita's Draw weapons safety zone,
- Drainage issues due to more terrain sloping directly to Rita's Draw,
- Potential Burrowing owl and grama grass cactus issues,
- Distance from the Atlas Power Substation would require longer transmission lines or a new substation, and
- New access road(s) would have to be constructed.

2.2.2.3 Alternative 3: Use of an Area Northeast of the Preferred Alternative

Alternative 3 could provide an area for development of a smaller array to the north of the preferred area (Figures 3 and 4). Alternative 3 is approximately 215 acres in size. Its borders are Atlas and Vandergrift Roads, the La Luz Gate and the eastern base boundary, and the Atlas substation is within 0.05 miles of its southeast corner. It includes an historic Balloon Operations Area and White Sands Missile Range (WSMR) and Test Group Instrumentation stations. The area has multiple concerns, making it an unlikely location for the proposed action:

- Development and operation of the proposed action may interfere with Test Group and WSMR range Instrumentation sites,
- The area is known to have substantial numbers of Cold War historic properties (Sale et al 1996b, HAFB Cultural Resource Records 2014),
- Building the WSMR test instrumentation stations and Cold War historic properties created rougher terrain that is less suited to economical PV array placement, and
- Burrowing owl and grama grass cactus habitat issues similar to all of the possible alternative sites.

2.2.2.4 Alternative 4: Use of Area West of the Preferred Alternative

Alternative 4 would utilize an area to the west of the preferred area for development of a PV array (Figures 3 and 4). Alternative 4 is an open area totaling approximately 350 acres with possibly 200 acres reasonably developable. It is west of Malone Draw and south of the current Combat Arms Training facility safety zone. The area has multiple concerns, making it an unlikely location for the proposed action, these are:

- The area is located under the east edge of an approach path which could result in impacts to or from flight operations (although such impacts would likely be negligible),
- The southeastern half of this area is located in an old Rita's Draw weapons safety zone,
- The south third of this area is heavily eroded toward Rita's Draw, leaving less developable space or requiring more site preparation and erosion control work than the other alternative sites,
- There are two WSMR radar sites that would be surrounded by the PV panels,
- It is situated substantially farther from the Atlas Power Substation than any other alternative area (about 2 miles southwest) which would increase impacts and costs associated with transmission of electric power from the array to the Atlas substation and/or a new substation at the 115kV power line 1.5 miles east, and
- It has potential burrowing owl and grama grass cactus habitat issues similar to all the alternative sites.

2.2.2.5 Alternative 5: No Action Alternative

As required by NEPA and the EIAP, the No Action Alternative is considered as a possible alternative. Under the No Action Alternative, the area would remain in its current undeveloped status. There would be no ground disturbing activities with consequent impacts to local natural

and cultural resources. The Green Energy Initiative would not be implemented. The resulting increase in jobs in the HAFB area, reduction in regional air pollutant emissions, and achievement of military renewable energy use to enhance national security would not occur.

2.3 ALTERNATIVES ELIMINATED FROM DETAILED STUDY

2.3.1 Solar Trough Array

A parabolic solar trough system would produce electric power and cause terrain modifications roughly equivalent to a PV array. A solar trough system requires highly reflective parabolic mirrors that concentrate sunlight/heat on pipes of heat transfer fluid (HTF). The HTF is pumped to a heat exchanger that generates steam to drive a generator. The steam is cooled and recycled. To move the HTF through the process and to condense and recycle the steam requires energy and cooling water, and both require moving parts that require maintenance and replacement over time: photovoltaic panel systems do not (NREL 2012b).

High quality water is required for the steam and for the cooling process. Ground water within the Tularosa Basin is very high in dissolved solids and chemically bound compounds that bond to heated metallic surfaces and rapidly degrade operability. Purifying either the ground water or the base's potable water to the clarity required for steam and cooling processes would involve expensive reverse osmosis or distillation techniques and would generate waste streams that would be costly to handle properly. Photovoltaic panel systems do not entail these issues.

Parabolic troughs are arranged and driven to be continuously pointed toward the sun and are highly reflective. There is a distinct possibility of problems with flight operations near a parabolic array due to reflected sunlight interfering with pilot vision. Photovoltaic panels are absorptive rather than reflective.

2.3.2 Solar Tower Array

As with the parabolic trough alternative, a solar tower array would produce comparable electric energy and extensive surface disturbance similar to a PV array. The arrangement of a solar tower array requires a tall tower in the center of an extensive field of reflective mirrors. The mirrors focus concentrated solar energy onto the tower where water is heated to produce steam to operate generators. Quality water is required for the steam process and would produce the same water concerns as the solar trough array. The tower and the reflective mirrors would provide a potential problem for flight operations due to the height of the tower and its proximity to flight paths. The reflectivity of the mirrors would have impacts on flight operations much the same or worse than a solar trough array. Photovoltaic panel systems do not entail these issues.

2.3.3 Biomass Generation

Biomass fueled power generation is not reasonable due to the lack of fuel stock in this low population desert location and the transportation costs to source distant potential fuel stocks, as well as a high quality water requirement similar to solar trough or tower systems for steam and cooling processes. Providing the water quantity and the desalination processes required by the

trough, tower or biomass technologies would cause environmental impacts beyond the site and add substantial costs to the development of alternate energy production. The incineration process that provides heat for biomass power generation also entails continuing air quality and solid waste disposal concerns for the life of system. Photovoltaic panel systems do not entail these issues.

2.3.4 Wind Power

Wind generation is not a reasonable alternative as the rotating blades of the generators disrupt radar signals critical to aircraft navigation and typical wind generator tower heights are not physically compatible with air traffic in proximity to the airfield. Further, HAFB is located in a <5 meters per second (mps) average wind speed region that is below the 5.9 mps cutoff for marginal electrical generation potential (DOE 2010). Photovoltaic panel power generation is the Preferred Technology.

2.4 COMPARISON OF ALTERNATIVES

Table 2 summarizes the site choice constraints and opportunities and environmental impacts of developing the site alternatives and the No Action Alternative. This further describes the selection standards mentioned in Table 1. Detailed evaluation of the alternative sites can be found within Section 4, Environmental Consequences.

Table 2. Summary of Potential Environmental Impacts of the Alternatives

Category/Site	Preferred Alternative Site 1	South Area Alternative Site 2	Northeast Area Alternative Site 3	West Area Alternative Site 4	No Action Alternative 5
<i>Acreage to be disturbed, New access required?</i>	~400 acres On paved road	>200 acres >0.5mi new road	<200 acres On paved roads	<200 acres On paved road	N/A
<i>Topography</i>	Low relief to flat, minimal dirt work required	Low relief but larger elevation variation	Low natural relief but large man made irregularities	Drops-off into Rita's & Malone Draws, eroding areas	N/A
<i>Impact of/on Flight Operations ?</i>	Under airfield circulation pattern (none)	Under airfield circulation pattern (none)	Under airfield circulation pattern (none)	Near runway approach airspace (none)	No change in current operations
<i>Vegetation & Species of Concern</i>	Loss of ground cover & potential Burrowing owl and grama grass cactus habitat	Loss of ground cover & potential Burrowing owl and grama grass cactus habitat	Loss of ground cover & potential Burrowing owl and grama grass cactus habitat	Loss of ground cover & potential Burrowing owl and grama grass cactus habitat	No impact to species of concern
<i>Cultural Resource Issues</i>	Low density of cultural sites adverse effects	High density of cultural sites adverse effects	Low density of cultural sites adverse effects	No cultural sites, no effects	No impact to cultural sites
<i>Ongoing Activity Conflicts</i>	No conflicting activities	Test Group sites & old Explosives Range on south	WSMR Instrument sites & historic balloon launch facilities	Active radar sites and active firing range on north	No change in current uses
<i>Proximity to Substation & required other construction disturbance</i>	Atlas Substation on site, only in-site lines & roads required	>0.5mi new line across Rita's Draw or new substation at 115kV line in site	Atlas Substation adjacent, minimal new line required	>1.0mi new line required to Atlas substation or to new substation at 115 kV line	Atlas Substation and Transmission lines and roads remain as are

3.0 AFFECTED ENVIRONMENT

Section 3 describes the existing environmental and socioeconomic conditions at and surrounding the proposed PV array site on HAFB. This section provides information to serve as a baseline from which to identify and evaluate environmental changes likely to result from the implementation and operation of the proposed action.

In compliance with NEPA and CEQ guidelines (40 CFR 1501.7[3]), only those resources and conditions having the potential to be affected by the action are discussed within this section and impacts analyzed in Section 4. The following resources will not be discussed in detail:

- **Farmlands** – The proposed site is not classified as important, unique or prime farmland, Natural Resources Conservation Service (NRCS) letter, 02 April 2013.
- **Wilderness / Recreation** – The project site is not located in or near a wilderness area. The closest recreational sites are in the developed area of HAFB, a few miles south.
- **Wild and Scenic Rivers** – No Wild or Scenic Rivers are in proximity to this project.
- **Wetlands and Flood Plains** – The proposed action would not impact wetlands and is not located in a flood plain.
- **Coastal Resources** – No coastal resources are in proximity to the proposed project.

3.1 GEOLOGY, SEISMICITY, AND SOILS

3.1.1 Geology

HAFB lies within the Tularosa Valley, a closed desert basin with no outlet for surface water flow. Formed due to Rio Grande rift action to the immediate west, the basin began as a large anticline of Paleozoic sedimentary rock between the present San Andres and Sacramento Mountains. Pull-apart faulting caused the arch to collapse, forming the valley (Chronic 1987). It dropped substantially below regional terrain and the Rio Grande ran through the early Tularosa Basin. Gradual uplift and the Organ Mountains orogeny diverted the Rio Grande back to the west and the Tularosa Valley became a basin with higher elevations on all sides.

The basin has filled to its current levels with alluvia from the Organ Mountains on the southwest; San Andres Mountains on the west; Chupadero Mesa and the New Mexico Highlands on the north; Carrizo, Sierra Blanca and Sacramento Mountains on the east. To the south, a subsurface divide separates the Tularosa Basin from the Hueco Bolson in Texas and Mexico. The basin fill found away from the piedmont consists of very deep, very fine grained and well-sorted soils with high calcium carbonate and sulfate levels, a poor soil for agricultural pursuits.

3.1.2 Seismicity

According to the United States Geological Survey (USGS), the magnitude of seismic activity in New Mexico has been minimal as exemplified by the 1973-2012 data represented in Figure 6 below (USGS 2012). There are faults at the west scarp of the Sacramento Mountains and the

east scarp of the San Andres Mountains that have been active in the last 15,000 years (USGS 2006). The most recent seismic activity near the proposed PV development was centered approximately 9 miles south of the proposed undertaking on March 9, 1968, measuring 3.4 in magnitude (New Mexico Bureau of Geology and Mineral Resources 2008).

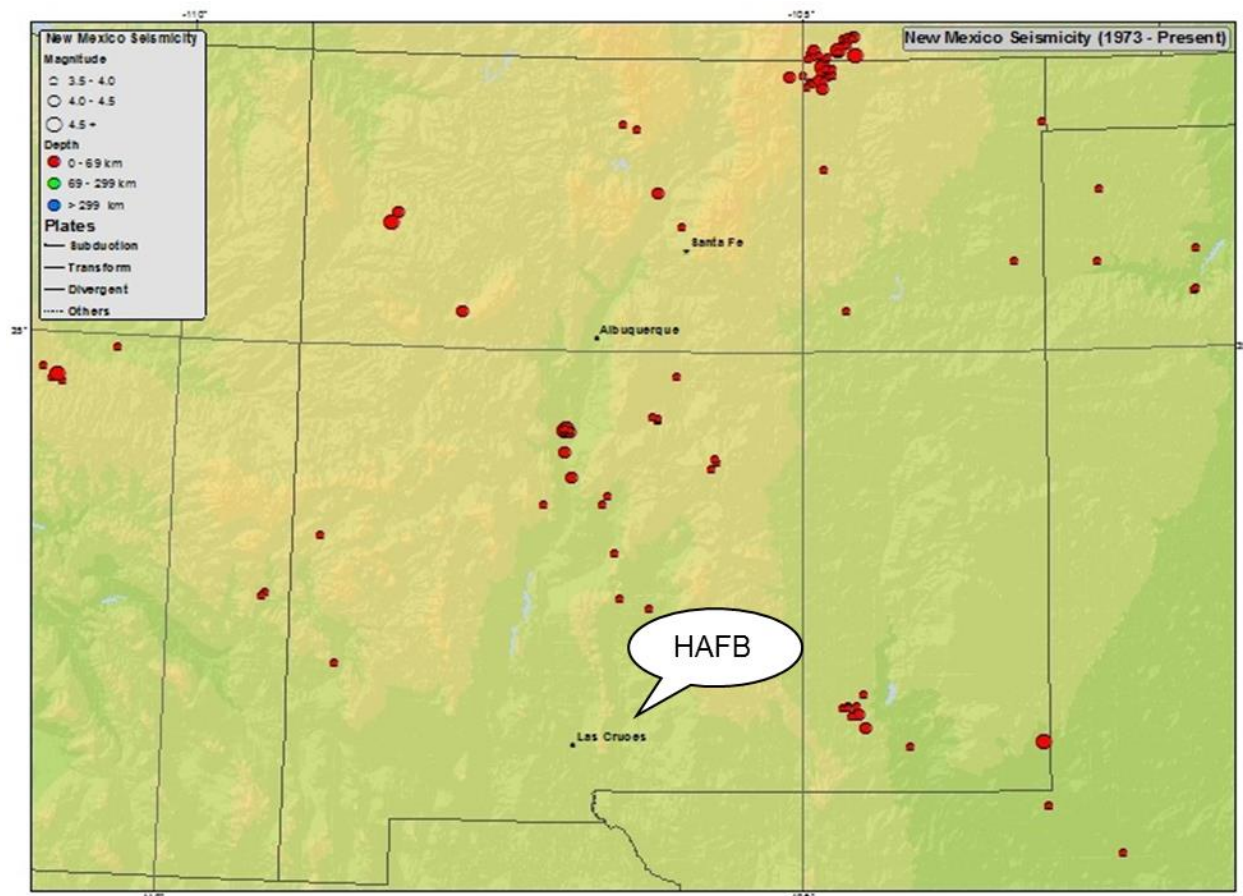


Figure 6. Seismicity of New Mexico
Green = Lower probability of events – Yellow = Higher probability - Red = Event epicenter

The U.S. Department of Defense has produced a structural load capacity document for particular locations within the United States and a few outside the country (DoD 2005). This structural load capacity recognizes seismic activities and the importance of its assessment for power generating facilities. The seismicity assessment for HAFB is shown in Table 3.

Table 3. Seismic Data for Structural Load

State	Base / City	Seismic Data (Site Class B)			
		MCE S _s (%g)	MCE S ₁ (%g)	10/50 S _s (%g)	10/50 S ₁ (%g)
New Mexico	Holloman AFB	35	10	13	4

MCE ~ Maximum Considered Earthquake; S ~ spectral response; S_s ~ 1-second spectral period acceleration; S₁ ~ 0.2 seconds spectral period acceleration; %g ~ percent gravity; 10/50 ~ Earthquake with a 10% probability of being exceeded in 50 yrs

3.1.3 Soils

Under the Farmland Protection Policy Act, Federal agencies are required to protect lands with prime or unique farmland distinctions and prevent conversion of these lands for local or nonagricultural use. According to the Natural Resources Conservation Service (NRCS) for New Mexico, soils must be comprised of over 50 percent prime, unique or statewide importance to be protected under the Farmland Protection Policy Act (United States Department of Agriculture [USDA] 2010). The soils in the project area are not prime, unique or of statewide importance.

Soils in the action area consist of one soil complex mapped by the NRCS Web Soil Survey (USDA 2012). Soil along a small portion of the western project boundary is not mapped by the NRCS; however, based upon topography, proximity, and soil maps within the HAFB INRMP (2010) the soil is of the same complex. The HAFB INRMP identifies this soil by an older nomenclature, the Holloman–Gypsum–Yesum complex, with the same composition as that now described by NRCS as Alamogordo–Gypsum land. While the INRMP was being published, the NRCS redefined the soils as the Alamogordo–Gypsum land complex.

Alamogordo–Gypsum land complex, 0 to 5 percent slopes

The Alamogordo–Gypsum land complex is found on 0 to 5 percent slopes in the Tularosa Basin. This complex is comprised of 50 percent Alamogordo soil and 30 percent gypsum land. It does not meet hydric selection standards, nor is it classified as important or prime farmland.

Alamogordo soil

Alamogordo soil consists of gypsiferous alluvium and eolian deposits found on piedmont fans and the perimeter of the basin floor. It is moderately saline and slightly sodic within 30 inches of the soil surface. This soil is classified as well drained, and is neither flooded nor ponded. Depth to a root restrictive layer is greater than 80 inches, and water movement in the most restrictive layer is moderate. Available water to a depth of 60 inches is moderate, and its shrink-swell potential is low. This soil has slight to moderate erodibility.

Gypsum land

Gypsum land consists of gypsiferous alluvium and eolian deposits found on piedmont fans and basin floor. According to the Web Soil Survey, it is not identified as a major soil component of the proposed action location. Many miles of gypsum land are not far west in the basin floor.

An important feature of desert soils is cryptogammic crusts. Living organisms (cyanobacteria, algae, microfungi, and bryophytes) create cryptogam biological soil crusts (BSC) with their by-products forming an erosion-resistant matrix with soil particles. They are found in arid to semi-arid regions of the world where vegetation is limited. In the U.S., they are known in semi-arid western regions. Much of the Tularosa Basin contains some percentage of BSC coverage.

According to Rosentreter et al (2007) BSCs have positive influences on soils. BSCs increase soil stability; contribute carbon to those soils below the crust; convert nitrogen from the atmosphere into nitrogen available within the soil and the organisms' waste products add more available phosphorus within the soil. BSC cover increases passage of water and gasses through the soil, resulting in higher likelihood of sprouted seedlings reaching the surface.

BSC growth is contingent on moisture and plant cover. The organisms become metabolically active when precipitation increases (Rosentreter, et al 2007). Additionally, since the organisms' are photosynthetic, the growth of BSC would be limited with more shade (Rosentreter, et al 2007).

According to the HAFB Integrated Natural Resources Management Plan (INRMP, 2014), recovery of BSC depends on the severity and extent of the disturbance, the vicinity vegetation structure, the texture of the soil and the climate before and after the disturbance. During the pedestrian survey, BSC was observed covering large portions of the proposed project area. According to the INRMP (2014), the north area of Holloman (roughly 50,000 acres) contains large areas of BSC. The soil types BSC grows on are susceptible to wind erosion when the crust is removed. Disturbed BSC readily regenerates from scattered fragments but requires several years of average or better precipitation to recover.

3.2 AIR QUALITY

3.2.1 Definition of Resource

The United States Environmental Protection Agency (EPA) has the primary responsibility for regulating air quality. Air quality is determined by the concentration of various pollutants in the atmosphere. The major pollutants of concern include ozone, nitrogen dioxide, carbon monoxide, sulfur dioxide, lead, and particulate matter (PM) less than 10 micrometers in diameter. The EPA institutes National Ambient Air Quality Standards (NAAQS), which establish the maximum allowable atmospheric concentration of each pollutant (Table 4).

NAAQS, defined by concentration over various periods of time, represent the maximum levels of air pollution that are considered safe for public health and safety. Short-term standards (1-hour, 8-hour, or 24-hour periods) were created for pollutants with acute health effects, whereas long-term standards (annual periods) were developed for pollutants with chronic health effects.

Table 4. National Ambient Air Quality Standards (NAAQS)

Pollutant	Primary Standards		Secondary Standards	
	Level	Averaging Time	Level	Averaging Time
Carbon Monoxide	9 ppm (10 mg/m ³)	8-hour	None	
	35 ppm (40 mg/m ³)	1-hour		
	0.15 mg/m ³	Rolling 3-Month Average	Same as Primary	
Lead	1.5 µg/m ³	Quarterly Average	Same as Primary	
	53 ppb	Annual (Arithmetic Average)	Same as Primary	
Nitrogen Dioxide	100 ppb	1-hour	None	
	150 µg/m ³	24-hour	Same as Primary	
Particulate Matter (PM ₁₀)	15.0 µg/m ³	Annual (Arithmetic Average)	Same as Primary	
Particulate Matter (PM _{2.5})	35 µg/m ³	24-hour	Same as Primary	
	0.075 ppm (2008 std)	8-hour	Same as Primary	

Pollutant	Primary Standards		Secondary Standards	
	Level	Averaging Time	Level	Averaging Time
Ozone	0.08 ppm (1997 std)	8-hour	Same as Primary	
	0.12 ppm	1-hour	Same as Primary	
	0.03 ppm	Annual (Arithmetic Average)	0.5 ppm	3-hour
Sulfur Dioxide	24-hour			
	75 ppb	1-hour	None	

(EPA 2010a)

3.2.2 Existing Conditions

Most emissions from HAFB are the result of vehicle operations, aircraft, and aircraft maintenance activities. Dust storms occur within the Tularosa Basin during times of high winds, and generate airborne particulates from the land surface. HAFB is in Otero County which is an “Air Quality Attainment Area” under New Mexico and National Ambient Air Quality Standards.

3.3 AESTHETIC AND NOISE RESOURCES

3.3.1 Definition of Resource

Aesthetic resources include visual resources and the noise environment. Visual resources are the natural and manmade features that give a particular environment its aesthetic qualities. In undeveloped areas, landforms, water surfaces, and vegetation are the primary components that characterize a landscape. Manmade elements may also be visible. These may dominate the landscape or be relatively unnoticeable. Both manmade and natural features inform the overall impression that an observer receives of an area’s landscape character.

Noise is considered objective or subjective unwanted sound that interferes with normal activities or otherwise diminishes the quality of the environment. It may be intermittent or continuous, steady or impulsive, stationary or transient. According to the Occupational Safety and Health Administration (OSHA), the threshold of human hearing discomfort or pain is approximately 120 decibels (dB) (Table 5).

