CENTENNIAL ARCHAEOLOGY

A CLASS III CULTURAL RESOURCE INVENTORY FOR THE FRONT RANGE-MIDWAY SOLAR PROJECT IN EL PASO COUNTY, COLORADO

Western Area Power Administration

by

Christopher C. Kinneer
Eva M. Donkin
Kristin A. Gensmer
Benjamin F. Perlmutter
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July 2015

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Submitted to:

Western Ecosystems Technology, Inc.
Cheyenne, Wyoming
and
Front Range-Midway Solar Project, LLC
Lenexa, Kansas

Submitted by:

Centennial Archaeology, LLC.
Fort Collins, Colorado

Principal Investigator: Christopher C. Kinneer

All Work Performed under the Terms and Conditions of State of Colorado Archaeological Permit No. 2015-44

July 2015

OAHP1421

Colorado Historical Society - Office of Archaeology and Historic Preservation

COLORADO CULTURAL RESOURCE SURVEY

Cultural Resource Survey Management Information Form

I. PROJECT SIZE

Total federal acres in project	0	Total federal acres surveyed	0
Total state acres in project	0	Total state acres surveyed	0
Total private acres in project	1,162.16	Total private acres surveyed	1,109.52
Total other acres in project	0	Total other acres surveyed	0

II. PROJECT LOCATION

County: El Paso

USGS Quad Map: Buttes (1994)

Principal Meridian: 6th

NOTE: The legal location information below is meant to summarize the location of the survey and does not need to be precise.

Township: 17S Range: 65W Sec: 17, and 20-22

III. SITES

Smithsonian Number	Resource Type				Eligibility						Management Recommendations						
	Prehistoric	Historic	Paleontological	Unknown	Eligible	Not Eligible	Need Data	Supporting	Non Supporting	Contributes to a District	No Further Work	Preserve / Avoid	Monitor	Test	Excavate	Archival Research	Other
5EP7621	X					X					X						
5EP7623	X					X					X						
5EP7625	X						X					X					
5EP7627	X					X					X						
5EP7632	X						X					X					
5EP7640	X					X					X						

IV. ISOLATED FINDS

Smithsonian Number	Resource Type			
	Prehistoric	Historic	Paleontological	Unknown
5EP7613	X			
5EP7614	X			
5EP7615	X			
5EP7616	X			
5EP7617	X			
5EP7618	X			
5EP7619	X			
5EP7620	X			
5EP7622	X			
5EP7624	X			
5EP7626	X			
5EP7628	X			
5EP7629	X			
5EP7630	X			
5EP7631	X			
5EP7633	X			

Smithsonian Number	Resource Type			
	Prehistoric	Historic	Paleontological	Unknown
5EP7634	X			
5EP7635	X			
5EP7636	X			
5EP7637	X			
5EP7638	X			
5EP7639	X			
5EP7641	X			
5EP7642	X			
5EP7643	X			
5EP7644	X			
5EP7645	X			
5EP7646	X			
5EP7647	X			
5EP7648	X			
5EP7649	X			
5EP7650	X			

ABSTRACT

Centennial Archaeology LLC (Centennial) conducted a Class III cultural resource inventory for the Front Range - Midway Solar project, El Paso County, Colorado for Front Range - Midway Solar Project, LLC. The goal of the project is to construct a solar power generation facility adjacent to the existing Midway substation. Project oversight was provided by the Western Area Power Administration. The project area encompasses an area of 1,162.16 acres, all of which are privately held. Two parcels within the project were not included in the inventory because they are electrical facilities. Total pedestrian survey acreage was 1,109.52. The surrounding area within a two-mile buffer of the project boundary was subjected to a Class I file search and analyzed to determine if any NRHP-listed or eligible sites would incur visual impacts from the proposed solar project.

A total of six sites and 32 isolated finds (IFs) were documented within the project area, all six sites were newly recorded by Centennial. All of the sites and IFs are prehistoric. Five sites are open lithic scatters, and one consisted of a possible hearth. The IFs all consist of either single occurrences or small quantities of prehistoric debitage. Two sites (5EP7625 and 5EP7632) require additional information to determine eligibility recommendations, but will be avoided by the proposed project. The four remaining sites and all of the IFs are assessed as not eligible for the NRHP, and no further work is recommended. The visual impact analysis did not identify any sites that could be potentially impacted within the two-mile buffer.

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CHAPTER 1
INTRODUCTION

Project Description

Centennial Archaeology LLC (Centennial) performed a Class III cultural resource inventory of the proposed Front Range - Midway Solar (FRMS) project area in El Paso County, Colorado for Front Range - Midway Solar Project, LLC. The project area is located east of the Front Range foothills and approximately nine miles south of the City of Fountain, Colorado. The FRMS project proposes the construction of a solar power generation facility adjacent to the existing Midway substation. The project would generate an estimated 100 megawatts, and could deliver solar energy to multiple Colorado utilities. Federal permitting and oversight for the project was provided by the Western Area Power Administration (Western). The project area encompasses 1,162.16 acres, of which 1,109.52 was subjected to a pedestrian inventory. The remaining 52.64 acres lies within two small inaccessible parcels, including the Southwest Generation - Fountain Valley Facility and the Midway Substation. All of the property within the inventory is privately held.

Administrative Data

The work described in this report was conducted under a contract with Western Ecosystems Technology (WEST) for Front Range - Midway Solar Project, LLC. The project manager for WEST, and Centennial's day-to-day contact, was Gretchen Norman. Christopher C. Kinneer served as the principal investigator and project director for Centennial. Kristin A. Gensmer acted as the technical editor. Graphics and maps were produced by Rosemarie L. Pavel and Mr. Kinneer. The field investigation was conducted by Mr. Kinneer, Ms. Pavel, Benjamin F. Perlmutter, Eva M. Donkin, and K. Talle Hogrefe. Stephen Tromly and Cynthia Adornetto, administered the project for Western. File search information was collected on March 18 and July 7, 2015 through the Colorado Office of Archaeology and Historic Preservation (OAHP). The field investigation was conducted between May 27 and July 6, 2015. One piece of obsidian was collected for X-ray florescence analysis, and limited shovel probing was conducted at sites 5EP7621, 5EP7623, and 5EP7640. The single collected artifact was returned to the collection location; no permanent curation was required. Project administrative records and digital files of photographs are reposited permanently at the Centennial office in Fort Collins, Colorado.

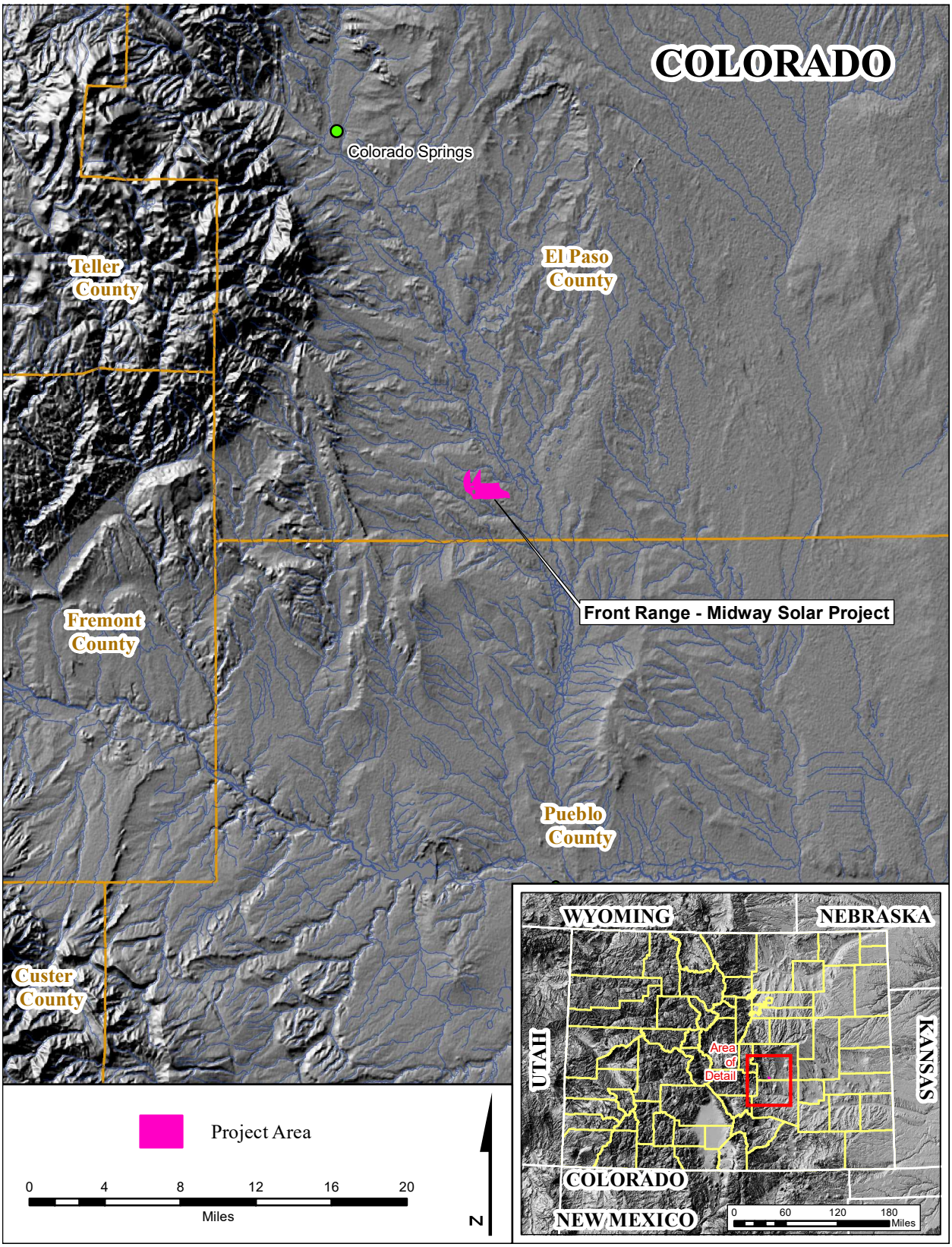


Figure 1. Map of central Colorado showing the Front Range - Midway Solar study area.

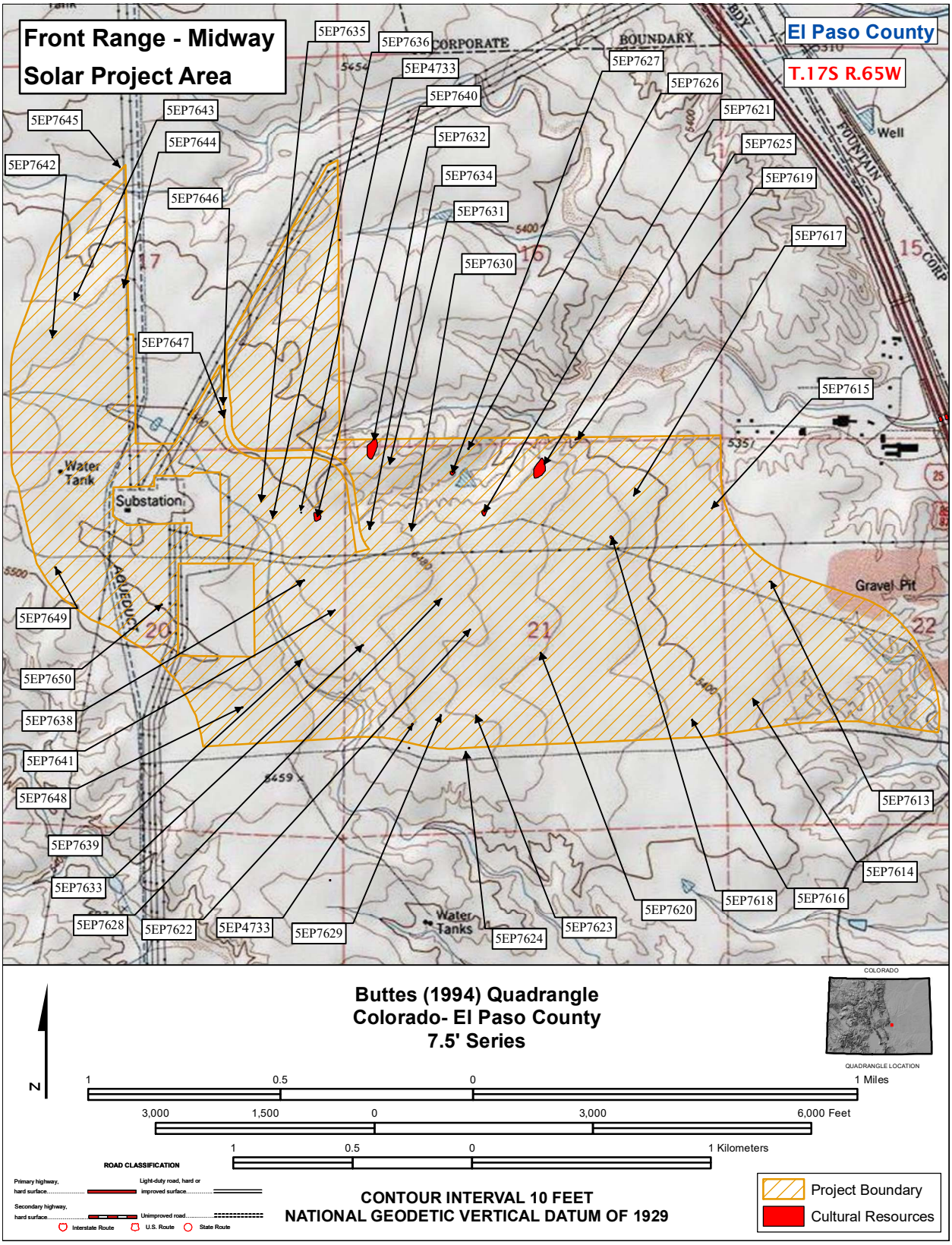


Figure 2. USGS 1:24,000 scale map showing the Front Range - Midway Solar project area.

CHAPTER 2

ENVIRONMENTAL SETTING

Physiography, Geology and Hydrology

The FRMS Project is situated within El Paso County, and is roughly equidistant from the cities of Colorado Springs and Pueblo. Located west of Interstate 25 (I-25) and south of the City of Fountain, the project encompasses an area of 1,109.52 acres. The project area is largely undeveloped despite its proximity to I-25 (Figures 3 and 4). However, gravel pits are present to the east and the Fountain Valley Power Plant (Southwest Generation), and associated infrastructure including transmission lines and an aqueduct is encompassed by the western portion of the project area. A partially developed residential community is located to the west and northwest of the survey area. Although a few houses were constructed and appear occupied, many of the streets and cul-de-sacs installed as part of the development appear abandoned and unused. Construction associated with the development does not appear to continuing. Terrain within the project area is a gently undulating grassland incised with unnamed intermittent drainages that flow into Fountain Creek to the east and Sand Creek to the south. Sand Creek is a tributary of Fountain Creek, which is included within the drainage basin of the Arkansas River. A gentle rise is present in the central portion of the survey area. Small finger ridges radiate out from the rise. Elevation in the area ranges from 5,530 ft to 5,450 ft.

The project is situated entirely within the Colorado Piedmont section of the Great Plains physiographic province. This section is differentiated from the High Plains to the east by the absence of mantling Tertiary rock, which was removed as a result of Quaternary erosion by the South Platte and Arkansas Rivers and their tributaries (Thornbury 1965:310-312; Morrison 1987:170). The Colorado Piedmont exhibits gentle terrain when compared to the Raton Basin to the south, and includes the broad valley of the Arkansas River, the lower reaches of tributaries on both sides of the valley, and dissected, low-relief uplands. Cretaceous sedimentary formations are exposed here, as is Pierre Shale to the north of the Arkansas River. In addition, significant Late Pleistocene and Holocene alluvial deposition is present along the Arkansas River, and Quaternary eolian and alluvial sediments mantle much of the surface north of the river (Tweto 1979).

Climate

The southeastern Colorado climate is semi-arid and continental, and as such is characterized by wide annual and diurnal fluctuations in temperature and precipitation. Climatic conditions are affected by a number of interrelated variables such as the movement of major air masses, topography, latitude, elevation, and local storm track patterns (Painter et al. 1999:8-10; Kalasz et al. 2007:13). Foothill settings such as those characterizing the project area experience interrupted airflow as a result of high mountains to the west, and are less prone to climactic extremes. However, the area may be described generally as exhibiting hot summers, cold winters, and frequent winds. Long-term temperature and precipitation records for the nearby City of Fountain were examined to provide an overview of climactic conditions in the area (Weatherbase 2015). The warmest month of the year is July with an average temperature of 86.1º F. The average

Figure 3. View of study area, facing west.

Figure 4. View of study area, facing east.

yearly precipitation is 14.3 inches, most of which falls between April and June (combination rainfall and snow in most years) and again in July and August (thunderstorms). The period October through February is extremely dry throughout the Colorado Piedmont.

Flora and Fauna

The project area is situated within a temperate grassland vegetation zone. While this zone extends through much of the central United States, and is therefore subject to variation, the grasslands of southeastern Colorado are dominated by drought-resistant grass species that tolerate low humidity, limited rainfall, and high winds, most notably blue grama, galleta, alkali sacaton, needle-and-thread, and western wheatgrass (Mutel and Emerick 1984). Vegetation in the project area includes stands of cholla interspersed with prickly pear cactus, various forbs, and assorted short-to-medium grasses.

The exposed and unprotected nature of the grassland environment tends to limit mammalian habitation to species that have the ability to move quickly or to live underground (Painter et al. 1999:10). Large species inhabiting high plains grasslands include pronghorn antelope, bison (formerly), and, in certain ecological niches, elk, mule deer, and whitetail deer. Small and medium-size mammals include jackrabbit, eastern cottontail, red and swift foxes, coyote, bobcat, raccoon, badger, spotted and striped skunks, blacktail prairie dog, and a various smaller rodent species including shrews, mice, voles, and rats. Larger species of grassland animals were not observed in the project area. Snakes observed during survey include common garter snakes, coachwhips, and prairie rattlesnakes.

CHAPTER 3
Culture-Historical Context

Prehistoric Narrative

The Arkansas River Basin, which coincides with the lower southeastern portion of the state of Colorado, has been subjected to archeological research for over 50 years. This section is intended to review and update briefly the more important aspects of previous work. The information is presented within the framework of the taxonomic scheme provided in the most recent prehistoric research contexts for the Arkansas River Basin (Zier and Kalasz 1999). Human occupation extending back to at least 11,500 years before present (B.P.) has been documented in this region. Three major stages are defined: Paleoindian, Archaic, and Late Prehistoric. Taxa or shorter duration, termed periods, are identified within the respective stages. The following taxonomic nomenclature follows a simple, hierarchical stage/period/phase scheme to alleviate confusion and helps to display fundamental patterns seen throughout the prehistory of the area.

Paleoindian Stage	<11,500 – 7800 B.P.
Pre-Clovis	<11,500 B.P.
Clovis Period	11,500 – 10,950 B.P.
Folsom Period	10,950 – 10,250 B.P.
Plano Period	10,250 – 7800 B.P.
Archaic Stage	7800 – 1850 B.P. (A.D. 100)
Early Archaic Period	7800 – 5000 B.P.
Middle Archaic Period	5000 – 3000 B.P
Late Archaic Period	3000 – 1850 B.P.
Late Prehistoric Stage	1850 – 225 B.P. (A.D. 100 – 1725 A.D.)
Developmental Period	1850 – 900 B.P. (A.D. 100 – 1050)
Diversification Period	900 – 500 B.P. (A.D. 1050 -1450)
Apishapa Phase	900 – 500 B.P. (A.D. 1050-1450)
Sopris Phase	900 – 750 B.P. (A.D. 1050 – 1200)
Protohistoric Period	500 – 225 B.P. (A.D. 1450 – 1725)

Paleoindian Era (11,500-7800 B.P.)

The earliest evidence of human occupation in the Arkansas River Basin defines this particular taxon. Paleoindian adaptation corresponds with ameliorating climatic conditions attendant with the late Pleistocene and early Holocene. The warming trend seen throughout the Paleoindian stage culminates in the arid, essentially modern climate of the Plano period. There is at present little evidence of Paleoindian occupation in the Arkansas River Basin. Although isolated surface finds are not unusual, only the Olsen-Chubbuck site (located on the eastern plains) and the Runberg site (situated in the high mountains) have produced comprehensive excavation data.

Paleoindian populations preferred the surrounding environments, factors such as less intensive levels of investigation and decreased archaeological visibility due to geomorphic conditions probably account for the differences in the known numbers of sites.

Pre-Clovis sites are yet to be found in southeastern Colorado. However, possible Pre-Clovis components are noted at three sites in northeastern Colorado and one site located at the Kansas-Colorado border near Interstate 70: Dutton, Selby, Lamb Springs, and Kanorado respectfully. Pre-Clovis attributes are largely limited to indications of intentional bone breakage, including the production of bone cores and flakes (Stanford 1983; Mandel et al.; 2005; Zier 1999a:77). Currently, there is a notable absence of diagnostic artifacts that clearly define this period.

The Clovis, Folsom, and Plano periods exhibit the oft-cited hallmarks of the Paleoindian stage, i.e., an emphasis on big-game hunting and flaked stone tool kits that showcase large, finely crafted lanceolate points. A marked preference for stone of the highest quality is noted among sites dating to these periods. The Hahn site (5EP1), consisting of surface materials situated near the northern boundary of the Arkansas River Basin on the Palmer Divide, is the only recorded Clovis site in southeastern Colorado (Zier 1999a:80). Information pertaining to this period must, therefore, be gleaned from other regions. The highly mobile Clovis period bands are strongly identified with a distinctive, bifacially fluted, lanceolate dart point found in dramatic association with mammoth bone. However, the more current and fuller view of Clovis adaptive strategy emphasizes a varied tool assemblage and a concomitantly diverse economy that includes plants and smaller game (Zier 1999a:81-82).

The succeeding Folsom and Plano periods are more strongly reflected in the archaeological record, and these taxa have a larger representation in the Colorado database. The Lindenmeier site in northeastern Colorado and Stewart's Cattle Guard, Zapata, and Linger sites in the Rio Grande River Basin are highly significant Folsom components (Gilmore et al. 1999; Martorano et al. 1999). As is the case with Clovis period remains, southeastern Colorado is minimally represented by Folsom occupations. Surface lithic scatters in the Mesa de Mayo vicinity of Las Animas County (5LA57 and 5LA986), and the previously mentioned Hahn site, are the only recorded Folsom sites in southeastern Colorado. The subsequent Plano period is characterized by a much broader time span than the Clovis and Folsom periods and, accordingly, is represented by a larger site sample (Zier 1999a:91-93). Still, most of the Plano period evidence in southeastern Colorado consists of spare albeit widely distributed remains found in isolated surface contexts (Anderson 1989). Two Plano components have been excavated in the Arkansas River Basin: the Olsen-Chubbuck site in the eastern plains, and the Runberg site and 5LK372 in mountain/foothill settings along the basin's western margin (Arthur 1981; Black 1986; Wheat 1972; Zier 1999a:91).

As with the Clovis period, our current understanding of Folsom and Plano existence is derived largely from sites within a broad geographical range outside the Arkansas River Basin. Whereas the Folsom period witnessed a continuation of a fluted point morphology initiated in Clovis times, the Plano period is associated with a series of temporally and spatially overlapping, non-fluted projectile point traditions. The latter include Agate Basin, Alberta, Cody (or Cody/Kersey), Eden, and Hell Gap. Similar to the more recent Clovis studies, the traditional view of Folsom and Plano economy as one which emphasized the procurement of extinct and modern

bison species is currently undergoing significant modification (Kuehn 1998, Zier 1999a:90). More recent data suggest a wider subsistence base that, in addition to bison, included vegetal processing and the exploitation of small and medium-sized game animals. However, Folsom adaptive strategy is often distinguishable from that of the Plano period on the basis of the level of cooperation among bands in hunting large game. Specifically, the dramatic shift from the small-scale hunts of the Folsom period to the communal Plano procurement efforts is believed to be a significant factor in differentiating the two taxa (Zier 1999a:95). This shift is probably a response to the arid environmental conditions of the Plano period that prompted the development of larger and more widely distributed bison herds.

Archaic Stage (7800 – 1850 B.P.)

The Archaic stage, further divided into Early, Middle, and Late periods, witnessed a continuation of the band-level hunting and gathering tradition initiated in the Paleoindian stage. However, this taxon is marked by a more varied subsistence base, a large and diverse feature assemblage, and a range of morphologically disparate, primarily non-lanceolate point styles.

The Arkansas River Basin has produced scant archaeological data pertaining to the Early Archaic period (7800-5000 B.P.). There was, as of 1999, a complete absence of radiometric assays in the Arkansas River Basin that date between 7740 B.P. and 4930 B.P. (Zier and Kalasz 1999:Figure 4-2). The presence of Early Archaic bands in southeastern Colorado is known entirely through the recovery of diagnostic projectile points. On the plains these are generally large, stemmed specimens with low, shallow side-notches. They are often termed "Hawken-like" because of similarities with Hawken Side-notched points of the Northwestern Plains (Frison 1991; Zier 1999b:105). High altitude sites also include stemmed-indented base points (Metcalf and Black 1991:92-98; Zier 1999b:105). Interestingly, this particular period is associated with the pronounced early Holocene warming and drying trend known as the Altithermal climatic episode. Previous studies have posited that the relatively hot and arid conditions of the Altithermal greatly affected Early Archaic settlement/subsistence strategies (Reeves 1973; Benedict 1978). Most notably, lowland regions were abandoned in favor of mountain/foothill niches sometimes termed refugia. However, other researchers have noted that the exploitation and occupation of these niches was firmly established by Mountain tradition populations prior to the onset of the Altithermal (Black 1991). Rather than a massive migration to higher elevations, the "reduction in occupation of the plains and basins is best explained as a simple diminution in human population" (Zier 1999b:105).

The Middle Archaic period (5000-3000 B.P.) witnessed a widespread reversion to more mesic (wetter and cooler) climatic conditions following the close of the Altithermal. This period represents the earliest portion of the southeastern Colorado prehistoric sequence that is associated with a substantial archaeological database (Zier 1999b:113). That the two preceding statements are related must be considered, given the broad range of ecological settings within which Middle Archaic sites are found. The small hunter-gatherer bands of the period developed a diverse economy featuring exploitation of a variety of wild plant and game resources. Even in southeastern Colorado, the lanceolate and stemmed-indented dart points typically ascribed to the McKean complex of the Northwestern Plains are the prevalent diagnostic artifact form. Large, side-notched Mallory points are also present. Although McKean and Mallory are manifestations derived from

Northwestern Plains contexts, it is acknowledged that similar point morphologies and radiometric dates are associated with the Pinto Series of the Great Basin. Edge serration, regardless of point form, is believed to be more prevalent in high country Middle Archaic sites. Examples of Middle Archaic architecture, in both simple and complex forms, make their first pronounced appearance, primarily in regions adjacent to the Arkansas River Basin (Shields 1998:Table 2; Zier 1999b:120). A morphologically variable assemblage of thermal features recorded in Middle Archaic contexts likely served functions ranging from simple hearths to more complex slab-lined "earth ovens" (Zier 1999b:120-121). The pervasiveness of cooking features corresponds with an attendant increase in the sheer number of ground stone artifacts. A storage feature at Wolf Spider Shelter near Trinidad yielding abundant charred wild plant seeds further attests to the escalation of plant processing during the Middle Archaic period (Hand and Jepson 1996).

Sites of the Late Archaic period (3000-1850 B.P.) in the Arkansas River Basin are more abundant and widespread than those of previous Archaic stage periods, but there is little to suggest that sweeping modifications in adaptive strategy occurred. The band-level hunter-gatherer strategy continued to be emphasized, but there are indications that populations expanded from previous Middle Archaic levels. Within sites where both Middle and Late Archaic components are present, the latter appear to represent much more intensive occupations (Zier 1999b:130). Although there is an increased sample of radiocarbon assays from the Late Archaic period, issues such as greater archaeological visibility and geomorphological conditions must be considered when interpreting these data. Simply put, the depositional contexts available for archaeological investigation likely favor the more recent occupations. Although subsistence practices focused on a variety of game and wild plant resources, there is firm evidence that some southeastern Colorado groups began to cultivate small patches of maize (corn), or perhaps obtained corn through trade. Use of the atl-atl continued, but the morphological trends seen among Late Archaic point assemblages differ notably from those of the Middle Archaic period. Lanceolate and stemmed-indented base styles in particular give way to large, corner-notched dart points. Late Archaic architecture is sparsely represented in southeastern Colorado, but the presence of structures at the McEndree Ranch site and 5LA2190 demonstrates that the tradition of constructing basin house shelters remained in place (Rood 1990; Shields 1980).

Late Prehistoric Stage (1850 – 225 B.P.)

This taxon, further divided into the Developmental, Diversification, and Protohistoric periods, is associated with the greatest number of chronometrically dated sites in the Arkansas River Basin (Zier and Kalasz 1999:Figure 4-1). As stated previously, the use of these data to posit population growth must be tempered with geoarchaeological considerations of site visibility. Still, the sheer number of Late Prehistoric age assays provides considerable interpretive weight to support such a premise. Furthermore, the time span between A.D. 100 and A.D. 1725 in southeastern Colorado witnessed profound changes in settlement, subsistence, technology, trade, interregional relationships, and demographics. It is becoming increasingly apparent, however, that at least until the inception of the Protohistoric period there was no significant replacement of the widespread, indigenous hunter-gatherer population that flourished during the Archaic stage (Kalasz et al. 1999:146).

The Developmental period (1850-900 B.P. [A.D. 100-1050]) spans roughly the first half of the Late Prehistoric stage, and was characterized by new technologies superimposed on a well-established Archaic stage mode of existence (Kalasz et al. 1999:141). Initially, it was the bow and arrow that supplanted, perhaps gradually, the use of the atl-atl. The launch of such technology is gauged by a dramatic reduction in the size, if not the overall form, of projectile points; i.e., the large, corner-notched dart point gives way to the small, triangular, corner-notched arrow point. The scant temporal data pertaining to the arrival of pottery indicate that ceramic technology was adopted by Developmental period groups in the Arkansas River Basin approximately 200-300 years after the appearance of the bow and arrow (Kalasz et al. 1999:Table 7-1). Local cord-marked wares indicative of stylistic influences from the Central Plains are virtually indistinguishable from those manufactured in the succeeding Diversification period. In addition, plain pottery described as thick, crude, oxidized, and sand-tempered has also been recovered from both Developmental period and Sopris phase contexts in the Trinidad District of the Park Plateau (Kalasz et al. 1999:173). Habitation structures are better represented than in the preceding Late Archaic period, and are recorded in both open and rock shelter settings. Several examples of complex architecture requiring considerable investment of time and effort for construction were exposed in Developmental period contexts (Hunt 1975; Loendorf et al. 1996). The more elaborate structures are free-standing basin houses with interior hearths, storage features, postholes, and stone slab foundational elements. Although such structures suggest increasing levels of sedentism, other characteristics associated with the same sites, e.g., a lack of substantial middens, are indicative of the temporary seasonal residences typical of hunter-gatherers. Furthermore, although maize was a consistent if not significant dietary item, wild faunal and floral resources continued to dominate the Developmental period subsistence base. Other than projectile point morphology, the Developmental period lithic assemblages do not differ significantly from those of the Archaic stage. Bedrock and/or boulder grinding surfaces are believed to be more commonplace, but these are often difficult to assign reliable dates. Also of note are indications that a bone and shell tool/ornament industry becomes increasingly prominent in the Developmental period. Several elaborate Late Prehistoric stage burials decorated with exotic bone and shell ornaments have been excavated along the Front Range (Black et al. 1991; Black 1997; Buckles et al. 1963; Jepson and Hand 1999). The presence of grave goods provides at least a tentative basis for inferring that greater levels of social organization and status differentiation were in place during the Developmental period.

The Diversification period (900-500 B.P. [A.D. 1050-1450]) is distinguished by the region's first well-defined occurrences of directional change in Late Prehistoric stage adaptive strategy. Such change permits discrimination of Apishapa phase sites from those assignable to the Sopris phase. Although both Apishapa and Sopris phase populations are probably derived from common Developmental period origins and overlap considerably in terms of overall adaptive strategy, they are perceived as geographically and culturally distinct manifestations. In general, the Diversification period is marked by the construction of multi-room architectural settlements (often referred to as hamlets or villages) that are larger and more complex, and were possibly occupied for longer durations, than those of the Developmental period.

Evidence of the Apishapa phase is widely distributed through the canyons and major watercourses exiting the Rocky Mountains between Colorado Springs and the Dry Cimarron River valley of northeastern New Mexico. Sites were initially identified by the "stone enclosure"

structures recorded in the 1930s along the Apishapa River north of Trinidad, Colorado. The Apishapa phase is most often viewed as the westernmost representation of the Plains Village tradition. However, rather than the sedentary, horticultural settlements of the Plains Villagers, the Apishapa populations retained the decided hunter-gatherer emphasis initiated by their Archaic ancestors. Maize is commonly recovered from Apishapa components, but generally in small quantities. Substantial numbers of cobs, i.e., 200-250 specimens, were associated with only two known sites, Medina and Pyeatt rock shelters (Campbell 1969). Located in the Purgatoire River vicinity, both were possible storage facilities. By far the greatest portion of the Apishapa phase subsistence base was comprised of a wide variety of faunal and wild plant resources. The notion that the Apishapa populations were more sedentary than their Developmental period antecedents is evidenced by "...unique and sometimes massive stone masonry architecture, often clustering in numbers suggestive of settlements or hamlets" (Kalasz et al. 1999:198). Eastern influences such as cord-marked pottery and semi-subterranean houses with circular foundations are predominant attributes of the Apishapa phase. However, this taxon is believed to be a unique manifestation that developed from well-established ancestral roots in the Rocky Mountain region; there are no indications that the Apishapa phase is derived from Southern or Central Plains groups that moved into the area.

Whereas the Apishapa phase exhibits influences primarily from Plains cultures to the east, Sopris phase groups established relationships with Rio Grande Puebloans near the end of the Developmental period (Kalasz et al. 1999:221-239). Furthermore, the Sopris phase in Colorado is restricted to the eastern slope of the Sangre de Cristo Mountains, primarily along the upper Purgatoire River in the Park Plateau region. Maize was evidently a more important resource in Sopris phase subsistence, but the long-lived hunting and gathering tradition remained a critical economic component. Intensive interaction with the northern Rio Grande Valley Pueblos is believed to account for the rectangular/subrectangular, multi-room, stone masonry architecture and various Taos culinary wares that are prominently represented at Sopris phase sites. The structures served as residences for distinct households and generally incorporated storage structures. In contrast to the Apishapa phase, there is considerable evidence for highly formalized mortuary practices among the Sopris phase populations. This evidence provides some basis for inferring that Sopris phase populations were generally more sedentary than those of the Apishapa phase.

The Protohistoric period (500-225 B.P. [A.D. 1450-1725]) encompasses the decidedly "gray area" of archaeological research that spans the traditional concepts of prehistory and history. Significantly, some of the events that transpired during this period are elucidated by documentary evidence. These documents were generated through Spanish expeditions into southeastern Colorado that began as early as the late sixteenth century. The onset of the Protohistoric period, ca. A.D. 1450, is defined by the possibly overlapping dates associated with Apishapa phase abandonment and the purported arrival of Athapaskan (also referred to as "Apachean") groups from the north (Kalasz et al. 1999:250). It is acknowledged that the timing and extent of the Southwestern Athapaskan entrada remains controversial, particularly as it applies to the Arkansas River Basin. The A.D. 1725 date offered recently as the Protohistoric period terminus is based on historical accounts from Spanish expeditions that describe the withdrawal of Athapaskan bands in response to Comanche and Ute incursions (Kalasz et al. 1999:250).

Evidence of Protohistoric occupation in the Arkansas River Basin is restricted to the aforementioned historical accounts and scant archaeological data recovered from sites associated with various micaceous wares. Large settlements are, to date, unknown archaeologically in the region. Most southeastern Colorado sites identified as Protohistoric are associated with small rock shelters and/or the enigmatic, circular, spaced stone foundations typically labeled "tipi rings" (Kalasz et al. 1999:252). These occupations appear to be representative of temporary, seasonal encampments used by nomadic bands traveling through the region. Research conducted by Brunswig (1995) indicates that the sites were affiliated with Apachean "hypothetical culture pattern variants," i.e., western Dismal River aspect and Sangre de Cristo or Jicarilla Apaches (Kalasz et al. 1999:255-256). Whereas the western Dismal River variant was believed to be influenced by Shoshonean groups of the western Rocky Mountains, the Sangre de Cristo or Jicarilla Apache is distinguished by significant interaction with Rio Grande Puebloans. However, these affiliations are based on assumptions derived from limited analysis of micaceous pottery. The difficulties involved in assigning micaceous pottery to specific culture groups are well-documented (Gulley 2000; Hummer 1989; Kalasz et al. 1999:255-256). Moreover, the concept of the Dismal River aspect as strictly an Apachean manifestation has recently been questioned (Gulley 2000).

Documents derived from Spanish explorations of the region provide intriguing narrative pertaining to the latter portion of the Protohistoric period (Hanson and Chirinos 1989; Jones et al. 1998; K. Weber 1990; Kalasz et al. 1999:256-257). Ethnohistoric accounts, such as those of the Ulibarri expedition of 1706, attest to Penxaye and Cuartelejo Apaches living in horticultural villages along the Purgatoire and Arkansas Rivers in southeastern Colorado. However, archaeological remains that demonstrate such a presence are yet to be found.

Historic Narrative

Spanish Exploration, Early Settlement, and Native-American Trade: The history of southeastern Colorado began over 400 years ago with the Spanish effort to colonize the "New World." In search of silver, Francisco Vasquez de Coronado began to explore the area in the 1530s. By the end of the 16th century his exploration, along with many others, resulted in the establishment of lucrative hunting grounds and trade networks with a number of Native American cultures. This initial trade carried out by both groups was generally a simple exchange, and was centered primarily on the trade of New Mexican Valley game, horses, hides, and guns. By the late 18th century the Spanish established small settlements in large portions of the American Southwest including Colorado (League of Revolutionary Struggle 2015). As a result of increased settlement much of the previous, symbiotic trade ceased. In the end, the Spanish were successful in creating a new trade system brought about by the differential access to the buffalo, the primary resource. Production, which was no longer limited to local needs, refocused on what the national and international markets could absorb. Indian tribes became competing and consuming economic groups locked into, and increasingly dependent upon, an external trade network over which they had no control. These previously self-sufficient societies became both the initial producers of items such as hides, leather, dried meats, and slaves and the ultimate consumers of guns, sword blades for lances, axes, wool blankets, agricultural products, and horse gear (Nebraska Studies.org 2015). The Spanish, and shortly thereafter the Mexicans and Anglo-Americans, took hold of the

region eliminating key fundamental processes of Native American culture, power, and ultimately traditional ways of life (K. Weber 1990).

Mexican Sovereignty and Settlement: The Spanish Empire was challenged in 1876 by the Anglo-Spanish War (1796-1808). In an attempt to defeat the British, Spain began to harshly tax Mexicans who occupied portions of North American including the American Southwest. The Mexican people moved for independence. By 1821 the Mexican revolutionary army successfully captured and forced the Spanish viceroy to resign and the Mexicans took political control over portions of the American Southwest (League of Revolutionary Struggle 2015).

In southeastern Colorado, the Arkansas River remained the international boundary, with Mexico controlling the south bank the U.S. controlling the north bank. The Mexican period in this area endured only through the close of the Mexican-American War of 1846-1848, which culminated in the Treaty of Guadalupe-Hidalgo. By the terms of this treaty Mexico ceded vast portions of the southern plains, Southwest, Rocky Mountains, and California to the United States. Lands in southeastern Colorado south of the Arkansas River became part of the U.S. at this time (D. Weber 1982; Boyer 2001:497-498).

With Mexican independence came a repeal of trade barriers on the New Mexican frontier that had been put in place by the Spanish government. The Santa Fe Trail, pioneered by William Becknell, was established immediately along common Indian, Spanish, and Mexican trade routes, connecting Missouri with the Mexican territorial capital of Santa Fe. The Santa Fe Trail, which passed through southeastern Colorado, was more a trail system than a trail. Unlike its northern counterpart the Oregon Trail, which served mainly as an emigrant route, the Santa Fe Trail was a freight road over which goods were hauled between the U.S. and Mexico (Lamar 1977:832).

The success of trade during the initial ten years of Mexican independence resulted in the construction of Bent's Fort by the Bent, St. Vrain and Company on the north (American) side of the Arkansas River in the early 1830s. During the fur trade era three principal routes to Santa Fe were established. Probably the oldest route was the Trappers or Taos Trail, which led from the upper Arkansas River along the Huerfano River and over Sangre de Cristo Pass into the San Luis Valley, then south along the Rio Grande into Taos in northern Mexican territory. The Cimarron Cutoff went southwest from the Arkansas River to the Cimarron and Canadian Rivers and then into Santa Fe over Glorieta Pass. The last route, known as the Mountain Branch of the Santa Fe Trail, departed the Arkansas River at Bent's Fort, ascended Timpas Creek parallel to and west of the Purgatoire River, crossed Raton Pass, and then rejoined the Cimarron Cutoff at the Mora River (Friedman 1985).

Lecompte (1978:55-56) argues convincingly that, prior to 1846, the majority of the trappers and traders employed by Bent, St. Vrain and Company used the Taos Trail when traveling between the fort and the Mexican settlements using pack animals. The traffic over the Mountain Branch was not heavy prior to 1845 because of the difficulties involved in crossing Raton Pass. To facilitate the northern invasion of Mexico by Stephen Watts Kearney's Army of the West, extensive improvements were made to the trail in 1846, and from that point on the Mountain Branch was used regularly by wagon traffic.

Early American Settlement: Several small Anglo-American settlements were started on the upper Arkansas River during the Mexican period. In 1842 a small community was founded at present-day Pueblo near the mouth of Fountain Creek by George Simpson, a former Bent employee. Also in 1844, a farming community was started by Simpson on Hardscrabble Creek. Named for the creek, this settlement was the first to be built on the south side of the Arkansas River in Mexican territory. The following year another community was established on Mexican soil by Anglo-American mountain men. The settlement, called Greenhorn, lay a short distance south of Pueblo. These communities represent the first agricultural settlements in southeastern Colorado. The Anglo-Americans who settled in Mexican territory squatted in these areas without official Mexican sanction, but the New Mexican governor was powerless to stop them (Friedman 1985:51-52; Lecompte 1978).

The post-war era beginning in 1849 brought several important changes to southern Colorado that led to permanent occupation of the region. Among these changes were the removal of the indigenous populations and the establishment of a stage line. After Kearney's Army of the West had destroyed the pasture surrounding Bent's Fort, William Bent attempted to sell the fort to the United States. However, the government's offer was considered unsatisfactory, and in August of 1849 Bent abandoned and blew up his fort before moving downriver to Big Timbers near present-day Lamar to continue trading activities. During the winter of 1852-1853 he built a stone fort called Bent's New Fort where he operated a freighting business and continued trading with the Indians (Friedman 1985:60-61; Moore 1973).

At the beginning of Anglo-American control of the area there were only a few non-Hispanic settlers in southern Colorado. The settlements in the Arkansas River Valley were restricted primarily to the area of present Pueblo. In the early 1850s one of the settlers was Richens "Uncle Dick" Wootten. He claimed that in 1853 he had a ranch consisting of a log house and stockade. His nearest neighbors were Joseph Doyle, who had settled in the region in the early 1850s, and Charles Autobees, who settled on the Huerfano River in 1853. There was also a group of mountain farming on the St. Charles River. The settlements did not endure. A Ute Indian massacre of the residents of the Pueblo fort at the mouth of Fountain Creek in 1854 drove most of the settlers out of the area; Hardscrabble and Greenhorn were abandoned by 1856 (Friedman 1985:61-62).

Gold Rush, Politics, and Statehood: It can be argued that the solidification of Anglo-American settlement within the region did not occur until after the gold rush in the mid-19th century. Although gold had been discovered in 1858, it was in the spring of 1859 that the first of approximately 100,000 gold-seekers began the trek to the Rocky Mountain region. The activity was short-lived, however, and of those who eventually set out approximately 60,000 turned back before arriving. Between April and October of 1859 about 25,000 people entered the mountains in the areas such as those near Colorado Springs. Crude homes were built, as were stores, hotels, and saloons. The newly established businesses were supplied with merchandise and equipped by wagon trains. The growth occurred not only in Denver but also in other locations along the Colorado Front Range and adjacent mountain areas. These settlements were the origins of such towns as Boulder, Central City, Fort Collins, Colorado Springs, and Pueblo (Hafen 1948:176-177; Carrillo et al. 1993). In the spring of 1859 immigrants began to demand the creation of a new state or territory in Pikes Peak country. It was thought that a legally constituted government would

serve to provide effective local control over the area. In addition, Colorado, as a territory, could unite all the mining districts under one administrative unit. Until the territory was established, the mining districts in northeastern Colorado north of the 40th parallel were under the jurisdiction of Nebraska territory but beyond its effective control. The early settlers therefore established the territory of Jefferson. The newly established government – essentially an extralegal territory – had considerable support from its members as it assured stability and order in the region. The Jefferson territory served as the initial step toward the creation of the Colorado territory (Mehls 1984:30-40). In December of 1860 Congress acted on Colorado's request for territorial status; the measure was finally passed in late February 1861 (Hafen 1948:199-221; Mehls 1984:40).

Homesteading in Southern Colorado: Further facilitating the Anglo-American inhabitance in the area was homesteading which began in Colorado in mid-1860s. Early homesteading in the American West including Colorado was an immediate result of the passage of the Homestead Act of 1862. Under this act a settler could claim a 160-acre plot of undeveloped land outside of the original 13 colonies. If the homesteader occupied the land for five years and made adequate improvements, he or she could apply for a patent, or deed of title to the land. Most of the early homesteaders in southern Colorado during the mid-1800s were Hispanics from northern New Mexico and Anglo-Americans from the U.S. and Ireland. Droughts and blizzards, however, forced many of the initial homesteaders out of the region in the 1880s (Friedman 1985:73-101). Homesteading from 1891 to 1915 witnessed the failure of a number of homesteads, and consolidation of land holding was held by a limited number of individuals, primarily Anglo-Americans. Large ranches tended to dominate the open range and controlled major water sources.

The passage of the Enlarged Homestead Act of 1909, which allowed settlers to claim 320 acres, resulted in an influx of homesteaders in the early 20th century. Similarly, starting in 1916 with the passage of the Stock-Raising Homestead Act of 1916 and ending in 1930, the United States government provided successful homesteaders with 640-acre parcels. The inflow of settlers that began at this time was supported and encouraged by several factors: improvements in dryland farming techniques, a stretch of several consecutive years with above-average rainfall, high demand for agricultural products resulting from World War I, and improved transport of products through the railroad system (Carrillo 1990:XVIII-34 – 35). An economic recession in the early 1920s followed by an intensifying drought on the southern and central plains culminated in the Dust Bowl, resulted in the failure of many homesteads and the vast majority of settlers abandoned their claims by 1930s. Many of the homesteaded parcels of land reverted to government ownership while others were bought out by more successful neighbors. Consolidation of land holdings ultimately concluded in land ownership patterns that prevail in the area to this day.

CHAPTER 4
Class I File Search Data

A Class I file search was conducted in July of 2015 through the OAHP. Information from OAHP was requested as GIS shapefiles clipped to sites and surveys situated within a two mile buffer of the study area. Supplemental information about each resources and investigation was acquired using the Compass database maintained by the OAHP. OAPH file search information includes records of past cultural resource investigations as well as all cultural resources that have been previously recorded. Background research was conducted for all or parts of Township 17 South – Range 65 West (T17S – R65W), Sections 4, 9-11, 15-17, 20-22, 26-29, and 31-35 and all or parts of Township 17 South – Range 66 West (T17S – R 66W), Sections 12-13, 24-25 and 36. In addition, historic General Land Office (GLO) records available through the Bureau of Land Management (BLM) website were examined to determine if trails, transportation routes, homesteads, utilities, or other resources are present in the project area. These maps were then compared to 1:24,000 scale topographic maps produced by the USGS and aerial imagery to determine if any resources portrayed in the GLO maps still existed. Survey plats from July of 1862 (T17S – R66W) and January of 1864 (T17S – R65W) show that the Canon City Road once traversed portions of Sections 20, 16, and 9 of T17S – R66W, and an unnamed road ran through Sections 8, 9, and 15 of the same map. The unnamed road intersected the Canyon City Road in the SW ¼ of Section 9 and continued northwest through the SW ¼ of Section 6. Neither road appears on modern maps or aerial imagery, and no evidence of the roads was found during the current survey project. Although property boundaries were drawn on the historic GLO maps, no buildings are depicted and no historic-era cultural materials were encountered during survey.