Table 5. OSHA Permissible Noise Exposure

Duration per day (hours)	8	6	4	3	2	1 ½	1	½	¼ or less
A-Scale Sound level, slow response (dBA)	90	92	95	97	100	102	105	110	115

3.3.2 Existing Conditions

The HAFB solar PV array project area is currently an open, undeveloped parcel dominated by native vegetation, containing several power lines with associated unimproved service roads and an electric substation. Current aerial views of the parcel and vegetation surveys demonstrate an essential similarity to naturally vegetated basin areas throughout the region. Power lines and

the substation, Holloman mission buildings a mile south and southwest, WSMR instrument stations, old Balloon facilities and the La Luz Gate to the north, and embankments of a construction debris landfill a mile northeast, are the man-made visual elements within the immediate vicinity. The area is remote from any residential area, visible only to traffic on Vandergrift Road and is not in any sensitive view-shed.

A combat arms training (pistol and rifle) range and safety zone located west across Vandergrift from the project area causes intermittent low level noise. The proposed PV area lies between two of the aircraft approaches to HAFB and under the general airfield circulation pattern that contribute to the ambient noise levels. Sonic booms are pulses of sound pressure that cause startle effects in humans and may rattle loose structural elements. Sonic booms were relatively frequent with the F-22 aircraft previously stationed at HAFB. The F-22s have been replaced with F-16s that are less likely to “boom” the vicinity but sonic booms do occur in the proposed project area.

Ambient noise levels result from aircraft operations, small arms firing on the training range and vehicular traffic along Vandergrift Road. The proposed project area is currently in a 65 dB noise contour zone (USAF 2011) and there are no noise sensitive receptors in or nearby the PAS.

3.4 WATER RESOURCES

3.4.1 Definition of Resource

Under the New Mexico Water Quality Act and the Federal Clean Water Act (CWA), the State of New Mexico is required to adopt water quality standards that “protect the public health or welfare, enhance the quality of water, and are consistent with and serve the purposes of the New Mexico Water Quality Act and the Federal CWA” (New Mexico Administrative Code [NMAC] 20.6.4). On HAFB water resources are both on the surface and under the ground.

EO 11988 requires Federal agencies to consider and evaluate potential effects that a proposed action may have on floodplains. Where applicable, actions should reduce the risk of flood loss, minimize the impact of floods on human safety, and restore and preserve the natural and beneficial values provided by floodplains. The source for floodplain information is the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM). These maps define zones according to varying levels of flood risk; the zones reflect the severity of flooding reasonably predictable in a given area.

3.4.2 Existing Conditions

3.4.2.1 Surface Water

The September 21 to October 5, 2010 natural resources survey (Hyre, et. al 2011) confirmed that the proposed and alternative sites contain no ponding areas and no perennially flowing surface waters. There are no wetlands or jurisdictional waters as defined by the United States Army Corps of Engineers (USACE, 1987) and none regulated under Section 404 of the CWA.

Rita's Draw demarcates the southeastern boundary of the proposed project area, and Malone Draw is located approximately 1 mile to the west. Although neither drainage is perennial, both draws had been classified as Waters of the U.S. (WUS). This classification was appealed due to recent Supreme Court decisions and both Malone and Rita's Draw are now not WUS.

3.4.2.2 Ground Water

The proposed project is located within the Tularosa Valley Watershed (USEPA 2010b). The Tularosa Valley is a closed basin with no known water outflow. Precipitation runoff and ground water from the surrounding mountains sink into the permeable basin fill. After times of high precipitation in the watershed, the top of basin ground water is seen as ponding in low areas such as Stinky Playa and Lost River Playa on HAFB (Chronic 1987).

Much of the basin groundwater recharge results from >15 inch per annum rainfall and snowmelt in the Sacramento and San Andres Mountains. The average annual precipitation in the basin is 10.33 inches (IDcide.com 2015), half of it comes in summer thunderstorms and much of that evaporates rather than infiltrate to ground water. Despite the arid surface, estimates exist that the Tularosa Basin contains over 100 million-acre feet of brackish ground water. Water salinities range from 1,000 parts per million (ppm) total dissolved solids (TDS), approximate to fresh water at the basin perimeter, to over 20,000 ppm TDS, approximate to seawater under the central basin (Huff 2004). There is no potable groundwater underneath HAFB (Griffin 2015).

3.4.2.3 Floodplains

All the alternative sites discussed in this EA are in FEMA-designated Zone X (FIRM 35035C0925D, FEMA 2010) and are not in the 100 or 500-year floodplain. As shown in HAFB maps and records, floodplains on HAFB are only found in drainage courses and playas.

3.5 BIOLOGICAL RESOURCES

3.5.1 Definition of Resource

Biological resources include native, invasive (noxious), and special status species of plants and wildlife, and their associated habitats. New Mexico Territorial Laws Chapter 76 Article 7, the New Mexico Noxious Weed Act of 1963, and the Federal Noxious Weed Act of 1974 direct how noxious weeds are to be managed throughout the State and the nation. Noxious weeds within New Mexico are distinguished by a class ranking system in which Class A are those species currently not present or having a limited distribution in the State, Class B are those species limited to portions of the State, and Class C are those species that are widespread throughout the State. Preferred management means include eradication, prevention and control.

Under the Federal Endangered Species Act of 1973, the New Mexico Wildlife Conservation Act of 1978 and subsequent agency regulations, threatened and endangered species are subject to protection from impacts associated with proposed actions. Protection varies depending upon the State or Federal listing status of each species. An endangered listing provides Federal and/or State protection for any species in danger of extinction throughout all or a significant portion of their range. A threatened listing provides protection for species, which are likely to become endangered within the foreseeable future through all or a significant portion of their

range. Candidate species are those for which data has been presented to USFWS in support of their being listed as threatened or endangered, but the process of listing has not yet gone to completion or is on hold for various reasons. Take of Federally-listed or State-listed endangered or threatened species may result in fines and imprisonment if the action occurs without appropriate permits.

Federal Species of Concern (SOC) listings include taxa for which further information is needed to resolve their conservation status. SOC are only included in project planning for data gathering purposes, but failure to consider those species in project planning may result in project delays. Federal SOC are often also listed by the State or other agencies as Sensitive or local agency SOC. Sensitive species are those for which an agency such as the New Mexico Department of Game & Fish (NMDGF), the United States Forest Service (USFS), the United State Fish and Wildlife Service (USFWS) and/or the New Mexico Rare Plant Technical Council (NMRPTC) has conservation concerns and recommends avoidance of unnecessary impacts to the species in lands or projects reviewed or managed by that agency. Legal protection does not extend to SOC or sensitive species. Protection is warranted to keep the population from becoming degraded and officially listed as threatened or endangered.

Extirpated species (as defined by the USFWS and NMDGF) are no longer known to occur in areas that they previously inhabited. However, concern that the species may actually remain, or that there is habitat to re-establish the species, merits the attention of project planners.

3.5.2 Existing Conditions

The following sections are based upon data gathered and maintained by the HAFB Natural Resources Program and observations made during a pedestrian field survey from September 21 to October 5, 2010 (Hyre et. al 2011). That field work covered approximately 800 acres of land including and surrounding the 400 acre Preferred Alternative Site.

3.5.2.1 Vegetation

The proposed project area is a closed basin located within the Chihuahuan Basins and Playas ecoregion. This ecoregion includes alluvial fans, internally drained basins, and river valleys mostly below 4,500 ft (1,372 m) in elevation. Most of the basins within the Chihuahuan Basins and Playas ecoregion were formed during Tertiary Basin and Range tectonic activity.

Vegetation typical for the lower elevations includes desert shrubs and grasses, which may consist of dominant creosotebush (*Larrea tridentata*), tarbush (*Flourensia cernua*), and/or fourwing saltbush (*Atriplex canescens*), as well as acacias (*Acacia* spp.) and mesquite brush (*Prosopis* sp.), gypsum grama (*Bouteloua breviseta*), alkali sacaton (*Sporobolus airoides*) and other dropseed grasses (*Sporobolus* sp.). Horse creeper (*Echinocactus texensis*), prickly pear and cholla (*Opuntia* sp.) and other cacti are also common. The vegetation within this ecoregion must have the ability to withstand large seasonal and diurnal ranges in temperature, low available moisture and high evapotranspiration (Griffith, et al 2006). Except for lack of horse creeper cactus, the surveyed habitat is consistent with the described ecoregion.

The vegetation observed at the time of the pedestrian survey was relatively undisturbed. Sixty six plant species were located during the survey: seven cacti (one illustrated in Photograph 4), twenty-eight forbs, seventeen grasses, twelve shrubs, and two subshrubs. The grasses occur in isolated clumps and small denser areas with up to approximately 40% ground cover, Other than the grasses, the most abundant species observed were honey mesquite (*Prosopis glandulosa*), sticky range ratany (*Krameria erecta*), Texas hornbill (*Erodium texanum*), and claret cup cactus (*Echinocereus triglochidiatus*).



Photograph 4. Claret cup cactus (Echinocereus triglochidiatus) and honey mesquite (Prosopis sp.)

Class A and C noxious weeds were not identified within or adjacent to the survey area. African rue (*Peganum harmala*), a New Mexico Class B noxious weed, was observed on the northeast side of the preferred project area occurring predominantly near roadways. African rue is an invasive species of particular concern at HAFB. Russian thistle (*Salsola tragus*), although not classified a noxious weed by the New Mexico Department of Agriculture (NMDA), is identified in the INRMP as an invasive species, and was observed in the project area. Efforts to control this species at HAFB are of low priority. General and species-specific control measures are described within the INRMP (HAFB 2011).

3.5.2.2 Wildlife

A variety of wildlife species were observed during the pedestrian survey. Observers located thirty-seven bird species, four mammal species, seven reptile species (one shown in Photograph 5), and twelve invertebrate species. Passerine birds, hawks, and vultures were the most commonly observed wildlife. Activity indicators of wildlife included tracks, scat, and burrows of small, medium, and large mammals. Burrows were observed throughout the project area.

Numerous migratory birds and nests were observed throughout the approximately 800 acre parcel. Nests identified were characteristic of cactus wrens (*Campylorhynchus brunneicapillus*), black-throated sparrows (*Amphispiza bilineata*), Scott's orioles (*Icterus parisorum*), thrashers (*Toxostoma* sp.) and raptors. None of the nests observed were occupied by adults, eggs, or young at the time of the survey.



Photograph 5. Desert box turtle
(*Terrapene ornate*)

Oryx (*Oryx gazella*), a big game species native to South Africa were introduced to the Tularosa Basin in 1969. Oryx were observed within the project area during the pedestrian survey. This species has been known to interfere with HAFB operations (HAFB 2011) and occasional depredation hunts have been conducted to remove oryx that are habituated to base activities.

3.5.2.3 Threatened, Endangered, and Sensitive Species

Habitat available in the proposed project area was compared with the habitat requirements for the listed threatened, endangered, and sensitive (TES) plant and wildlife species that may occur in Otero County (Hyre et. al 2011). Detailed lists are in Appendix B that presents data from the NMDGF 2010, USFWS 2010, USFWS 2015, NMRPTC 1999 and the New Mexico Natural Heritage Program (NMNHP 1998). Of the species listed in Appendix B, those that may have suitable habitat within the project area and/or were observed during the survey are discussed below.

TES Plants

Federal and State listed TES plant species were not observed during the pedestrian survey; however, three specimens of grama grass cactus once considered a HAFB sensitive species were located. Designated critical habitat for threatened or endangered plant species is not located at or near the project site (USFWS 2010b, 2015). Of the TES plant species known to occur in Otero County, those that may have potentially suitable habitat, that are known to utilize habitat located within the project area, that were observed during the survey, or that may be impacted by the proposed action within the project area are listed in Table 6.

Table 6. TES Plants with Potential to Occur in Proposed Action Area

Common Name	Scientific Name	Status	Potentially Suitable Habitat Present?	Known Occupied Habitat Present?	Species Impacted by Action?
Plants					
Kuenzler's hedgehog cactus	<i>Echinocereus fendleri</i> var. <i>kuenzleri</i>	USFWS-E, NM-E	Yes	No	No
grama grass cactus	<i>Sclerocactus papyracanthus</i>	HAFB-S	Yes	Yes	No, Not in 400 acre PAS
USFWS ~ U.S. Fish and Wildlife Service, NM ~ New Mexico, HAFB ~Holloman Air Force Base, E ~ Endangered; S ~ Sensitive;				(NMRPTC 1999; USFWS 2010; NMNHP 1998)	

Kuenzler's hedgehog cactus (Echinocereus fendleri var. kuenzleri)

Kuenzler's hedgehog cactus grows primarily on gentle, gravelly to rocky slopes and benches on limestone or limy sandstone. It is typically associated with grasslands and woodlands. This species has not been previously observed within the project area, and was not observed during the pedestrian survey.

Grama grass cactus (Sclerocactus papyracanthus)

Grama grass cactus (Photograph 6) is no longer listed by USFWS, but it is considered a sensitive species by HAFB although continuing observations indicate it is not uncommon (Anderson 2014). This cactus grows in pinyon-juniper woodlands and desert grasslands. It is almost always associated with grama grasses (*Bouteloua* spp.), blue grama (*B. gracilis*) in particular, although specimens have been found among dropseed grasses (*Sporobolus* spp.). Three individuals of this cactus species were observed in the survey area in association with alkali sacaton and gyp grama, away south of the Preferred Alternative Site.



Photograph 6.
Grama grass cactus

TES Wildlife

Federal and State listed threatened and endangered wildlife species were not observed in the proposed project area during the pedestrian survey. Federal SOC burrowing owl and New Mexico sensitive loggerhead shrike were observed. Visual evidence of sensitive wildlife species (burrowing owl burrows) was observed in the surveyed area south of the proposed action site. Other TES wildlife species activity indicators were not observed. There is no designated critical habitat for threatened or endangered wildlife species within or adjacent to the preferred project area (USFWS 2010, 2015). Of the TES wildlife known to occur in Otero County, those that may have potentially suitable habitat, are known to utilize habitat located within the project area, were observed during the survey, or may be impacted by the proposed action within the project area, are listed in Table 7 and discussed on the following page.

Table 7. TES Wildlife with Potential to Occur in Proposed Action Area

Common Name	Scientific Name	Status	Potentially Suitable Habitat Present?	Known Occupied Habitat Present?	Species Impacted by Action?
Fish					
White Sands pupfish	<i>Cyprinodon tularosa</i>	USFWS-SOC, NM-T	No	No	No
Birds					
Baird's sparrow	<i>Ammodramus bairdii</i>	USFWS-SOC, NM-T	Yes	No	No
Burrowing owl	<i>Athene cunicularia hypugaea</i>	USFWS-SOC	Yes	Yes	No, burrows south of PAS
Loggerhead shrike	<i>Lanius ludovicianus excubitorides</i>	NM-S	Yes	Yes	No
Mammals					
common hog-nosed Skunk	<i>Conepatus leuconotus mearnsi</i>	NM-S	Yes	No	No
Townsend's pale big-eared bat	<i>Corynorhinus townsendii pallescens</i>	USFWS-SOC, NM-S	Yes	No	No
Spotted bat	<i>Euderma maculatum</i>	NM-T	Yes	No	No
Western small-footed myotis bat	<i>Myotis ciliolabrum melanorhinus</i>	NM-S	Yes	No	No
Occult little brown myotis bat	<i>Myotis lucifugus occultus</i>	NM-S	Yes	No	No
Fringed myotis bat	<i>Myotis thysanodes thysanodes</i>	NM-S	Yes	No	No
Cave myotis bat	<i>Myotis velifer incautus</i>	NM-S	Yes	No	No
Long-legged myotis bat	<i>Myotis volans interior</i>	NM-S	Yes	No	No
Big free-tailed bat	<i>Nyctinomops macrotis</i>	NM-S	Yes	No	No
USFWS ~ U.S. Fish and Wildlife Service, NM ~ New Mexico; E ~ Endangered; T ~ Threatened; SOC ~ Species of Concern; S ~ Sensitive; C ~ Candidate, CH ~ Critical Habitat designated				(NMDGF 2010; USFWS 2010, 2015; NMNHP 1998)	

Fish

The White Sands pupfish on HAFB are a population that originated from the Salt Creek in Sierra County and were introduced to the Lost River drainage on HAFB. Since its introduction, the species has undergone some morphogenesis most likely attributable to changed ecological conditions such as salinity. The Lost River population's water is received from the Malone-Rita's Draw segment upstream from Range Road 9. Standing pools in the deeply entrenched segment of Lost River between Range Road 9 and the Lost River Playa are fed by that flow during wet seasons, but are fed by ground water during drought conditions. This entrenchment is apparently enlarged by soil dissolution cavities, and provides a pupfish refuge during extremely dry periods (HAFB 2011). Although areas important to the conservation of the pupfish are defined in Rita's Draw south, and Malone Draw west of the proposed PV development, no essential habitat, as defined by the INRMP (HAFB 2011) and no pupfish were observed in or adjacent to the surveyed project area.

Birds

The preferred project area and the surrounding region contain habitat suitable for the Baird's sparrow, burrowing owl, and loggerhead shrike. The Baird's sparrow is rare in Otero County occurring mostly during winter months. Both the burrowing owl and loggerhead shrike were observed during the pedestrian survey. Burrows associated with burrowing owls were also identified during the pedestrian survey (Photograph 7) but are located well south of the PAS. According to the INRMP (HAFB 2011), burrowing owls are considered "a high conservation priority" species. Research on these owls, both during and out of the breeding season, is ongoing at HAFB as is monitoring of the reproductive success of this species.



*Photograph 7.
Burrowing owl burrow*

Mammals

Habitat within the vicinity of the preferred project area appeared suitable for the common hog-nosed skunk, pale Townsend's big-eared bat, western small-footed myotis bat, occult little brown myotis bat, fringed myotis bat, long-legged myotis bat, cave myotis bat, and big free-tailed bat. The common hog-nosed skunk and the listed bat species may forage in or pass through the project area. Night spotting and mist net capture surveys have found bats near water bodies on the south and west of the base and there are known colonies in buildings near those water sources. Bats or skunks need a water source for foraging and drinking and the PAS or nearby Rita's and Malone Draws very rarely contain water. Skunks, bats and/or their sign were not observed during the survey of the preferred photovoltaic development area.

3.6 CULTURAL RESOURCES

3.6.1 Definition of Resource

The National Historic Preservation Act (NHPA) of 1966 is the federal law requiring protection of historic properties including historic structures, constructs, places, prehistoric and historic sites of human activities and associated artifacts from adverse effects as a result of Federal undertakings. The term "historic property" is defined in the NHPA as: "any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion on the National Register"; such term includes artifacts, records, and remains which are related to such district, site, building, structure, or object. The term "undertaking" covers essentially all proposed actions that Federal agencies fund, permit, allow or cause to happen.

Complying with the NHPA first requires definition of the Area of Potential Effect (APE) for a proposed undertaking. In this case the proposed photovoltaic development site is the APE. Next, records and field searches identify and record whatever cultural resources may be present in the APE. Subsequently, evaluation of those resources under National Register of Historic Places selection standards for significance determines what historic properties are in the APE. Then the character of the undertaking is analyzed to determine the effects that the proposed action would have upon those historic properties; the Federal agency makes a determination of effect; and, forwards that determination to the SHPO for concurrence. Subsequently, consultation with SHPO, other entities, Tribal and Federal agencies and publics regarding those historic properties and the proposed impacts defines what further actions are taken. HAFB consults with relevant tribes, cultural groups, and other agencies regarding projects that may affect archaeological, historical and traditional cultural properties and this EA is part of that process.

3.6.2 Existing Condition

3.6.2.1 Cultural Resources Background

There has been a human presence in the project region for over 12,000 years (Table 8). For a more in-depth discussion of the area, see Carmichael (1986) or Miller and Kenmotsu (2004). Paleoindian remains (10,000 to 6,000 B.C.) are present in the region, but are rare (Irwin-Williams 1979). Three approximately 8000 year old sites have been recorded on HAFB.

Table 8. Regional Cultural History Chronology

Period/Phase	Approximate Date	Reference
Paleoindian	Ca. 10,000 - 6000 B.C.	Irwin-Williams 1979
Archaic	6000 B.C. - A.D. 200	MacNeish and Beckett 1987
Early	6000 - 4300 B.C.	MacNeish and Beckett 1987
Middle	4300 - 900 B.C.	O’Laughlin 1980
Late	900 B.C. - A.D. 200	O’Laughlin 1980
Formative	A.D. 200 - 1450	Lehmer 1948; LeBlanc and Whalen 1980
Mesilla	A.D. 200 - 1100	Lehmer 1948; LeBlanc and Whalen 1980
Doña Ana	A.D. 1100 - 1200	Lehmer 1948; LeBlanc and Whalen 1980
El Paso	A.D. 1200 - 1450	Lehmer 1948; LeBlanc and Whalen 1980
Protohistoric	A.D. 1450 - 1659	Beckett and Corbett 1992
Historic	A.D. 1659 - present	Wilson et al. 1989

MacNeish and Beckett (1987) defined an Archaic Chihuahuan tradition (6,000 B.C. to A.D. 200) for the Tularosa Basin, describing small groups that traversed the landscape, leaving small campsites as evidence of their search for seasonal plant and animal subsistence resources. Excavation at the Keystone Dam site (O’Laughlin 1980) near El Paso suggested that, by 2000 B.C., the seasonal round included winter base camp pit structures near reliable water sources. By the end of the Archaic times, local populations were growing corn and squash.

The Ceramic period (A.D. 200-1450) is divided into Mesilla, Doña Ana, and El Paso phases (LeBlanc and Whalen 1980; Lehmer 1948). The Mesilla phase (A.D. 200-1100) included small pit house villages along the Rio Grande or at alluvial fans, but most sites were small limited-activity areas. The Archaic pattern of high residential mobility probably continued during the Mesilla phase. In the Doña Ana phase (A.D. 1100-1200), both pithouses and surface structures were present. In the El Paso phase (A.D. 1200-1450), above-ground adobe pueblos, a few of which were large enough to house multiple families, had been constructed in the area. The El Paso phase has been linked to the Medio period Casas Grandes culture in northern Mexico, though the exact relationship remains unclear.

By 1450, the El Paso phase villages lay abandoned. When the Spanish arrived in the area in the 1500s, it was home to the Mansos Indians (Beckett and Corbett 1992). The Mansos were fully missionized by about 1700, leaving the river region without un-aculturated aboriginal populations. However, away from the Rio Grande the Apaches occupied vast areas, including the Warm Springs Apache in the Gila and San Andres Mountains, and the Mescalero Apache in the Tularosa vicinity, Sacramento Mountains and Guadalupe Mountains. Due to a running conflict with the Apache, the region's Hispanics were unable to establish a permanent foothold in the Basin until the mid-1800s (Wilson et al. 1989).

After the United States seized the region in 1846 during the Mexican-American War, El Paso del Norte south of the Rio Grande became part of Mexico while parts of the town north of the river became El Paso, Texas. A military presence was established in the El Paso area following the war in 1848. Fort Fillmore was established near La Mesilla, NM, in 1851 (Harris 1993) and near El Paso, Fort Bliss, TX, was established in 1854 (Harris and Sadler 1993). Fort Stanton near Capitan, NM, was built in 1855 to control the Apache in the Sierra Blanca and Sacramento Mountains as well as the Tularosa Basin. Fort Selden near Las Cruces, was built in 1865 to further protect settlers and travelers in the Rio Grande Valley from bandits and Indian attacks.

Small towns were settled along the Rio Grande, including Doña Ana as part of the Doña Ana Bend Colony Grant in 1839, Las Cruces in 1849 as an expansion of Doña Ana, and La Mesilla in 1850 (Julyan 1998:226-227). After the Mexican-American War, La Mesilla was founded by Mexican settlers in the Mesilla Valley who were unhappy with their treatment by Americans. They moved across the Rio Grande that at the time ran between Las Cruces and La Mesilla. They petitioned the Mexican government for land and received a land grant under the Mesilla Colony Grant in 1853. However, Mesilla was situated on a narrow strip of land claimed by both the United States and Mexico. Fort Fillmore was built by the Americans in this "no man's land" near La Mesilla in 1851 to aid in fighting the Apache, but was supplied entirely by the Mexican town. In 1854, the dispute was settled with the Gadsden Purchase, and the residents of Mesilla were again Americans (Julyan 1998:226-227). In the Tularosa Basin, the village of La Luz was settled in 1854 by Hispanic farmers from the Rio Grande Valley near Socorro, NM, because their farms had been devastated by floods. Tularosa was first settled in 1855 and Alamogordo was founded later as a railroad town, in 1898.

The Old La Luz Road, which runs through the survey area, connected La Luz and Tularosa across the Tularosa Basin to Doña Ana and Mesilla in the Mesilla Valley of the Rio Grande. During the Territorial years, travel across the Tularosa Basin to St. Augustine Pass at the south end of the San Andres Mountains exposed wayfarers to attack by the ever vigilant Apache. For the Tularosa Basin vicinity the Territorial period was tumultuous, including the Lincoln County War (1878) and on-going Apache Wars (1847-1890s), but by 1900 the US Cavalry had confined the Apache and European-Americans ranged freely across the region.

Numerous homesteads were attempted in the Tularosa Basin, but only those near the most reliable water sources (La Luz, Tularosa, and Alamogordo) survived. Likewise, even the larger Stock Raising Homestead Act farms and ranches of the 1920s and 30s often did not support a family. The Taylor Grazing Act of 1934 further limited grazing so that few ranches survived in the Basin and most of those ranchers lived in or very near the towns (Hawthorne-Tagg 1997).

World War II brought a stark need for aircrew training, then weapons test and development for the purpose of national defense. The sparsely populated desert of the Tularosa Basin was chosen for the establishment of a British Overseas Training Base and the Alamogordo Bombing and Gunnery Range in 1942 (US Army 1998 and 2002). The British were soon too busy fighting to send people to the United States to train and the US had entered the war. By 1943, Alamogordo Army Airfield (AAAF) and the Alamogordo Bombing and Gunnery Range (ABGR) were supporting American heavy bomber crew training, and the first atomic bomb was detonated in 1945 at Trinity Site in the north end of the Alamogordo Bombing and Gunnery Range.

White Sands Proving Grounds (WSPG) was established to the south of the ABGR in 1945 (US Army 1998, 2002), and used the ABGR for missile impacts. In 1946, AAAF closed briefly, then was reopened as an Air Force rocket and missile test center and in 1947 renamed Holloman AFB, with the ABGR as the downrange impact area. In August 1952, the services signed a DOD Memorandum of Agreement combining the White Sands Proving Grounds (WSPG) and the Alamogordo Bombing and Gunnery Range into one Joint Range, with the Navy, Air Force, and Army sharing its management. HAFB became an AF Air Development Center in 1952 and was renamed an Air Force Missile Development Center in 1957. Over the years, day-to-day operations of the Joint Range have devolved to the Army, although the Navy and Air Force maintain an interest, and continue to use the range for missile development and weapons system testing (HAFB 2010).

WSPG started testing captured German V-2 Rockets, but quickly became host to a variety of Army, Navy, and Air Force missile programs and remains so to the present. WSPG was renamed White Sands Missile Range (WSMR) in 1958 (US Army 2002). HAFB also hosted an interesting array of early American rocketry, but as the Air Force concentrated more on strategic, long range missiles, the Tularosa Basin became too small for adequate testing. The Missile Development Center was moved from HAFB to Vandenberg AFB, on the coast of California, in 1962. HAFB was restocked with fighter aircraft and since 1970 has remained primarily a fighter base, although many AF weapons test programs and much bombing and gunnery training are conducted on the former ABGR that is now WSMR (HAFB 2010).

Cultural Resource Inventory

All open surface areas of HAFB have been surveyed for cultural resources within the past 20 years. Ongoing update resurvey and site evaluations are conducted to ascertain the presence or absence of cultural resources and any changes in site character or visibility after the earlier recording.

From September 21 to October 5, 2010, archaeologists conducted a Class III inventory of 800 acres surrounding and including the APE (Zia 2010b). The pedestrian survey located and gathered updated information on nine previously recorded archaeological sites: Laboratory of Anthropology (LA) numbers 103408, LA 108304, LA 108305, LA 108696, LA 108697, LA 108698, LA 108699, LA 111253, and LA 115878). One previously recorded prehistoric site, LA 115877 could not be found.

In addition to reassessing the nine previously recorded sites, the survey also identified nine new sites (LA 168646, LA 168650, LA 168651, LA 168653, LA 168654, LA 168655, LA 168657, LA 168660, and LA 168662). Two of the previously recorded sites (LA 103408 and LA 115878) and one new site (LA 168662) are historic. In total, new or updated records of 3 historic sites and 15 prehistoric sites were completed during this inventory survey, and one previously noted site remained incognito.

All artifacts observed were recorded on site during the survey to generate an accurate record of the artifact assemblage for each site and on-site analysis was conducted at the prehistoric sites. The artifact categories recorded at the prehistoric sites were: chipped stone, including flakes, angular debris, tools, projectile points (Photograph 8), cores, and hammer stones; ground stone, including manos, metates (Photograph 9) and abraded fragments; and, broken pieces (known as “sherds”) of ceramic vessels.



Photograph 8. Projectile Point



Photograph 9. Metate

The historic sites include the 1910 to 1942 C.C. McNatt ranch West Well range camp (LA 103408) with fence debris, an artifact concentration, a stock tank base and a collapsed windmill that are in the center of the PAS. A portion of the historic (1855~1910) road from Lincoln, Tularosa and La Luz to Las Cruces and Mesilla, NM, complete with a linear scatter of

time appropriate artifacts, is in the larger area inventoried for cultural resources but is west of the 400 acres PAS development location, as is a Cold War Era 1956 railroad and siding (LA 115878) that was built for Atlas missile development on HAFB.

In the Draft report (ZIA 2010b) twelve of eighteen sites were considered eligible for inclusion in the National Register of Historic Places (NRHP), including all three of the historic sites. Recommendations for NRHP eligibility were based on surface apparent site integrity and professional assessment of the potential for recovery of subsurface deposits, radiocarbon datable samples, structural or habitation remains and/or potential association with important historic themes, people or events.

The final report (Gibbs 2010), with recommendations on the National Register of Historic Places eligibility of sites in the entire survey area was forwarded to NM SHPO. HAFB requested consultation on the inventory survey and our determination that historic properties would be adversely affected by the proposed development (Gomolak 2013a) and included a work plan for evaluation of the sites (Condon 2013). The SHPO concurred with the determination of adverse effect and requested appropriate further steps be completed.

The archaeological sites in the APE, the 400 acre Preferred Alternative Site, were then evaluated through additional surface analysis and test excavations of select archaeological features and non-feature proveniences (Graves 2014). HAFB submitted a copy of that evaluation and proposed further work report, with final site eligibility determinations and a draft Memorandum of Agreement (MOA) on site treatment to NM SHPO. SHPO concurred with the site eligibility determinations and requested further details in a data recovery plan and MOA.

A further documentation and consultation package (Gomolak 2015) comprised of the revised draft MOA, updated site records with test and evaluation data, and a proposed final research design for archaeological data recovery is in review at the NM SHPO and the President's Advisory Council on Historic Preservation (ACHP) has been notified. This consultation process paves the way for the required data recovery from the historic properties within the PAS. Archaeological field work, analysis and archive research will be completed prior to the direct or indirect impacts on the sites that would result from the proposed solar energy development.

Of nineteen historic properties on record or newly recorded in the general area of the project, thirteen are actually in the Preferred Alternative Site. In addition to the intensive inventory recording, these sites were subsequently tested for data important to the regional prehistory. Through test excavation and thorough confirmation of the inventory records, it has been determined that six of the thirteen sites contain no important further data potential and are not eligible to the NRHP. The seven remaining sites are within the PAS, have been determined historic properties eligible to the NRHP by testing and evaluation that found apparently datable and potentially intact subsurface features. Table 9 summarizes those NM SHPO concurred determinations for all of the sites found within the proposed development vicinity.

Table 9. NM SHPO Concurred NRHP Eligibility, Location & Action Summary for All Archaeological Sites Surveyed, Tested and Evaluated for the Proposed Photovoltaic Development

Site LA#	Site Type & Artifact Presence	NRHP Determination	IN PAS?	Further Data Recovery?
103408	Historic Range Camp, 100s	Eligible	In	Yes
108304	Deflated Prehistoric, <10	Not Eligible	Out	No
108305	Deflated Prehistoric, <10	Not Eligible	Out	No
108696	Deflated Prehistoric, <20	Not Eligible	In	No
108697	Eroded Prehistoric, <100	Not Eligible	In	No
108698	Eroded Prehistoric, <200	Not Eligible	In	No
108699	Subsurface Prehistoric, >200	Eligible	in	Yes
111253	Subsurface Prehistoric, >500	Eligible	In	Yes
115877	Unfound Prehistoric	Undetermined	Out	No
115878	Atlas Missile Railroad	Eligible	Out	No
168646	Subsurface Prehistoric, <20	Eligible	In	Yes
168650	Subsurface Prehistoric,>100	Eligible	In	Yes
168651	Deflated Prehistoric, <50	Not eligible	In	No
168653	Subsurface Prehistoric,>100	Eligible	In	Yes
168654	Deflated Prehistoric,<20	Not Eligible	In	No
168655	Subsurface Prehistoric,>100	Eligible	In	Yes
168657	Eroded Prehistoric	Not Eligible	In	No
168660	Surface Prehistoric	Eligible	Out	No
168662	La Luz-Mesilla Historic Road	Eligible	Out	No

3.7 LAND USE

3.7.1 Definition of Resource

Land use is the occupation or management of land by humans, in a natural or modified state.

3.7.2 Existing Conditions

The proposed project area is currently unused for modern purposes and adjoining areas are mostly undeveloped lands that are Federally Withdrawn for Military Purposes and managed by HAFB (Photograph 10). Three low voltage power lines traverse the project area providing power to other areas of HAFB, and these utility corridors have unimproved dirt trails associated with them. A two-lane improved road (Vandergrift) that provides access to nearby facilities and the La Luz entry gate for HAFB parallels the northwestern boundary of the proposed development area. A paved one lane road bounds the northern side of the PAS from Vandergrift Road to the Atlas electrical substation on the eastern edge of the project area. The area is under the HAFB aircraft airfield circulation pattern.

No public zoning is in effect in Otero County or on HAFB, but safety, security, current and future programmed uses (known as constraints and opportunities) greatly limit potential land uses. The proposed 400 acre PAS development would occupy 0.007 percent of HAFB's total acreage.



Photograph 10. Preferred project area facing south

3.8 SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE

3.8.1 Definition of Resource

EO 12898 mandates each Federal agency to assess environmental justice for a proposed action as part of its mission. The mandate is to identify and address the potential for disproportionately high and adverse health or environmental effects on minority and low-income communities due to the proposed action. Air Force guidance for implementation of the EO is provided in the "Interim Guide for Environmental Justice Analysis" within the EIAP (USAF 1997).

3.8.2 Existing Conditions

Socioeconomics

Table 10 compares general demographic, social, and economic data from the US Census Bureau for the United States, State of New Mexico, and Alamogordo, the nearest major town to the project area (U.S. Census Bureau 2009).

The 2005 – 2009 population for Alamogordo is similar to the total 2000 population; 35,646 and 35,582 respectively. This reflects negligible population change in the area surrounding the proposed undertaking. Total population in the State of New Mexico amounted to 1,819,046 in 2000 and 1,922,850 between 2005 and 2009 (U.S. Census Bureau 2009).

Table 10. Demographic and Socioeconomic Comparison

	Alamogordo, NM	New Mexico	United States
Racial Characteristics			
White	77.7 %	70.3 %	74.5 %
Black or African American	7.1 %	2.2 %	12.4 %
American Indian and Alaska Native	0.2 %	9.3 %	0.8 %
Asian	2.2 %	1.4 %	4.4 %
Native Hawaiian and Other Pacific Islander	0.2 %	0 %	0.1 %
Hispanic or Latino	31.9 %	44.8 %	15.1 %
Other Race	9.4 %	13.6 %	5.6 %
Social Characteristics			
Speak a language other than English at home (population 5 years and over)	27.3 %	35.9 %	19.6 %
Economic Characteristics			
Families below poverty level	12.2 %	13.7 %	9.9 %
Individuals below poverty level	14.7 %	18.1 %	13.5 %
Median household income in 2009 inflation- adjusted dollars	\$39,427	\$42,742	\$51,425

(US Census Bureau, 2005-2009 American Community Survey)

Environmental Justice

The distribution of low-income and minority populations relative to the proposed project area is outlined in Table 11. Minority populations in the vicinity of HAFB range between 30 to 40 percent (EPA, 2013).

3.9 HEALTH AND SAFETY

3.9.1 Definition of Resource

Health and safety resources are those qualities of well-being and security for the local human population, both persons on the ground (civilian and military) and aircraft crew.

3.9.2 Existing Conditions

The PAS is currently relatively natural open range, and is not considered a health or safety hazard for the local population or aircraft flight operations. The power lines that traverse the area and the existing substation emit electromagnetic radiation. The electromagnetic emissions produced by power lines and substations are not known to affect human health nor to cause any impact to aircraft flying over the area.

Field personnel identified apparently unfired, old 50 caliber ammunition rounds in three locations within surveyed area. Scattered unfired rounds, shell casings and bullets are not uncommon throughout the military installations of southern New Mexico, including HAFB (Hoppes 2011, MMRP 2015). South of the PAS and nearer to a now closed small arms range in Rita's Draw, numerous expended lead bullets of various sizes were observed. No other potentially harmful ordnance was observed.

3.10 SOLID WASTE, HAZARDOUS MATERIALS AND WASTES, TOXIC MATERIALS

3.10.1 Definition of the Resource

The resource for this category of analysis is uncontaminated terrain that does not present any concerns under the terms of the Resource Conservation and Recovery Act of 1976 (42 USC 82), the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (42 USC 103) as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA) and the Small Business Liability Relief and Brownfields Revitalization Act of 2002, and no concerns under the Toxic Substances Control Act of 1976 (15 USC 53).

3.10.2 Existing Conditions

Other than the prehistoric and historic features and artifacts associated with historic properties, the power lines that cross the PAS and the Atlas electrical substation in the northeast corner, there is no evidence of human activities affecting the location. There is no evidence of solid or hazardous wastes and no sign of hazardous or toxic materials in the proposed project area.

3.11 SUMMARY OF IMPACTS

Table 11 summarizes the contents of Section 3 by showing each resource and the potential impacts for each Alternative.

Table 11. Summary of Impacts

Resource	Preferred Alternative	Alternative 2: South Area	Alternative 3: Northeast Area	Alternative 4: West Area	No Action Alternative
Geology, Seismicity, and Soils	<p>No extensive deep excavations and no groundwater withdrawals are proposed. Construction of a PV array would not significantly disturb the underlying sedimentary geology of the project site or the surrounding area, nor would it affect local or regional seismic susceptibility.</p> <p>The project would require clearing and grading of several hundred acres. The negative long-term erosive impacts of disrupting the vegetative cover and soil crusts would be somewhat ameliorated as native vegetation re-establishes cover in the non-traffic areas of the site. Construction would adhere to a SWPPP to control erosion and soil loss.</p>	<p>Geology, seismicity, and soils impacts associated with this alternative would be essentially similar to the Preferred Alternative.</p> <p>The project could require clearing and grading of several hundred acres.</p>	<p>Geology, seismicity, and soils impacts associated with this alternative would be essentially similar to the Preferred Alternative.</p> <p>The project could require clearing and grading of several hundred acres.</p>	<p>Geology, seismicity, and soils impacts associated with this alternative would be essentially similar to the Preferred Alternative.</p> <p>The project could require clearing and grading of several hundred acres. Due to rougher topography, larger earthmoving efforts would be required.</p>	<p>The solar generating facility would not be constructed; thus the project site would not experience any changes to the existing geological, seismic, or soil conditions.</p>
Air Quality	<p>Temporary impairment of air quality would occur from the operation of construction equipment (combustion emissions) and disturbance of soils (fugitive dust) during site grading and placement of the PV system.</p> <p>Construction and operation of a solar generating facility would contribute to long-term beneficial impacts on regional air quality through reduction of demand on carbon-fueled generators.</p> <p>Some minor increase in long term fugitive dust emissions may impact HAFB operations and/or the town of Alamogordo. Re-establishing native vegetation after construction will minimize this possible impact.</p>	<p>Impacts to air quality associated with implementation of this alternative would be the same as for the Preferred Alternative.</p>	<p>Impacts to air quality associated with implementation of this alternative would be the same as for the Preferred Alternative.</p>	<p>Impacts to air quality associated with implementation of this alternative would be the same as for the Preferred Alternative.</p>	<p>Additional emission would not be generated under the No Action Alternative, and current fossil fuel related pollution would remain unchanged.</p> <p>The No Action Alternative would negatively impact the USAF's ability to meet Federal energy mandates and increase its use of renewable energy.</p>
Aesthetic and Noise	<p>The change in the visual character of the preferred development site would be distinctive, but only base personnel would be affected.</p> <p>Short term noise increase during construction. Noise from operations and maintenance would be imperceptible away from the site.</p> <p>Solar panel glass is designed to withstand sonic boom overpressures up to 75 psf (Rowell, D. Pers. Comm., December 2010; Schott Solar 2009). Sonic booms are reasonably expected to have no impact.</p>	<p>Aesthetics and noise impacts associated with this alternative would generally be the same as for the Preferred Alternative.</p>	<p>Aesthetics and noise impacts associated with this alternative would generally be the same as for the Preferred Alternative.</p>	<p>Aesthetics and noise impacts associated with this alternative would generally be the same as for the Preferred Alternative.</p>	<p>The viewshed of the project area would remain unchanged. Noise resources in and surrounding the project area would be unchanged from current conditions.</p>
Surface Water, Ground Water, and Floodplains	<p>Execution of the SWPP and BMPs would prevent potential impacts to surface water resources by controlling runoff from proposed action. No ground water and minimal potablewater is required for construction or operation on the site. Petroleum or hazardous materials in quantities large enough to be a hazard would not be on site.</p> <p>Construction design features and NPDES permit-related BMPs would incorporate soil contouring, drainage controls, and detention/retention swales, as appropriate. Construction would also follow the Holloman AFB spill response plan to protect water resources.</p>	<p>Impacts to surface water, ground water, and floodplains associated with implementation of this alternative would be the same as for the Preferred Alternative.</p>	<p>Impacts to surface water, ground water, and floodplains associated with implementation of this alternative would be the same as for the Preferred Alternative.</p>	<p>Impacts to surface water, ground water, and floodplains associated with implementation of this alternative would be the same as for the Preferred Alternative.</p>	<p>No impacts would occur to surface water, ground water, or floodplains.</p>
Biological	<p>Several hundred acres of vegetation would be directly impacted by any PV array configuration. Some loss of vegetation would be permanent. The site biome is not unique, being essentially similar over miles in any direction. Wildlife would be temporarily displaced by construction activities. Any wildlife species present in the project area at the time of construction are reasonably expected to avoid the disturbance.</p> <p>Of the threatened, endangered, and sensitive species known to occur in Otero County, only the burrowing owl was observed during field survey. Impacts may occur to this species as a result of the Preferred Alternative, but no owl burrows are in the 400 acre development site.</p>	<p>The area included under this alternative was not formally surveyed for biological resources. It can be assumed that the impacts associated with this alternative would be similar to the Preferred Alternative.</p>	<p>The area included under this alternative was not formally surveyed for biological resources. Other than less direct drainage into Rita's Draw, it can be assumed that the impacts associated with this alternative would be similar to the Preferred Alternative.</p>	<p>The area included under this alternative was not formally surveyed for biological resources. It can be assumed that the impacts associated with this alternative would be similar to the Preferred Alternative.</p> <p>Construction would adhere to a SWPPP, thereby preventing erosion of sediment. No impacts to the White Sands pupfish or its nearby essential habitat are expected.</p>	<p>Biological resources within the project area would be unchanged from current conditions under the No Action Alternative since no construction would occur.</p>

Resource	Preferred Alternative	Alternative 2: South Area	Alternative 3: Northeast Area	Alternative 4: West Area	No Action Alternative
Cultural	This proposed action would adversely affect historic properties. Known cultural resources on site were resurveyed to confirm their extent. Then consultation with the New Mexico State Historic Preservation Office resulted in further site evaluations, significance definitions, and a course of action that will be completed prior to development of the area. Data and artifacts that would otherwise be lost to the construction activities will be captured, analyzed, reported and curated for posterity.	Alternative 2 was not resurveyed for cultural resources. Previous surveys of the area identified very large NRHP-eligible sites related to the prehistoric period (Sale et al 1996a). Impacts associated with this site would be much greater than the Preferred Alternative.	Alternative 3 was not resurveyed for cultural resources. Previous research and surveys of the area identified several large NRHP-eligible sites especially relating to the Cold War (Sale et al 1996b). Impacts associated with this alternative would be similar to the Preferred Alternative.	The area included under this alternative was not resurveyed for cultural resources. Previous archaeological survey did not identify cultural resources in this site.	Cultural resources within the project area would not be impacted by the No Action Alternative.
Land Use	Land use within the project site would change from previously open, undeveloped land to a solar energy generating facility. The Preferred Site of 400 acres is 0.007 percent of the total HAFB acreage that would not be available for other uses.	Land use within the project site would change from previously open, undeveloped land to a solar energy generating facility. Less acreage for larger facility.	Land use within the project site would change from previously open, undeveloped land to a solar energy generating facility. No space for larger facility.	Land use within the project site would change from previously open, undeveloped land to a solar energy generating facility. No space for larger facility.	Under the No Action Alternative, the proposed project site would remain undeveloped and land use would be unchanged.
Socioeconomics and Environmental Justice	The action would be on Federal land and would not disproportionately impact low-income or minority individuals or families. The local economy would benefit from creation of a few high-tech jobs.	Impacts to socioeconomics and environmental justice concerns would be similar to the Preferred Alternative.	Impacts to socioeconomics and environmental justice concerns would be similar to the Preferred Alternative.	Impacts to socioeconomics and environmental justice concerns would be similar to the Preferred Alternative.	The socioeconomics of the area would not be impacted under the No Action Alternative.
Health and Safety	Solar arrays meet or exceed Federal Communications Commission (FCC) Part 15 (Enphase Energy 2008) and Mil Std 461E (DOD 1999) for electromagnetic emissions and are not a health or spectrum hazard. OSHA guidelines would be followed during construction. Black & Veatch (2011) determined that the maximum glare from PV panels is comparable to that of smooth water. No flight hazards of PV arrays reported at military or civilian airfields with PV solar facilities.	Health and safety impacts associated with this alternative would be the same as for the Preferred Alternative.	Health and safety impacts associated with this alternative would be the same as for the Preferred Alternative.	Health and safety impacts associated with this alternative would be the same as for the Preferred Alternative.	The health and safety issues relative to the project area would remain unchanged under the No Action Alternative. There would be no new electromagnetic emissions produced.
Solid Wastes	Expect a surge in crating/packing materials from the PV panels, during construction. A landfill for such material is <1 mile from the proposed site. Operation of the PV array would generate little if any solid waste.	Solid wastes would be essentially similar.	Solid wastes would be essentially similar.	Solid wastes would be essentially similar.	No solid waste impacts.
Hazardous or Toxic Wastes or Materials	Extensive research finds no evidence of either on site. Construction and operation of a PV array would not introduce either in quantities that would trigger CERCLA, RCRA, FHWA or TOSCA concerns.	Construction and operation of a PV array would not introduce quantities that would trigger concerns.	Construction and operation of a PV array would not introduce either in quantities that would trigger concerns.	Construction and operation of a PV array would not introduce either in quantities that would trigger concerns.	No hazardous or toxic wastes or materials impacts.