The OAHP search revealed that 28 prior investigations have been conducted within a two mile radius of the current project area. These projects include road and bridge improvements, utility line right-of-way clearance and facility developments, highway realignments, and a settlement survey for the Fort Carson Military Reservation. These investigations resulted in the documentation of 35 sites and 22 IFs. Three previously recorded IFs are situated within the present project area. These three IFs are prehistoric in age and consist of two pieces of lithic debitage (5EP2100 and 5EP6909) and a flaked stone tool (5EP4733). They were not relocated during the current survey project. The previous investigations (Table 1) and known cultural resources (Table 2) are summarized below.

Table 1
Class I File Search Data: Previous Cultural Resource Inventories Conducted within Two Miles of Project Area

Survey ID	Survey Name	Author(s)	Date	Contractor
EP.CH.NR5	Cultural Resources Survey of Project IR 025-2(202), Sand Creek - 1 Mile North of El Paso County Line, Colorado	Wallace, Steven M.	11/01/1985	Colorado Department of Highways

Table 1 (Continued)
Class I File Search Data: Previous Cultural Resource Inventories Conducted within Two Miles of Project Area

Survey ID	Survey Name	Author(s)	Date	Contractor
EP.CH.NR11	Cultural Resources Survey of Project BRO 0004(4), Bridge Replacement on Old Pueblo Highway, El Paso County, Colorado	Baugh, Susan T.	09/01/1986	Colorado Department of Highways
EP.CH.NR20	Cultural Resources Survey of Old Pueblo Highway - Fountain Creek, El Paso County, Colorado (BRO 0004(4))	Pearce, Sally	07/12/1988	Colorado Department of Highways
EP.CH.NR63	Archaeological Survey of Project IR 025-2(192), El Paso County, Colorado	Chocol, Barbara and Steven M. Wallace	12/03/1984	Archaeologist for Colorado Department of Highways
EP.CH.R1	Archaeological Survey of Project IR 025-2(203), 2 Miles North of Pueblo, El Paso County Line, Colorado	Wallace, Steven M.	11/01/1985	Colorado Department of Highways
EP.CM.R1	Cultural Resources Survey of Midway Ranches Water Line, El Paso County, Colorado	Arbogast, William R.	03/12/1993	William Arbogast for Colorado Mined Land Reclamation
EP.DA.NR47	No Information Available	No Information Available	No Information Available	No Information Available
EP.E.NR2	A Cultural Resources Inventory for Moving One Wood Pole Structure at the Midway Substation, El Paso County, Colorado	Barger, Mary	09/06/1996	Western Area Power Administration
EP.E.R5	Colorado Interstate Gas Company Midway Pipeline Intensive Inventory for Cultural Resources El Paso County, Colorado. (Original and Addendums)	Barclay, Dulaney	11/2000	Metcalf Archaeological Consultants for the Department of Energy

Table 1 (Continued)
Class I File Search Data: Previous Cultural Resource Inventories Conducted within Two Miles of Project Area

Survey ID	Survey Name	Author(s)	Date	Contractor
EP.R.R1	Southern Delivery System Geotechnical Corridor - Report 12: Class II Cultural Resource Inventory of Approximately 159 Acres in Eagle County, Colorado	Chambellan, Collette C.	05/09/2005	Western Cultural Resource Management, Inc. for the Bureau of Reclamation
EP.R.R3	Southern Delivery System Geotechnical Corridor - Report 11: Class II Cultural Resource Inventory of Approximately 142 Acres in El Paso County, Colorado (MWH-TDK5/03-B-065)	Chambellan, Collette C.	05/06/2005	Western Cultural Resource Management, Inc. for the Bureau of Reclamation
EP.R.R10	Cultural Resource Inventory of Teepee Buttes Pipeline Alignment Southern Delivery System Project El Paso County, Colorado	Briggs, Clive and Jessica Gabriel	12/2011	ERO Resources Corporation for Colorado Springs Utilities on Behalf of the Bureau of Reclamation
EP.R.R21	No Information Available	No Information Available	No Information Available	No Information Available
EP.RE.R1	Midway to Geesen OPGW Installation Project Class III Cultural Resource Inventory	Anderson, Stephen	08/2011	Tetra Tech for the Rural Utilities Service
EP.SC.NR3	K-5 Farms, Colorado, El Paso County Emergency Watershed Protection Program (EWP)	Sims, Marsha	07/20/1999	Natural Resources Conservation Service

Table 1 (Continued)
Class I File Search Data: Previous Cultural Resource Inventories Conducted within Two Miles of Project Area

Survey ID	Survey Name	Author(s)	Date	Contractor
EP.SC.NR35	El Paso County Limited Results Cultural Resource Survey Report on Private Lands (Sundance Investment)	Gohlke, Barbara	05/02/2012	USDA Natural Resources Conservation Service (NRCS)
MC.DA.NR19	Memorandum for Record: Archaeological Survey for the 13MP Upgrade Communication System on Fort Carson, El Paso and Pueblo Counties, Colorado (REC2006-161)	Cowen, Pamela	11/10/2006	Department of Defense - Fort Carson
MC.DA.NR21	No Information Available	No Information Available	No Information Available	No Information Available
MC.DA.R22	A Settlement Survey of the Fort Carson Military Reservation, El Paso, Fremont and Pueblo Counties, Colorado (Volumes 1 and 2) (1978-001)	Alexander, Robert K., John D. Hartley, Thomas F. Babcock, James V. Sciscenti, Dorothy M. Griffiths, et. al.	08/29/1983	Grand River Consultants for the United States Army
MC.DA.R32	Memorandum for Record: Cultural Resources Survey and Evaluation for 2007 DECAM FCMR Prescribed Burn Survey, El Paso and Pueblo Counties, Colorado (2007-196)	Cowen, Pamela	12/06/2007	Department of Defense - Fort Carson
MC.E.R27	Cultural Resources Survey of the Poncha-Midway Transmission Line Access Roads & Tower Locations Chaffee, Fremont, Pueblo & El Paso Counties, Colorado. (Original and Addendum) (1997-010)	Taylor, Melissa L. and Ted Hoefer III	05/04/1998	Foothill Engineering Consultants, Inc.

Table 1 (Continued)
Class I File Search Data: Previous Cultural Resource Inventories Conducted within Two Miles of Project Area

Survey ID	Survey Name	Author(s)	Date	Contractor
MC.FH.R1	Class III Cultural Resource Inventory of Lincoln to Midway 230kV Transmission Line, Lincoln, Elbert, and El Paso Counties, Colorado	Wunderlich, Robert, Eric Hendrickson and David Killam	12/2009	RMC Consultants, Inc. for the USDA Rural Development
MC.NP.R46	An Intensive Archaeological Inventory of the Multi-Purpose Range Complex Water Pipeline Right of Way, Fort Carson Military Reservation, El Paso and Pueblo Counties, Colorado (1985-005)	Zier, Christian J.	01/01/1986	Centennial Archaeology for the National Park Service and Fort Carson
MC.R.R58	Southern Delivery System Geotechnical Corridor - Report 13: Class III Cultural Resource Inventory of Approximately 151 Acres in El Paso and Pueblo Counties, Colorado (MWH-TKD5/03-B-065)	Chambella, Collette C.	05/09/2005	Western Cultural Resource Management, Inc. for the Bureau of Reclamation
MC.CH.NR27	An Intensive Cultural Resource Survey Along Interstate 25 in the Vicinity of Pinon, El Paso and Pueblo Counties, Colorado	Hand, O.D.	12/1998	Colorado Department of Transportation, Archaeological Unit
MC.CH.R22	Cultural Resource Survey of Several Locations Near Pueblo, El Paso, Pueblo, and Huerfano Counties, Colorado (M2-90-3)	Unspecified	11/15/1990	Colorado Department of Highway, Archaeological Unit

Table 1 (Continued)
Class I File Search Data: Previous Cultural Resource Inventories Conducted within Two Miles of Project Area

Survey ID	Survey Name	Author(s)	Date	Contractor
MC.R.R81	Bureau of Reclamation and Colorado Springs Utilities Southern Delivery System Geotechnical Corridor Report 14: Class III Cultural Resources Inventory of Approximately 50 Acres in El Paso and Pueblo Counties, Colorado	Chambella, Collette, Robert Fiske, Amie Gray and Steven Mehls	08/2005	Western Cultural Resource Management, Inc. for the Bureau of Reclamation
MC.R.R82	Historic Resources Survey Report: Towner to NA JCT. Union Pacific/Missouri Pacific Railroad Line	Norgren, Barbara	06/15/1998	Historian for Sugnet and Associates on Behalf of the Colorado Department of Transportation

Table 2
Class I File Search Results: Previous Cultural Resources within Two Miles of Project Area

Site No.	Description	Recorder	NRHP Eligibility	Distance from Project Area
5EP592	Wilson Cemetery – Butte Cemetery	Unknown	Field Not Eligible	3.2 kilometers northeast
5EP607	Late Prehistoric – Open Lithic Scatter	Centennial Archeology, Inc.	Officially Needs Data	2.0 kilometers southeast
5EP801	Debitage **(IF)**	Wallace, Steven M.	Field Not Eligible	800 meters east
5EP814	Unspecified **(IF)**	Centennial Archaeology, Inc.	Field Not Eligible	2.5 kilometers northwest
5EP815	Debitage **(IF)**	Centennial Archaeology, Inc.	Field Not Eligible	2.5 kilometers northwest
5EP816	Debitage **(IF)**	Centennial Archaeology, Inc.	Field Not Eligible	2.5 kilometers southwest

Table 2 (Continued)
Class I File Search Results: Previous Cultural Resources within Two Miles of Project Area

Site No.	Description	Recorder	NRHP Eligibility	Distance from Project Area
5EP817	Debitage **(IF)**	Centennial Archaeology, Inc.	Field Not Eligible	2.8 kilometers southwest
5EP1003.8	Denver and Santa Fe, Atchison Topeka and Santa Fe, Burlington Northern and Santa Fe Railroad (Segment)	RMC Consultants, Inc.	Officially Needs Data	2.0 kilometers north
5EP1985	Debitage **(IF)**	Centennial Archaeology, Inc.	Field Not Eligible	3.2 kilometers northwest
5EP1986	Debitage **(IF)**	Centennial Archaeology, Inc.	Field Not Eligible	2.0 kilometers west
5EP2099	Prehistoric Open Camp	Western Cultural Resource Management, Inc.	Officially Eligible	1.5 kilometers
5EP2100	Debitage **(IF)**	Arbogast, William R.	Field Not Eligible	In Project Area
5EP2101	Mano **(IF)**	Arbogast, William R.	Field Not Eligible	500 meters south
5EP2102	Debitage **(IF)**	Arbogast, William R.	Field Not Eligible	2.0 kilometers south
5EP2103	Debitage **(IF)**	Arbogast, William R.	Field Not Eligible	700 meters northeast
5EP2181.10	Denver and Rio Grande, Denver and Rio Grande Western Railroad, Burlington Northern and Rio Grande Western (Segment)	RMC Consultants, Inc.	Officially Needs Data	2.0 kilometers north
5EP3298.2	Owen and Hall Ditch / Ditch No. 8	Western Cultural Resource Management, Inc.	Officially Not Eligible	2.0 kilometers southeast
5EP3367	Historic Trash Dump	Centennial Archaeology, Inc.	Officially Not Eligible	2.25 kilometers
5EP3368	Debitage **(IF)**	Centennial Archaeology, Inc.	Field Not Eligible	2.0 kilometers north
5EP3611	Culvert, J-18-AH	Fraser Design	Officially Not Eligible	500 meters east

Table 2 (Continued)
Class I File Search Results: Previous Cultural Resources within Two Miles of Project Area

Site No.	Description	Recorder	NRHP Eligibility	Distance from Project Area
5EP3618	Sand Creek Bridge, J-18-F	Fraser Design	Officially Not Eligible	2.25 kilometers southeast
5EP3619	Rock Creek Bridge, J-18-G	Fraser Design	Officially Not Eligible	3.0 kilometers north
5EP3620	Bridge, J-18-I	Fraser Design	Officially Not Eligible	800 meters northeast
5EP3621	Sand Creek Bridge, J-18-J	Fraser Design	Officially Not Eligible	2.3 kilometers southeast
5EP3622	Bridge, J-18-K	Fraser Design	Officially Not Eligible	800 meters northeast
5EP3623	Bridge, J-18-L	Fraser Design	Officially Not Eligible	1.7 kilometers northeast
5EP3625	County Road Overpass, J-18-P	Fraser Design	Officially Not Eligible	1.7 kilometers northeast
5EP3628	Rock Creek Bridge, J-18-U	Fraser Design	Officially Not Eligible	3.0 kilometers north
5EP3629	Bridge, J-18-V	Fraser Design	Officially Not Eligible	1.7 kilometers northeast
5EP3620	Bridge, J-18-I	Fraser Design	Officially Not Eligible	800 meters northeast
5EP3630	Bridge, J-18-W	Fraser Design	Officially Not Eligible	1.8 kilometers north
.5EP3633	Underpass, J-18-R Minor	Fraser Design	Officially Not Eligible	450 meters east
5EP3936.1	Talcott and Cotton Ditch, Ditch No. 20	Western Cultural Resource Management, Inc.	Officially Not Eligible	3.0 kilometers northeast
5EP3936.2	Talcott and Cotton Ditch	ERO Resources Corporation	Officially Needs Data	3.0 kilometers northeast
5EP3937.1	Liston and Love Ditch, Ditch No. 14	Western Cultural Resource Management, Inc.	Officially Not Eligible	3.0 kilometers northeast
5EP3937.2	Liston and Love Ditch, Ditch No. 14 - Segment	ERO Resources Corporation	Supports - Linear	3.0 kilometers northeast

Table 2 (Continued)
Class I File Search Results: Previous Cultural Resources within Two Miles of Project Area

Site No.	Description	Recorder	NRHP Eligibility	Distance from Project Area
5EP4718	Historic Trash Dump	Western Cultural Resource Management, Inc.	Officially Not Eligible	2.0 kilometers northeast
5EP4722	Historic Trash **(IF)**	Western Cultural Resource Management, Inc.	Field Not Eligible	2.5 kilometers northeast
5EP4724	Archaic, Late Prehistoric Open Camp	Western Cultural Resource Management, Inc.	Officially Eligible	3.1 kilometers south
5EP4725	Prehistoric Open Lithic Scatter	Western Cultural Resource Management, Inc.	Officially Not Eligible	2.0 kilometers south
5EP4726	Prehistoric Open Camp, Burial	Western Cultural Resource Management, Inc.	Officially Eligible	1.5 kilometers south
5EP4728	Historic Animal Control Structure	Western Cultural Resource Management, Inc.	Officially Not Eligible	1.8 kilometers north
5EP4731	Debitage **(IF)**	Western Cultural Resource Management, Inc.	Field Not Eligible	1.0 kilometers south
5EP4732	Core/Tested Cobble **(IF)**	Western Cultural Resource Management, Inc.	Field Not Eligible	17 meters south
5EP4733	Core, Flake **(IF)**	Western Cultural Resource Management, Inc.	Field Not Eligible	In Project Area
5EP4734	Debitage **(IF)**	Western Cultural Resource Management, Inc.	Field Not Eligible	1.2 kilometers northeast
5EP4735	Historic Artifact **(IF)**	Western Cultural Resource Management, Inc.	Field Not Eligible	2.5 kilometers northeast
5EP4736.1	Tom Wanlass Ditch Segment	Western Cultural Resource Management, Inc.	Officially Not Eligible	2.0 kilometers northeast
5EP4737	Prehistoric Open Camp	Western Cultural Resource Management, Inc.	Officially Not Eligible	1.7 kilometers south

Table 2 (Continued)
Class I File Search Results: Previous Cultural Resources within Two Miles of Project Area

Site No.	Description	Recorder	NRHP Eligibility	Distance from Project Area
5EP4738	Historic Structure/Foundation/ Alignment	Western Cultural Resource Management, Inc.	Officially Not Eligible	1.5 kilometers south
5EP4739	Core/Tested Cobble **(IF)**	Western Cultural Resource Management, Inc.	Field Not Eligible	1.3 kilometers south
5EP5025	Prehistoric Open Lithic Scatter	DECAM Fort Carson Military Facility	Officially Not Eligible	2.0 kilometers west
5EP5026	Prehistoric Open Camp	DECAM Fort Carson Military Facility	Officially Not Eligible	2.0 kilometers southwest
5EP5027	Prehistoric Open Lithic Scatter	DECAM Fort Carson Military Facility	Officially Not Eligible	2.0 kilometers southwest
5EP4738	Historic Structure/Foundation/ Alignment	Western Cultural Resource Management, Inc.	Officially Not Eligible	1.5 kilometers south
5EP4737	Prehistoric Open Camp	Western Cultural Resource Management, Inc.	Officially Not Eligible	1.7 kilometers south
5EP6595	Range 119 - Building 199B - Multi-Purpose Machine Gun Range	Fort Carson Cultural Resource Management Program	Officially Not Eligible	2.7 kilometers west
5EP6909	Debitage **(IF)**	Tetra Tech EC, Inc.	Field Not Eligible	In Project Area
5EP6911.1	Unnamed Ditch Segment	Tetra Tech EC, Inc.	Supports - Linear	1.7 kilometers northeast
5EP.6925	Biface **(IF)**	ERO Resources Corporation	Field Not Eligible	2.7 kilometers northeast

CHAPTER 5
SIGNIFICANCE CRITERIA AND FIELD METHODS

Criteria for Significance Evaluation

Cultural resources are regarded as significant if they are enrolled in, or meet the eligibility criteria of, the NRHP. NRHP eligibility criteria are enumerated in 36 CFR 60 and are described as follows:

> The quality of *significance* in American history, architecture, archaeology, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association, *and*:
>
> (a) that are associated with events that have made a significant contribution to the broad patterns of our history; or,
>
> (b) that are associated with the lives of persons significant in our past; or,
>
> (c) that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or,
>
> (d) that have yielded, or may be likely to yield, information important in prehistory or history.

To qualify for NRHP eligibility then, a property must exhibit integrity in at least one of the areas cited above, and it must meet one or more of the four additional criteria. The National Historic Preservation Act (NHPA) of 1966 (as amended) makes clear that a site need not be of national historic significance to be considered eligible; sites of local, state, and regional importance may also be listed, and thus are significant in the legal sense. The phrasing of the NHPA is critical with respect to actual management of cultural resources. A site does not have to be included on the NRHP to receive protection under the law, but must simply meet the requirements of eligibility.

In order to bring the NRHP evaluation process into better focus, the OAHP and Colorado Council of Professional Archaeologists have produced a series of historic and prehistoric contexts. These documents identify pertinent research themes and attendant deficiencies in current historic and prehistoric databases. Sites that have the potential to yield information important to one or more research themes, and that exhibit physical integrity, are most likely to be judged eligible for the NRHP. The research contexts that apply to the current project are *Colorado Prehistory: A Context for the Arkansas River Basin* (Zier and Kalasz 1999) and *Colorado History: A Context for Historical Archaeology* (Church et al. 2007).

Field Methods

A prehistoric site is defined as any locality exhibiting at least one structure or feature (for example, a stone circle or hearth), or having five or more artifacts in apparent association with one another and occurring within a restricted area. A locality with fewer than five artifacts may also be regarded as a site if the potential exists for buried materials, or if the area is disturbed and other materials are likely to have been removed. Prehistoric IFs are nonstructural remains and consist of four or fewer artifacts. Historic sites are defined minimally as any structure or structural remnant (for example, house, outbuilding, root cellar), any trash concentration or scatter suggesting residential or industrial use of the area, or any linear feature suggesting sustained or long-term use (for example, transportation corridors such as old roads or railroad line, electrical conveyance lines, or irrigation canals). Historic IFs are individual historic artifacts or small clusters of artifacts that do not represent established refuse dumps. The minimum age criterion for historic sites and isolates is 50 years.

Prior to commencement of fieldwork, the boundaries of the project corridor were uploaded to a hand-held Garmin 60CSx and Trimble GeoXT GPS units. The Garmin units were then used for navigation within the boundaries of the project area. The field survey was conducted by four archaeologists walking parallel transects spaced at 15 m intervals throughout the project area. Parcels within the project boundaries where right-of-entry was denied by land owners were avoided. GPS track logs were maintained for all survey transects.

The survey was halted for the discovery of any cultural materials and an intensive inspection of the immediate area was initiated to determine if additional artifacts and/or features were present. Efforts focused on defining the spatial limits of the resource. The sites, which were assigned a unique field number with a "CA" (Centennial Archaeology) prefix, were recorded on Colorado Cultural Resource Survey Forms. Sites and IFs were mapped with Trimble GeoXT - GeoExplorer 2008/2006 Series - Handheld GPS units loaded with ArcPad ver. 10. The types of information collected during the mapping process included, but were not limited to, the datum location, site boundaries, locations of features, tools, artifact concentrations, and diagnostic artifacts, prominent topographic features of the immediate site area, drainage channels, and recent man-made features such as roads, fences, and electrical lines. During final map preparation contour lines were generated in ESRI ArcGIS 10.2 software using spatial analyst and 10-meter National Elevation Dataset (NED) files. The sites were further documented through digital photography. Artifact collection was limited to the temporary removal of an obsidian flake for non-destructive X-ray florescence analysis. The specimen was returned to the point of collection. No permanent curation was required.

Some sites required shovel probing to aid in the delineation of site boundaries and to assess potential for NRHP eligibility. Shovel test units measuring approximately 40 cm in diameter were excavated across the sites at 5 m intervals in two perpendicular lines bisecting the sites along cardinal directions. Shovel tests were excavated to depths ranging from 60 cm to 100 cm below the ground surface. The soil from each shove test location was backfilled, and no artifacts were collected during testing.

CHAPTER 6
CLASS III INVENTORY RESULTS

The cultural resource inventory for the FRMS project resulted in the recording of 38 newly identified cultural resources including six sites and 32 IFs. All of the sites and IFs are prehistoric. Descriptive and locational information for these resources is presented in Table 3.