4.0 ENVIRONMENTAL CONSEQUENCES

Section 4 addresses the potential impacts on the specific environmental resources within or adjacent to the proposed project area, as discussed in Section 3.0. An impact (consequence or effect) is defined as a modification of the existing human or natural environment that would result from implementation of the proposed action. Impacts can be directly related to the action or indirectly caused by the action. Direct impacts are those effects that are caused by the action and occur at the same time and place (40 CFR 1508.8[a]). Indirect impacts are those effects that are caused by the action and are later in time or further removed in distance, but are still reasonably foreseeable (40 CFR 1508.8[b]). The effects can be temporary, short in duration (short-term), long lasting (long-term), or permanent. For purposes of this EA, temporary and short-term effects would occur during and immediately after construction of the proposed project. Long-term effects are defined as those lasting well beyond completion of the construction phase, while permanent impacts indicate an irretrievable loss or alteration.

The significance of impacts presented in this EA is based upon existing regulatory standards, scientific and environmental knowledge, and best professional opinions. Potential impacts presented for each affected resource are classified at one of three levels: significant, insignificant (or negligible), or no effect. Significant impacts are those effects that would result in substantial changes to the affected resource (40 CFR 1508.27) and should receive the greatest attention during the decision-making process. Insignificant impacts are those that would result in minimal or barely discernable changes to the existing environment.

4.1 GEOLOGY, SEISMICITY, AND SOILS

4.1.1 Potential Impacts

Alternative 1 - Preferred Alternative Site

Other than surface clearing, cable trenching and relatively shallow excavations for facility foundations, construction of a PV array would not disturb geologic resources at the project site or the surrounding HAFB area. The probability of seismic events in the region is considered low, and the PV project would not cause changes in geologic structures that effect seismicity. No groundwater would be withdrawn during construction activities that might contribute to subsidence; therefore, impacts on the geology or the seismicity of the area would not occur.

Negative long-term or permanent impacts may arise from the destruction of vegetation and soil crust (HAFB 2011; Rosentreter et al 2007). The disturbance of ground cover for construction and operation of the solar facility may result in a higher likelihood of wind carried particulates affecting HAFB and/or residents of the vicinity during high winds (HAFB 2011; Rosentreter, et al 2007). Measures to reestablish ground cover and BSC would lessen the direct impacts.

The project would require clearing and some grading of 400 hundred acres of topsoil and entail gravel spread on service traffic routes. The impact of disturbing vegetation and soil crusts is reasonably expected to diminish over time with reseeding and regrowth from seeds and BSC

spores remaining in the soil. This would cause short term change in general and long term impact in the trafficked areas; both are reasonably expected to not be significant..

A very small percentage of the PAS would be covered by impervious surfaces (e.g. pedestal foundations, junction manholes) that would slightly reduce the amount of soil surface available for infiltration and slightly increase the potential for surface runoff. However, the terrain of the PAS is gentle enough that runoff is highly unlikely to impact adjacent soils and arroyos, and overall project design will include measures to minimize erosive effects.

In accordance with EPA requirements, construction activities would conform to a National Pollutant Discharge Elimination System (NPDES) permit with preparation and implementation of a Stormwater Pollution Prevention Plan (SWPPP). Further, implementation of appropriate design, construction and post-construction Best Management Practices (BMPs) would reduce the potential for soil erosion. Impacts on soils are reasonably expected to not be significant.

Alternative 2 - Use of an Area South of the Preferred Alternative

Geology, seismicity, and soils impacts associated with this alternative would be essentially similar to the Preferred Alternative.

Alternative 3 - Use of an Area Northeast of the Preferred Alternative

Geology, seismicity, and soils impacts associated with this alternative would be essentially similar to the Preferred Alternative.

Alternative 4 –Use of an Area West of the Preferred Alternative

Geology, seismicity, and soils impacts associated with this alternative would be essentially similar to the Preferred Alternative.

Alternative 5 – No Action

Under the No Action Alternative, the solar generating facility would not be constructed; thus the project site would not experience any changes to the existing geological, seismic, or soil conditions.

4.2 AIR QUALITY

According to the EPA's General Conformity Rule (40 CFR 51, Appendix W), any proposed Federal action with the potential to cause violations in a nonattainment or maintenance area must undergo a conformity analysis. Such analysis is not required for areas in attainment with air quality standards. Since Otero County is an "Attainment Area" within all New Mexico and National Ambient Air Quality Standards (NAAQS), a conformity determination is not required.

4.2.1 Potential Impacts

Alternative 1 - Preferred Alternative

Temporary impairment of air quality would occur from the operation of construction equipment (i.e. combustion emissions) and disturbance of soils (i.e. fugitive dust) during site clearing and

grading and placement of the solar panels and conduit. During construction of the proposed action, proper and routine maintenance of all vehicles and other construction equipment would be followed to ensure that emissions are within the designated standards for construction equipment. BMPs for dust suppression, such as applying wetting solutions, would be implemented to minimize fugitive dust.

Any emissions discharged during construction of the proposed action would not be expected to cause a significant increase in local air pollutant concentrations, nor would the project be expected to result in nonattainment of NAAQS or New Mexico air quality standards. Construction and operation of a solar generating facility would contribute to long-term beneficial impacts on regional air quality through the reduced dependence on fossil fuels.

Detailed understanding of the impact of the project on ground cover is dependent on the final design of the solar PV array. Disturbance of the ground cover would be extensive but not permanent. In the short term windstorms could increase particulate emissions (blowing dust) and may briefly impact HAFB operations and/or the vicinity of Alamogordo, but differentiating any particulates contribution of the 400 acre PAS from that of the thousands of acres of dunes a few miles west would be problematic at best. At most, the PAS would cause an insignificant quantity of windblown particulates. This impact of disturbing vegetation and soil crusts is reasonably expected to diminish over time with reseeding and regrowth from seeds and BSC spores remaining in the soil.

Alternative 2 - Use of an Area South of the Preferred Alternative

Impacts to air quality associated with implementation of this alternative would be essentially similar to the Preferred Alternative.

Alternative 3 - Use of an Area Northeast of the Preferred Alternative

Impacts to air quality associated with implementation of this alternative would be essentially similar to the Preferred Alternative.

Alternative 4 –Use of an Area West of the Preferred Alternative

Impacts to air quality associated with implementation of this alternative would be essentially similar to the Preferred Alternative.

Alternative 5 – No Action

Additional emissions would not be generated under the No Action Alternative, and current fossil fuel related pollution would remain unchanged. The No Action Alternative would negatively impact the HAFB's ability to meet Federal energy mandates and would not increase the use of renewable energy.

4.3 AESTHETIC AND NOISE RESOURCES

4.3.1 Potential Impacts

Although there are no Federal laws specifically protecting visual resources, both Federal and State land managing agencies and local governments have the option to adopt regulations to

protect resources within their jurisdiction. Agencies or local jurisdictions may establish standards of visual value but none have been applied to the vicinity. The degree to which an action would modify the existing visual milieu is used to assess the level of impact.

Noise is characterized quantitatively, but noise impacts are also considered qualitatively. The degree of impact from noise is characterized based on the sensitivity of affected areas to noise, and relative changes to the ambient noise environment. Noise impacts are generally addressed as being generated by a project but, in this case, potential impacts to the PV array from impulsive noise generated by aircraft were also raised as a concern.

Alternative 1 - Preferred Alternative

The visual character of the preferred project area would change due to the placement of PV panels in an array covering several hundred acres. From ground level, the current view of native vegetation with a few power lines and trails would become one of numerous vertical supports and large, flat PV panels. From the air immediately above the array, it would appear as a large, somewhat shiny surface. HAFB personnel accessing the base via Vandegrift road or aircraft flying overhead would be the receptors of the aesthetic change. Both are unlikely to consider the panels an adverse impact to the aesthetics of the area.

PV solar arrays produce no noise in and of themselves. During periods of high wind, turbulent airflow over the structures might result in low noise but it would be expected to be localized and intermittent. Most noise associated with the array would be during construction and routine maintenance operations. Both would be short-term insignificant impacts.

Sonic booms, associated with aircraft overflights, produce brief overpressures that generally do not exceed 10 psf. The glass in solar panels is designed to withstand overpressures of from 33 to 75 psf (Rowell, D. Pers. Comm., December 2010; Schott Solar 2009). Experience at Luke AFB, where PV arrays are quite close to the airfield, substantiates a lack of impacts on PV cells. Sonic boom overpressures are anticipated to have no effect on the proposed undertaking.

Alternative 2 - Use of an Area South of the Preferred Alternative

Aesthetics and noise impacts associated with this alternative would be essentially similar to the Preferred Alternative.

Alternative 3 - Use of an Area Northeast of the Preferred Alternative

Aesthetics and noise impacts associated with this alternative would be essentially similar to the Preferred Alternative.

Alternative 4 –Use of an Area West of the Preferred Alternative

Aesthetics and noise impacts associated with this alternative would be essentially similar to the Preferred Alternative.

Alternative 5 – No Action

The view shed of the project area would remain unchanged under the No Action Alternative. Noise conditions in and surrounding the project area would be unchanged from current conditions under the No Action Alternative.

4.4 WATER RESOURCES

4.4.1 Potential Impacts

Alternative 1 - Preferred Alternative

As may be required by EPA regulations, construction activities would conform to a NPDES permit and SWPPP. The SWPPP would outline storm water management controls designed to reduce soil erosion and minimize the potential for impacts to surface water, ground water, and floodplains. Construction design features and permit-related BMPs would incorporate soil contouring, drainage controls, and detention/retention swales, as appropriate. Following construction, disturbed areas not covered with impervious surfaces would be reestablished in native seed mixtures, and managed to minimize future erosion potential.

To minimize the risk of spills or accidental releases of waste or hazardous materials, construction operations would comply with equipment maintenance due diligence and comply with the HAFB Spill Prevention, Control, and Countermeasures Plan.

There are no wetlands, no surface water ponding areas and no appreciable drainage courses within the PAS. Light precipitation infiltrates or evaporates rapidly. Severe precipitation events result in sheet-wash and minor rivulets that flow to relatively level areas and infiltrate. The ground water is saline, not potable and not regulated. The PAS is not in a floodplain and no wetlands are in or nearby the proposed location. It is reasonably expected that there will be no significant impacts to surface water, ground water, wetlands or floodplains.

Alternative 2 - Use of an Area South of the Preferred Alternative

Impacts to surface water, ground water, and floodplains associated with implementation of this alternative would be essentially similar for the Preferred Alternative.

Alternative 3 - Use of an Area Northeast of the Preferred Alternative

Impacts to surface water, ground water, and floodplains associated with implementation of this alternative would be essentially similar for the Preferred Alternative.

Alternative 4 –Use of an Area West of the Preferred Alternative

Impacts to surface water, ground water, and floodplains associated with implementation of this alternative would be essentially similar to the Preferred Alternative. Although Malone Draw is located immediately to the west of this alternative's boundary, proper execution and design of erosion control techniques outlined in a SWPPP, would prevent impacts to water resources.

Alternative 5 – No Action

Under the No Action Alternative, no impacts would occur to surface water, ground water, or floodplains.

4.5 BIOLOGICAL RESOURCES

4.5.1 Potential Impacts

Alternative 1 - Preferred Alternative

Vegetation

With implementation of the Preferred Alternative, up to 400 acres of vegetation would be directly impacted. Depending on the PV array configuration, a portion of the impacts to vegetation and soil crusts would continue throughout the economic life of the PV installation. Spaces within the array that are not regularly impacted by maintenance activities and service vehicle traffic are reasonably expected to host natural regeneration of soil crusts and vegetation. Further, the developer will be responsible for reseeding disturbed areas with native plant seed mix as required by base policy (INRMP, 2011).

Although the INRMP identifies the biota of the proposed project location as worthy of preservation, the land surrounding the project site includes thousands of acres of essentially similar native vegetation, both on and off HAFB. The PAS comprises 0.007 percent of the north area of HAFB (0.0068 of the entire base land area). The short term loss and long term partial restoration of the vegetation cover is reasonably considered not a significant impact on the regional biota and is not thought to cause a significant decrease in available habitat.

African rue, a New Mexico Class B noxious weed, and Russian thistle, a HAFB invasive species, were observed in the preferred project area. Control measures (i.e. pressure washing equipment, avoiding traffic through existing concentrations) as outlined within the INRMP (HAFB 2011) would be implemented during construction to decrease the probability of new infestations and the spread of existing colonies.

Wildlife

Under the Preferred Alternative, wildlife activities would likely be temporarily displaced during construction activities. Mobile species, such as birds, mammals, and reptiles, are reasonably expected to avoid the site during construction and migrate to the extensive suitable habitat surrounding the project site. There are no known migratory mammals in this region and no visible game trails in the proposed project area. In order to minimize impacts on migratory birds, pre-construction surveys would be conducted during the March through September nesting season or construction activities would take place out of the nesting season. Any active nests imperiled would be marked and avoided until the young have successfully fledged and left the nest. Construction efforts will comply with these requirements as appropriate to assure no significant impacts to migratory birds.

Threatened, Endangered, and Sensitive Species (TES)

Plants – Federal and State listed plant species are not known to be present in the survey area. Three specimens of grama grass cactus, a HAFB INRMP sensitive species, were observed to the south of the PAS and will not be impacted. No impact on TES plants is expected.

Wildlife – During the pedestrian survey, threatened and endangered wildlife species were not observed within the PAS. Federal SOC burrowing owl and New Mexico sensitive loggerhead shrike were observed in flight during the pedestrian survey and owl burrows were identified south of the PAS during the pedestrian survey. Suitable habitat for Baird’s sparrow, common hog nosed skunk, pale Townsend’s big-eared bat, occult little brown myotis bat, fringed myotis bat, long-legged myotis bat, western small-footed myotis bat, cave myotis bat, and big free-tailed bat was observed within and adjacent to the preferred project area, but the scarcity of surface water in the vicinity makes it unlikely that these species reside in the PAS. There are no indications that the proposed project would impact TES animals.

The PAS is located well north of an “area of concern” in Rita’s Draw defined for the White Sands pupfish. Essential habitat for this species does not occur within the PAS vicinity; but occurs at the confluence of Malone and Rita’s Draw, located southwest of Alternative Site 4 (HAFB 2011). Under an existing cooperative agreement, HAFB, WSMR, NMDGF and the USF&WS collaborate to prevent the pupfish from being adversely affected by implementation of any projects (HAFB 2011).

The proposed PV development is not projected to impact species of concern. No TES are resident in or nearby the PAS. No significant impact on wildlife or vegetation is anticipated.

Alternative 2 - Use of an Area South of the Preferred Alternative

The area included under this alternative was not formally resurveyed for biological resources, but has been transected by the continuous survey program conducted under the HAFB INRMP. The landform and biological community is essentially the same as the PAS. It is reasonably expected that the impacts of this alternative would be similar to the Preferred Alternative.

Alternative 3 - Use of an Area Northeast of the Preferred Alternative

The area included under this alternative was not formally resurveyed for biological resources, but has been transected by the continuous survey program conducted under the HAFB INRMP. The landform and biological community is essentially the same as the PAS. It is reasonably expected that the impacts of this alternative would be similar to the Preferred Alternative.

Alternative 4 –Use of an Area West of the Preferred Alternative

The area included under this alternative was not formally resurveyed for biological resources, but has been transected by the continuous survey program conducted under the HAFB INRMP. The landform and biological community is essentially the same as the PAS. It is reasonably expected that the impacts of this alternative would be similar to the Preferred Alternative. The pupfish habitat at the confluence of Rita’s and Malone Draws is near this alternative. Construction would be required to adhere to a SWPPP and runoff detention design, to prevent erosion of sediment into the habitat. No impacts to the White Sands pupfish or its essential habitat would be expected.

Alternative 5 – No Action

Biological resources within the project area would be unchanged from current conditions under the No Action Alternative since no construction would occur.

4.6 CULTURAL RESOURCES

4.6.1 Potential Impacts

Alternative 1 - Preferred Alternative

Initial inventory and subsequent testing and evaluation of historic properties within the Area of Potential Effect determined that National Register eligible archaeological remains are present at seven locations and would be adversely affected by development of the PAS. The NM SHPO has concurred with those eligibility and effects determinations. Further consultation with the SHPO has defined the actions required to ameliorate the adverse effects through recovery and analysis of materials and data, publication of the findings, and the curation of the recovered materials and data in a 36 CFR 79 compliant facility.

A Memorandum of Agreement (MOA) between HAFB and the NM SHPO is being completed contemporary with this EA and the ACHP has been notified. The steps defined by the MOA will be completed prior to any proposed development. The data recovery will adequately preserve information important to regional history and prehistory from each of the NRHP eligible historic properties, resulting in an insignificant impact on cultural resources due to use of the PAS.

Alternative 2 - Use of an Area South of the Preferred Alternative

The area included under this alternative was not resurveyed for cultural resources for this currently proposed action. However, previous survey of this area identified several large, high density, NRHP-eligible concentrations of prehistoric materials (Sale et al 1996a). One small test excavation recovered materials that apparently date to 8000 years before present (HAFB 2014). Impacts on historic properties associated with Alternative 2 are reasonably expected to be greater than the adverse effects on historic properties within the PAS.

Alternative 3 - Use of an Area Northeast of the Preferred Alternative

The area included under this alternative was not resurveyed for cultural resources under the proposed action. However, previous surveys of the area identified several large NRHP-eligible sites especially relating to the Cold War (Sale et al 1996b; HAFB 2014). Cultural resources impacts associated with this alternative would be similar to the Preferred Alternative.

Alternative 4 –Use of an Area West of the Preferred Alternative

The area included under this alternative was previously surveyed for cultural resources and no potentially significant remains were identified (HAFB 2014).

Alternative 5 – No Action

Cultural resources within the project area would be unchanged from current condition under the No Action Alternative since no construction would occur.

4.7 LAND USE

4.7.1 Potential Impacts

Alternative 1 - Preferred Alternative

The project site is currently part of a Federal military installation and would remain so under the Preferred Alternative. Land use within the project site would change from previously open, undeveloped land to an almost completely reworked surface with an installed photovoltaic electrical generating facility. This would constrain any other development of the parcel for the life of the facility.

The proposed facility would be compatible with HAFB's plan to increase renewable energy use, compatible with base planning constraints and opportunities, and congruent with national renewable energy guidance. This 400-acre change would affect 0.0068 percent of the total base acreage, and is reasonably expected to have no significant impacts on on-base or off-base land uses, with the exception of precluding any other development on the PAS.

Alternative 2 - Use of an Area South of the Preferred Alternative

Impacts on land use under this alternative would involve a slightly smaller (~300 acres) parcel than the Preferred Alternative. Additional road, substation and/or high voltage power line construction would be required.

Alternative 3 - Use of an Area Northeast of the Preferred Alternative

Impacts on land use acreage under this alternative would be slightly less than the Preferred Alternative. Missile range test equipment stations would have to be avoided or relocated.

Alternative 4 –Use of an Area West of the Preferred Alternative

Impacts on land use under this alternative would be smaller than the other alternatives, but more than a mile of high voltage power line construction right of way would be required.

Alternative 5 – No Action

Under the No Action Alternative, the proposed project site would remain undeveloped and land use would be unchanged.

4.8 SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE

4.8.1 Potential Impacts

Alternative 1 - Preferred Alternative

The project area and surroundings are Federal Land Withdrawn for Military Purposes. There is no public zoning in effect and no neighborhood closer than six miles. Placement of solar panels would mildly affect the socioeconomic environment of the area by providing construction jobs and a few long term operating jobs. The proposed undertaking is located a few miles from any area populated by the low-income and minority populations summarized in Table 11. Construction and operation of the proposed solar generating facility would not disrupt existing

community structure since all activities would occur within HAFB. Therefore, the action would not disproportionately impact low-income or minority individuals or families.

Alternative 2 - Use of an Area South of the Preferred Alternative

Under this alternative, impacts to socioeconomics and environmental justice impacts would be similar to the Preferred Alternative.

Alternative 3 - Use of an Area Northeast of the Preferred Alternative

Under this alternative, impacts to socioeconomics and environmental justice impacts would be similar to the Preferred Alternative.

Alternative 4 –Use of an Area West of the Preferred Alternative

Under this alternative, impacts to socioeconomics and environmental justice impacts would be similar to the Preferred Alternative.

Alternative 5 – No Action

The No Action Alternative would not disproportionately affect minority or low-income households or individuals since no construction would occur. The socioeconomics of the area would not be impacted under the No Action Alternative.

4.9 HEALTH AND SAFETY

4.9.1 Potential Impacts

Alternative 1 – Preferred Alternative

All electrical generating and transfer equipment produces electromagnetic emissions during operation. The power production by the proposed solar panels is not anticipated to produce emissions that would be measureable at any distance away from the panels. Conversion of the direct current (DC) produced by the panels to alternating current (AC) for transmission through the power grid requires use of inverters, which may produce electromagnetic emissions that could potentially be measured at some distance from the device. The safety of individuals constructing, maintaining and visiting the solar array is subject to good management practices and OSHA guidelines that would be followed to minimize the potential for impact to personnel.

There have been public concerns that electromagnetic radiation (EMR) emissions could impact the health of persons traversing or working nearby but extensive long term studies of electrical utility infrastructure EMR have not substantiated any hazard. Concern that the emissions could potentially interfere with aircraft flight operations by impacting flight electronics was also expressed. The currently available equipment used in solar arrays meets or exceeds Federal Communications Commission (FCC) Part 15 (Enphase Energy 2008) and Military Standard 461E (DOD 1999) for allowable electromagnetic emissions, and are reasonably expected to not constitute any health or aircraft hazard. Recent experience with PV development at Nellis AFB and Luke AFB supports this conclusion.

Light reflection from the panels was a concern expressed during scoping. Questions were raised whether the PV array would be a source of glare and potential ocular after-image hazard for pilots. A study by Black & Veatch (2011) determined that the maximum glare resulting from PV panels is comparable to that of smooth water. PV panels are covered with glass that is specially designed to transmit as much sunlight as possible, hence reducing reflection of sunlight to a minimum (Atizado, W.J., November 2010, Pers. Comm., Rowell, D., Pers. Comm., December 2010). Although some glare hazard exists, it is relatively low compared to snow, structural glass, and the commonly used light colored runway concrete (Black & Veatch 2011).

No flight hazards related to PV arrays have been reported at other military installations or civilian airfields with solar generating facilities (Black & Veatch 2011), thus the impact on HAFB flying and personnel under the Preferred Alternative is expected to be negligible. No significant impacts on human health or safety are predicted to result from PV development on the PAS.

Alternative 2 - Use of an Area South of the Preferred Alternative

Health and safety impacts associated with this alternative would be the same as for the Preferred Alternative.

Alternative 3 - Use of an Area Northeast of the Preferred Alternative

Health and safety impacts associated with this alternative would be the same as for the Preferred Alternative.

Alternative 4 –Use of an Area West of the Preferred Alternative

Health and safety impacts associated with this alternative would be the same as for the Preferred Alternative.

Alternative 5 – No Action

The health and safety issues relative to the project area would remain unchanged under the No Action Alternative.

4.10 SOLID WASTE, HAZARDOUS MATERIALS AND WASTE, TOXIC MATERIALS

No solid waste is currently located on the PAS. Solid waste, mostly solar panel packing and crating materials, would be generated during the construction phase of the project. Any solid waste will be recycled to the extent possible through the HAFB Recycling Program and non-recyclable materials will be disposed in state permitted landfills.

No petroleum or hazardous waste storage or processing has occurred on the proposed project location, and none will be allowed. The construction and operation of the project would likely entail small quantities of vehicle and equipment maintenance materials and wastes that will be managed in accordance with established HAFB procedures and would not constitute a significant concern.

One incident of polychlorinated biphenyl contamination is on record in association with early maintenance activities at the Atlas Substation. A small spill that became environmental restoration site “DP-43 AOC-6” was documented in 1995, then remediated and closed-out in 1996. No further action is required at this site.

All the Alternatives and all HAFB properties have been the subject of extensive document and field research for contamination under both the Installation Restoration Program and the Military Munitions Remediation Program. Although numerous remediation sites have been found in other areas, neither program has identified any concerns with the proposed project location. Likewise, while conducted for other purposes, the intensive pedestrian survey for cultural and biological resources reported no evidence of past human activities that would lead to contamination concerns within the PAS. The bullets reported south of the PAS are likely lead, are thus toxic, and will be dealt with by existing remediation programs. Any individual munitions, hazardous or potentially toxic items encountered during construction will be dealt with through the appropriate existing protocol for the character of the find.

The reasonable expectation is that no significant impacts related to solid wastes, hazardous materials and waste, or toxic substances would be associated with or result from the proposed project.

4.11 CUMULATIVE IMPACTS

Cumulative impacts are incremental impacts accumulated over time, which result from the implementation of the proposed action or action alternatives and other past, present, and reasonably foreseeable future actions regardless of the agency or person undertaking such other actions. Cumulative impacts can result from individually minor, but collectively significant actions taking place over a period of time. Reasonably foreseeable future actions refer to future action projections, or estimates, of undertakings likely to occur.

In the event of future major solar projects in undeveloped areas of the Tularosa Basin, observable if not significant cumulative impacts may arise from the disturbance of soil crusts (HAFB 2011; Rosentreter et al 2007). The disturbance of ground cover for construction and operation of massive solar facilities would have some long-term impacts on soil stability and result in a higher likelihood of airborne fine particulates during high winds; although, discerning those manmade impacts from the massive clouds of particulates generated by winds across the 250 square miles of natural gypsum dunes and flats in the west central Tularosa Basin would be difficult. Through design requirements to minimize initial ground disturbance, re-vegetate all but regularly trafficked areas, and gravel the trafficked areas, fugitive dust impacts from PV development would be considerably lessened.

Present and reasonably foreseeable future projects in the region of the proposed project include:

- SunZia Southwest Transmission Project – Construction of two transmission lines across central and southwestern New Mexico to Arizona to service western power markets and load centers, distant from HAFB with no known interrelationship and differing cumulative effects;
- High Plains Express Transmission Project – Construction of two transmission lines extending from Wyoming, through Colorado and New Mexico, to Arizona, possibly with a substation near WSMR or an interconnection with the proposed SunZia project. This is also distant from HAFB with no known interrelationship and differing cumulative effects;
- Red Sands Solar Energy Zone (SEZ) Solar Development – Development of 10,000 – 30,000 acres over a 20-year period for utility-scale solar energy projects, 20+ miles south of HAFB, this development on Bureau of Land Management acreage of red sand dunes partially stabilized by mesquite brush (quite dissimilar to the PAS) would dwarf the 400 acre development on HAFB in size and impacts. Other than being driven by public policy and desire for renewable energy there is no known interrelationship beyond possible cumulative increases in airborne particulates and lower fossil fueled generation greenhouse gas emissions for the region;
- Alamogordo Regional Water Supply Project – Construction and installation of 10 ground water wells, a desalinization plant, booster pump station, and associated water transmissions lines, impacts from 6 to 30 miles distant from HAFB, with no known interrelationship; and
- On-going military activities at HAFB and neighboring WSMR that generally impact small acreages. No projects are known that would interact with the small impacts of the proposed HAFB PV development.

Long-term beneficial cumulative impacts would occur for HAFB from a greater use of renewable energy and possible reduced energy costs. HAFB would achieve a degree of self-sufficiency in its energy consumption and that would reduce the load on the regional electric service network. Over time this could result in cost savings to the USAF.

Also over the long-term and across the region, the development of the proposed action and other solar energy related projects would contribute beneficial cumulative impacts to air quality from the reduction in fossil fuel energy consumption and reduced greenhouse gas emissions. Development of the proposed action and other solar energy related projects could also result in long-term cumulative beneficial impacts on the socioeconomics of the region through the creation of jobs, greatest during facility construction, but of long term value during operations.

5.0 PUBLIC AND AGENCY COORDINATION

Preparation of the EA was conducted in consultation with Federal, State, Tribal and local agencies. The specific agencies contacted and receipt date of their response appears in Table 12. Copies of the letters as mailed and agency responses are contained in Appendix C.

The USAF provides the public the ability to submit oral and written comments concerning the proposed action. Comments generated by the public and the published Public Notice will be included in Appendix D of the final edition of this environmental assessment.

Table 12. Agency Coordination

Agency	Individual Contacted	Title	Mailing Date	Response Date
City of Alamogordo	Susie Galea	Mayor	25 Mar 2013	none
Village of Tularosa	Ray S. Cordova	Mayor	25 Mar 2013	none
Alamogordo Chamber of Commerce	Richard Koehler	Chairman	25 Mar 2013	none
Otero County Commission	Ronny Rardin Susan Flores Tommie Herrell	Chairman and Commisioners	25 Mar 2013	none
Mesa Verde Enterprises	Timothy A. Rabon	Adjacent land owner	25 Mar 2013	none
Mescalero Apache Tribe	Frederick Chino Sr. Holly Houghton	President Tribal HPO	25 Mar 2013 31 Mar 2015 09 Nov 2015	none
New Mexico EMNRD Forestry Division	Bob Sivinski	NEPA Coordinator	25 Mar 2013	none
New Mexico State Land Office	Ray Powell	Commissioner (Adjacent land owner)	25 Mar 2013	none
New Mexico Department of Game and Fish	Lisa Kirkpatrick	Chief, Conservation Services	25 Mar 2013	08 Apr 2013
New Mexico Environment Department	Gedi Cibas	Environmental Impact Review Coordinator	25 Mar 2013	none
New Mexico Historic Preservation Division	Jeff Pappas, PhD.	State Historic Preservation Officer	25 Mar 2013 24 Oct 2013 05 Dec 2013 21 Nov 2014 24 Feb 2015	IICEP 22 Nov 2013 07 Jan 2014 29 Dec 2014 22 Apr 2015
		Research Plan Approved	28 July 2015	30 July 2015
U.S. Fish & Wildlife Service, New Mexico	Susan MacMullin	Field Supervisor	25 Mar 2013	none
USDA Forest Service Lincoln National Forest	Patti Turpin	NEPA Coordinator	25 Mar 2013	none

Agency	Individual Contacted	Title	Mailing Date	Response Date
USDA Natural Resources Conservation Service	J. Xavier Montoya	State Conservationist	25 Mar 2013	02 Apr 2013
USDOJ Bureau of Land Management, Las Cruces District	Jennifer Montoya	Planning and Environmental Coordinator	25 Mar 2013	none
U.S. Environmental Protection Agency, Region 6	Debra Griffin	Associate Director	25 Mar 2013	none
National Park Service White Sands National Monument	Maria Frias Sauter	Superintendent	25 Mar 2013	05 Apr 2013
Department of the Army White Sands Missile Range	Debra Hartell	NEPA Support, Environment and Safety Directorate	25 Mar 2013	none

Table 13. Public Information and Outreach

Location	Audience	Times	Date	Responses
City of Alamogordo City Commission Public Meeting	Mayor, Mayor Protem 5 Commissioners 8 Staff 38 Citizens	1	20 Jan 2015	Mayor Pro Tem very supportive, general verbal approval, 7 citizens requested and received info flyer, No written responses
City of Alamogordo Planning Commission Public Meeting	4 Commissioners 4 City Staff 12 Citizens	1	20 Jan 2015	General verbal approval, 2 citizens requested and received info flyer, No written responses
Otero County County Commission Public Meeting	3 Commissioners 8 County Staff 43 Citizens	1	12 Feb 2015	General verbal approval, 5 citizens requested and received info flyer, No written responses
Otero County Planning Commission Public Meeting	4 Commissioners 3 County Staff 1 Citizen	1	10 Feb 2015	General verbal approval No written responses
“Holloman Happenings” Radio PSA aired on KRSY-FM 92.7 KNMZ-FM 103.7 KRSY-AM 1230	Alamogordo, Tularosa, La Luz, Holloman AFB and vicinity	3 stations 2 per day 7 days 42 total aired	26 Jan 2015 Thru 1 Feb 2015	No responses
Posted on Holloman Public Affairs Website	Open to public	Available 24-7	Posted 26 Jan 2015	No responses
Notice of Availability Published in the Alamogordo Daily News	Local region	To Be Determined	Contemporary With release of this EA	To be determined

6.0 LIST OF PREPARERS

The EA was prepared by Zia Engineering & Environmental Consultants, LLC under United States Army Corps of Engineers (USACE) contract number W912PP-10-T-0089. Zia’s points of contact with the USACE-SPA were Walter Migdal, SPA, Trent Simpler, Carol Brewer and Teresa King. Zia’s point of contact with HAFB was Andrew R. Gomolak, “JR”, Geologist-Archaeologist for the Installation Management Flight of the 49th Civil Engineer Squadron. Following are the names of those primarily responsible for preparation the document.

Table 14. List of Preparers

Name	Agency/Organization	Role	Qualifications
Fenton R. Kay, Ph.D.	Zia Engineering & Environmental Consultants, LLC	Project Manager, NEPA Coordinator, QAQC	35 years’ experience in Natural Resources and NEPA Studies
Jennifer K. Hyre	Zia Engineering & Environmental Consultants, LLC	Author, Biological Resources, NEPA Specialist	11 years’ experience in Natural Resources and NEPA Studies
Leah R. Markiewitz	Zia Engineering & Environmental Consultants, LLC	Biological Resources, NEPA Specialist, QAQC	8 years’ experience in Natural Resources and NEPA Studies
Victor R. Gibbs, M.A., RPA	Zia Engineering & Environmental Consultants, LLC	Cultural Resources, Principal Investigator	20 years’ experience in Cultural Resources
David Vaughan, J.D., Ph.D.	Zia Engineering & Environmental Consultants, LLC	Cultural Resources, QAQC	16 years’ experience in Cultural Resources, 10 years’ experience practicing law
Victoria T. Brown, M.A.	Zia Engineering & Environmental Consultants, LLC	Cultural Resources, Historian, Health and Safety	8 years’ experience in Cultural Resources, 13 years Environmental Studies
Lora Jackson Legare, M.A.	Zia Engineering & Environmental Consultants, LLC	Cultural Resources	13 years’ experience in Cultural Resources
Robert Deitner	Zia Engineering & Environmental Consultants, LLC	GIS Specialist	16 years GIS analysis
Bennie Benavidez	Zia Engineering & Environmental Consultants, LLC	GIS Specialist	6 years GIS analysis
Robert Sabie	Zia Engineering & Environmental Consultants, LLC	GIS Specialist	3 years GIS analysis

Name	Agency/Organization	Role	Qualifications
Jon Williams	Zia Engineering & Environmental Consultants, LLC	GIS Specialist	5 years GIS analysis
Andrew R Gomolak	Holloman AFB Civil Engineer Sqd. NEPA Manager	Editor, Contributor	39 years Cultural Resources 24 years NEPA Analysis

REFERENCES

Amick, D.S.

- 1994 *Folsom Diet Breadth and Land Use in the American Southwest*.
Doctoral Dissertation. University of New Mexico, Albuquerque.

Anderson, David, Ph.D. – WSMR Natural Resources Manager

- 2014 Personal Communication.

Atizado, Walton Jan; SunPower Technical Support; Email, November 18, 2010.

Beckett, P. H., and T. L. Corbett

- 1992 *The Mansos Indians*. COAS Publishing and Research, Las Cruces.

Black & Veatch

- 2011 *Flat Plate PV Glare Study*. NV Energy. January 2011.

Carmichael, D.L.

- 1986 *Archaeological Survey in the Southern Tularosa Basin of New Mexico*.
Historic and Natural Resources Report No. 3. Environmental Management
Office, Directorate of Engineering and Housing, United States Army Air Defense
Artillery Center, Fort Bliss, Texas.

Chronic, Halka.

- 1987 *Roadside Geology of New Mexico*. Mountain Press Publishing Company,
Missoula.

Condon, Peter C and Timothy Graves

- 2013 Research Design and Work Plan (for) NRHP Evaluation and Data Recovery at
13 Archaeological Sites in the Proposed Atlas Photovoltaic Development
Footprint, Holloman Air Force Base, Otero County, New Mexico, Geo-Marine Inc.
for the US Army Corps of Engineers, Fort Worth, TX

Department of Defense

- 1999 *Department of Defense Interface Standard, Requirements for the Control of
Electromagnetic Interference Characteristics of Subsystems and Equipment
MIL-STD-461E*. August 20, 1999.

Department of Energy WINDEXchange

- 2010 *New Mexico Wind Resource Map and Wind Potential Capacity*.
http://apps2.eere.energy.gov/wind/windexchange/wind_resource_maps.asp?stateab=nm

Enphase Energy

2008 *Installation and Operations Manual*. Enphase Micro-Inverter Models M175 and M200, p. 3.

FEMA Federal Emergency Management Agency

2010 *Otero County, New Mexico and Incorporated Area*. Flood Insurance Rate Map. Map Number: 35035C0925D. December 17, 2010.

Gibbs, Victor T. with Lora Jackson, Victoria Brown, Leah Markiewitz and Robert Dietner

2010 Final Cultural Resources Survey of 800 Acres for a Proposed Solar Facility on Holloman Air Force Base, Otero County, New Mexico, Zia Engineering & Environmental for the US Army Corps of Engineers, Albuquerque, NM

Gomolak, Andrew R., Civ USAF ACC 49 CES/CEAO Holloman AFB

2010 Personal Communications. December 7.

Gomolak, Andrew R. HAFB Cultural Resources Program Manager and NEPA Technical Representative

2012 Personal Communication based on HAFB Cultural Resources Records

2013 New Mexico State Historic Preservation Office Inventory Consultation Package, 49th Civil Engineer Squadron, Holloman Air Force Base, October 2013.

2014 New Mexico State Historic Preservation Office Evaluation Consultation Package, 49th Civil Engineer Squadron, Holloman Air Force Base, November 2014.

2015 New Mexico State Historic Preservation Office Data Recovery Plan and MOA Package, 49th Civil Engineer Squadron, Holloman Air Force Base, 24 February 2015.

2015a Personal communication

Graves, Timothy, Peter C Condon, Juan Arias and Melinda Landreth

2014 *Interim Report for the NRHP Eligibility Evaluation and Data Recovery at 13 Archaeological Sites in Proposed Atlas Photovoltaic Development Footprint, Holloman Air Force Base, Otero County, New Mexico*, GeoMarine Report No. 829EP for the US Army Corps of Engineers, Fort Worth, TX

Griffin, David G. HAFB Water Program Manager

2015 Personal Communication

Griffith, G.E., J.M. Omernik, M.M. McGraw, G.Z. Jacobi, C.M. Canavan, T.S. Schrader, P.J. Mercer, R. Hill, B.C. Moren.

2006 *Ecoregions of New Mexico (color poster with map, descriptive text, summary tables, and photographs)*. Reston, Virginia. U.S. Geologic Service (map scale 1:1,400,00).

Holloman Air Force Base

2011 *Integrated Natural Resource Management Plan*. 49 CES/CEA Holloman Air Force Base, New Mexico. April.

2014 Base-wide Cultural Resources, Historic Properties and Archaeological Sites Data Files

2015a Installation Restoration Program map and records

2015b Military Munitions Remediation Program map and records

Hoppes, Larry B., HAFB Bombing and Gunnery Range Manager

2011 Personal Communication

Huff, G.F.

2004 *Simulation of Ground-Water Flow in the Basin-Fill Aquifer of the Tularosa Basin, South-Central New Mexico*, Predevelopment through 2040. USGS Scientific.

Hyre, Jennifer K. with Fenton R. Kay, Leah R. Markiewitz and Bennie Benavidez

2011 Final Biological Survey of 800 Acres for Proposed Photovoltaic Development at Holloman Air Force Base, Otero County, New Mexico, Zia Engineering & Environmental for the US Army Corps of Engineers, Albuquerque, NM

IDcide – Local Information Data Server

2010 *Holloman AFB, New Mexico*. <http://www.idcide.com/weather/nm.htm>. Accessed October 22, 2010.

Inhabit.com

2011 *Photo gallery: Largest Solar Array in Europe*. <http://inhabitat.com/largest-solar-plant-in-europe-set-to-open-in-italy/solar-panel-array/>. (Accessed January 13, 2011)

Irwin-Williams, C.

1979 *Post-Pleistocene Archaeology, 7000-2000 B.C. In Southwest*, edited by Alfonso Ortiz, pp. 31-42. Handbook of North American Indians, vol. 9, W.C. Sturtevant, general editor. Smithsonian Institution, Washington, D.C.

Joho Joho

- 2010 *Bing fotos: Photovoltaic arrays tilted to sun in Chino Valley, Arizona.*
<http://bingfotos.blogspot.com/2010/05/photovoltaic-arrays-tilted-to-sun-in.html>.
Last updated: May 31, 2010. Accessed January 13, 2011.

Julyan, Robert

- 1998 *The Place Names of New Mexico.* University of New Mexico Press, Albuquerque

Krivokapich, G. A. CTR USAF ACC 49 CES/CEAO

- 2010 Personal Communications. November 17.

LeBlanc, S. A. and M. E. Whalen

- 1980 *An Archaeological Synthesis of South-Central and Southwestern New Mexico.*
University of New Mexico Office of Contract Archaeology, Albuquerque.

Lehmer, D.

- 1948 *The Jornada Branch of the Mogollon.* University of Arizona Social Science
Bulletin 17.

MacNeish, R. S. and P. H. Beckett

- 1987 *The Chihuahua Archaic Tradition of South-Central New Mexico and
Chihuahua, Mexico.* COAS Publishing and Research Center, Las Cruces.