Table 3
Cultural Resource Summary Data for the Front Range - Midway Solar Project

Site No.	General Age	Brief Resource Description	Location (T/R/Sec.)	NRHP
Newly Recorded Sites				
5EP7621	Prehistoric	Open lithic scatter	T17S/R65W/Sec 21	Field Not Eligible
5EP7623	Prehistoric	Possible Hearth feature with lithics	T17S/R65W/Sec 21	Field Not Eligible
5EP7625	Prehistoric	Open lithic scatter	T17S/R65W/Sec 21	Need Data
5EP7627	Prehistoric	Open lithic scatter	T17S/R65W/Sec 21	Field Not Eligible
5EP7632	Prehistoric	Open lithic scatter	T17S/R65W/Sec 21	Need Data
5EP7640	Prehistoric	Open lithic scatter	T17S/R65W/Sec 20	Field Not Eligible
Isolated Finds				
5EP7613	Prehistoric	Lithic debris – secondary flake and chalcedony shatter	T17S/R65W/Sec 22	Field Not Eligible
5EP7614	Prehistoric	Lithic debris – chert shatter	T17S/R65W/Sec 22	Field Not Eligible
5EP7615	Prehistoric	Lithic debris – chert tertiary flake	T17S/R65W/Sec 21	Field Not Eligible
5EP7616	Prehistoric	Lithic debris – quartz cobble and chert shatter	T17S/R65W/Sec 21	Field Not Eligible
5EP7617	Prehistoric	Lithic debris – petrified wood flake	T17S/R65W/Sec 21	Field Not Eligible
5EP7618	Prehistoric	Lithic debris – three flakes and one cortical shatter	T17S/R65W/Sec 21	Field Not Eligible
5EP7619	Prehistoric	Lithic debris – two flakes	T17S/R65W/Sec 21	Field Not Eligible
5EP7620	Prehistoric	Lithic debris – chert flake	T17S/R65W/Sec 21	Field Not Eligible
5EP7622	Prehistoric	Lithic debris – chert flake	T17S/R65W/Sec 21	Field Not Eligible
5EP7624	Prehistoric	Lithic debris – core and two flakes	T17S/R65W/Sec 21	Field Not Eligible
5EP7626	Prehistoric	Lithic debris – two chert angular debris	T17S/R65W/Sec 21	Field Not Eligible
5EP7628	Prehistoric	Lithic debris – two flakes	T17S/R65W/Sec 21	Field Not Eligible
5EP7629	Prehistoric	Lithic debris – quartzite flake	T17S/R65W/Sec 21	Field Not Eligible
5EP7630	Prehistoric	Lithic debris – two chert flakes	T17S/R65W/Sec 21	Field Not Eligible
5EP7631	Prehistoric	Lithic debris – chert shatter	T17S/R65W/Sec 21	Field Not Eligible
5EP7633	Prehistoric	Lithic debris –chert flake and tested pebble	T17S/R65W/Sec 21	Field Not Eligible

Table 3
Cultural Resource Summary Data for the Front Range - Midway Solar Project

Isolated Finds (Continued)				
Site No.	**General Age**	**Brief Resource Description**	**Location (T/R/Sec.)**	**NRHP**
5EP7634	Prehistoric	Lithic debris – chert shatter and two chert flakes	T17S/R65W/Sec 21	Field Not Eligible
5EP7635	Prehistoric	Lithic debris – obsidian flake	T17S/R65W/Sec 20	Field Not Eligible
5EP7636	Prehistoric	Lithic debris – chert flake	T17S/R65W/Sec 20	Field Not Eligible
5EP7637	Prehistoric	Lithic debris – chert shatter	T17S/R65W/Sec 20	Field Not Eligible
5EP7638	Prehistoric	Lithic debris – chert flake	T17S/R65W/Sec 20	Field Not Eligible
5EP7639	Prehistoric	Lithic debris – tertiary thinning flake	T17S/R65W/Sec 20	Field Not Eligible
5EP7641	Prehistoric	Lithic debris – two chert flakes	T17S/R65W/Sec 20	Field Not Eligible
5EP7642	Prehistoric	Lithic debris – two chert flakes	T17S/R65W/Sec 17	Field Not Eligible
5EP7643	Prehistoric	Lithic debris – chert tested cobble	T17S/R65W/Sec 17	Field Not Eligible
5EP7644	Prehistoric	Lithic debris – chert core and cortical flake	T17S/R65W/Sec 17	Field Not Eligible
5EP7645	Prehistoric	Lithic debris – petrified wood flake	T17S/R65W/Sec 17	Field Not Eligible
5EP7646	Prehistoric	Lithic debris – chert core	T17S/R65W/Sec 17	Field Not Eligible
5EP7647	Prehistoric	Lithic debris – chert flake	T17S/R65W/Sec 17	Field Not Eligible
5EP7648	Prehistoric	Lithic debris – chert reduction fragment	T17S/R65W/Sec 20	Field Not Eligible
5EP7649	Prehistoric	Lithic debris – chert flake	T17S/R65W/Sec 20	Field Not Eligible
5EP7650	Prehistoric	Lithic debris – chert shatter	T17S/R65W/Sec 20	Field Not Eligible

Sites

Site 5EP7621 (CA7190) (Figure 5)

Setting: Site 5EP7621 is situated on the upper edge of a broad, rolling plain overlooking a dry gulch that descends to the north and east toward an unnamed intermittent stream. The terrain is open to the north, east, and south. Large mountain peaks, including Booth Mountain and Timber Mountain, are visible to the west of the site. Elevation is 5,446 ft above sea level. Boca Raton Heights Road can be seen to the southeast, and power distribution lines from the Fountain Valley Power Plant flank the locale to the north and south. Vegetation includes sagebrush, mixed grasses, and succulents such as cholla and prickly pear cactus. A man-made earthen berm is located on the

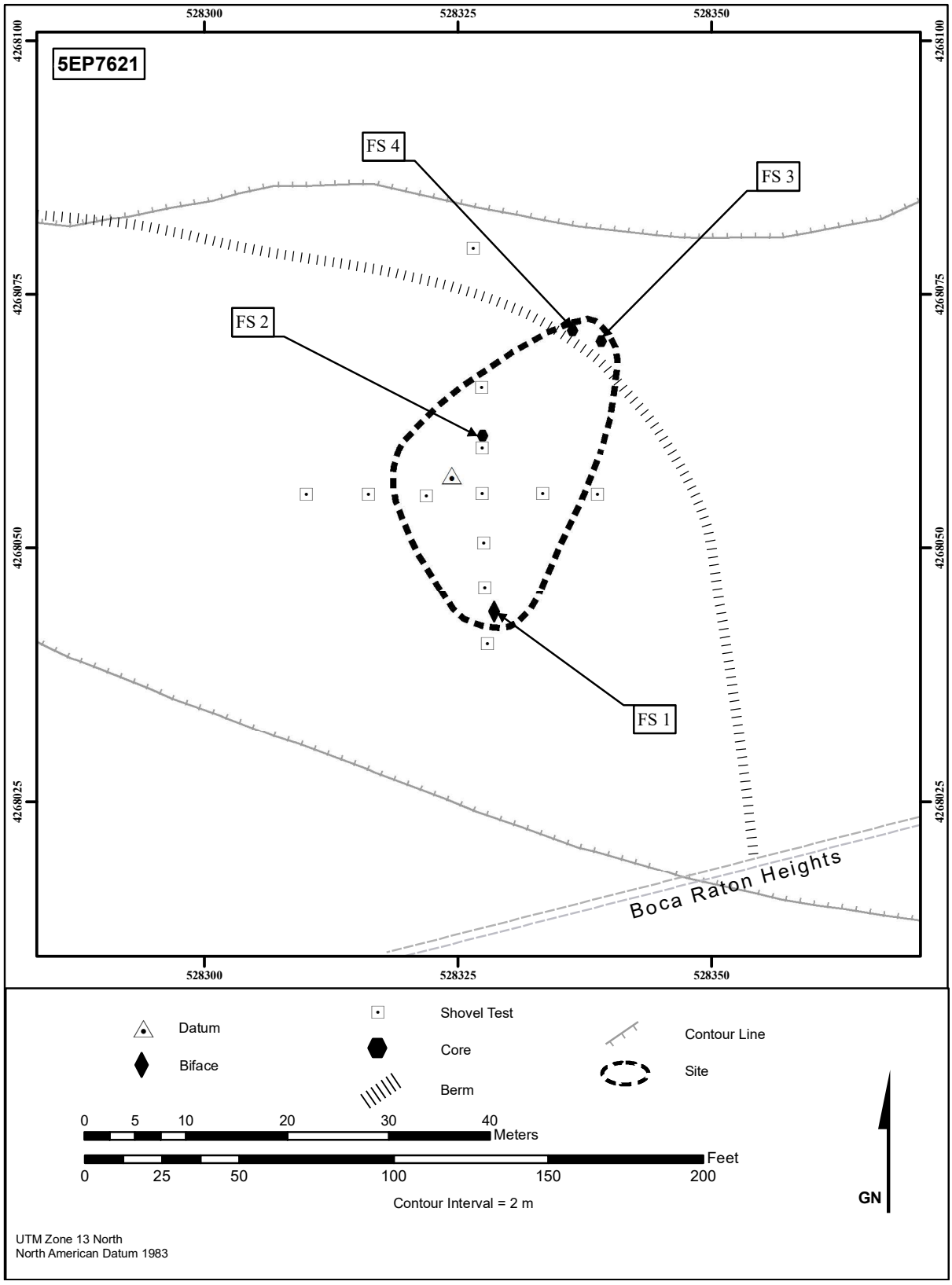


Figure 5. Site 5EP7621 plan map.

north and east margins of the locale, and likely conceals or obscures a portion of the site. Soil consists of sandy silt with pea gravel and cobbles sparsely distributed across the landscape. The deposition is alluvial with evidence of recent outwash, and soil depth is thought to be 1-2 m based on cutback and rodent holes. Ground visibility ranges from 30 to 80 percent with an average of approximately 50 percent.

Description: The site is a low density surface scatter of prehistoric lithic artifacts, and measures 32 m (SW/NE) x 20 m (NW/SE), covering 425 m^2. The artifact assemblage includes three multi-directional cores made of white and yellow chert (FS 2, FS 3, and FS 4), an early stage biface with cortex covering roughly 10 percent of the dorsal surface and measuring 4 cm x 3 cm x 1.5 cm (FS 1), and a light-gray quartzite primarily flake with 20 percent dorsal cortex and a flat platform. The flake measures 3.6 cm in length. Two of the cores (FS 3 and FS 4) were found in a disturbed context in the northeast portion of the site area near a low man-made earthen berm.

Site boundary delineation was accomplished by excavating 13 shovel probes. The probes were excavated in two intersecting perpendicular rows oriented on cardinal directions. The depth of the shovel tests ranged from 70 cm to 100 cm. No artifacts or features were encountered in any of the probes.

Evaluation and Management Recommendation: Site 5EP7621 is a small concentration of prehistoric flakes and minimally reduced cores, and is interpreted as a low intensity lithic procurement site. Based on the results of the shovel testing, the site has low potential for significant buried cultural remains. It is unlikely to generate additional data important to history, and is assessed as not eligible for the NRHP. No further work is recommended.

Site 5EP7623 (CA7192) (Figure 6)

Setting: Site 5EP7623 is positioned on a shallow north-facing slope on an open, rolling plain south of Fountain, Colorado and east of Fort Carson. No named landforms are immediately adjacent to the site, but a grouping of large mountain peaks, including Booth Mountain, Timber Mountain, and Mount Pittsburg, is located to the northwest. The depositional environment is alluvial outwash, and soil is estimated to be at least one meter deep, based on an examination of rodent burrows in the vicinity. Soil is composed of sandy silt with pea gravel interspersed with cobbles and boulders made of quartz, granite, and quartzite. Sparse chert gravel is also present. Vegetation includes cholla, prickly pear cacti, sage, and an assortment of short and tall grasses, forbs, and shrubs. Ground visibility ranges from 30 to 80 percent, and averages 50 percent. Flanking the site to the west is a linear depression that may be associated with the installation of a fiber optic cable. Just northeast of the site boundary is a distribution line that trends roughly east/west. Elevation is 5,463 ft.

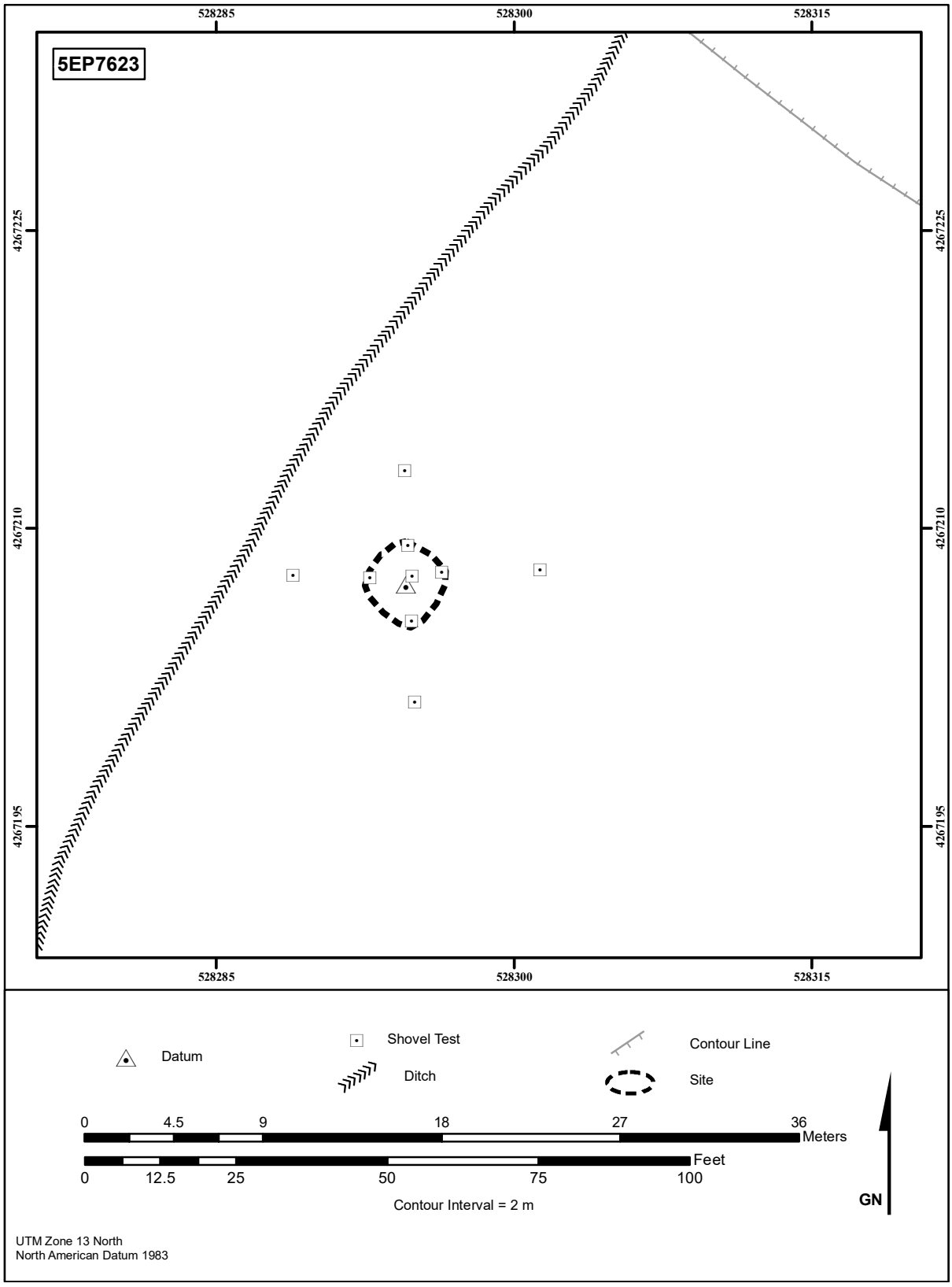


Figure 6. Site 5EP7623 plan map.

Description: The site includes a concentration of large cobbles arranged in a rough circular pattern and one piece of debitage. The cobbles range in size from 10-20 cm in length, and the cluster measures approximately 140 cm (E/W) x 120 cm (N/S). At least two of the cobbles show clear signs of thermal fracturing, and one is blackened. Fire cracked rock (FCR) was observed within a 2 m area surrounding the stone concentration. A single chert flake was identified on the ground surface. A linear depression marked by patterned vegetation runs southwest/northeast approximately 15 m north of the feature and indicates ground disturbance that may be associated with the installation of a fiber cable. The site measures approximately 4.33 m (north/south) x 3 m (east/west), and covers an area of 12 m^2.

The depth, horizontal extent, and potential for subsurface cultural and fire-related deposits were explored with eight shovel test probes placed in two intersecting transects oriented along the cardinal directions. No artifacts, cultural deposits, or charcoal staining were identified in these probes. An auger probe was placed within the center of the possible feature, but did not yield cultural deposits or staining.

Evaluation and Management Recommendation: The age and function of this site, which consists of a possible hearth and a single artifact, beyond activities related to lithic reduction, is unknown. The results of the shovel testing indicate that the site does not harbor subsurface cultural deposits, and has limited potential to offer additional significant information. The site is therefore assessed as not eligible for the NRHP under Criterion D, and no further work is recommended.

Site 5EP7625 (CA7194) (Figure 7)

Setting: Site 5EP7625 is located on a small terrace on an open, flat plain overlooking an unnamed intermittent drainage that extends northeast to Fountain Creek. A man-made linear berm and depression extends through the northern and eastern portions of the site. Cultural materials were observed in disturbed soil of the berm. Vegetation consists of mixed bunch grasses, sagebrush, forbs, prickly pear, and cholla. Ground visibility is good with over 50 percent of the surface exposed. Soil is a brown sandy clay that is at least 1 m deep, based on and examination of rodent holes. Elevation is 5,446 ft.

Description: The site is a prehistoric open lithic scatter with debitage and nine tools. It measures 89 m (SW/NE) x 48 m (SE/NW), and encompasses 2,745.1 m^2. Debitage consists of 40 flakes, which are associated with primary-stage reduction and range in size from 1 cm to 4 cm in length. Much of the debitage is chert, but quartz, quartzite, and petrified wood debitage was also observed. Tools consist of tested chert cobbles with almost 100 percent cortex (FS 3, FS 4, FS 5, FS 7, and FS 9). One tested quartzite cobble was also documented (FS 8). Other tools include an exhausted 3.2 mm x 3 mm x 1.5 mm brown chert core (FS 1), an early stage quartzite biface measuring 4 mm x 2.3 mm x 0.5 mm (FS 2), and a mottled, brown and yellow chert core (FS 6).

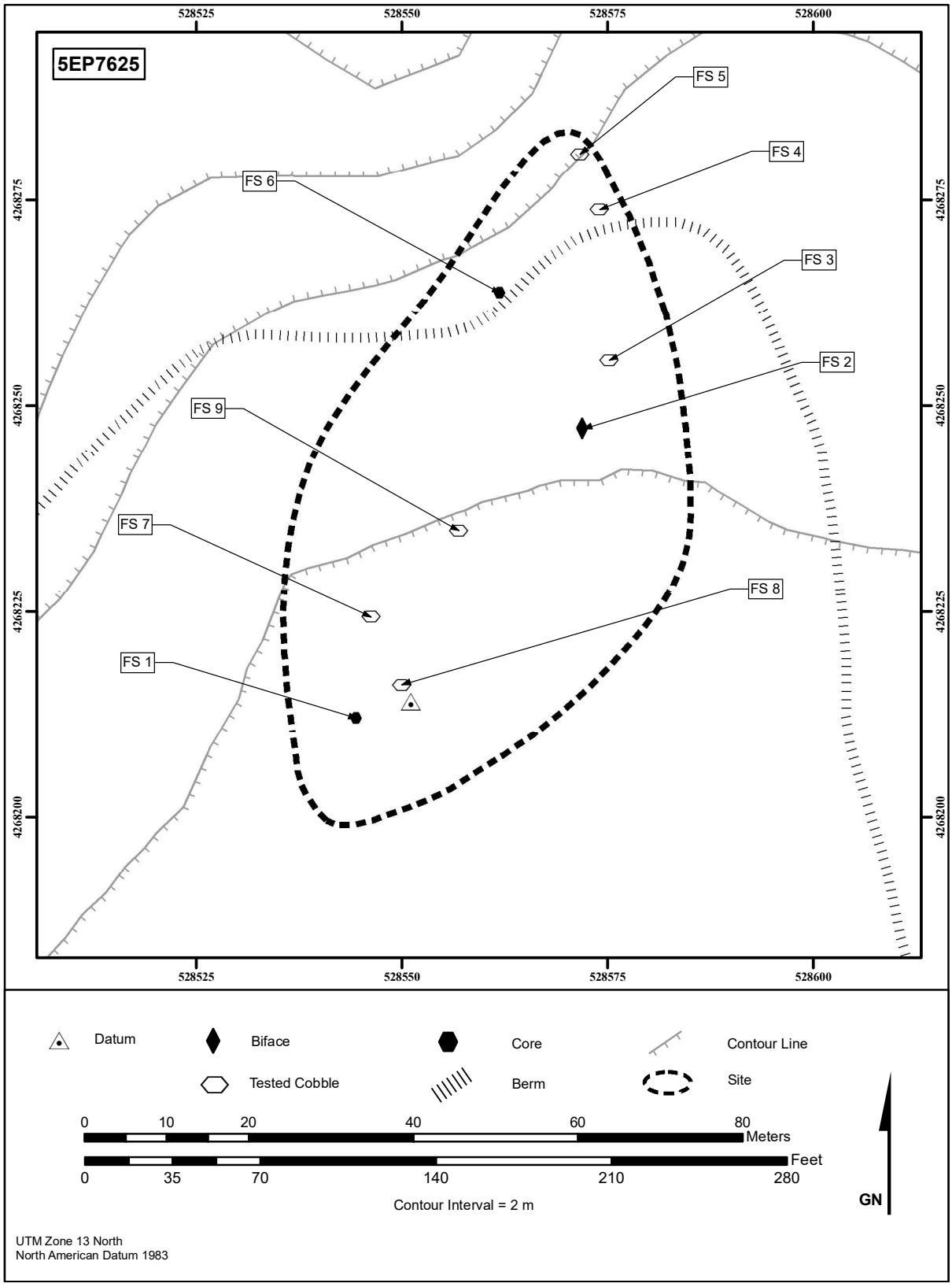


Figure 7. Site 5EP7625 plan map.

Evaluation and Management Recommendation: Activities inferred from this lithic scatter include core reduction, core procurement, and lithic raw material testing. Although part of the site has been disturbed by the construction of the berm, most of the site area remains undisturbed. Based on the presence of deep soil, the site is assessed as having potential for intact subsurface cultural deposits. Site 5EP7625 remains unevaluated with respect to the NRHP eligibility until test excavation can be conducted to determine the potential for buried cultural materials.

Site 5EP7627 (CA7196) (Figure 8)

Setting: This prehistoric open lithic scatter is situated on a low ridge that descends toward an unnamed intermittent drainage. The channel of the northeast/southwest flowing drainage is located 70 m south of the site. A small man-made dam and dry pond are located 95 m southeast of the site. The artifact scatter occurs in a denuded area that likely experiences sheet wash erosion. Ground visibility is good to excellent. Soils are predominantly sandy silt with angular cobbles and pebbles. Vegetation observed at the site includes mixed forbs, prickly pear, and sparse grasses. The elevation on site is 5,446 ft. Deposition is estimated to exceed 20 cm based on pin-flag probing. Based on the mantle of gravel and cobbles across the site surface, the site is considered to be heavily deflated.

Description: Site 5EP7627 is a low density lithic scatter that covers an area of roughly 257 m^2, and measures 20 m (NW/SW) x 17 m (N/S). The site includes two chert flakes, a chert core fragment with cortex (FS 1), and a tested chert cobble (FS 2). Also found within the boundaries of the site was a piece of chert shatter, a single piece of quartzite shatter, and two chert cores (FS 3 and FS 4). None of the artifacts are temporally or culturally diagnostic. The locale is likely associated with limited lithic procurement or testing based on the low density of debitage and the presence of two cores and one tested chert cobble.

Evaluation and Management Recommendation: The site was likely used for the procurement of lithic raw materials. It is located in a heavily deflated area with large exposed cobbles and gravels, and the potential for buried cultural remains is minimal. Further investigation of the site is unlikely to produce additional information important to the prehistory of the area. Centennial assesses the lithic scatter as not eligible under Criteria A, B, C, or D. No further work is recommended

Site 5EP7632 (CA7201) (Figure 9)

Setting: Site 5EP7632 is situated on an open, rolling plain and overlooks an unnamed intermittent tributary of Fountain Creek to the north. La Questa Drive is passes by the site 120 m to the southwest. The depositional environment is a combination of colluvial processes and sheet wash from the slopes to the west and eolian deposits caused by a lack of rainfall during the fall and winter months. The soil is brown silty loam with pea gravel deposits, and the depth of the soil is thought to exceed 20 cm based on rodent burrows. Vegetation includes low-growing sagebrush, bunch grasses, prickly pear cactus, forbs and cholla. The elevation is 5,482 ft. Ground surface visibility is approximately 50 percent.