Miller, M.R., and N.A. Kenmotsu

- 2004 *Prehistory of the Eastern Trans-Pecos and Jornada Mogollon Regions of West
Texas.* In *The Prehistory of Texas*, edited by T.K. Pertulla, pp. 205-265. Texas
A&M Press, College Station, Texas.

New Mexico Bureau of Geology and Mineral Resources

- 2008 *Earthquake catalogs for New Mexico and bordering areas-1962-1998, moment
magnitude ≥ 3.0 , Remainder of New Mexico.* New Mexico Tech, Socorro, NM.
<http://geoinfo.nmt.edu/publications/circulars/210/>

NMDGF – New Mexico Department of Game and Fish

- 2010 *Biota Information System of New Mexico (BISON-M).* <http://www.bison-m.org/>.
Accessed September 18, 2010.
2007 *Guidelines and Recommendations for Burrowing Owl Surveys and Mitigation,*
New Mexico Department of Game and Fish. July.
2003 *Trenching Guidelines, New Mexico Department of Game and Fish.* September.

NMNHP - New Mexico Natural Heritage Program

- 1998 *Holloman Air Force Base Sensitive Species Management Plan.* File number:
98-6TR-146.

NMRPT - New Mexico Rare Plant Technical Council

1999 *New Mexico Rare Plants. Albuquerque, NM: New Mexico Rare Plants Home Page.* <http://nmrareplants.unm.edu>. (Version April 23, 2010). Accessed September 18, 2010.

NOAA National Oceanic and Atmospheric Administration

2004 "Ranking of Cities Based on % Annual Possible Sunshine." <http://www.ncdc.noaa.gov/oa/climate/online/ccd/pctpos.txt>

NRCS – Natural Resources Conservation Service

2015 Consultation letter concerning Unique Farmlands. April 2, 2015.

O'Laughlin, T. C.

1980 *The Keystone Dam Site and Other Archaic and Formative Sites in Northwest El Paso, Texas.* Publications in Anthropology 8.

Rosentreter, R., M. Bowker, and J. Belnap

2007 *A Field Guide to Biological Soil Crusts of Western U.S. Drylands.* U.S. Government Printing Office. Denver, Colorado.

Rowell, David, Schott Solar PV; Email, December 10, 2010.

Sale, M., V. Gibbs, C. Browning, M. Ernst, C. Wende, and R. Giese

1996a *North Area, Tularosa Peak, and Boles Wells Cultural Resource Survey, Holloman Air Force Base, Otero County, New Mexico.* Miscellaneous Report of Investigations No. 105. HAFB Report No. 1995-004. Geo-Marine, Inc., El Paso, Texas.

Sale, M. V. Gibbs, M. Landreth, M. Ernst, B. McC Carson, and R. Giese

1996b *North Main Base Cultural Resource Survey, Holloman Air Force Base, Otero County, New Mexico.* HAFB Report No. 1995-019. Geo-Marine, Inc., El Paso, Texas.

Schott Solar Inc.

2009 *Installation and User Manual Schott Solar Photovoltaic Modules,* 11 pp.

Solar Power House

2011 *Solar Power House - Solar Power Potential.* <http://esolarpowerhouse.net/solar-power-house-solar-power-potential>. (Accessed January 13, 2011).

Staski, E.

1984 *Beneath The Border City: Urban Archaeology in Downtown El Paso.* New Mexico State University, Las Cruces.

Thurman, Peter C. HAFB Energy Program Manager

2015 Personal communication

USAF - United States Air Force

- 1997 "Interim Guidance for Environmental Justice Analysis"
- 2006 *Draft Environmental Assessment – Transforming the 49th Fighter Wing's Combat Capability, Appendix E Aircraft Noise Analysis and Airspace Operations.*
- 2011 "Final Environmental Assessment – Recapitalization of the 49th Wing Combat Capabilities and Capacities" FONSI. 29 July 2011

USArmy - United States Army

- 1998 *White Sands Missile Range-Wide Environmental Impact Statement. White Sands Missile Range Environmental Services Division Report No. WSMR EIS-1, White Sands Missile Range, NM.*
- 2002 *White Sands Missile Range, New Mexico.*
<http://www.wsmr.army.mil/NewWSMR/whitesands.pdf>.

USACE - United States Army Corps of Engineers

- 1987 *Corps of Engineers Wetlands Delineation Manual.* U.S. Army Corps of Engineers Waterways Experimentation Station. January.

USCB - United States Census Bureau

- 2009 *2005-2009 American Community Survey 5-Year Estimates.*
http://factfinder.census.gov/home/saff/main.html?_lang=en.
(Accessed December 29, 2010).

USDA - United States Department of Agriculture

- 2009 *Otero County Area, New Mexico.* <http://websoilsurvey.nrcs.usda.gov/app/>.
Natural Resources Conservation Service Web Soil Survey. (Version 10
September 24, 2009) Accessed November 29, 2010.

USDOD - United States Department of Defense

- 2005 *Unified Facilities Criteria (UFC): Structural Load Data.* UFC 3-310-01. 25 May 2005.

USEPA - United States Environmental Protection Agency.

- 2010a *Air and Radiation: National Ambient Air Quality Standards.*
<http://www.epa.gov/air/criteria.html>. (Last updated June 3, 2010)
Accessed January 9, 2011.
- 2010b *Surf Your Watershed, Watershed Profile for Tularosa Valley, New Mexico.*
http://cfpub.epa.gov/surf/huc.cfm?huc_code=13050003. (Last updated
December 10, 2010). Accessed December 10, 2010.

- 2010c *EnviroMapper for Envirofacts*. <http://www.epa.gov/emefdata/em4ef.home>. Accessed January 3, 2011.
- 2013 Environmental Justice View. <http://epamap14.epa.gov/ejmap/entry.html>. Last Updated January 11, 2013. Accessed September 2, 2014.
- USGS - United States Geological Survey
- 2009 *Seismicity of New Mexico*.
http://earthquake.usgs.gov/earthquakes/states/new_mexico/seismicity.php.
(Last updated October 21, 2009). Accessed December 29, 2010.
- USGS U.S. Geological Survey and New Mexico Bureau of Mines and Mineral Resources,
2006 Quaternary fault and fold database for the United States 2006, accessed Jan 12, 2015, from USGS web site: <http://earthquake.usgs.gov/hazards/qfaults/>
- USFWS - United States Fish and Wildlife Service
- 2010 *Endangered Species List for Otero County, New Mexico*.
http://www.fws.gov/southwest/es/NewMexico/SBC_intro.cfm. (Last updated April 15, 2009) Accessed September 18, 2010.
- 2015 Information, Planning and Conservation System (IPAC). Consultation Code: 02ENNM00-2015-SLI-0258. Event Code: 02ENNM00-2015-E-00327. April 15, 2015.
- Wilson, C., S. Hordes, and H. Walt
- 1989 *The South Central New Mexico Regional Overview: History, Historic Archaeology (9500 B.C.-A.D. 900) Architecture, and Historic Preservation*. New Mexico Office of Cultural Affairs Historic Preservation Division, Santa Fe.

APPENDIX A

SITE PHOTOS



Photograph 11. Preferred project area facing north



Photograph 12. Preferred project area facing north



755 S. Telshor Blvd., Suite F-201 / Las Cruces, New Mexico 88011
 phone: (575) 532-1526 / fax: (575) 532-1587

Photographic Log
Environmental Assessment
Of A Photovoltaic Development for Holloman Air Force Base, Otero County, New Mexico

Project No.: FHOL-10-001

Date: January 2011

Updated: May 2015



Photograph 13. Recent rain on bare soil within the preferred project area facing southeast



Photograph 14. Oryx on preferred project area facing south



755 S. Telshor Blvd., Suite F-201 / Las Cruces, New Mexico 88011
 phone: (575) 532-1526 / fax: (575) 532-1587

Photographic Log
Environmental Assessment
Of A Photovoltaic Development for Holloman Air
Force Base, Otero County, New Mexico

Project No.: FHOL-10-001

Date: January 2011

Updated: May 2015



Photograph 15. Biological soil crust within preferred project area



Photograph 16. Rita's Draw on south end of preferred project area facing northeast



755 S. Telshor Blvd., Suite F-201 / Las Cruces, New Mexico 88011
 phone: (575) 532-1526 / fax: (575) 532-1587

Photographic Log
Environmental Assessment
Of A Photovoltaic Development for Holloman Air Force Base, Otero County, New Mexico

Project No.: FHOL-10-001

Date: January 2011

Updated: May 2015

APPENDIX B
THREATENED, ENDANGERED, AND
SENSITIVE SPECIES RESOURCES



Biota Information System Of *New Mexico*

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Report County TES Table for Otero

NEW MEXICO WILDLIFE OF CONCERN

For complete up-dated information on federal-listed species, including plants, see the US Fish & Wildlife Service website at <http://ecos.fws.gov/ipac/wizard/chooseLocation!prepare.action>. For information on state-listed plants, contact the NM Energy, Minerals and Natural Resources Department, Division of Forestry, or go to <http://nmrareplants.unm.edu/>. If your project is on Bureau of Land Management, contact the local BLM Field Office for information on species of particular concern. If your project is on a National Forest, contact the Forest Supervisor's office for species information. E = Endangered; T = Threatened; s = sensitive; SOC = Species of Concern; C = Candidate; Exp = Experimental non-essential population; P = Proposed

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Common Name	Scientific Name	NMGF	US FWS	Critical Habitat
Spotted Bat	<i>Euderma maculatum</i>	T		
Penasco Least Chipmunk	<i>Tamias minimus atristriatus</i>	E	C	
Meadow Jumping Mouse	<i>Zapus hudsonius luteus</i>	E	E	
Brown Pelican	<i>Pelecanus occidentalis</i>	E		
Common Black Hawk	<i>Buteogallus anthracinus</i>	T		
Bald Eagle	<i>Haliaeetus leucocephalus</i>	T		
Aplomado Falcon	<i>Falco femoralis</i>	E	E	
Peregrine Falcon	<i>Falco peregrinus</i>	T		
Arctic Peregrine Falcon	<i>Falco peregrinus tundrius</i>	T		
Least Tern	<i>Sternula antillarum</i>	E	E	
Neotropic Cormorant	<i>Phalacrocorax brasilianus</i>	T		
Common Ground-dove	<i>Columbina passerina</i>	E		
Mexican Spotted Owl	<i>Strix occidentalis lucida</i>		T	Y
Broad-billed Hummingbird	<i>Cyananthus latirostris</i>	T		
White-eared Hummingbird	<i>Hylocharis leucotis</i>	T		
Elegant Trogon	<i>Trogon elegans</i>	E		
Southwestern Willow Flycatcher	<i>Empidonax traillii extimus</i>	E	E	Y

Bell's Vireo	Vireo bellii	T		
Gray Vireo	Vireo vicinior	T		
Sprague's Pipit	Anthus spragueii		C	
Yellow-eyed Junco	Junco phaeonotus	T		
Baird's Sparrow	Ammodramus bairdii	T		
Varied Bunting	Passerina versicolor	T		
Mottled Rock Rattlesnake	Crotalus lepidus lepidus	T		
Sacramento Mtn. Salamander	Aneides hardii	T		
White Sands Pupfish	Cyprinodon tularosa	T		

[Close Window](#)



United States Department of the Interior



FISH AND WILDLIFE SERVICE
New Mexico Ecological Services Field Office
2105 OSUNA ROAD NE
ALBUQUERQUE, NM 87113
PHONE: (505)346-2525 FAX: (505)346-2542
URL: www.fws.gov/southwest/es/NewMexico/;
www.fws.gov/southwest/es/ES_Lists_Main2.html

Consultation Code: 02ENNM00-2015-SLI-0258

April 15, 2015

Event Code: 02ENNM00-2015-E-00327

Project Name: FHOE-10-001 Solar EA

Subject: List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

Thank you for your recent request for information on federally listed species and important wildlife habitats that may occur in your project area. The U.S. Fish and Wildlife Service (Service) has responsibility for certain species of New Mexico wildlife under the Endangered Species Act (ESA) of 1973 as amended (16 USC 1531 et seq.), the Migratory Bird Treaty Act (MBTA) as amended (16 USC 701-715), and the Bald and Golden Eagle Protection Act (BGEPA) as amended (16 USC 668-668c). We are providing the following guidance to assist you in determining which federally imperiled species may or may not occur within your project area and to recommend some conservation measures that can be included in your project design.

FEDERALLY-LISTED SPECIES AND DESIGNATED CRITICAL HABITAT

Attached is a list of endangered, threatened, and proposed species that may occur in your project area. Your project area may not necessarily include all or any of these species. Under the ESA, it is the responsibility of the Federal action agency or its designated representative to determine if a proposed action "may affect" endangered, threatened, or proposed species, or designated critical habitat, and if so, to consult with the Service further. Similarly, it is the responsibility of the Federal action agency or project proponent, not the Service, to make "no effect" determinations. If you determine that your proposed action will have "no effect" on threatened or endangered species or their respective critical habitat, you do not need to seek concurrence with the Service. Nevertheless, it is a violation of Federal law to harm or harass any federally-listed threatened or endangered fish or wildlife species without the appropriate permit.

If you determine that your proposed action may affect federally-listed species, consultation with the Service will be necessary. Through the consultation process, we will analyze information

contained in a biological assessment that you provide. If your proposed action is associated with Federal funding or permitting, consultation will occur with the Federal agency under section 7(a)(2) of the ESA. Otherwise, an incidental take permit pursuant to section 10(a)(1)(B) of the ESA (also known as a habitat conservation plan) is necessary to harm or harass federally listed threatened or endangered fish or wildlife species. In either case, there is no mechanism for authorizing incidental take "after-the-fact." For more information regarding formal consultation and HCPs, please see the Service's Consultation Handbook and Habitat Conservation Plans at www.fws.gov/endangered/esa-library/index.html#consultations.

The scope of federally listed species compliance not only includes direct effects, but also any interrelated or interdependent project activities (e.g., equipment staging areas, offsite borrow material areas, or utility relocations) and any indirect or cumulative effects that may occur in the action area. The action area includes all areas to be affected, not merely the immediate area involved in the action. Large projects may have effects outside the immediate area to species not listed here that should be addressed. If your action area has suitable habitat for any of the attached species, we recommend that species-specific surveys be conducted during the flowering season for plants and at the appropriate time for wildlife to evaluate any possible project-related impacts.

Candidate Species and Other Sensitive Species

A list of candidate and other sensitive species in your area is also attached. Candidate species and other sensitive species are species that have no legal protection under the ESA, although we recommend that candidate and other sensitive species be included in your surveys and considered for planning purposes. The Service monitors the status of these species. If significant declines occur, these species could potentially be listed. Therefore, actions that may contribute to their decline should be avoided.

Lists of sensitive species including State-listed endangered and threatened species are compiled by New Mexico state agencies. These lists, along with species information, can be found at the following websites:

Biota Information System of New Mexico (BISON-M): www.bison-m.org

New Mexico State Forestry. The New Mexico Endangered Plant Program:
www.emnrd.state.nm.us/SFD/ForestMgt/Endangered.html

New Mexico Rare Plant Technical Council, New Mexico Rare Plants: nmrareplants.unm.edu

Natural Heritage New Mexico, online species database: nhnm.unm.edu

WETLANDS AND FLOODPLAINS

Under Executive Orders 11988 and 11990, Federal agencies are required to minimize the destruction, loss, or degradation of wetlands and floodplains, and preserve and enhance their natural and beneficial values. These habitats should be conserved through avoidance, or mitigated to ensure that there would be no net loss of wetlands function and value.

We encourage you to use the National Wetland Inventory (NWI) maps in conjunction with ground-truthing to identify wetlands occurring in your project area. The Service's NWI program website, www.fws.gov/wetlands/Data/Mapper.html integrates digital map data with other resource information. We also recommend you contact the U.S. Army Corps of Engineers for permitting requirements under section 404 of the Clean Water Act if your proposed action could impact floodplains or wetlands.

MIGRATORY BIRDS

The MBTA prohibits the taking of migratory birds, nests, and eggs, except as permitted by the Service's Migratory Bird Office. To minimize the likelihood of adverse impacts to migratory birds, we recommend construction activities occur outside the general bird nesting season from March through August, or that areas proposed for construction during the nesting season be surveyed, and when occupied, avoided until the young have fledged.

We recommend review of Birds of Conservation Concern at website www.fws.gov/migratorybirds/CurrentBirdIssues/Management/BCC.html to fully evaluate the effects to the birds at your site. This list identifies birds that are potentially threatened by disturbance and construction.

BALD AND GOLDEN EAGLES

The bald eagle (*Haliaeetus leucocephalus*) was delisted under the ESA on August 9, 2007. Both the bald eagle and golden eagle (*Aquila chrysaetos*) are still protected under the MBTA and BGEPA. The BGEPA affords both eagles protection in addition to that provided by the MBTA, in particular, by making it unlawful to "disturb" eagles. Under the BGEPA, the Service may issue limited permits to incidentally "take" eagles (e.g., injury, interfering with normal breeding, feeding, or sheltering behavior nest abandonment). For information on bald and golden eagle management guidelines, we recommend you review information provided at www.fws.gov/midwest/eagle/guidelines/bgepa.html.

On our web site www.fws.gov/southwest/es/NewMexico/SBC_intro.cfm, we have included conservation measures that can minimize impacts to federally listed and other sensitive species. These include measures for communication towers, power line safety for raptors, road and highway improvements, spring developments and livestock watering facilities, wastewater facilities, and trenching operations.

We also suggest you contact the New Mexico Department of Game and Fish, and the New Mexico Energy, Minerals, and Natural Resources Department, Forestry Division for information regarding State fish, wildlife, and plants.

Thank you for your concern for endangered and threatened species and New Mexico's wildlife habitats. We appreciate your efforts to identify and avoid impacts to listed and sensitive species in your project area. For further consultation on your proposed activity, please call 505-346-2525 or email nmesfo@fws.gov and reference your Service Consultation Tracking Number.

Attachment



United States Department of Interior
Fish and Wildlife Service

Project name: FHOE-10-001 Solar EA

Official Species List

Provided by:

New Mexico Ecological Services Field Office

2105 OSUNA ROAD NE

ALBUQUERQUE, NM 87113

(505) 346-2525

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

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

Consultation Code: 02ENNM00-2015-SLI-0258

Event Code: 02ENNM00-2015-E-00327

Project Type: Power Generation

Project Name: FHOE-10-001 Solar EA

Project Description: Holloman AFB is proposing to construct a solar farm within the identified project area. The project area depicted includes all 4 alternative locations. The proposed action will disturb 400 acres for the installation of solar panels.

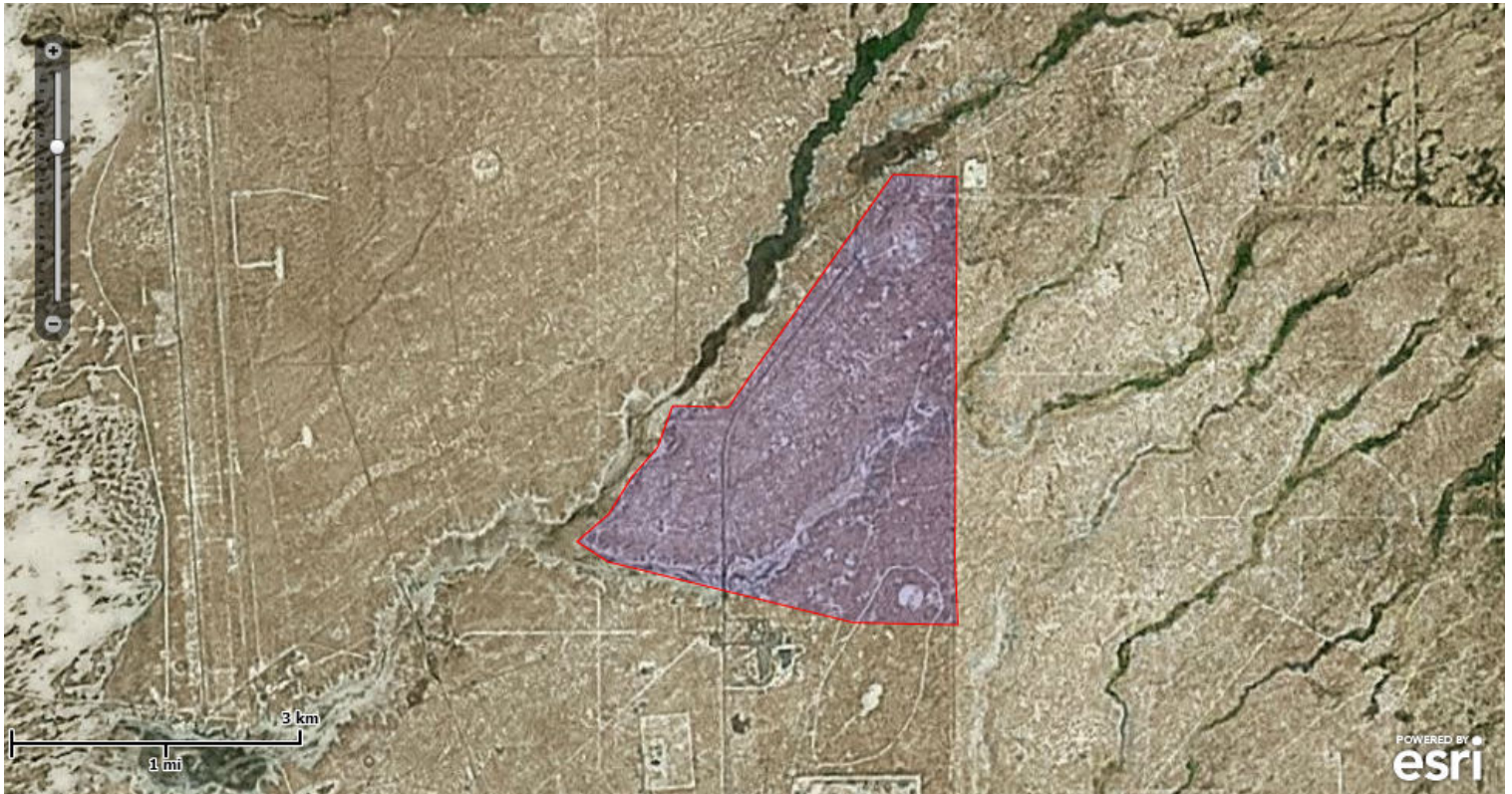
Please Note: The FWS office may have modified the Project Name and/or Project Description, so it may be different from what was submitted in your previous request. If the Consultation Code matches, the FWS considers this to be the same project. Contact the office in the 'Provided by' section of your previous Official Species list if you have any questions or concerns.