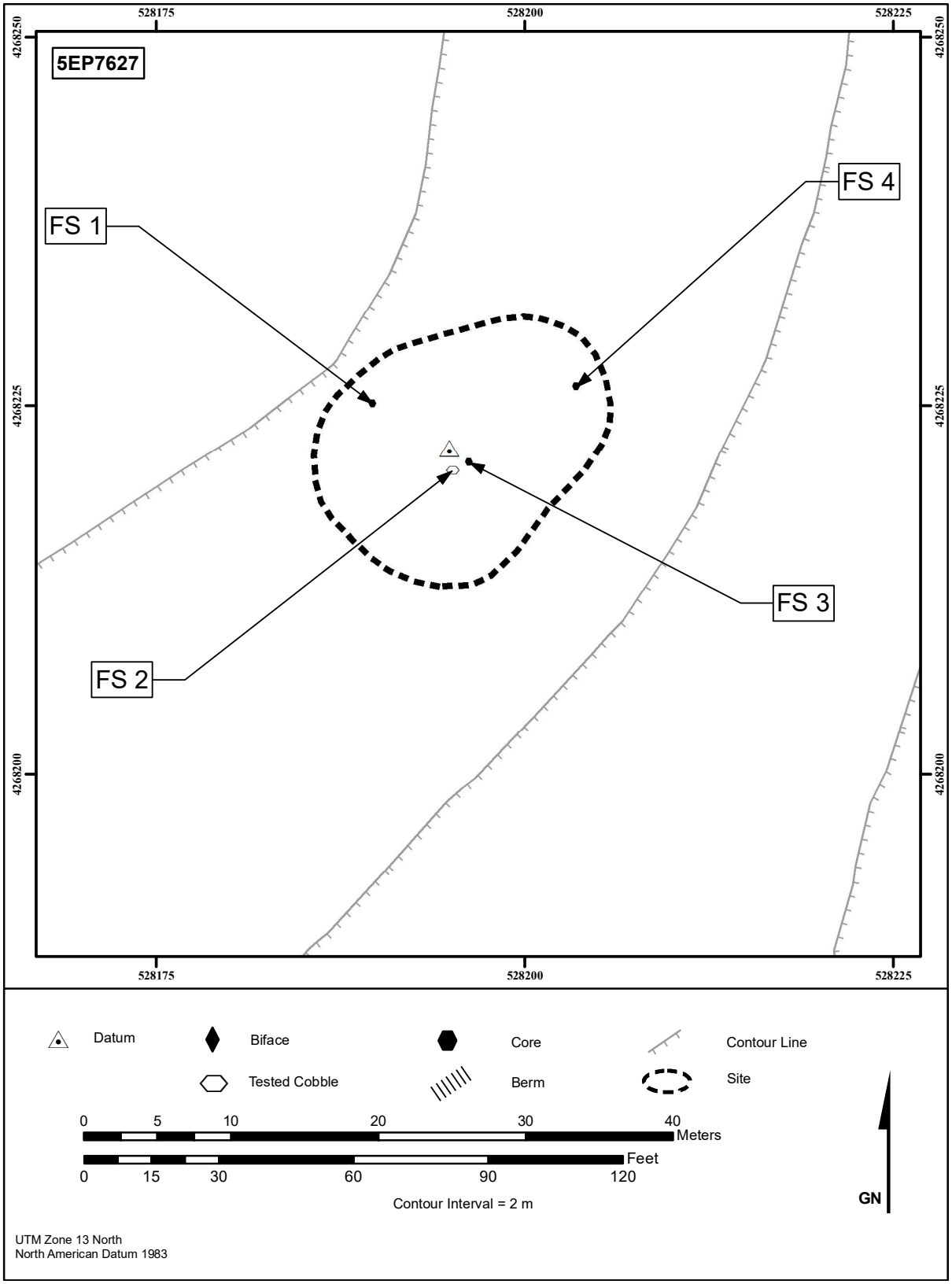


Figure 8. Site 5EP7627 plan map.

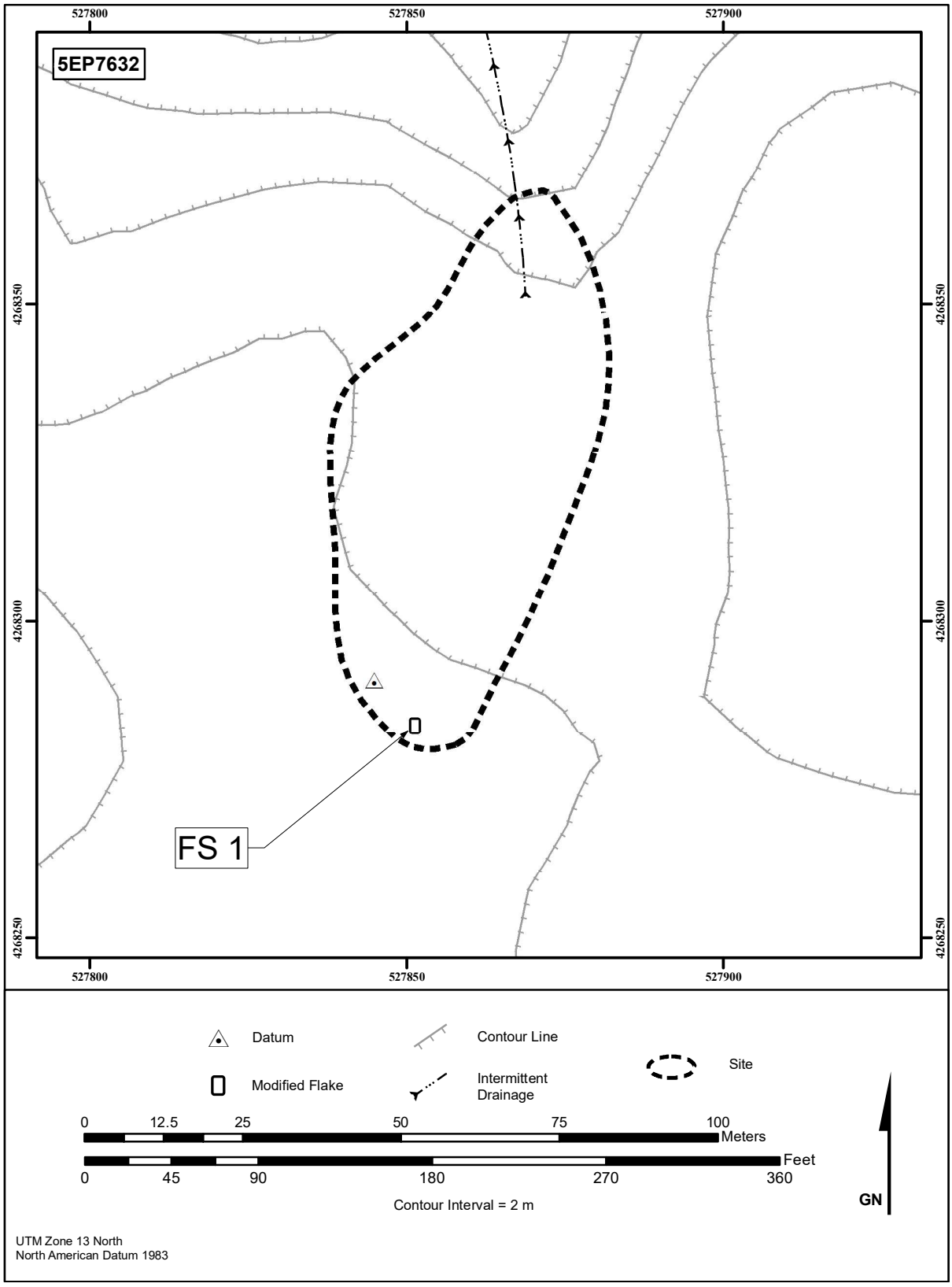


Figure 9. Site 5EP7632 plan map.

Description: Site 5EP7632 is a low-density lithic scatter that includes six chert flakes with maximum dimensions ranging from 4 cm to 5 cm, and one modified flake tool. All artifacts were observed within an area that measures 85 m (N/S) x 40 m (E/W), and encompasses approximately 2,600 m^2. The smallest, tan chert flake is situated at the north end of the site within an erosional cut, indicating that there is a potential for buried cultural materials. The modified flake (FS 1) consists of a small piece of chert with cortex covering the dorsal surface and flake scars along one lateral edge.

Evaluation and Management Recommendation: Based on the observed artifacts, the site functioned as a lithic reduction locale. Although the surface assemblage is sparse, the presence of artifacts in the actively eroding cut indicates a moderate potential for buried cultural materials. Site 5EP7632 remains unevaluated for the NRHP pending further investigation. Avoidance is recommended. If the site cannot be avoided, test excavation is recommended.

Site 5EP7640 (CA7209) (Figure 10)

Setting: This site is situated on an open, rolling plain with multiple finger ridges to the northwest/southeast. The terrain is incised with narrow cuts that drain to Sand Creek, which flows past the site to the northeast. The elevation on site is 5,495 ft. Deposition is alluvial with evidence of recent sheet wash erosion. Ground visibility is good with 50 to 60 percent of the surface exposed. Small forbs, prickly pear, cholla, and sparse grasses cover the site. Soil is light brown sandy silt with small gravel inclusions. Cobbles and pebbles mantle the surface of the site and the surrounding area. Soil depth is estimated to range from 1 m to 2 m based on examinations of erosional cuts and rodent holes.

Description: This lithic scatter measures 35 m (N/S) x 28 m (E/W), and encompasses an area of 792 m^2. The artifact assemblage is dominated by angular chert shatter with average sizes ranging from 2 cm to 3 cm. Tools consist of a late-stage chert biface (FS 1) and a multi-faceted chalcedony core (FS 2).

Shovel testing was conducted to delineate the site boundary and evaluate the potential for buried cultural deposits. A total of 15 shovel tests were excavated at 5 m intervals in two perpendicular rows oriented through the long and short axis of the site. Shovel tests were excavated to depths ranging from 60 cm to 1 m. All of the shovel tests were negative, and no anomalous soil horizons or staining was encountered suggesting limited potential for intact subsurface cultural deposits.

Evaluation and Management Recommendation: The absence of lithic remains associated with mid-to-late stage reduction indicates that activities at this site were limited to procurement and testing of raw material as well as small-scale tool manufacture. Based on the dearth of artifacts materials encountered on the ground surface and the negative shovel test results, the site is assessed as having low potential to offer additional significant information. The site is therefore assessed as not eligible for the NRHP. No additional work is recommended.

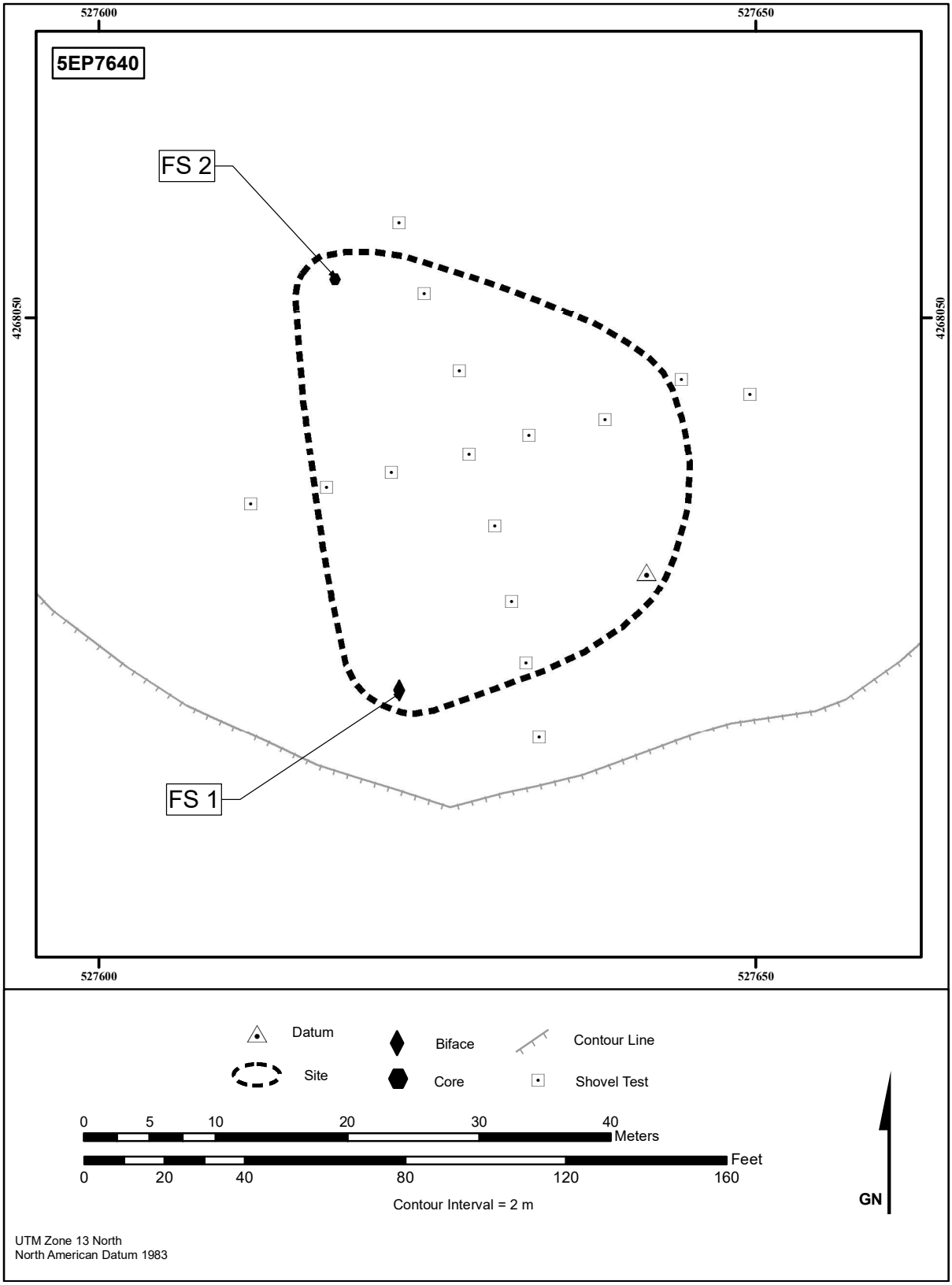


Figure 10. Site 5EP7640 plan map.

Isolated Finds

Thirty-two prehistoric IFs were recorded for the FRMS project (Table 3). These resources are primarily individual flakes (5EP7615, 5EP7617, 5EP7620, 5EP7622, 5EP7629, 5EP7635, 5EP7636, 5EP7638, 5EP7639, 5EP7645, 5EP7633, and 5EP7649), or small concentrations of two to three flakes (5EP7619, 5EP7628, 5EP7630, and 5EP7642). One of the individual flakes (5EP7635) is an obsidian artifact that was collected for sourcing. X-ray fluorescence analysis of the obsidian artifact indicates that the material was procured from Polvadera Peak in the Jemez Mountains of northern New Mexico (Appendix 1). This source is approximately 200 miles southwest of the project area. Other IFs are pieces of lithic shatter (5EP7614, 5EP7631, 5EP7637, 5EP7650) or angular debris associated with reduction (5EP7626, 5EP7647, and 5EP7648). Four IFs (5EP7613, 5EP7618, 5EP7634, 5EP7641) are flakes found with shatter or angular debris. IF 5EP7616 consists of a quartz cobble with flake scaring located roughly 4 m from a small piece of chert shatter. Four other IFs include cores or tested cobbles: the first (5EP7624) is a core with two associated flakes; the second (5EP7644) includes a grey chert core and a cortical grey chert flake; the third is a tested cobble (5EP7643); and the fourth is a chert core (5EP7646). Naturally occurring large gravels and cobbles are prevalent in the surrounding area, and these artifacts may represent casual materials testing or preliminary reduction. The IFs are neither temporally nor culturally diagnostic. Furthermore, none of the IFs are considered to have the potential to yield additional information important to the prehistory of the area. They are evaluated as not eligible for the NRHP, and no further work is necessary.

CHAPTER 6
PROJECT SUMMARY AND MANAGEMENT RECOMMENDATIONS

Survey Summary

An intensive Class III cultural resource inventory was undertaken of the proposed FRMS project area in El Paso County, Colorado for Front-Range-Midway Solar Project, LLC. The project includes the construction of a solar power generation facility next to the existing Midway substation. The project area consists of 1,162.16 privately owned acres, 1,109.52 of which were surveyed.

Thirty eight resources were recorded for this project, including six sites and 32 IFs. All resources documented during this survey were prehistoric in age. All of the sites are open lithic scatters with artifact assemblages that include debitage, cores, and flaked stone tools. A possible hearth with no evidence of charcoal was identified at one site. All of the IFs consisted of debitage or cores. Taken together, these resources reflect a lithic industry focused the expedient reduction of locally procured alluvial cobbles. No evidence of intensive camping or domestic activities were noted, and no temporally diagnostic artifacts were recorded to assign chronological affiliation to prehistoric occupation of the project area.

In addition to the Class III inventory for the FRMS project, Western requested an analysis of potential visual impacts to NRHP-listed or potentially eligible cultural resources. Specifically, this analysis was to investigate potential impacts to standing structures or landmarks in the vicinity of project area. Visual impacts analysis was conducted within a two-mile-wide buffered area surrounding the direct APE. Six resources, including five linear resources (5EP1003.8, 5EP2181.10, 5EP3936.2, 5EP3937.2, and 5EP6911.1) and one prehistoric site (5EP4726) were identified in the visual impact area. However, no standing structures or landmarks were identified in this analysis.

Significance Assessments and Management Recommendations

Prehistoric and historic sites are regarded as eligible for inclusion on the NRHP if they meet one or more of the four criteria for eligibility, and also exhibit integrity as defined in 36 CFR 60. Research potential and/or relationships with historically significant events, processes, or individuals (all of which indicate NRHP eligibility) may be identified by establishing associations between sites and specific research themes in prehistoric and historic context documents, particularly Zier and Kalasz (1999) and Church et al. (2007). The 32 IFs are, by definition, not NRHP eligible due to their low potential to yield additional data. Significance evaluations for the six sites are presented on a site-by-site basis above and are summarized in Table 3.

- Site 5EP7621 is a sparse open lithic scatter with a low density surface scatter of prehistoric artifacts. Shovel testing was conducted on the site to delineate the site boundaries, however no subsurface artifacts were recovered. This site has low potential to yield additional information and is evaluated as not eligible for the NRHP.
- Site 5EP7623 consists of an amorphous concentration of large cobbles, and one piece of debitage. Shovel testing was conducted on the site to delineate the site boundaries,

however, no subsurface artifacts were recovered. Soil probes placed in the rock concentration did not yield charcoal. This site has low potential to yield additional information and is evaluated as not eligible for the NRHP.

- Site 5EP7625 is a large, open lithic scatter featuring debitage and flaked stone tools. The depositional environment of the site suggests there is good potential for the site to contain additional subsurface cultural materials. This site is assessed as needs data until subsurface testing can be completed to evaluate for NRHP eligibility.
- Site 5EP7627 is a low density open lithic scatter featuring debitage and cores. The site is located on a deflated ridge with minimal potential to contain buried cultural deposits or yield additional data. The site is evaluated as not NRHP eligible.
- Site 5EP7632 is a small, open lithic scatter featuring debitage and one flaked stone tool. The depositional environment suggests that the site may harbor buried cultural materials. This site is assessed as needs data until subsurface testing can be completed to evaluate for NRHP eligibility
- Site 5EP7640 is a low density open lithic scatter featuring debitage and flaked stone tools. Shovel testing was conducted on the site to delineate the site boundaries, however no subsurface artifacts were found. This site has low potential to yield additional information and is evaluated as not NRHP eligible.

The primary management recommendation for sites 5EP7625 and 5EP7632 is avoidance by future development. The project, as it is currently designed, will not impact either of these two sites, so testing was not required for these locations. Should avoidance of these sites not be possible, additional testing should be conducted to assess the nature of any subsurface archaeological deposits on the site and evaluate for NRHP eligibility. No further work is recommended for the 32 IFs and sites 5EP7621, 5EP7623, 5EP7627, and 5EP7640.

Cultural resource clearance is recommended for the entire survey area based on the proposed avoidance of sites 5EP7625 and 5EP7632. Should the design shift or additional development be planned that would impact these two sites, clearance is recommended pending the results of testing or mitigative excavation. In the event that previously undocumented archaeological or historical materials are encountered during construction, all work should cease in the immediate area of the find, and the discovery locale should be protected until its significance can be assessed by a qualified archaeologist.

REFERENCES CITED

Abbott, Carl, Stephen Leonard, and David McComb
1982 *Colorado: A History of the Centennial State.* Colorado Associated University Press, Boulder.

Anderson, Jane L.
1985 Chronological Framework. In, *A Chronological Framework of the Fort Carson Pinon Canyon Maneuver Site*, Las Animas County, Colorado, edited by C. Lintz. U.S. Army Fort Carson Pinon Canyon Cultural Resources Project, *Contribution*, No. 2. Center for Archaeological Research, University of Denver, Denver, Colorado.

Arthur, Christopher
1981 Final Report of the Archaeological Testing of Two Prehistoric Sites in the Barlett Mountain Land Exchange. *Reports of the Laboratory of Public Archeology*, No. 60. Colorado State University, Fort Collins.

Benedict, James B.
1978 The Mount Albion Complex and the Altithermal. In *The Mount Albion Complex: A Study of Prehistoric Man and the Altithermal*, by J. B. Benedict and B. L. Olson, pp. 139-180. Research Report No. 1, Center for Mountain Archeology, Ward, Colorado.

Black, Kevin D.
1986 *Mitigative Archaeological Excavations at Two Sites for the Cottonwood Pass Project, Chaffee and Gunnison Counties, Colorado.* Metcalf Archaeological Consultants, Inc., Eagle, Colorado.

1991 Archaic Continuity in the Colorado Rockies: The Mountain Tradition. *Plains Anthropologist* 36(133):1-29.

1997 *Testing Tradition: Assemblage Attributes vs. Regional Studies on Archaic Period Adaptations in the Southern Rocky Mountains*. Paper presented at the 55 annual Plains Anthropological Conference in the symposium, "The View from Above: High Altitude Archaeology and the Mountain Tradition," Boulder, Colorado.

Black, Kevin D., Kimberly Spurr, and Diane L. France
1991 Two Ceramic Period Burials from Southeastern Colorado. *Southwestern Lore* 57(3):1-27.

Boyer, Paul S. (editor).
2001 *The Oxford Companion to United States History.* Oxford University Press, New York.

Buckles, William G., George H. Ewing, Nancy Buckles, George J. Armelagos, John J. Wood, James D. Haug, and John H. McCullough
1963 The Excavation of the Hazeltine Heights Site. *Southwestern Lore* 29(1):1-33.

Campbell, Robert G.
1969 *Prehistoric Panhandle Culture on the Chaquaqua Plateau, Southeast Colorado*. Ph.D. dissertation, University of Colorado, Boulder.

Carrillo, Richard F.
1990 Historic Overview. In, *An Introduction to the Archaeology of Pinon Canyon, Southeastern Colorado,* Volume III: Ethnohistory and History, edited by W. Andrefsky, Jr. Prepared for Department of the Army, Fort Carson Command, Environment, Energy and Natural Resources Division, Directorate of Engineering and Housing, and National Park Service, Interagency Archaeological Services – Denver, by Larson-Tibesar Associates, Inc., Laramie, Wyoming, and Centennial Archaeology, Inc., Fort Collins, Colorado.

Carrillo, Richard F., Sally Pierce, Stephen M. Kalasz, and Denial A. Jepson
1993 The Tremont House (5DV2954): The Historical Archaeological Investigations of an Early Hotel in Denver, Colorado. *Colorado Department of Transportation Archaeological Research Series,* No. 1. Colorado Department of Transportation, Office of Environmental Services, Denver.

Church, Minette C., Steven G. Baker, Bonnie J. Clark, Richard F. Carrillo, Jonathon C. Horn, Carl D. Späth, David R. Guilfoyle, and E. Steve Cassells
2007 *Colorado History: A Context for Historical Archaeology* (with contributions by Kathleen Corbett, Duane A. Smith, Martha Sullenberger-Fry, and Burr Neely). Colorado Council of Archaeology, Denver.

Friedman, Paul D.
1985 *Final Report of History and Oral History Studies of the Fort Carson – Pinon Canyon Maneuver Area, Las Animas County, Colorado.* Submitted to National Park Service, Rocky Mountain Regional Office, by Powers Elevation, Denver, Colorado.

Frison, George C.
1991 *Prehistoric Hunters of the High Plains*, Second Edition. Academic Press, New York.

Gilmore, Kevin. P., Marcia Tate, Mark L. Chenault, Bonnie Clark, Terri McBride, and Margaret Wood
1999 *Colorado Prehistory: A Context for the Platte River Basin*. Colorado Council of Professional Archaeologists, Denver.

Gulley, Cara C.
2000 *A Reanalysis of Dismal River Archaeology and Ceramic Typology*. Master's thesis, Department of Anthropology, University of Colorado, Boulder.

Hafen, Le Roy R.
1948 *Colorado and its People: A Narrative and Topical History of the Centennial State,* Volumes I and II. Lewis Historical Publishing Company, New York.

Hand, O D, and Daniel A. Jepson
1996 *Archaeological Investigation of Wolf Spider Shelter (5LA6197), Las Animas County, Colorado*. Research Series No. 5, Colorado Department of Transportation, Denver.

Hanson, Jeffery R., and Sally Chirinos
1989 Ethnohistory. In, *Nine Rock Art Sites in the Pinon Canyon Maneuver Site, Southeastern Colorado*, edited by L. L. Loendorf, pp. 18-37. Contribution No. 248, Department of Anthropology, University of North Dakota, Grand Forks.

Hummer, Anne G.
1989 Prehistoric Ceramics. In, *Temporal Assessment of Diagnostic Materials from the Pinon Canyon Maneuver Site*, edited by C. Lintz and J. L. Anderson, pp. 316-374. Memoirs of the Colorado Archaeological Society No. 4. Denver, Colorado.

Hunt, Grant Owen
1975 *Archaeology of the Belwood Site*. Unpublished Master's Thesis, Department of Anthropology, University of Denver.

Jepson, Daniel A., and O D Hand
1999 *The Salvage Excavation of Two Human Burials at the Lena Gulch Site (5JF1780), Jefferson County, Colorado*. Archaeological Research Series No. 6, in preparation. Colorado Department of Transportation, Denver.

Jones, Donald G., Martha Williams, Kathy Stemmler, Michael H. McGrath, and Elizabeth C. Winstead
1998 *Ethnohistoric and Ethnographic Information Related to the Fort Carson Military Reservation and Pinon Canyon Maneuver Site in Colorado*. Prepared for Department of the Army, Corps of Engineers, by R. Christopher Goodwin and Associates, Inc., Frederick, Maryland.

Kalasz, Stephen M., Cody M. Anderson, Bonnie K. Gibson, John D. Kennedy, Christopher C. Kinneer, Lawrence L. Loendorf, Cortney A. Wands
2007 *Archaeological Investigations at sites 5LA3186, 5LA3188, and 5LA3189 Along Burke Arroyo in the Pinon Canyon Maneuver Site, Las Animas County, Colorado.* Centennial Archaeology, Inc., Fort Collins, Colorado.

Kalasz, Steven M., Mark Mitchell, and Christian J. Zier
1999 Chapter 7 – Late Prehistoric Stage. In, Colorado Prehistory: A Context for the Arkansas River Baisin by Christian J. Zier and Stephen M. Kalasz (with contributions by Mary A. Painter, Mark Mitchell, Amy Holmes, and Michael McFaul). Colorado Council of Professional Archaeologists, Denver.

Kuehn, Steven R.
1998 New Evidence for Late Paleoindian-Early Archaic Subsistence Behavior in the Western Great Lakes. *American Antiquity* 63(3):457-476.

Lamar, Howard R.
1977 *The Reader's Encyclopedia of the American West.* Harper and Row, New York.

League of Revolutionary Struggle (Marxist-Leninist)
2015 History of the Chicano Liberation. Electronic document, https://www.marxists.org/history/erol/ncm-5/lrs-chicano/part-1.htm#fw02, accessed June 22, 2015.

Lecompte, Janet
1978 *Pueblo, Hardscrabble, Greenhorn: The Upper Arkansas, 1832 – 1856.* University of Oklahoma Press, Norman.

Loendorf, Lawrence L., Jeani L. Borchert, and Duane G. Klinner
1996 *Archaeological Investigations at Ceramic Stage Sites in the Pinon Canyon Maneuver Site, Colorado*. Contribution No. 308, Department of Anthropology, University of South Dakota, Grand Forks.

Mandel, Rolfe D., Steven Holen, and Jack L. Hofman
2005 Geoarchaeology of Clovis and Possible Pre-Clovis Cultural Deposits at the Kanorado Locality, Northwestern Kansas. *Current Research in Pleistocene* 22:56-57.

Martorano, Marilyn A., Ted Hoefer III, Margaret A. Jodry, Vince Spero, and Melissa L. Taylor
1999 *Colorado Prehistory: A Context for the Rio Grande Basin*. Colorado Council of Professional Archeologists, Denver.

Mehls, Steven F.
1984 The New Empire of the Rockies: A History of Northeast Colorado. *Cultural Resources Series,* No. 16. Colorado Bureau of Land Management, Denver.

Metcalf, Michael D., and Kevin D. Black
1991 Archaeological Excavations at the Yarmony Pit House Site, Eagle County, Colorado. *Cultural Resource Series*, No. 31. Colorado Bureau of Land Management, Lakewood.

Morrison, Roger B.
1987 Long-Term Perspective: Changing Rates and Types of Quaternary Surficial Processes: Erosion-Deposition-Stability Cycles. In, *Geomorphic Systems of North America,* Centennial Special Volume 2, edited by W. L. Graf, pp. 167-176. Geological Society of America, Boulder, Colorado.

Mutel, Cornelia Fleischer, and John C. Emerick
1984 *From Grassland to Glacier: The Natural History of Colorado and the Surrounding Region.* Johnson Printing, Boulder, Colorado.

Nebraska Studies.org
2015 Expanding Trade: 1541 Coronado Reaches "Quivera." Electronic document, http://www.nebraskastudies.org/0300/frameset_reset.html?http://www.nebraskastudies.org/0300/stories/0301_0110.html, accessed July 9, 2015.

Painter, Mary W., Amy Holmes, Michael McFaul, and Christian J. Zier
1999 Chapter 2 – Environmental Setting. In, *Colorado Prehistory: A Context for the Arkansas River Basin* by Christian J. Zier and Stephen M. Kalasz (with contributions by Mary W. Painter, Mark Mitchell, Amy Holmes, and Michael McFaul). Colorado Council of Professional Archaeologists, Denver.

Reeves, Brian O. K.
1973 The Concept of an Altithermal Cultural Hiatus in Northern Plains Prehistory. *American Anthropologist* 75(5):1221-1253.

Rood, Ronald J.
1990 Archaeological Excavations at 5LA2190: Evidence for Late Archaic Architecture in Southern Colorado. *Southwestern Lore* 56(3):22-29.

Shields, Wm. Lane
1980 Preliminary Investigation at the McEndree Ranch Site, 5BA30. *Southwestern Lore* 46(3):1-17.

1998 *Basin Houses in Colorado and Wyoming: Delineation of a Culture Area and Parsing Hunter-Gatherer Modeling*. Unpublished Master's thesis, University of Colorado, Boulder.

Stanford, Dennis
1983 Pre-Clovis Occupation South of the Ice Sheets. In *Early Man in the New World*, edited by R. Shutler, Jr., pp.65-72. Sage Publications, Beverly Hills, California.

Thornbury, William D.
1965 *Regional Geomorphology of the United States.* John Wiley & Sons, Inc., New York.

Tweto, Ogden
1979 *Geologic Map of Colorado.* U.S. Geological Survey, Denver, Colorado.

Weatherbase
2015 Summary - All Data: Fountain, Colorado. Electronic Document, http://www.weatherbase.com/weather, accessed June, 20015.

Weber, David J.
1982 *The Mexican Frontier, 1821 – 1846: The American Southwest under Mexico.* University of New Mexico Press, Albuquerque.

Weber, Kenneth R.
1990 Ethnohistory of the Pinon Canyon Maneuver Site. In, *An Introduction to the Archaeology of Pinon Canyon, Southeastern Colorado,* Volume III: Ethnohistory and History, edited by W. Andrefsky, Jr. Prepared for Department of the Army, Fort Carson Command, Environment, Energy and Natural Resources Division, Directorate of Engineering and Housing, and National Park Service, Interagency Archaeological Services – Denver, by Larson-Tibesar Associates, Inc., Laramie, Wyoming, and Centennial Archaeology, Inc., Fort Collins, Colorado.

Wheat, Joe Ben
1972 *The Olsen-Chubbock Site: A Paleo-Indian Bison Kill*. Society for American Archaeology Memoir No. 26. Washington D.C.

Zier, Christian J.
1999a Chapter 5 – Paleoindian Stage. In, *Colorado Prehistory: A Context for the Arkansas River Basin* by Christian J. Zier and Steven M. Kalasz (with contributions by Mary A. Painter, Mark Mitchell, Amy Holmes, and Michael McFaul). Colorado Council of Professional Archaeologists, Denver.

Zier, Christian J.
1999b Chapter 6 – Archaic Stage. In, *Colorado Prehistory: A Context for the Arkansas River Basin* by Christian J. Zier and Steven M. Kalasz (with contributions by Mary A. Painter, Mark Mitchell, Amy Holmes, and Michael McFaul). Colorado Council of Professional Archaeologists, Denver.

Zier, Christian J. and Stephen M. Kalasz
1999 *Colorado Prehistory: A Context for the Arkansas River Basin*. Colorado Council of Professional Archaeologists, Denver.

APPENDIX A

X-RAY FLUORESCENCE ANALYSIS REPORT

Geochemical Research Laboratory Letter Report 2015-52

Energy Dispersive X-ray Fluorescence Analysis of an Obsidian Artifact from 5EP7635, Central Colorado

July 17, 2015

Mr. Christopher C. Kinneer
Centennial Archaeology, Inc.
300 East Boardwalk, Building 4-C
Fort Collins, CO 80205

Dear Mr. Kinneer:

Enclosed with this letter you will find a table and figure presenting energy dispersive x-ray fluorescence (edxrf) data generated from the analysis of one obsidian artifact from archaeological site 5EP7635 located along the Front Range foothills in central Colorado. This research was conducted pursuant to you letter request of July 14, 2015.

Analyses of obsidian are performed at my laboratory on a QuanX-EC™ (Thermo Electron Corporation) edxrf spectrometer equipped with a silver (Ag) x-ray tube, a 50 kV x-ray generator, digital pulse processor with automated energy calibration, and a Peltier cooled solid state detector with 145 eV resolution (FWHM) at 5.9 keV. The x-ray tube was operated at differing voltage and current settings to optimize excitation of the elements selected for analysis. In this case analyses were conducted for the elements rubidium (Rb Kα), strontium (Sr Kα), yttrium (Y Kα), zirconium (Zr Kα), and niobium (Nb Kα). Iron vs. manganese (Fe Kα/Mn Kα) ratios also were computed with x-ray tube current scaled to the physical size of the sample.

X-ray spectra are acquired and elemental intensities extracted for each peak region of interest, then matrix correction algorithms are applied to specific regions of the x-ray energy spectrum to compensate for inter-element absorption and enhancement effects. After these corrections are made, intensities are converted to concentration estimates by employing a least-squares calibration line established for each element from analysis of up to 30 international rock standards certified by the U.S. Geological Survey, the U.S. National Institute of Standards and Technology, the Geological Survey of Japan, the Centre de Recherches Petrographiques et Geochimiques (France), and the South African Bureau of Standards.

Trace element measurements in the data table are expressed in quantitative units (i.e. parts per million [ppm] by weight), and matches between unknowns (the artifacts you sent) and known obsidian chemical groups are made on the basis of correspondences (at the 2-sigma level) in diagnostic trace element concentration values (in this case, ppm values for Rb, Sr, Y, Zr, Nb, Ba, Ti, Mn and $Fe_2O_3^T$) that appear in Anderson et al. (1986), Baugh and Nelson (1987, 1988), Glascock et al. (1999), Hughes (1984, 2005a), Hughes and Nelson (1987), Jack (1971), Nelson (1984), Shackley (1995, 1998, 2005), in unpublished form on other Nevada , Utah and New Mexico obsidians (Hughes 2005b), and my own in-house Jemez Volcanic Field geologic reference collection. Artifact-to-obsidian source (geochemical type, *sensu* Hughes 1998) correspondences were considered reliable if diagnostic mean measurements for artifacts fell within 2 standard deviations of mean values for source standards. I use the term "diagnostic" to specify those trace elements that are well-measured by x-ray fluorescence, and whose concentrations show low intra-source variability and marked variability across sources. In short, diagnostic elements are those whose concentration values allow one to draw the clearest geochemical distinctions between sources (Hughes 1993). Zn and Ga ppm concentrations are not considered "diagnostic" because they don't usually vary significantly across obsidian sources (see Hughes 1982, 1984). This is particularly true of Ga, which occurs in concentrations between 10-30 ppm in nearly all parent obsidians in the study area. Zn ppm values are infrequently diagnostic; they are always high in Zr-rich, Sr-poor peralkaline volcanic glasses, but otherwise they do not vary significantly between sources in the study area vicinity.

The trace element composition measurements in the enclosed table are reported to the nearest ppm to reflect the resolution capabilities of non-destructive energy dispersive x-ray fluorescence spectrometry. The resolution limits of the present x-ray fluorescence instrument for the determination of Rb is about 4 ppm; for Sr about 3 ppm; Y about 2 ppm; Zr about 4 ppm; Nb about 2 ppm; and Ba about 10 ppm (see Hughes [1994] for other elements). When

counting and fitting error uncertainty estimates (the "±" value in the table) for a sample are greater than calibration-imposed limits of resolution, the larger number is a more conservative indicator of composition variation and measurement error arising from differences in sample size, surface and x-ray reflection geometry.

Table 1

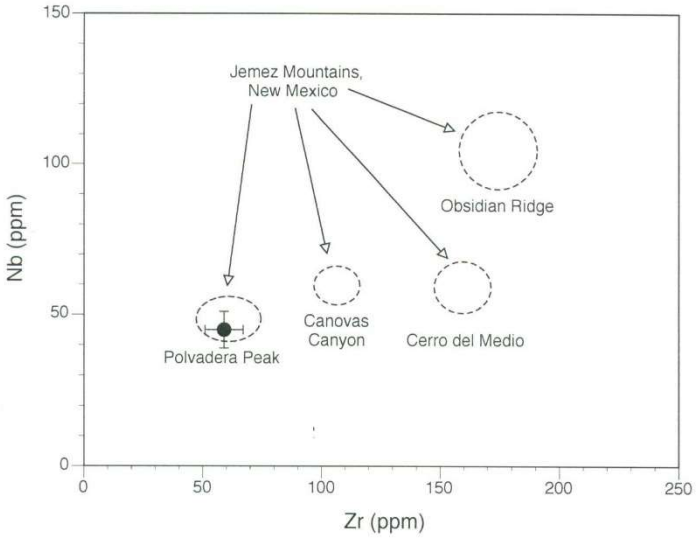
Quantitative Composition Estimates for an Obsidian Artifact from 5EP7635, Colorado

	Trace Element Concentrations											Ratio	
Cat. Number	Zn	Ga	Rb	Sr	Y	Zr	Nb	Ba	Ti	Mn	$Fe_2O_3^T$	Fe/Mn	Obsidian Source (Chemical Type)
CA7204, OB 1	nm	nm	150 ±4	5 ±2	22 ±3	59 ±3	45 ±3	nm	nm	nm	.56 ±.02	13	Polvadera Peak, NM
U.S. Geological Survey Reference Standard													
RGM-1 (measured)	nm	nm	151 ±4	111 ±3	26 ±3	223 ±4	9 ±3	nm	nm	nm	1.86 ±.02	63	Glass Mountain, CA
RGM-1 (recommended)	32	15	149	108	25	219	9	807	1600	279	1.86	nr	Glass Mountain, CA

Values in parts per million (ppm) except total iron [in weight %] and Fe/Mn intensity ratios; ± = expression of x-ray counting uncertainty and regression fitting error at 120-360 seconds livetime. nm= not measured.

Figure 1

Nb vs. Zr Composition of an Obsidian Artifact from 5EP7635, Colorado



Dashed lines represent range of variation measured in geological obsidian source samples. Black dot plots the artifact in Table 1; error bars are two-sigma (95% confidence interval) estimates for this specimen.

Edxrf data in Table 1 and Figure 1 indicate that this obsidian flake has the same trace element composition as Polvadera Peak (aka El Rechuelos rhyolite) obsidian from the Jemez Mountains, New Mexico (cf. Macdonald et al. 1992: Appendix I, p. 148; Baugh and Nelson 1987: Table 1; Glascock et al. 1999: Table 1; Hughes 2005b; Shackley 2005: Table A.5; see Church [2000] for discussion of the availability of obsidian in the Rio Grande gravels).

I hope this information will help in your analysis and interpretation of materials from this site. Please contact me at my laboratory ([650] 851-1410; e-mail: rehughes@silcon.com) if I can be of further assistance.

Sincerely,

Richard Hughes

Richard E. Hughes, Ph.D., RPA
Director, Geochemical Research Laboratory

REFERENCES

Anderson, Duane C., Joseph A. Tiffany, and Fred W. Nelson
1986 Recent Research on Obsidian from Iowa Archaeological Sites. **American Antiquity** 51: 837-852.

Baugh, Timothy G., and Fred W. Nelson
1987 New Mexico Obsidian Sources and Exchange on the Southern Plains. **Journal of Field Archaeology** 14: 313-329.

1988 Archaeological Obsidian Recovered from Selected North Dakota Sites and Its Relationship to Changing Exchange Systems in the Plains. **Journal of the North Dakota Archaeological Association** 3: 74-94.

Church, Tim
2000 Distribution and Sources of Obsidian in the Rio Grande Gravels of New Mexico. **Geoarchaeology** 15: 649-678.

Glascock, Michael D., Raymond Kunselman, and Daniel Wolfman
1999 Intrasource Chemical Differentiation of Obsidian in the Jemez Mountains and Taos Plateau, New Mexico. **Journal of Archaeological Science** 26: 861-868.

Hughes, Richard E.
1982 Age and Exploitation of Obsidian from the Medicine Lake Highland, California. **Journal of Archaeological Science** 9: 173-185.

1984 Obsidian Sourcing Studies in the Great Basin: Problems and Prospects. *In* Richard E. Hughes (ed.) **Obsidian Studies in the Great Basin**, pp. 1-19. Contributions of the University of California Archaeological Research Facility No. 45. Berkeley.

1993 Trace Element Geochemistry of Volcanic Glass from the Obsidian Cliffs Flow, Three Sisters Wilderness, Oregon. **Northwest Science** 67: 199-207.

1994 Intrasource Chemical Variability of Artefact-Quality Obsidians from the Casa Diablo Area, California. **Journal of Archaeological Science** 21: 263-271.

REFERENCES (continued)

Hughes, Richard E.

1998 On Reliability, Validity, and Scale in Obsidian Sourcing Research. *In* Ann F. Ramenofsky and Anastasia Steffen (eds.), **Unit Issues in Archaeology: Measuring Time, Space, and Material**, pp. 103-114. University of Utah Press, Salt Lake City.

2005a Determination of the Geologic Sources for Obsidian Artifacts from Camels Back Cave, and Trace Element Analysis of Some Western Utah and Eastern Nevada Volcanic Glasses. *In* Dave N. Schmitt and David B. Madsen (eds.), **Camels Back Cave**, pp. 249-256. University of Utah Anthropological Papers No. 125. Salt Lake City.

2005b Appendix D: ED-XRF Analyses. *In* The Dome Fire Obsidian Study: Investigating the Interaction of Heat, Hydration, and Glass Geochemistry, by Anastasia Steffen, pp. 333-351. Ph.D. Dissertation, Department of Anthropology, University of New Mexico.

Hughes, Richard E., and Fred W. Nelson

1987 New Findings on Obsidian Source Utilization in Iowa. **Plains Anthropologist** 32 (117): 313-316.

Jack, Robert N.

1971 The Source of Obsidian Artifacts in Northern Arizona. **Plateau** 43: 103-114.

Macdonald, Ray, Robert L. Smith, and John E. Thomas

1992 Chemistry of the Subalkalic Silicic Obsidians. **U.S. Geological Survey Professional Paper** 1523.

Nelson, Fred W., Jr.

1984 X-ray Fluorescence Analysis of Some Western North American Obsidians. *In* Richard E. Hughes (ed.) **Obsidian Studies in the Great Basin**, pp. 27-62. Contributions of the University of California Archaeological Research Facility No. 45. Berkeley.

Shackley, M. Steven

1995 Sources of Archaeological Obsidian in the Greater American Southwest: An Update and Quantitative Analysis. **American Antiquity** 60: 531-551.

1998 Geochemical Differentiation and Prehistoric Procurement of Obsidian in the Mount Taylor Volcanic Field, Northwest New Mexico. **Journal of Archaeological Science** 25: 1073-1082.

2005 **Obsidian: Geology and Archaeology in the North American Southwest**. University of Arizona Press, Tucson.

U.S. DEPARTMENT OF ENERGY
WESTERN AREA POWER ADMINISTRATION
ROCKY MOUNTAIN REGION

FINDING OF NO SIGNIFICANT IMPACT

Front Range - Midway Solar Interconnection Project
El Paso County, Colorado

DOE/EA-2018

AGENCY: U.S. Department of Energy, Western Area Power Administration

ACTION: Finding of No Significant Impact

On May 20, 2014, Front Range - Midway Solar (Midway Solar) submitted an interconnection request to Western Area Power Administration (WAPA) to interconnect Midway Solar's proposed photovoltaic (PV) solar electric generation facility (proposed Project) and WAPA's existing Midway Substation. The project is located 8 miles south of the City of Fountain in El Paso County, Colorado. Midway Solar will be the developer, contractor, and operator of the Project.

WAPA is a federal power marketing agency within the U.S. Department of Energy (DOE). Under its Open Access Transmission Service Tariff (Tariff), WAPA is required to respond to Midway Solar's interconnection request. WAPA's Tariff conforms to section 211 of the Federal Power Act and Federal Energy Regulatory Commission's (FERC) Final Orders addressing non-discriminatory transmission system access. WAPA's Tariff provides for interconnections to WAPA's transmission system by all eligible entities, consistent with, and subject to environmental review under the National Environmental Policy Act (NEPA), and other environmental regulations. Under its Tariff, WAPA must offer access to capacity on its transmission system, when capacity is available, on a non-discriminatory basis. WAPA also needs to ensure that by offering such capacity, existing transmission system reliability and service is not degraded by new or additional generation interconnections.

In accordance with applicable law and regulations, WAPA prepared an Environmental Assessment (EA), entitled *Environmental Assessment for the Front Range - Midway Solar, LLC Interconnection Project* (DOE/EA-2018). WAPA's purpose and need for the EA is to consider the interconnection request in accordance with its Tariff. WAPA's proposed Federal action is to execute an interconnection agreement with Midway Solar to interconnect the proposed PV solar electric generation facility and WAPA's existing Midway Substation. WAPA would be required to build a new 230-kilovolt (kV) bay within the Midway Substation; install new communications and protection equipment within the substation's control building; and install new take-off and gen-tie structures to direct the 230-kV transmission line into the new bay. Depending on final design, WAPA may be required to alter existing 115-kV and 230-kV transmission lines entering and exiting the Midway Substation to accommodate the proposed 230-kV gen-tie transmission line connecting the substation with the solar facility. Outside of the scope of this EA, Midway Solar may opt to interconnect into an adjacent substation owned by Public Service Company of

Colorado (PSCo) which would require obtaining a licensing agreement across WAPA-owned property. This agreement would be subject to an environmental review, payment of fair market value, and confirmation that the design would not interfere with WAPA's operations.

WAPA's Federal action does not include Midway Solar's proposed Project, which would be constructed, owned, operated, and maintained by Midway Solar. However, WAPA's EA analyzed and disclosed the potential environmental impacts of Midway Solar's proposed Project. The EA identified no significant impacts to environmental resources resulting from either WAPA's Federal action or Midway Solar's proposed Project.

The Draft EA was distributed to interested agencies, tribes, groups, and individuals on July 19, 2016. The public comment period ended on August 19, 2016. No comments were received during the comment period for the Draft EA. Based on the information contained in the EA, WAPA's Federal action would not result in significant environmental impacts. WAPA has determined that proposed Federal action described above does not constitute a major Federal action significantly affecting the quality of the human environment within the meaning of NEPA. Thus, the preparation of an environmental impact statement is not required, and WAPA is issuing this Finding of No Significant Impact (FONSI). The Final EA is approved concurrently with this FONSI.