United States Department of Interior
Fish and Wildlife Service

Project name: FHOE-10-001 Solar EA

Project Location Map:



Project Coordinates: MULTIPOLYGON (((-106.0659889 32.934263, -106.0662206 32.8985974, -106.0658773 32.8923995, -106.077516 32.8926157, -106.1048445 32.8983091, -106.1082777 32.9001829, -106.1046728 32.9028132, -106.102218 32.9061641, -106.0993084 32.9089888, -106.0976433 32.9128654, -106.0914549 32.9127213, -106.0730871 32.9344792, -106.0659889 32.934263)))

Project Counties: Otero, NM



United States Department of Interior
Fish and Wildlife Service

Project name: FHOE-10-001 Solar EA

Endangered Species Act Species List

There are a total of 12 threatened, endangered, or candidate species on your species list. Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species. Critical habitats listed under the **Has Critical Habitat** column may or may not lie within your project area. See the **Critical habitats within your project area** section further below for critical habitat that lies within your project. Please contact the designated FWS office if you have questions.

Birds	Status	Has Critical Habitat	Condition(s)
Least tern (<i>Sterna antillarum</i>) Population: interior pop.	Endangered		
Mexican Spotted owl (<i>Strix occidentalis lucida</i>) Population: Entire	Threatened	Final designated	
northern aplomado falcon (<i>Falco femoralis septentrionalis</i>) Population: U.S.A (AZ, NM)	Experimental Population, Non-Essential		
Sprague's Pipit (<i>Anthus spragueii</i>)	Candidate		
Yellow-Billed Cuckoo (<i>Coccyzus americanus</i>) Population: Western U.S. DPS	Threatened	Proposed	
Flowering Plants			
Kuenzler Hedgehog cactus (<i>Echinocereus fendleri</i> var. <i>kuenzleri</i>)	Endangered		
Sacramento Mountains thistle (<i>Cirsium vinaceum</i>)	Threatened		
Sacramento Prickly poppy (<i>Argemone</i>)	Endangered		



United States Department of Interior
Fish and Wildlife Service

Project name: FHOE-10-001 Solar EA

<i>pleiakantha ssp. pinnatisecta</i>			
Todsens pennyroyal (<i>Hedeoma todsenii</i>)	Endangered	Final designated	
Wright's Marsh thistle (<i>Cirsium wrightii</i>)	Candidate		
Mammals			
New Mexico meadow jumping mouse (<i>Zapus hudsonius luteus</i>)	Endangered	Proposed	
Penasco least chipmunk (<i>Tamias minimus atristriatus</i>)	Candidate		



United States Department of Interior
Fish and Wildlife Service

Project name: FHOE-10-001 Solar EA

Critical habitats that lie within your project area

There are no critical habitats within your project area.

[Home](#)[About
NMRPTC](#)[Contacts](#)[Rare Plant List](#)[County List](#)[Agency Status](#)[Photo List](#)[About the List](#)[History of
Changes](#)[Species
Considered,
but dropped](#)[Photographers,
Illustrators and
Authors](#)[Image Usage
Guidelines](#)[Sponsors](#)[Discussion
Group](#)[Useful
Literature](#)[Links](#)

Results of County Search

OTERO	
Scientific name	County-NM
<i>Anulocaulis leiosolenus var. howardii</i>	Otero
<i>Aquilegia chaplinei</i>	Eddy, Otero
<i>Argemone pinnatisecta</i>	Otero
<i>Astragalus altus</i>	Otero
<i>Astragalus neomexicanus</i>	Chaves, Lincoln, Otero
<i>Cirsium inornatum</i>	Lincoln, Otero
<i>Cirsium vinaceum</i>	Otero
<i>Cirsium wrightii</i>	Chaves, Eddy, Guadalupe, Otero, Sier Socorro
<i>Delphinium novomexicanum</i>	Lincoln, Otero
<i>Dermatophyllum guadalupense</i>	Eddy, Otero
<i>Draba standleyi</i>	Doña Ana, Otero, Sierra, Socorro
<i>Echinocereus fendleri var. kuenzleri</i>	Chaves, Eddy, Lincoln, Otero
<i>Ericameria nauseosa var. texensis</i>	Eddy, Otero
<i>Erigeron rybius</i>	Lincoln, Otero
<i>Eriogonum wootonii</i>	Lincoln, Otero
<i>Escobaria villardii</i>	Doña Ana, Otero
<i>Hedeoma pulcherrima</i>	Lincoln, Otero
<i>Hedeoma todsenii</i>	Otero, Sierra
<i>Heuchera wootonii</i>	Catron, Lincoln, Otero
<i>Hexalectris arizonica</i>	Doña Ana, Hidalgo, Otero, Sierra
<i>Hexalectris nitida</i>	Eddy, Otero
<i>Lepidospartum burgessii</i>	Otero
<i>Lupinus sierrae-blancae</i>	Lincoln, Otero
<i>Mentzelia humilis var. guadalupensis</i>	Otero

<i>Microthelys rubrocallosa</i>	Otero
<i>Muhlenbergia villiflora var. villosa</i>	Eddy, Otero
<i>Nama xylopodum</i>	Chaves, Eddy, Otero
<i>Nerisyrenia hypercorax</i>	Chaves, Otero
<i>Paronychia wilkinsonii</i>	Otero
<i>Penstemon alamosensis</i>	Doña Ana, Lincoln, Otero
<i>Penstemon cardinalis ssp. cardinalis</i>	Lincoln, Otero
<i>Penstemon cardinalis ssp. regalis</i>	Eddy, Otero
<i>Penstemon neomexicanus</i>	Lincoln, Otero
<i>Perityle staurophylla var. staurophylla</i>	Doña Ana, Otero, Sierra
<i>Phacelia cloudcroftensis</i>	Otero
<i>Philadelphus microphyllus var. argyrocalyx</i>	Lincoln, Otero
<i>Physaria aurea</i>	Lincoln, Otero
<i>Potentilla sierrae-blancae</i>	Lincoln, Otero
<i>Ribes mescalerium</i>	Lincoln, Otero
<i>Sedum integrifolium ssp. neomexicanum</i>	Lincoln, Otero
<i>Senecio sacramentanus</i>	Lincoln, Otero
<i>Synthyris oblongifolia</i>	Lincoln, Otero
<i>Valeriana texana</i>	Eddy, Lincoln, Otero

Photo credits in header *Peniocereus greggii var. greggii* © T. Todsén,
Lepidospartum burgessii © M. Howard, *Argemone pleiacantha ssp. pinnatisecta* © R. Sivin
©2005 New Mexico Rare Plant Technical Council

APPENDIX C
AGENCY COORDINATION



DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 49TH WING (ACC)
HOLLOMAN AIR FORCE BASE, NEW MEXICO

FILE COPY

MAR 25 2013

Colonel Andrew A. Croft
Commander, 49th Wing
490 First Street, Suite 1700
Holloman AFB NM 88330-8277

Susan MacMullin, Field Supervisor
New Mexico Ecological Services Field Office
U S Fish and Wildlife Service
2105 Osuna NE
Albuquerque NM 87113-1001

Dear Ms. MacMullin

Pursuant to the National Environmental Policy Act (NEPA) of 1969, as amended, and its implementing regulations, the United States Air Force (USAF) intends to have an Environmental Assessment (EA) completed on a proposed Photovoltaic (PV) Solar Power Array on Holloman AFB. The proposed action could directly impact up to 400 acres of land near the La Luz Gate on Holloman AFB to support construction and operation of the proposed PV array. In addition to the installation impacts, traffic is expected to increase on the county road accessing the La Luz Gate during periods of construction or major maintenance.

NEPA requires the Air Force to analyze the potential environmental impacts of this proposed project on the installation and local community. The EA will include brief discussions of the proposal, alternatives, the environmental impacts of the proposed action and alternatives, and a listing of agencies and persons consulted. The EA will also examine a No Action Alternative. Additionally, the EA will provide evidence and analysis for determining whether to prepare an environmental impact statement or a finding of no significant impact.

Should you wish to participate in evaluating this proposal, please provide your comments no later than 15 April 2013. No decision will be made on allowing this proposal to proceed until after completion of the EA or, if required, EIS, with full consideration of any inputs.

If you have any questions or comments on this request, please contact Mr. Charlie Lawton, Environmental Scientist: 49 CES/CEA, 550 Tabosa Ave, Holloman AFB, NM 88330 or at (575) 572-3931. An alternate point of contact is Mr. Andrew Gomolak, Cultural Resources Manager, at (575) 572-6647.

I look forward to continuing our good working relationship with the local community. Thank you in advance for your assistance in this matter.

Sincerely

ANDREW A. CROFT
Colonel, USAF
Commander



DEPARTMENT OF THE AIR FORCE

HEADQUARTERS 49TH WING (ACC)
HOLLOMAN AIR FORCE BASE, NEW MEXICO

FILE COPY

MAR 25 2013

Colonel Andrew A. Croft
Commander, 49th Wing
490 First Street, Suite 1700
Holloman AFB NM 88330-8277

Lisa Kirkpatrick
Chief, Conservation Services Division
New Mexico Department of Game and Fish
P O Box 25112
Santa Fe NM 87504

Dear Ms. Kirkpatrick

Pursuant to the National Environmental Policy Act (NEPA) of 1969, as amended, and its implementing regulations, the United States Air Force (USAF) intends to have an Environmental Assessment (EA) completed on a proposed Photovoltaic (PV) Solar Power Array on Holloman AFB. The proposed action could directly impact up to 400 acres of land near the La Luz Gate on Holloman AFB to support construction and operation of the proposed PV array. In addition to the installation impacts, traffic is expected to increase on the county road accessing the La Luz Gate during periods of construction or major maintenance.

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Colonel, USAF
Commander



DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 49TH WING (ACC)
HOLLOMAN AIR FORCE BASE, NEW MEXICO

FILE COPY

MAR 25 2013

Colonel Andrew A. Croft
Commander, 49th Wing
490 First Street, Suite 1700
Holloman AFB NM 88330-8277

Gedi Cibas
Environmental Impact Review Coordinator
New Mexico Environment Department
P O Box 26110
Santa Fe NM 87502

Dear Dr. Cibas

Pursuant to the National Environmental Policy Act (NEPA) of 1969, as amended, and its implementing regulations, the United States Air Force (USAF) intends to have an Environmental Assessment (EA) completed on a proposed Photovoltaic (PV) Solar Power Array on Holloman AFB. The proposed action could directly impact up to 400 acres of land near the La Luz Gate on Holloman AFB to support construction and operation of the proposed PV array. In addition to the installation impacts, traffic is expected to increase on the county road accessing the La Luz Gate during periods of construction or major maintenance.

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Sincerely

A handwritten signature in black ink that reads "Andrew A. Croft".

ANDREW A. CROFT
Colonel, USAF
Commander



DEPARTMENT OF THE AIR FORCE

HEADQUARTERS 49TH WING (ACC)
HOLLOMAN AIR FORCE BASE, NEW MEXICO

FILE COPY

MAR 25 2013

Colonel Andrew A. Croft
Commander, 49th Wing
490 First Street, Suite 1700
Holloman AFB NM 88330-8277

Debra Griffin, Associate Director
Compliance Assurance and Enforcement Division
US EPA Region 6, 6EN-X
1445 Ross Ave
Dallas TX 75202-2733

Dear Ms. Griffin

Pursuant to the National Environmental Policy Act (NEPA) of 1969, as amended, and its implementing regulations, the United States Air Force (USAF) intends to have an Environmental Assessment (EA) completed on a proposed Photovoltaic (PV) Solar Power Array on Holloman AFB. The proposed action could directly impact up to 400 acres of land near the La Luz Gate on Holloman AFB to support construction and operation of the proposed PV array. In addition to the installation impacts, traffic is expected to increase on the county road accessing the La Luz Gate during periods of construction or major maintenance.

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Colonel, USAF
Commander



DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 49TH WING (ACC)
HOLLOMAN AIR FORCE BASE, NEW MEXICO

FILE COPY

MAR 25 2013

Colonel Andrew A. Croft
Commander, 49th Wing
490 First Street, Suite 1700
Holloman AFB NM 88330-8277

J. Xavier Montoya
State Conservationist
US Department of Agriculture
Natural Resources Conservation Service
6200 Jefferson NE
Albuquerque NM 87109-3734

Dear Mr. Montoya

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Colonel, USAF
Commander



DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 49TH WING (ACC)
HOLLOMAN AIR FORCE BASE, NEW MEXICO

FILE COPY

MAR 25 2013

Colonel Andrew A. Croft
Commander, 49th Wing
490 First Street, Suite 1700
Holloman AFB NM 88330-8277

Jennifer Montoya
Planning & Environmental Coordinator
Bureau of Land Management Las Cruces District Office
1800 Marquess Street
Las Cruces NM 88005-3371

Dear Ms. Montoya

Pursuant to the National Environmental Policy Act (NEPA) of 1969, as amended, and its implementing regulations, the United States Air Force (USAF) intends to have an Environmental Assessment (EA) completed on a proposed Photovoltaic (PV) Solar Power Array on Holloman AFB. The proposed action could directly impact up to 400 acres of land near the La Luz Gate on Holloman AFB to support construction and operation of the proposed PV array. In addition to the installation impacts, traffic is expected to increase on the county road accessing the La Luz Gate during periods of construction or major maintenance.

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If you have any questions or comments on this request, please contact Mr. Charlie Lawton, Environmental Scientist: 49 CES/CEA, 550 Tabosa Ave, Holloman AFB, NM 88330 or at (575) 572-3931. An alternate point of contact is Mr. Andrew Gomolak, Cultural Resources Manager, at (575) 572-6647.

I look forward to continuing our good working relationship with the local community. Thank you in advance for your assistance in this matter.

Sincerely

ANDREW A. CROFT
Colonel, USAF
Commander



DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 49TH WING (ACC)
HOLLOMAN AIR FORCE BASE, NEW MEXICO

FILE COPY

MAR 25 2013

Colonel Andrew A. Croft
Commander, 49th Wing
490 First Street, Suite 1700
Holloman AFB NM 88330-8277

Marie Frias Sauter
Superintendent, White Sands National Monument
P O Box 1086
Holloman AFB NM 88330

Dear Ms. Sauter

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DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 49TH WING (ACC)
HOLLOMAN AIR FORCE BASE, NEW MEXICO

FILE COPY

MAR 25 2013

Colonel Andrew A. Croft
Commander, 49th Wing
490 First Street, Suite 1700
Holloman AFB NM 88330-8277

Debra Hartell
NEPA Customer Support Division
Environment and Safety Directorate
Bldg 163, Springfield Street
White Sands Missile Range NM 88002

Dear Ms. Hartell

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ANDREW A. CROFT
Colonel, USAF
Commander



DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 49TH WING (ACC)
HOLLOMAN AIR FORCE BASE, NEW MEXICO

FILE COPY

MAR 25 2013

Colonel Andrew A. Croft
Commander, 49th Wing
490 First Street, Suite 1700
Holloman AFB NM 88330-8277

Patti Turpin
NEPA Coordinator
Lincoln National Forest, US Forest Service
3463 Las Palomas St
Alamogordo NM 88310

Dear Ms. Turpin

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Colonel, USAF
Commander



DEPARTMENT OF THE AIR FORCE

HEADQUARTERS 49TH WING (ACC)
HOLLOMAN AIR FORCE BASE, NEW MEXICO

FILE COPY

MAR 25 2013

Colonel Andrew A. Croft
Commander, 49th Wing
490 First Street, Suite 1700
Holloman AFB NM 88330-8277

Ray Powell, Commissioner
New Mexico State Land Office
310 Old Santa Fe Trail
Santa Fe NM 87501

Dear Commissioner Powell

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ANDREW A. CROFT
Colonel, USAF
Commander



DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 49TH WING (ACC)
HOLLOMAN AIR FORCE BASE, NEW MEXICO

FILE COPY

MAR 25 2013

Colonel Andrew A. Croft
Commander, 49th Wing
490 First Street, Suite 1700
Holloman AFB NM 88330-8277

Bob Sivinski
Forestry Division
New Mexico Energy, Minerals and Natural Resources Department
1220 South St Francis Drive
Santa Fe NM 87505

Dear Mr. Sivinski

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Sincerely

ANDREW A. CROFT
Colonel, USAF
Commander

GOVERNOR
Susana Martinez



DIRECTOR AND SECRETARY
TO THE COMMISSION
James S. Lane, Jr.

Daniel E. Brooks, Deputy Director

STATE OF NEW MEXICO
DEPARTMENT OF GAME & FISH

One Wildlife Way
Santa Fe, NM 87507
Post Office Box 25112
Santa Fe, NM 87504
Phone: (505) 476-8008
Fax: (505) 476-8123

Visit our website at www.wildlife.state.nm.us
For information call: (888) 248-6866

STATE GAME COMMISSION

SCOTT BIDEKAIN
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Farmington, NM

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Albuquerque, NM

BILL MONTOYA
Alto, NM

RALPH RAMOS
Las Cruces, NM

April 8, 2013

Mr. Charlie Lawton
49 CES/CEA
550 Tabosa Avenue
Holloman AFB NM 88330

*Proposed Photovoltaic Array Draft Environmental Assessment Scoping, Holloman Air Force Base;
NMDGF Doc. No. 15567*

Dear Mr. Lawton:

The Department of Game and Fish (Department) has reviewed your 25 March 2013 scoping letter regarding the above-referenced project. Holloman Air Force Base is conducting a draft environmental assessment (DEA) to analyze the effects of the construction and operation of a proposed photovoltaic solar power array. According to your letter, the proposed action could directly impact up to 400 acres of land near the La Luz gate.

The Department recommends that the DEA analyze the potential for adverse effects to riparian and aquatic habitats as well as birds, bats, reptiles and amphibians from the construction and operation of the proposed solar array.

We appreciate the opportunity to comment on this project, and look forward to commenting on the EA. Should you have any questions regarding these comments, please contact Mark Watson, Terrestrial Habitat Specialist at (505) 476-8115 or mark.watson@state.nm.us.

Sincerely,

Matt Wunder, Ph.D.
Chief, Conservation Services Division

MW/mlw

cc: USFWS NMES Field Office
Leon Redman, Captain, Southeast Area Field Operations, NMDGF
Donald Auer, Habitat Manager, NMDGF

United States Department of Agriculture



Natural Resources Conservation Service
6200 Jefferson NE, Room 305
Albuquerque, NM 87109
Phone: (505) 761-4400 Fax: (505) 761-4462
Website: www.nm.nrcs.usda.gov

April 2, 2013

Mr. Charlie Lawton
Environmental Scientist
49 CES/CEA
550 Tabosa Avenue
Holloman AFB, New Mexico 88330

Dear Mr. Lawton:

Thank you for providing the Natural Resources Conservation Service (NRCS) the opportunity to review the proposed Photovoltaic (PV) Solar Power Array on Holloman AFB, Otero County, New Mexico.

The Farmland Protection Policy Act (FPPA) authorizes the NRCS to provide review of proposed projects that have the potential to irreversibly convert farmlands to non-farmland uses as the result of programs funded by the federal government. In review of the information provided on the project, it is determined that the entire project is located in an existing 400 acres of non-farmland, near La Luz Gate on Holloman AFB. The FPPA rules define farmland conversion to be "to the extent that it irreversibly converts farmland to other purposes", this project is not expected to have that effect. With this acknowledged, the proposed project will not cause Prime or Unique Farmlands to be converted to non-agricultural uses, and is not subject to the Act.

If you have any questions concerning soils information, please contact Clarence Chavez, Soil Data Quality Specialist, at (505) 761-4435 or email at clarence.chavez@nm.usda.gov.

Sincerely,

A handwritten signature in black ink, appearing to read "J. Xavier Montoya".

J. XAVIER MONTOYA
State Conservationist

cc:

Clarence Chavez, Soil Data Quality Scientist, NRCS, Albuquerque, NM

Helping People Help the Land

An Equal Opportunity Provider and Employer





United States Department of the Interior

NATIONAL PARK SERVICE
White Sands National Monument
P.O. Box 1086
Holloman AFB, NM 88330



IN REPLY REFER TO:

L7619(WHSA)

April 5, 2013

Charlie Lawton
Environmental Scientist
49 CES/CEA
550 Tabosa Ave
Holloman AFB, NM 88330

Dear Mr. Lawton,

I received correspondence from Colonel Andrew Croft dated March 25, 2013 regarding an invitation to participate in an agency review of the draft EA for a proposed Photovoltaic (PV) Solar Power array at Holloman AFB. The National Park Service would be pleased to be able to review and evaluate the proposal to be located near the La Luz Gate. Thank you for consideration of White Sands National Monument in the planning process.

Please feel free to contact me directly at 575-679-2599, ext. 210 or marie_frias@nps.gov.

Sincerely,

Marie Frias Sauter
Superintendent

cc: David Bustos, Chief of Resources Management, WHSA, National Park Service
John Reber, Physical Scientist, Regional Energy Coordinator, IMR, National Park Service
Lara Rozzell, Renewable Energy Specialist, IMR, National Park Service



DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 49TH WING (ACC)
HOLLOMAN AIR FORCE BASE, NEW MEXICO

FILE COPY

MAR 25 2013

Colonel Andrew A. Croft
Commander, 49th Wing
490 First Street, Suite 1700
Holloman AFB NM 88330-8277

Jeff Pappas
Director, Historic Preservation Division
New Mexico Department of Cultural Affairs
407 Galisteo Road, Suite 236
Santa Fe NM 87501

Dear Mr. Pappas

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I look forward to continuing our good working relationship with the local community. Thank you in advance for your assistance in this matter.

Sincerely

ANDREW A. CROFT
Colonel, USAF
Commander



DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 49TH WING (ACC)
HOLLOMAN AIR FORCE BASE, NEW MEXICO

FILE COPY

MAR 25 2013

Colonel Andrew A. Croft
Commander, 49th Wing
490 First Street, Suite 1700
Holloman AFB NM 88330-8277

Frederick Chino, Sr., President
Mescalero Apache Tribe
P O Box 227
Mescalero NM 88340

Dear President Chino

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DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 49TH WING (ACC)
HOLLOMAN AIR FORCE BASE, NEW MEXICO

FILE COPY

MAR 25 2013

Colonel Andrew A. Croft
Commander, 49th Wing
490 First Street, Suite 1700
Holloman AFB NM 88330-8277

Susie Galea, Mayor
City of Alamogordo
1376 East 9th Street
Alamogordo NM 88310

Dear Mayor Galea

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DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 49TH WING (ACC)
HOLLOMAN AIR FORCE BASE, NEW MEXICO

FILE COPY

MAR 25 2013

Colonel Andrew A. Croft
Commander, 49th Wing
490 First Street, Suite 1700
Holloman AFB NM 88330-8277

Mayor Ray S. Cordova
Village of Tularosa
705 St Francis Drive
Tularosa NM 88352

Dear Mayor Cordova

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DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 49TH WING (ACC)
HOLLOMAN AIR FORCE BASE, NEW MEXICO

FILE COPY

MAR 25 2013

Colonel Andrew A. Croft
Commander, 49th Wing
490 First Street, Suite 1700
Holloman AFB NM 88330-8277

Ronny Rardin
Chairman, Board of Otero County Commissioners
1101 New York Ave, Rm 101
Alamogordo NM 88310

Dear Mr. Rardin

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Colonel, USAF
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DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 49TH WING (ACC)
HOLLOMAN AIR FORCE BASE, NEW MEXICO

FILE COPY

MAR 25 2013

Colonel Andrew A. Croft
Commander, 49th Wing
490 First Street, Suite 1700
Holloman AFB NM 88330-8277

Richard Koehler
Chair, Alamogordo Chamber of Commerce
1301 North White Sands Blvd
Alamogordo NM 88310

Dear Mr. Koehler

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ANDREW A. CROFT
Colonel, USAF
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DEPARTMENT OF THE AIR FORCE

HEADQUARTERS 49TH WING (ACC)
HOLLOMAN AIR FORCE BASE, NEW MEXICO

FILE COPY

MAR 25 2013

Colonel Andrew A. Croft
Commander, 49th Wing
490 First Street, Suite 1700
Holloman AFB NM 88330-8277

Timothy A. Rabon
Mesa Verde Inc
396 La Luz Gate Road
P O Box 907
Alamogordo NM 88311-0907

Dear Mr. Rabon

Pursuant to the National Environmental Policy Act (NEPA) of 1969, as amended, and its implementing regulations, the United States Air Force (USAF) intends to have an Environmental Assessment (EA) completed on a proposed Photovoltaic (PV) Solar Power Array on Holloman AFB. The proposed action could directly impact up to 400 acres of land near the La Luz Gate on Holloman AFB to support construction and operation of the proposed PV array. In addition to the installation impacts, traffic is expected to increase on the county road accessing the La Luz Gate during periods of construction or major maintenance.

NEPA requires the Air Force to analyze the potential environmental impacts of this proposed project on the installation and local community. The EA will include brief discussions of the proposal, alternatives, the environmental impacts of the proposed action and alternatives, and a listing of agencies and persons consulted. The EA will also examine a No Action Alternative. Additionally, the EA will provide evidence and analysis for determining whether to prepare an environmental impact statement or a finding of no significant impact.

Should you wish to participate in evaluating this proposal, please provide your comments no later than 15 April 2013. No decision will be made on allowing this proposal to proceed until after completion of the EA or, if required, EIS, with full consideration of any inputs.

If you have any questions or comments on this request, please contact Mr. Charlie Lawton, Environmental Scientist: 49 CES/CEA, 550 Tabosa Ave, Holloman AFB, NM 88330 or at (575) 572-3931. An alternate point of contact is Mr. Andrew Gomolak, Cultural Resources Manager, at (575) 572-6647.

I look forward to continuing our good working relationship with the local community. Thank you in advance for your assistance in this matter.

Sincerely

ANDREW A. CROFT
Colonel, USAF
Commander

APPENDIX D
PUBLIC NOTICE AND PUBLIC COMMENTS

PUBLIC INTEREST & COMMENT SHEET – PHOTOVOLTAIC DEVELOPMENT

If you wish to comment on this proposed development of photovoltaic power generation on Holloman Air Force Base, please complete the personal information requested and write your comments below.

NAME _____

MAILING ADDRESS _____

OTHER CONTACT INFORMATION _____

Please circle your choice: **I DO** or **I DO NOT** request a copy of the Public Draft EA when it becomes available.

Please return comments to:	Public Affairs Photovoltaic EA 49 WG/PA 490 First Street Holloman AFB, NM 88330	or	49 Civil Engineer Squadron Photovoltaic EA 49 CES/CEI 550 Tabosa Avenue Holloman AFB, NM 88330
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PROPOSED PHOTOVOLTAIC DEVELOPMENT HOLLOMAN AIR FORCE BASE

BACKGROUND

The Analysis Office of the 49th Civil Engineer Squadron, Installation Management Flight, is preparing an Environmental Assessment (EA) to address proposed development of a photovoltaic (PV) solar energy project on open military land in the northeast portion of Holloman Air Force Base (HAFB), Otero County, New Mexico. The land was intermittently used by Native Americans until the late 1800s, served as European American livestock range until 1942, and since has been managed by the Air Force. Native American camp sites, grazing and an old livestock windmill and tank, the Atlas electrical power substation, power lines and a now removed water storage tower, are the known previous uses of this land.

The proposed action was originated by the 49th Civil Engineer Squadron (49 CES) Energy Manager in 2009 in response to new national and Air Force (AF) energy policies. The project is supported locally by the 49th Wing (49 WG) and at higher levels by Headquarters Air Combat Command (ACC).

Purpose & Need

The purpose and need is to meet national requirements in the Energy Policy Act (EPA) of 2005 (Public Law [PL] 109-58); Executive Order (EO) 13423, "Strengthening Federal Environmental, Energy, and Transportation Management"; and EO 13514, "Federal Leadership in Environment, Energy, and Economic Performance". The 2008 United States Air Force Infrastructure Energy Strategic Plan provides a goal to produce 7.5 percent of energy use from renewable sources by FY 2015 and 25 percent by FY 2025. HAFB typically has over 300 days a year of sunshine (~80% of average annual possible sunshine) making HAFB an ideal location to achieve the purpose.

The HAFB Energy Manager researched various technologies and locations and prepared an Air Force Form AF-813 "Request for Environmental Impact Analysis" for the project specifying PV technology and a candidate location to meet the need. Use of the existing Atlas Power Substation is proposed in the AF-813 because it is an existing utility that would eliminate construction of a completely new substation to serve the solar energy project.

To address the environmental impacts of PV electrical power development, an EA is being prepared in accordance with the National Environmental Policy Act (NEPA) of 1969, as amended (42 United States Code [USC] 4321-4347), following Council on Environmental Quality (CEQ) regulations (40 Code of Federal Regulations [CFR] 1500-1508) and the Environmental Impact Analysis Process (EIAP) as defined in Air Force Instruction (AFI) 32-7061 and published in the Code of Federal Regulations at 32 CFR 989.

PROPOSED ACTION

The proposed action is to develop a PV energy production facility on HAFB by means of a legal arrangement between the AF, a public utility and/or a private power producer to develop, operate and maintain the electrical generation facility with HAFB as the customer. Some forms of such an arrangement would require additional environmental documentation known as an Environmental Baseline Survey (EBS), although previous base wide research has found no indications of hazardous concerns associated with the proposed development location.

The development would require adequate acreage, ease of interconnection with existing utility infrastructure and long term access for operations and maintenance. Such a proposed action would result in relatively complete disturbance of the development area.

Solar PV technology captures energy directly from sunlight and converts it to electricity. There is a wide variety of PV panels available and a variety of ways they can be mounted. The details depend upon manufacturer, array design and the setting where the panels are to be placed. The choice of panels, mounting design and array configuration for HAFB will depend upon the developer's design, cost and panel efficiency decisions. Depending upon configuration of the panels and desired power output, the project would require clearing, grading, cable trenching and foundation excavations throughout the PV development site to be addressed by the EA.



*Photograph 1. Large solar panel array
requiring extensive surface disturbance
(Inhabit.com 2011)*

DESCRIPTION OF ALTERNATIVES

TECHNOLOGY

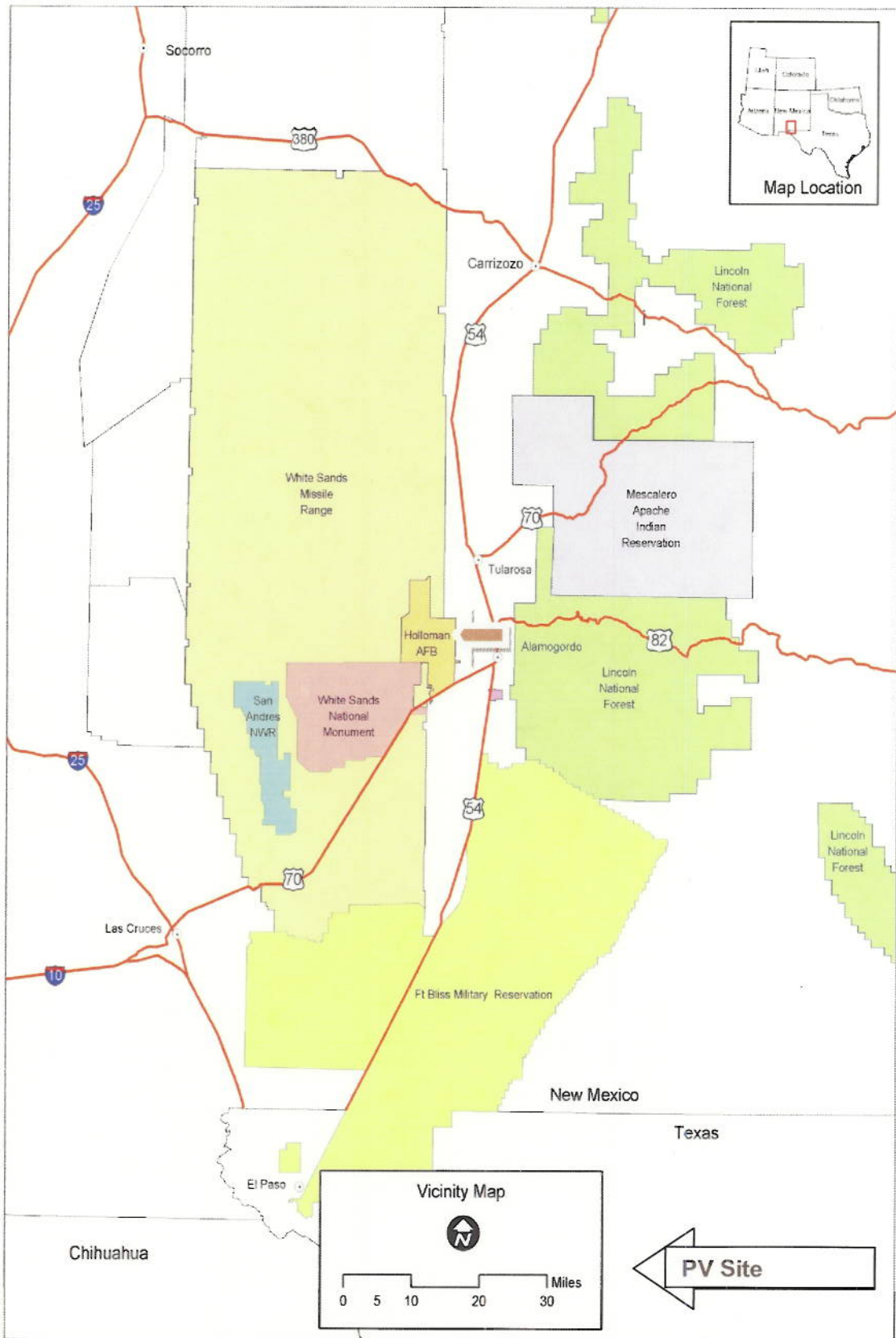
The PV technology proposed on the AF-813 was the chosen result of extensive research, consultation and coordination by the HAFB Energy Manager, the HAFB Engineering Flight and ACC Electrical Engineers and Energy Managers.

Alternative Technologies

Development of a parabolic solar trough array was considered not reasonable due to a requirement for high quality water and the possibility of reflected glare affecting flying operations. A central tower heliostat would also entail reflectivity and water issues as well as possible air space obstruction. Biomass fueled power generation is not reasonable due to the lack of fuel stock in this low population desert location and the distances to potential fuel stock, as well as a similar requirement for high quality water. While ground level site impacts would be essentially similar to PV development, providing the water quantity and desalination processes required by the other technologies would cause environmental impacts beyond the site and add substantial costs to the development of alternate energy production. Wind generation is not a reasonable alternative as the rotating blades disrupt radar signals and typical tower heights are not compatible with air traffic. Photovoltaic panel power generation is the Preferred Technology.

LOCATION

The general location proposed on the Air Force Form AF-813 "Request for Environmental Impact Analysis", was selected in coordination with the 49 CES Natural and Cultural Resources staff, Engineering staff and Base Comprehensive Planner, the 49th Wing Safety Office, the 49th Security Forces Squadron and the 49th Operations Group Airfield and Air Space staff. It is the only location that satisfies air and ground safety, security, accessibility, land ownership, flood plain/wetlands avoidance, physical size and economic reasonability criteria while causing apparently minimal environmental impacts. No other locations are known to meet these selection criteria. Alternative siting within the general location will be addressed in the EA.



SITE ALTERNATIVES

The Preferred Site (Alternative Site 1, see Figure 1 and Table 1) for the construction of the PV array is 400 acres including the Atlas Power Substation near the La Luz Gate on HAFB. The Preferred Site includes the existing Atlas Substation and is bounded on the east by an existing high voltage transmission line and the east base boundary and on the north by the paved one-lane road to the Atlas Substation. The west limit is a line approximately 1,000 feet southeast of and parallel to Vandergrift Road. The south limit is a perpendicular to the west line that connects to the break-in-slope above Rita's Draw and the southeast limit follows the edge of Rita's Draw northward to the east base boundary. This Preferred Site is within the general location requested by project planners, within acreage intensively surveyed for cultural and natural resources, and thought to provide a balance between site size, site engineering, site construction effort and environmental impacts. Combined, a photovoltaic array on this site is the Preferred Alternative addressed in this EA.

Three other possibly developable areas (Alternative Sites 2, 3 and 4) were within the constraints and opportunities criteria of availability, air and ground safety, security, accessibility, land ownership, flood plain/wetlands avoidance and, to a lesser extent, physical size. These possible sites were considered based on existing field survey records, current resources and constraints knowledge and topography. The suitability of the sites is summarized in Table 1.

Alternative 5 is the No Action Alternative. Under the No Action Alternative, the area would remain in its current undeveloped status (Figure 1). There would be no ground disturbing activities with no consequent impacts to local natural and cultural resources. The Green Energy Initiative would not be implemented and AF goals would not be achieved.

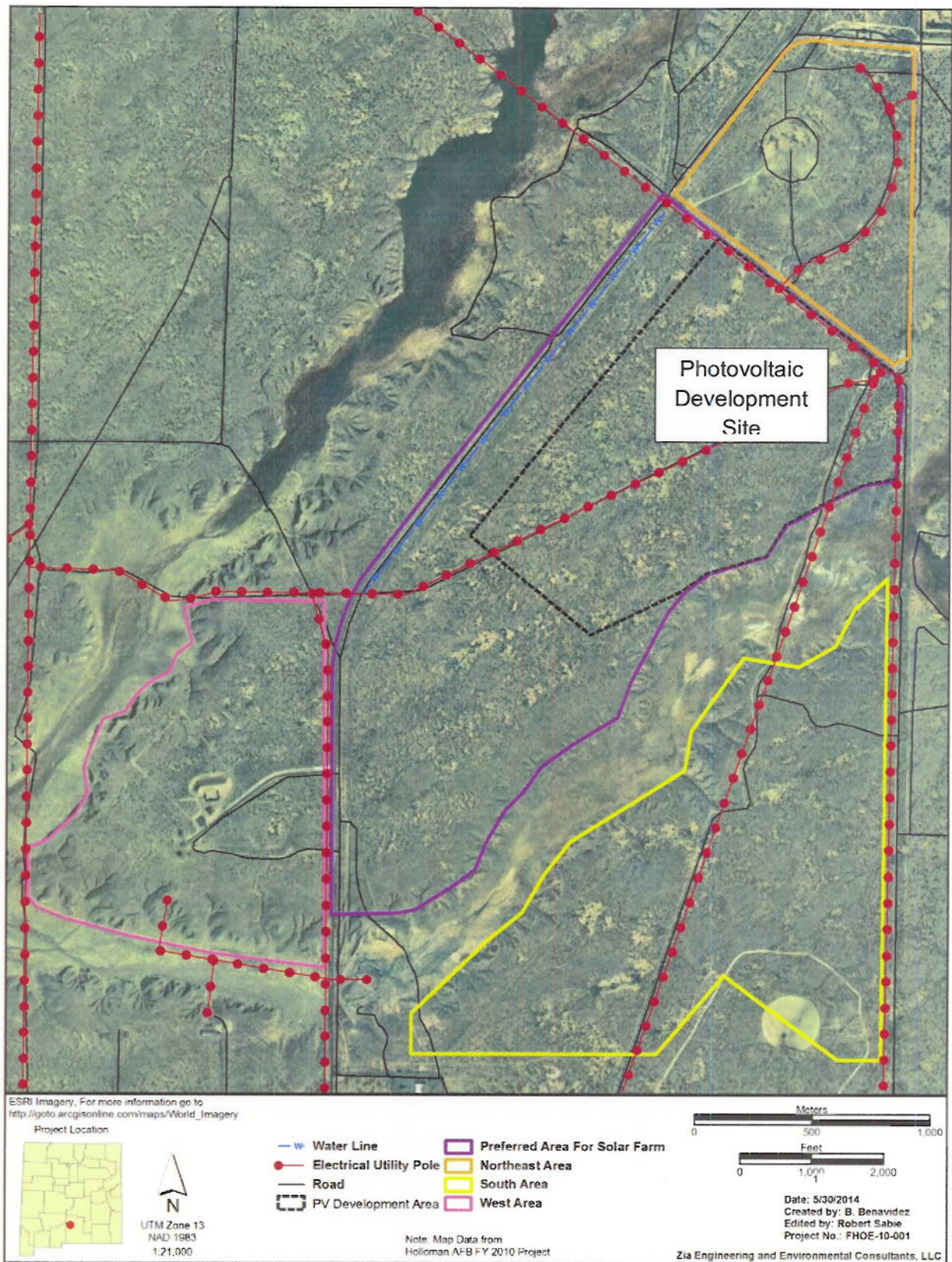


Figure 1. Alternative Locations

As the analysis has progressed it became apparent that the Preferred Alternative Site had clear advantages as exemplified in Table 1. Scoring is expressed in a simple order of magnitude, positive scores represent factors that make a greater contribution to the purpose of the proposed action. Negative scores represent levels of impact complexity at the sites.

Table 1: Feasibility Criteria Table

Criterion	Preferred Alternative Site 1	Site 2	Site 3	Site 4	No Action Alternative 5
1. Cultural Res	-2	-4	-1	0	0
2. Plants (NR)	-1	-1	-1	-1	0
3. Animals (NR)	-1	-1	-1	-1	0
4. Activity Conflicts	0	0	Various -1	0	0
5. Grid Access	On +1	Distant -2	Near -0-	Distant -3	0
6. Build Feasibility	+1	0	+1	-1	0
7. 100s of Acres	+4	+3	+2	+2	0
Totals	+2	-5	-1	-4	0

1. Cultural resources, higher (-) or lower (+) disturbance/ impact;
2. Plant resources (NR), higher (-) or lower(+) disturbance/impact;
3. Animal resources (NR), higher (-) or lower (+) disturbance/impact
4. Current military activities affected adversely (-);
5. Access to grid at Atlas Substation, higher (-) or lower (+) distance; and
6. Topography, road access,
7. Suitable size, 100s of acres provided (+).

ENVIRONMENTAL IMPACT ANALYSIS

The categories to be analyzed are based on the nature of the location and the character of the proposed action in light of identified constraints and opportunities. Environmental categories considered possibly subject to impacts include geology, seismicity, soils, air quality, aesthetics, noise, surface and ground water resources, biological resources, cultural resources, land use, socioeconomics, environmental justice, health and safety, solid wastes, hazardous and toxic substances. Extant environmental documents such as base cultural and natural resources survey data, Installation Restoration Program reports and maps and Military Munitions Remediation Program reports and maps will be used in the analysis of the proposed action.

Field surveys to evaluate and record the cultural and natural resources present were conducted by archaeologists and biologists in October, 2010, demonstrating that the proposed action would cause adverse effects on cultural resources, but that impacts to species of concern could be avoided by a prudent choice of development location. Further field work was conducted in 2014 with similar results. Consultation with the New Mexico State Historic Preservation Officer is being conducted and archaeological work as required will be completed prior to development. The proposed action does not entail direct impacts on resources of known importance to Native Americans, nor on species of concern or Threatened and Endangered Species. The U.S. Fish and Wildlife Service, the New Mexico Department of Game and Fish and the Mescalero Apache Tribe have been provided an initial opportunity to comment and will receive the public draft EA for further comment.

SUMMARY OF REASONABLY EXPECTABLE ENVIRONMENTAL IMPACTS

Implementation of the action would not significantly impact geology, seismicity, soils, ground water, land use, socioeconomic and environmental justice concerns, human health and safety, nor would there be hazardous or toxic materials concerns.

Negligible or brief transient impacts would occur in the local air quality (construction dust), aesthetics, noise, wildlife and solid waste categories.

Construction and operation of the proposed facility may have some potential to cause adverse impacts on surface water resources, vegetation, species of concern and cultural resources (archaeological sites). These impacts may or may not be reasonably expected to be significant. The levels of impact and significance will be presented and analyzed in the assessment.

Long-term beneficial cumulative impacts would include: lower stress on regional air quality through reduced HAFB load on carbon-fueled generators and reduced load on the regional service network; creation of a few high-tech jobs; possible energy cost savings as the price of carbon-fuels escalates, and a degree of energy self-sufficiency for the base.