FOR FURTHER INFORMATION:
Additional information and copies of the EA and this FONSI are available to all interested parties and the public from the following contact:

Brian Little, Supervisory Environmental Protection Specialist
Western Area Power Administration
Rocky Mountain Regional Office
P.O. Box 3700
Loveland, CO 80539-3003
Phone: (970) 461-7287
Fax: (970) 461-7213
Email: blittle@wapa.gov

This FONSI will be sent directly to individuals who previously requested a copy. A notification of availability will be sent to other potentially affected parties. A copy of the Final EA and this FONSI are also available on the following website:

https://www.wapa.gov/regions/RM/environment/Pages/Front_Range-Midway_Solar_Interconnection_Project.aspx

For further information on the DOE NEPA process, contact:

Ms. Carol M. Borgstrom
Director, Office of NEPA Policy and Compliance, GC-54
U.S. Department of Energy
1000 Independence Avenue, S.W.
Washington, DC 20585
Phone: (202) 586-4600 or (800) 472-2756

SUPPLEMENTARY INFORMATION:
This FONSI was prepared in accordance with the Council on Environmental Quality Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act, 40 CFR 1508.13, and the DOE NEPA Implementing Procedures, 10 CFR 1021.322. The FONSI briefly presents the reasons why WAPA's proposal to execute an interconnection agreement for the Midway Solar Project will not have a significant impact on the human environment within the meaning of NEPA. Execution of the interconnection agreement would allow Midway Solar to interconnect their proposed Project to WAPA's existing Midway substation. WAPA's EA evaluated the environmental effects of WAPA's proposed Federal action and also included an analysis and disclosure of the potential environmental impacts of Midway Solar's proposed Project.

WAPA's PROPOSED FEDERAL ACTION:
WAPA's proposed Federal action is to execute an interconnection agreement with Midway Solar to interconnect the proposed PV solar electric generation facility and WAPA's existing Midway Substation. WAPA would be required to build a new 230- kV bay within the Midway Substation; install new communications and protection equipment within the substation's control building; and install new take-off and gen-tie structures to direct the 230-kV transmission line into the new bay. Depending on final design, WAPA may be required to alter existing 115-kV and 230-kV transmission lines entering and exiting the Midway Substation to accommodate the proposed 230-kV gen-tie transmission line connecting the substation with the solar facility.

Midway SOLAR'S PROPOSED PROJECT DESCRIPTION:
Midway Solar proposes to construct two main but connected components: a 100-MW PV solar electric generation facility and the associated gen-tie line to connect the solar facility to WAPA's Midway Substation. The proposed Project would consist of PV panels, tracking system, and associated electric power collection system, with light-duty gravel covered service roads and would occupy approximately 911 acres. A full and complete Project description is included in the EA.

COMMENTS RECEIVED ON THE PRE-APPROVAL EA:
No formal public comments, questions, or concerns were received. The Northern Arapaho Tribe of the Wind River Reservation requested the opportunity to participate in the cultural resources site survey; however, the survey was completed at the time of the request. The Northern Arapaho Tribal Historic Preservation Office was given an opportunity to review the Class III Cultural Resources Inventory report. Further details of WAPA's and Midway Solar's public scoping and tribal consultation efforts are included in the Final EA.

ALTERNATIVES:
DOE's NEPA regulations require that an EA include the proposed action and the no action alternative (10 CFR 1022.321(c)).

WAPA's above-described proposed Federal action was considered. In addition, as part of the EA, WAPA evaluated modifications to existing 115-kV and 230-kV transmission lines entering and exiting the Midway Substation to accommodate the proposed 230-kV gen-tie transmission line connecting the substation with the solar facility.

Under the No Action Alternative, WAPA would not execute an interconnection agreement with Midway Solar and the proposed Project would not be constructed or interconnected to WAPA's transmission system. WAPA would continue to operate the Midway Substation, however the construction activities associated with the proposed Action would not occur. Midway Solar could continue to pursue the proposed Project by applying for an interconnection into an adjacent substation owned by PSCo which would require obtaining a licensing agreement across WAPA-owned property. This agreement would be subject to an environmental review, payment of fair market value, and confirmation that that the design would not interfere with WAPA's operations. For the purpose of the Final EA and this FONSI, which discusses WAPA's proposed Action, the No Action Alternative is considered to result in the proposed Project not being constructed, and thus provides a baseline against which the proposed Action can be evaluated.

ENVIRONMENTAL IMPACTS OF WAPA'S ACTION:
The execution of an interconnection agreement with Midway Solar to connect the proposed Project to WAPA's Midway Substation and taking possession of: a new 230-kV bay within the Midway Substation; new communications and protection equipment within the substation's control building; new take-off and gen-tie structures to direct the 230-kV transmission line into the new bay, and, depending on final design, WAPA may be required to alter existing 115-kV and 230-kV transmission lines entering and exiting the Midway Substation to accommodate the proposed 230-kV gen-tie transmission line connecting the substation with the solar facility. WAPA's Federal action will have no significant impact to environmental resources.

ENVIRONMENTAL IMPACTS OF FRONT RANGE MIDWAY SOLAR'S PROPOSED PROJECT:
The EA evaluated the potential for Midway Solar's proposed Project to impact environmental resources found in the proposed Project area. Midway Solar has incorporated WAPA's Standard Construction Practices and Best Management Practices into the description of its proposed Project. The analysis of environmental impacts identified no potential impacts that would be considered significant and no mitigation measures that should be implemented additional to those already embedded within the proposed project description. The principal reasons for the lack of significant environmental impact was the avoidance of sensitive resources during siting of the solar facility, the minor amount of disturbance at structure locations, and Midway Solar's efforts to work cooperatively with affected landowners.

DETERMINATION:
WAPA will allow 15 days of public review after publication of this statement of findings before implementing the Proposed Action. Based on the information contained in the EA, WAPA's Federal action would not result in significant environmental impacts. WAPA has determined that it's proposed Federal action is not a major Federal action significantly affecting the quality of the human environment within the meaning of NEPA. Therefore, preparation of an environmental impact statement is not required and WAPA is issuing this FONSI.

Bradley S. Warren
Senior Vice President
Rocky Mountain Regional Manager
Western Area Power Administration
U.S. Department of Energy

9-21-16
Date

Final Environmental Assessment
for the Front Range-Midway Solar LLC
Interconnection Project

DOE Project Number: DOE/EA-2018

Prepared for:

US Department of Energy

Western Area Power Administration

Rocky Mountain Region

Prepared by

Western EcoSystems Technology, Inc.

415 West 17th Street, Suite 200
Cheyenne, Wyoming 82001

September 2016

LIST OF ACRONYMS AND ABBREVIATIONS

Acronym	Meaning
°	degree
°C	degrees Celsius
°F	degrees Fahrenheit
1041 Regulations	*Guidelines and Regulations for Areas and Activities of State Interest*
AC	alternating current
ACHP	Advisory Council on Historical Preservation
AF	acre-foot
APE	area of potential effects
APLIC	Avian Power Line Interaction Committee
Argonne	Argonne National Laboratories
BMP	best management practice
CA	Centennial Archeology
CAA	Clean Air Act
CFR	Code of Federal Regulations
CH_4	methane
Cm	centimeter
CO_2	carbon dioxide
CPW	Colorado Division of Parks and Wildlife
CRS	Colorado Revised Statutes
DC	direct current
Dir.	Director
DOE	Department of Energy
EA	Environmental Assessment
EIS	Environmental Impact Statement
EMF	Electromagnetic Fields
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FONSI	Finding of No Significant Impact
Fort Carson	Fort Carson US Army Installation
FR	Federal Register
ft	foot
ft^2	square foot
ft^3	cubic foot
GCC	GCC Colorado Energy Recyclers
gen-tie	generation intertie or generation intertie transmission line
ha	Hectare
HAZMAT	hazardous materials
HMP	Hazard Mitigation Plan
I-25	Interstate 25
I-3	Zoning classification for heavy industrial or manufacturing
ICNIRP	International Commission on Non-Ionizing Radiation Protection
kph	kilometers per hour
kV	kilovolt
kV/m	kilovolt per meter
M	meter
m^2	square meter
m^3	cubic meter
mG	milliGauss
Midway Solar	Front Range-Midway Solar, LLC

Acronym	Meaning
mph	miles per hour
MW	megawatt
N_2O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NAGPRA	Native American Graves Protection and Repatriation Act of 1990
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NRCS	Natural Resource Conservation Service
NRHP	National Register of Historic Places
O&M	operations and maintenance
OAHP	Office of Archeology and Historical Preservation
OEM	Office of Emergency Management
OEM	Office of Emergency Management
OHV	off-highway vehicle
OSHA	Occupational Safety and Health
Phase 1	Phase I Environmental Site Assessment
PM10	Particulate matter between 2.5 and 10 microns
PM2.5	Particulate matter less than or equal to 2.5 microns
Project	Front Range-Midway Solar, LLC Interconnection Project
PSCo	Public Services Company of Colorado
PSCW	Public Service Commission of Wisconsin
PV	photovoltaic
REC	Recognized Environmental Condition
ROW	right-of-way
RR-2.5	Zoning classification for rural, single family, and residential dwellings on parcels of approximately 2.5 acres
RR-5	Zoning classification for rural, single family, residential dwellings on parcels of approximately five acres
Sandia	Sandia National Laboratories
SB40	Senate Bill 40
Service	US Fish and Wildlife Service
SGHAT	Solar Glare Hazard Analysis Tool
SHPO	State Historic Preservation Office
SHP Officer	State Historic Preservation Officer
SPCC	Spill Prevention, Control, and Countermeasures
SWPPP	Stormwater Pollution Prevention Plan
Tariff	Open Access Transmission Service Tariff
Terracon	Terracon Consulting Engineers and Scientists
Tetra Tech	Tetra Tech Inc.
UCSUSA	Union of Concerned Scientists of the United States of America
US	United States
USC	United States Code
USDA	US Department of Agriculture
US EPA	US Environmental Protection Agency
USFWS	US Fish and Wildlife Service
USGS	US Geological Survey
UTC	Coordinated Universal Time
WAPA	Western Area Power Administration
WEST	Western Ecosystem Technologies, Inc.

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EXECUTIVE SUMMARY

Project Location

The Front Range-Midway Solar, LLC Interconnection Project (Project) is located in El Paso County, Colorado, on private, county, and federally owned lands.

Project Participants

Western Area Power Administration (WAPA), a federal power marketing agency within the US Department of Energy (DOE), is the lead federal agency for the Project under the National Environmental Policy Act (NEPA) review. Front Range-Midway Solar, LLC (Midway Solar) is a private solar development company and the Project proponent.

Purpose and Need

WAPA Area Power Administration's Purpose and Need

WAPA's purpose and need is to consider and respond to an interconnection request from Midway Solar in accordance with its Open Access Transmission Service Tariff and the Federal Power Act. The Open Access Transmission Service Tariff is submitted to and accepted by the Federal Energy Regulatory Commission.

Midway Solar's Purpose and Need

The Purpose of the Project is construct, operate and maintain a 100-megawatt (MW) photovoltaic solar facility to provide clean, cost effective, renewable energy. The need for the Project was established by multiple factors including local, state and federal statues and directives including Colorado's renewable energy standard ("RES") statute (Section 40-2-124, C.R.S.). The state of Colorado passed the RES in 2004, which requires electricity providers to obtain a minimum percentage of their power from renewable energy sources. This project would aid in meeting the stated requirements of the Renewable Energy Standard for the state of Colorado.

Summary of Environmental Consequences

The following resources were considered but were not further evaluated as these resources would not be impacted by the proposed Project: prime or unique farmland, floodplains, wetlands and riparian zones, recreation, rangelands, and environmental justice.

A summary of the environmental consequences resulting from the Proposed Action, the proposed Project for each resource analyzed is listed below:

Land Use

WAPA's Proposed Action would be limited to their existing substation and right-of-way (ROW). WAPA's actions would not affect land use near the Project Study Area or in El Paso County on

a larger scale. Continued operation of the Midway Substation by WAPA would have no effect on land use in the Project vicinity or within El Paso County.

Assuming Midway Solar's proposed Project were approved and proceeded with rezoning of the Project Study Area, Midway Solar's proposed Project would comply with county land use codes, plans, and regulations. Operation and maintenance of the proposed Project would not impact the zoned land use near the Project Study Area nor would it affect land use in El Paso County.

Air Quality and Climate Change

WAPA's Proposed Action would generate localized, short-term pollutant emissions from construction equipment during construction of the interconnection facilities. Over the long-term, minimal vehicular emissions associated with maintenance and repair of the Midway Substation would be released. WAPA's Proposed Action would have minimal temporary effects on air quality in the Project study area.

Midway Solar's proposed Project would generate localized, short-term pollutant emissions from construction equipment during construction of the solar and gen-tie facilities. Because of the limited time associated with Project construction and the use of dust suppression practices, impacts associated with construction on air quality would be minimal and temporary.

Midway Solar's permanent impacts to air quality associated with the operations and maintenance (O&M) of the solar facility would be negligible to minimal.

Beneficial long-term impacts to air quality and climate change would occur through the implementation of the proposed Project in that solar development would likely lead to a reduction in the reliance on the production of electricity from pollution-generating fossil fuels. No greenhouse gases are associated with the generation of electricity from solar energy. However, emissions are associated with the manufacturing, transportation of materials, and decommissioning of solar energy facilities (Union of Concerned Scientists of the United States of America [UCSUSA] 2013).

Soils and Geology

WAPA's Proposed Action would be limited to existing disturbances within the footprint of Midway Substation and WAPA's transmission line ROW. WAPA's impacts from the Proposed Action would have a negligible effect on native undisturbed soils.

The construction of the proposed Project would require disruption of the top surface of the soil profile (topsoil). Construction would occur in a phased approach that would help reduce the amount of topsoil that would be exposed to wind and water erosion during construction activities. Midway Solar would incorporate industry standard best management practices (BMPs) to minimize soil erosion potential during construction activities and promote an on-site vegetative community compatible with the proposed solar facility's operation for the duration of operations at the facility.

Water Resources

No surface water resources occur within or near the footprint of WAPA's Midway Substation or transmission line ROW. Additionally, WAPA would implement its Construction Standard 13 guidance manual, specifically Standard 13.11, which outlines measures WAPA is committed to take to prevent spills of pollutants and response procedures if a spill occurs. With no surface water present within the Proposed Solar Facility Area and following protocols identified in Standard 13.11, WAPA's impact to water resources would be negligible.

No surface waters would be impacted by Midway Solar's proposed Project. In the event of a spill or leak during construction or operation, Midway Solar's commitment to a Stormwater Pollution Prevention Plan (SWPPP) and best management practices would minimize impacts to surface and ground water.

Vegetation

WAPA's Proposed Action would be limited to disturbances within the footprint of the Midway Substation and WAPA's transmission line ROW. WAPA maintains a bare earth standard of a 5-foot (ft) bare earth apron around its substations, so no new direct impacts to vegetation would occur within and around Midway Substation. Indirect impacts of introducing weeds to the area would be negligible because WAPA's Construction Standard 13.6 states that WAPA would need to maintains a "clean vehicle policy" while entering and leaving construction areas to prevent the transport of noxious weed plants or seeds. WAPA also employs the use of noxious weed control in and around its facilities.

Temporary, high-level direct impacts would occur in areas that would be graded to achieve proper slope or elevation for solar array installation; and, all vegetative cover would be disturbed in graded areas. These impacts would be considered temporary because graded areas would be revegetated with an approved groundcover seed mix as part of the Midway Solar revegetation plan. Temporary impacts to vegetation would be minimal. However, if weed control were needed, Midway Solar would seek technical assistance from the El Paso County Forestry and Noxious Weed Inspector for determining appropriate noxious weed control methods.

Wildlife

The impacts of WAPA's Proposed Action to wildlife would be negligible. No wildlife habitat occurred at WAPA's Midway Substation as WAPA maintains a bare earth standard within their substations. The disturbance of wildlife would be a temporary negligible effect on wildlife; therefore, long-term impacts on wildlife would not occur.

Impacts to wildlife from Midway's proposed Project includes loss of grassland habitat, displacement and disturbance of individuals, and potential for direct mortality, but such impacts would be minimal since most wildlife are likely to avoid construction activities near the Project area. Long−term, grass and forb cover would likely recover after construction but the quality of habitat would be diminished due to the presence of the solar panels. Small ground-dwelling species might continue to use the habitat available under the panels, but some larger predators, such as raptors, may avoid the Project area. Solar panels would eliminate opportunities for

perching by birds on larger vegetation and shelter for other species. As a result of diminished habitat quality and quantity, species abundance may decline. Birds and bats would likely be impacted directly through collisions with Project structures; however, collision impact on bats and birds would likely be negligible.

Species Status Species

The impacts of WAPA's Proposed Action to species of concern would be negligible. No suitable habitat occurred at WAPA's Midway Substation. The addition of a new 230-kV bay at Midway Substation would not affect any threatened, endangered, or special status species.

The concern over injuries and deaths of special status species at the proposed solar facilities is centered on the theory that the bird species - piping plovers, least terns, and whooping cranes - may potentially mistake the extensive solar arrays for water features on which the birds can land; this theory has been coined the "lake effect hypothesis." Recent studies have concluded that no empirical evidence exists that PV facilities lead to distinct changes to water birds or waterfowl risk or mortality and that additional structured studies of utility scale PV facilities are necessary before a statistically significant conclusions about avian risk and mortality associated with solar facilities can be drawn. The general behavior of terns, plovers, and cranes to land on solid ground or shallow water requires these birds to approach slowly and identify the substrate they will touch upon, which would greatly reduce the potential for these species to impact PV panels. Therefore, even if there is a potential for lake effect hypothesis impacts to occur at Midway Solar's PV solar field, the Project would pose a low risk to least terns, piping plovers, whopping cranes, and other birds.

Cultural Resources

WAPA's Proposed Action would not result in impacts to cultural resources within the Project study area. Additionally, WAPA's Proposed Action would result in no visual impacts to cultural sites within a two-mile (3.2-kilometer) buffer around the substation.
While two cultural sites were identified through a Class III survey of the Project Study Area, measures were proposed by Midway Solar and agreed to by the State Historic Preservation Officer that would protect and preserve the two sites adequately. In adhering to the identified measures, Midway Solar's proposed Project would have no impact to known protected cultural resources.

Visual Resources

The visual impacts associated with WAPA's proposed construction activities would have minimal impact due to both the timing of activities and in that, the construction activities would occur on the south side of the substation while the nearest resident is approximately 0.5 miles to the northwest of the substation. WAPA's Proposed Action would have a negligible to minimal permanent impact to visual resources of the area.

The temporary visual impacts associated with Midway Solar's proposed construction activities would have a minimal impact. Midway Solar's proposed Project would have a minor to moderate permanent impact on the views and visual resources.

Transportation

WAPA's Proposed Action would temporarily impact transportation (traffic) within that Project area as these impacts would only primarily occur during construction of the Project, if approved. Impacts to transportation activities within the Project area would be minimal.

Negligible-to-minimal impacts to traffic would occur through implementation of Midway Solar's proposed Project. The Project would not require improvements to existing transportation facilities nor are any road closures. Midway Solar would construct new or improve existing roads within the Project Study Area that are needed for the proposed Project. No impacts to rail service or air traffic would occur as a result of the Midway Solar's proposed Project.

Public Health and Safety

WAPA's Proposed Action would result in negligible public health and safety impacts associated with electromagnetic fields (EMF), worker safety, or hazardous materials due to the temporary timeframe of construction activities.

The construction phase for Midway Solar's proposed Project would release fugitive dust and vehicle and equipment emission. Dust and exhaust would likely degrade local air quality temporarily during construction. Local sensitive receptors, the elderly, infants and people with pre-existing respiratory issues, may experience additional difficulties breathing as a result of construction. The severity of the impacts would depend on the health of the individuals affected. Construction crews would use water trucks to minimize fugitive dust and equipment would meet emission standards set by the state. In general, the operation of the proposed Project would negligibly affect workers' health and would not place additional demand on police or public emergency resources. Site maintenance and other requisite visits would not result in demonstrable additional vehicle emissions or fugitive dust releases. Electromagnetic Field (EMF) impacts from the proposed Project would be below the International Commission on Non-Ionizing Radiation Protection established magnetic field exposure limits for the general public and workers. No federal or Colorado state laws or policies regulate exposure levels of EMF.

Intentional Destructive Acts

Any electric grid infrastructure can be a target for intentional destructive acts including WAPA's and Midway Solar's infrastructure. While a terrorist attack is possible, destruction due to vandalism or theft is far more probable; however, such potential acts would unlikely have substantial effects on the environment.

For the purposes of this EA, the No Action Alternative would result in the proposed Project not being constructed. Therefore, the impacts on described for each resource would not occur under the No Action Alternative.

1.0 INTRODUCTION

1.1 Background

The WAPA Regional Manager, Bradley S. Warren, determined the scope of the project did not require an Environmental Impact Statement to be prepared, but could be evaluated through an Environmental Assessment (EA) (Warren 2015). WAPA prepared this EA to analyze the environmental impacts of the proposed Project as required under the National Environmental Policy Act (NEPA)

Midway Solar submitted an interconnection request to WAPA to connect a proposed 100-MW PV solar facility (proposed Project) located south of Fountain, Colorado, in El Paso County to WAPA's Midway Substation. The Project Study Area (approximately 1,085 acres) is located between Interstate-25 (I-25) and Fort Carson US Army Installation (Fort Carson), just north of the Midway Landfill, in unincorporated, southern El Paso County, Colorado (Figures 1.1 and 1.2). Of the 1,085 acres studied for the proposed Project, Midway Solar determined approximately 911 acres would be needed for the development and is referred to as the Proposed Solar Facility Area (Figure 1.3). Midway Solar would make the connection to the WAPA substation with a gen-tie transmission line approximately 0.85 mile in length.

Midway Solar has also submitted an interconnection request to the Public Service Company of Colorado (PSCo), who has a substation located adjacent to and east of WAPA's Midway Substation. However, in order to connect the proposed Project with the PSCo substation, Midway Solar's gen-tie line to the PSCo substation would likely cross WAPA owned land. Crossing WAPA's land would require a licensing agreement between Midway Solar and WAPA. Impacts would likely be similar from either gen-tie line. Impacts described in this EA that would result from the proposed Project's construction, operations, maintenance, or decommissioning, would remain the same regardless of which interconnection is made due to the close proximity of both WAPA's and PSCo's substations.

This chapter provides an overview of the proposed project, explains why WAPA needs to take action, details the proposed Project and its purpose and need, and provides the purpose that WAPA is trying to achieve to meet this need. This chapter also describes the public involvement that has occurred related to the proposed Project.

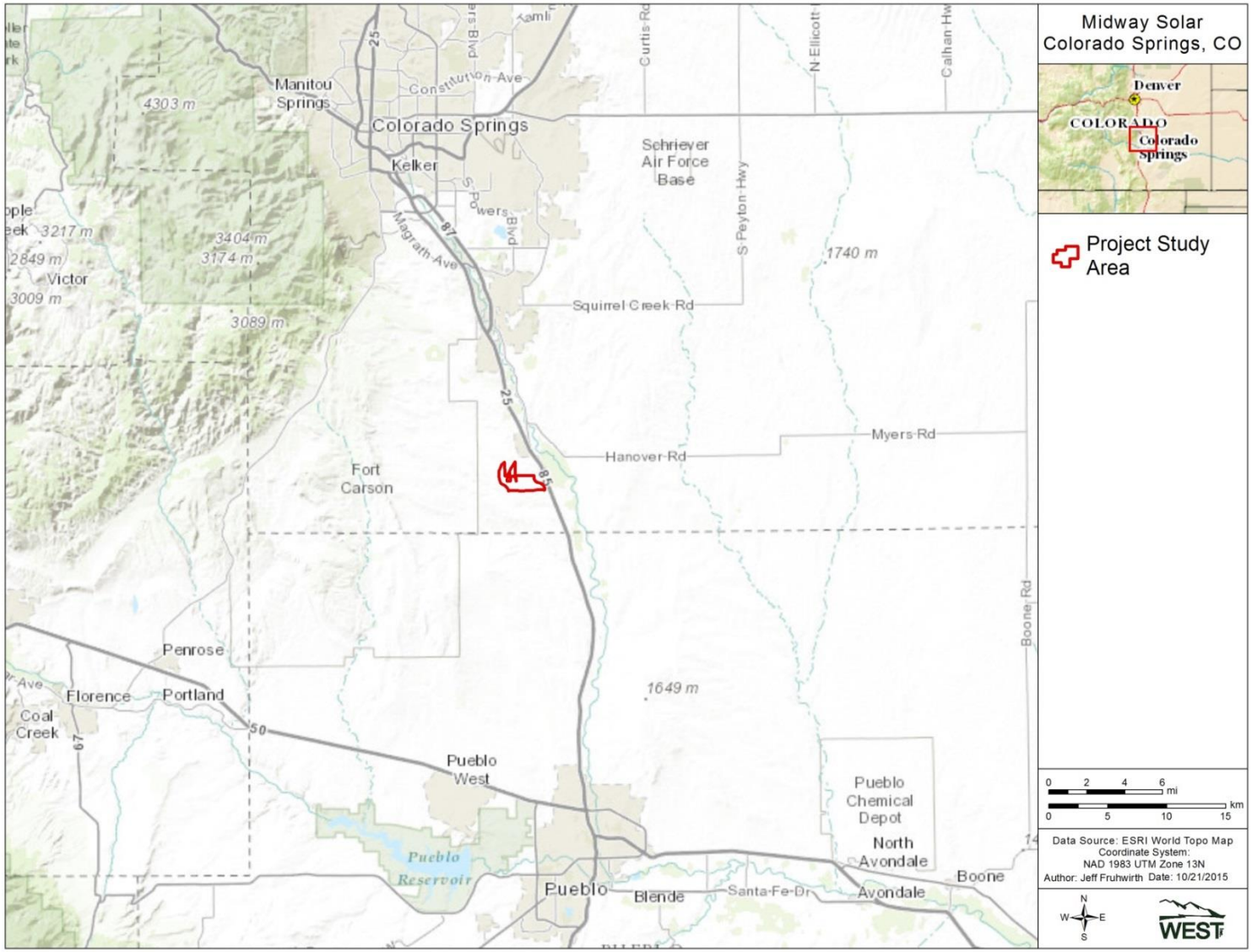


Figure 1.1 Location of the Midway Solar Interconnection Project, El Paso County, Colorado.

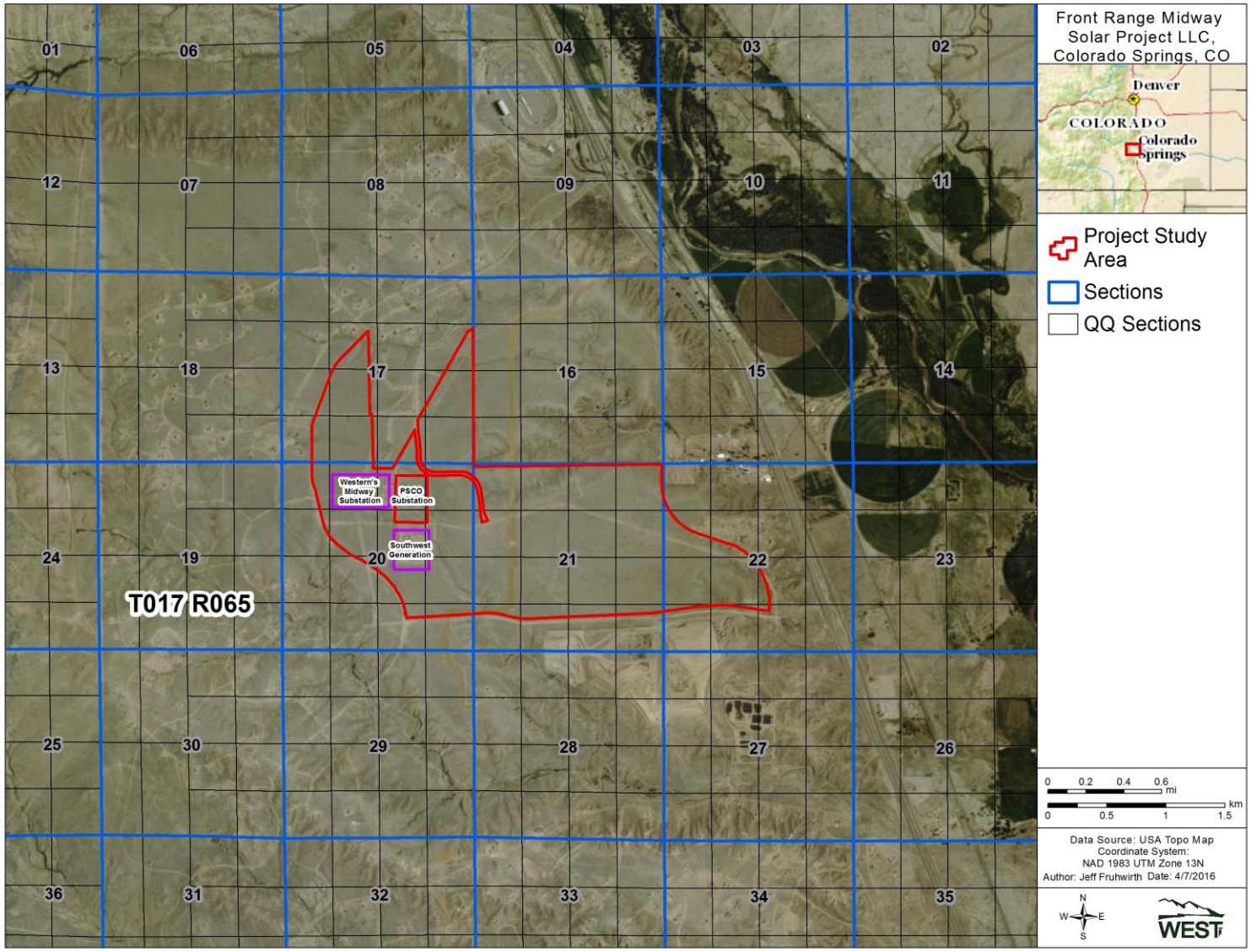


Figure 1.2 Location and study area boundary of the Midway Solar Interconnection Project, El Paso County, Colorado.

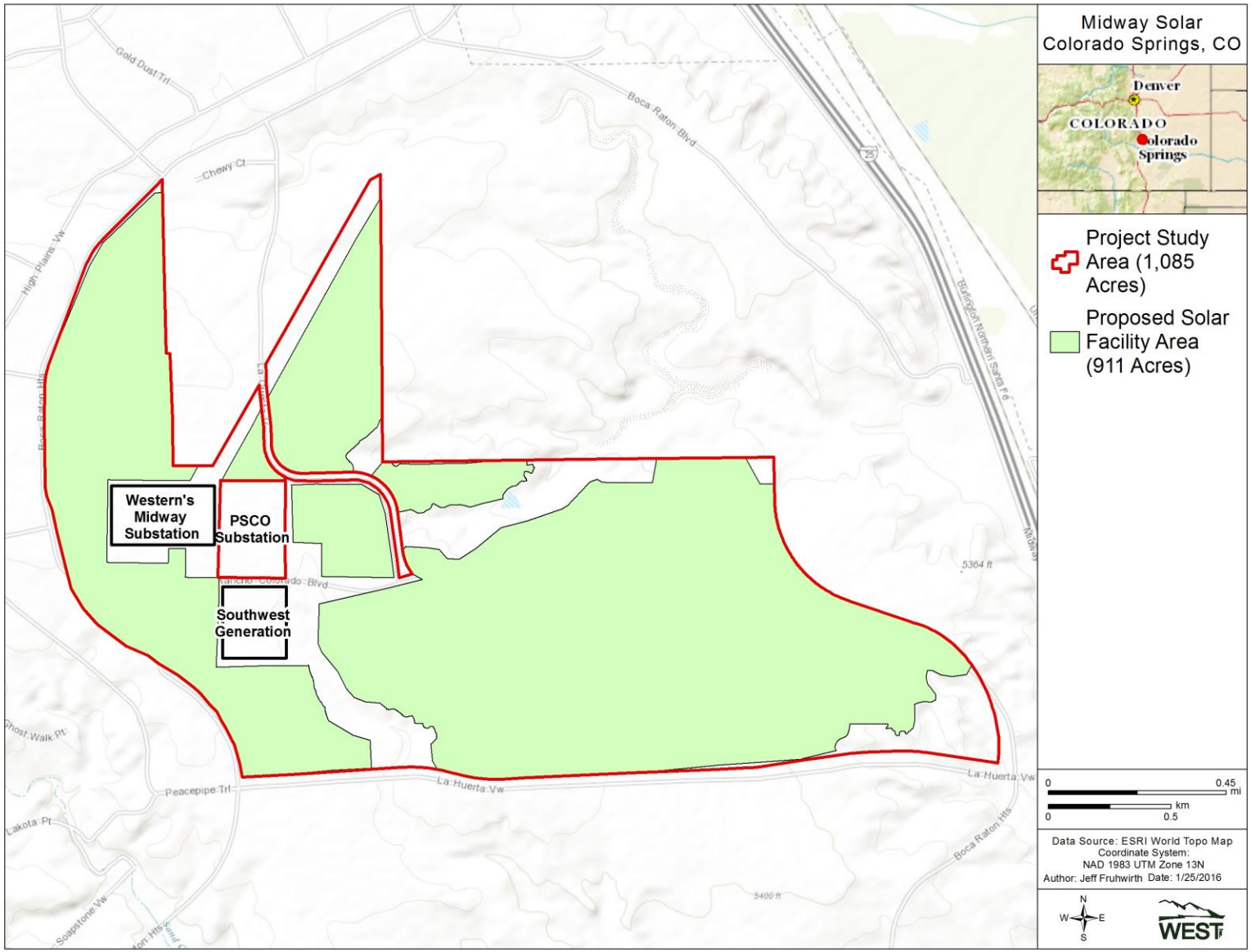


Figure 1.3 The Project Study Area and Proposed Solar Facility Area for the Midway Solar Interconnection Project.

1.2 Purpose and Need

1.2.1 WAPA's Purpose and Need

WAPA needs to consider and respond to Midway Solar's interconnection request in accordance with its Open Access Transmission Service Tariff (Tariff) and the Federal Power Act. Under the Tariff, WAPA offers capacity on its transmission system to deliver electricity when capacity is available. The Tariff also contains terms for processing requests for the interconnection of generation facilities to WAPA's transmission system. In reviewing interconnection requests, WAPA must ensure that existing reliability and services are not degraded. WAPA's Tariff provides for transmission and system studies to ensure that system reliability and service to existing customers are not adversely affected by new interconnections. These studies also identify system upgrades or additions necessary to accommodate the proposed Project and address whether the upgrades or additions are within the Project scope. Lastly, under WAPA's Tariff, WAPA offers interconnection to all eligible customers on a first-come, first-served basis, with a final decision on whether or not to make this offer subject to an environmental review under the NEPA.

1.2.2 Midway Solar Project Purpose and Need

The Purpose of the Project is construct, operate and maintain a 100-megawatt (MW) photovoltaic solar facility to provide clean, cost effective, renewable energy. The need for the Project was established by multiple factors. Colorado has a renewable energy standard ("RES") statute (Section 40-2-124, C.R.S.) requiring 30% of retail energy sales to be derived from renewable generation by 2020 from investor owned utilities, and 10% for large municipal utilities and cooperatives. While some utilities are in full compliance with the RES other utilities have not yet achieved compliance. The Project will allow cost effective solar energy to be delivered to those entities. In addition to the RES, however, other statutory and policy directives, including but not limited to the Colorado Governor's Climate Action Plan, the Environmental Protection Agency's Clean Power Plan, and local initiatives of Colorado rural cooperatives, municipal utilities, and generation and transmission associations are driving an increased need for clean, renewable sources of electricity that the Project intends to meet, in part. The cost of solar continues to decline making it more competitive with other sources of new generation, which has led to utilities procuring solar outside of needs established by mandates and goals.

Initially, Midway Solar planned to develop 1,085 acres within the Study Area for the proposed Project (Figure 1.3). However, portions of the Study Area were found to have existing utility easements; had slopes that were unsuitable for solar development; or contained ephemeral washes that greatly restrained Midway Solar's ability to develop the entire area. Based on these existing conditions, Midway Solar determined that only 911 acres were suitable for Project development. Within this EA, the 911-acre developable area is referred to as the Proposed Solar Facility Area (Figure 1.3) and was evaluated for potential environmental impacts.

1.3 Public Scoping and Tribal Consultation

1.3.1 Public Scoping

Midway Solar voluntarily conducted a public scoping effort to identify any potential concerns with the proposed Project. Midway Solar engaged potential stakeholders near the proposed Project since the early stages of project development and proposed to continue such outreach through project construction, if an interconnection or licensing agreement is approved. In order to solicit comments specific to the Draft EA, Midway Solar, in conjunction with WAPA, sent an informational brochure (Appendix A) to identified stakeholders on August 5, 2015. Recipients of the brochure were determined by their proximity to the Project Study Area and included local residences and businesses. The brochure contained information informing recipients of the proposed Project, the intent to prepare an EA, and the scoping period for comments to be considered as part of the EA. Comments from stakeholders were requested by September 10, 2015. Copies of the brochure were also made available at County offices. No public comments, questions, or concerns were received.

In addition to mailing informational brochures, Midway Solar personally met with several local private businesses in the area including: Southwest Generation, Midway Landfill, GCC Colorado Energy Recyclers (GCC), James Kirkland Aggregate/Quarries, Corvette Center of Colorado Springs, and Cactus Creek Ranch, Table 1.1. Representatives from El Paso County and Fort Carson were also contacted regarding the proposed Project. The purpose of the meetings were to discuss Project details, the preparation of the EA, and to solicit comments and concerns of businesses and affected communities within the Project area for their consideration in the EA. Midway Solar representatives conducted in-person meetings between May 27 and August 25, 2015, which resulted in no expressed opposition to the proposed Project. In general, people expressed interest and support for the proposed solar facility.

Table 1.1 Midway Solar Scoping Efforts.

Organization	Contact	Title	Comments/Concerns
Southwest Generation	Dave Rhodes	VP Business Development	Not opposed to Project; interested in solar development.
Fort Carson	Wayne Thomas	NEPA and Cultural Management Branch Chief	Not opposed to Project; Fort Carson has participated in solar project in the past and is looking to participate in future solar projects.
Fort Carson	Vince Guthrie	Director of Public Works Utility Programs Manager, CEM	
Midway Landfill	Rod Gabol	District Manager for Waste Management	Expressed belief that a large solar project would be a good neighbor and serve as a buffer around the landfill.
Groupo Cementos de Chihuahua (GCC)	Scott Pederson	Site Manager	Expressed belief that a large solar project would be a good neighbor.
El Paso County	Craig Dosey	Project Manager III El Paso County Development Services	Concerns over traffic congestions during construction; concerns over impacts and possible improvements to local roads; concerns over visual

Organization	Contact	Title	Comments/Concerns
El Paso County	Monnie Gore Jr.	Deputy County Administrator	impacts.
El Paso County	Lori Seago	Senior Assistant County Attorney	
El Paso County	Amy Lathen	El Paso County District 2 Commissioner	
El Paso County	Dennis Hisey	El Paso County District 4 Commissioner	
James Kirkland Aggregate/Quarries	James Kirkland	Owner	Would like to provide aggregates for the project.
Corvette Center of Colorado Springs – Cactus Creek Ranch	Ric Noring	Owner	Supportive of solar.

Through discussions with El Paso County and Fort Carson representatives, it was identified that Fort Carson held Contingent Rights to approximately 120 acres of land owned by El Paso County. The Department of the Army has established the Army Compatible Use Buffer (ACUB) Program. The ABUC aims to prevent encroachment that may interfere with the Army's mission on private property that abuts military installations. Therefore, Fort Carson maintains the right of first refusal for any potential development on the approximate 120 acre to ensure any such encroachment would not interfere with the objectives of the Army. The acreage where Fort Carson held Contingent Rights is located on the northwest portion of the Study Area and is subject to a Water Restriction Agreement. Fort Carson obtained the Contingent Rights as a result of Cooperative Agreement W911SR-07-2-0003 (Cooperative Agreement) executed between El Paso County and the United States Army Research Development and Environmental Command on the behalf of Fort Carson and the Army. Terms and conditions of the Cooperative Agreement specified that if El Paso County permits the land to be developed, then the County shall notify Fort Carson and receive written approval from the Army prior to permitting any development action. Neither the Army nor Fort Carson own property rights within the Study Area and therefore there are no additional federal actions or NEPA compliance requirements that need to be considered further. However, a representative from Fort Carson has requested that they be notified once the EA is made public so they can review the EA and determine whether they need to participate in the process if necessary.

1.3.2 Tribal Consultation

As the federal lead agency under NEPA and the National Historic Preservation Act (NHPA) Section 106 review, WAPA initiated government-to-government consultation with Native American tribes to identify locations of traditional or cultural importance within the Project vicinity of the proposed solar facility. Tribes that were contacted included:

- Northern Arapaho Tribe of the Wind River
- Southern Ute Indian Tribe
- Shoshone Tribe
- Ute Mountain Ute Tribe
- Ute Indian Tribe

A representative from the Northern Arapaho Tribe of the Wind River Reservation, Northern Arapaho Tribal Historic Preservation Office requested the opportunity to participate in the cultural resources survey of the site (see Section 3.11); however, the survey had been completed at the time of the request. WAPA and Midway Solar will continue to work with the Northern Arapaho Tribe in the future to address any concerns expressed as a result of their review of the Class III Cultural Resources Inventory report.

1.3.3 Draft Environmental Assessment Outreach

WAPA approved and released the Draft EA for this project on July 19, 2016. Notices were published on July 20, 2016 in the Colorado Springs Gazette and the El Paso County Advertiser and News stating the document was available and requested that comments be submitted by August 19, 2016. The announcements provided a website address where the document could be obtained as well as the contact information for the WAPA Project Manager. No comments were submitted.

In addition, tribes and locally affected individuals were informed through mailings that the Draft EA was available for review and comment. On July 19, 2016, letters were sent to the following tribes:

- Northern Arapaho Tribe of the Wind River
- Southern Ute Indian Tribe
- Eastern Shoshone Tribe
- Ute Mountain Ute Tribe
- Ute Indian Tribe

On July 15,' 2016 postcards were sent to the 37 residents within a half-mile of the study area boundary. WAPA received no comments from the tribes or general public.

2.0 PROPOSED ACTION AND ALTERNATIVES

2.1 WAPA's Proposed Action

2.1.1 Overview

In order to accommodate Midway Solar's interconnection request at WAPA's Midway Substation, WAPA would be required to build a new 230-kV bay within the existing Midway Substation fence line including new communications, metering and protection equipment and new take-off and gen-tie structures to direct the 230-kV transmission line into the new bay. Depending on final design, WAPA may need to alter existing transmission lines entering and exiting the Midway Substation to ensure safe clearances with the proposed 230-kV gen-tie transmission line connecting the substation with the proposed Project. WAPA's federal action would be limited to the construction of electrical infrastructure associated with the Midway Substation, the operation and maintenance of the substation, and implementation of the interconnection agreement.

2.1.2 Proposed Facilities

230-Kilovolt Substation Bay

To accommodate the interconnection between WAPA and Midway Solar, WAPA would construct a new 230-kV bay in an open portion of WAPA's Midway Substation. The new bay would require a 230-kV circuit breaker, 230-kV disconnecting switches, structural steel and foundation, bus-work, take-off structure, and protection equipment. Furthermore, WAPA would run additional communications and control cables within existing substation cable trays between the substation's control building and the new bay. Finally, WAPA would install metering equipment in the control building and at the new 230-kV bay.

Generation Intertie Substation Entry Structure

In order to ensure proper conductor tension and alignment between the proposed 230-kV gen-tie line and 230-kV substation bay, WAPA would construct a gen-tie substation entry structure approximately 200 to 400 ft outside the fenced Midway Substation yard. The gen-tie substation entry structure would be a self-supporting, full tension, dead-end structure aligned with the designated 230-kV substation bay. Less than one acre of disturbance within WAPA's existing right-of-way (ROW), and outside of the existing fence line of Midway Substation, would occur as a result of the gen-tie substation entry structure installation.

Existing Transmission Line Modification

WAPA may need to modify existing transmission lines that enter and exit WAPA's Midway Substation in order to physically and electrically interconnect the proposed Project to WAPA's system. Modification may include, but not be limited to, adjusting existing structure heights to provide sufficient clearance between proposed and existing conductors. WAPA would design and construct these modifications to fit within their existing ROW.

2.1.3 Construction

WAPA's proposed construction would last approximately seven months and employ a construction crew of approximately five to ten people.

The installation of the dead-end structure outside WAPA's Midway Substation has the potential to disturb less than one acre of ground within WAPA's existing ROW. Construction activities that would occur within the Midway Substation boundary would result in approximately one-half acre of ground disturbance. All of WAPA's combined construction activities would require less than one acre-foot (AF) of water to complete. The following equipment would be required to complete WAPA's Proposed Action.

- Backhoe
- Cement mixing truck
- Crane; 25-50 ton capacity
- Flatbed truck
- Front-end loader
- Motor grader
- Puller
- Tractor trailer
- 4-wheeled sedan
- 4-wheeled pick-up truck
- Boom line truck
- Construction trailer
- Dump truck
- Fork Lift
- Man lift
- Bulldozer
- Tensioner
- Tractor with auger
- 6-wheeled pick-up truck (dually

Generation Intertie Substation Entry Structure

As mentioned, WAPA would erect the gen-tie substation entry structure outside the Midway Substation to include a dead-end structure and foundation required to anchor the structure. The structure's location would be surveyed and staked. The foundation would be excavated using an auger. The diameter and depth of the foundation would be determined based on geotechnical investigations and engineering design criteria. After the foundation is excavated, a pre-fabricated anchor-bolt cage would be lowered into the foundation. The excavated foundation, with cage, would be filled with concrete and the surfaces would be finished. After the concrete cured, WAPA personnel or their contractors would then assemble the gen-tie entry pole by anchoring the base piece to the foundation and placing the sequential segments. Insulators and other hardware may be installed on the ground or in place once structure segments are erected.

Bay Take-Off Structure

WAPA would install the bay take-off structure in a similar manner as the gen-tie substation entry structure: stake foundation location; excavate foundations; place anchor bolt cages; fill foundations with concrete; allow the concrete to cure; and, install structure segments.

Conductor between Generation Intertie Substation Entry Structure and Takeoff Structure

WAPA would string conductors between the gen-tie substation entry structure and the takeoff structure. A combination of cable reel stringing trucks, pullers and tensioners, and lifts would pull the ground wire and phase conductors into the insulator attachment points and then clip and tension the cables.

2.1.4 Operation and Maintenance

WAPA's operations and maintenance (O&M) procedures at their Midway Substation would not likely change greatly once the proposed interconnection has been completed. General activities would include checking, testing, and replacing circuit breakers; disconnecting and replacing switches, transformers, or insulators; tightening, replacing, or repairing structures or bus work; or replacing conductors. WAPA would perform these tasks when damage, deterioration, or deficiencies of the substation facilities or transmission lines pose a threat to human life, the environment, or the reliability of the electrical system.

2.1.5 Decommissioning

In the event the proposed Project no longer requires an interconnection with WAPA's Midway Substation, WAPA would decommission the facilities that are no longer essential. Equipment added as WAPA's Proposed Action, would remain in service, except possibly line jumpers. Circuit breakers and switches would stay intact but be placed in the closed position. Protective equipment would remain in place but reprogrammed or recalibrated to reflect the operational change.

2.1.6 Permits and Authorizations

WAPA's Proposed Action would be limited to their existing substation and ROW. WAPA would not be required to obtain any additional permits.

2.1.7 WAPA's Resource Protection Measures

WAPA's Construction Standards, Standard 13 Environmental Quality Protection (Appendix B), would be strictly adhered to during all phases of construction and O&M of WAPA constructed and owned facilities.

2.2 Midway Solar's Proposed Project

2.2.1 Overview

Midway Solar proposed to construct two main but connected components: a 100-MW PV solar facility and the associated gen-tie line to connect their proposed solar facility to WAPA's Midway Substation. The solar facility would be constructed on lands either directly owned by Midway Solar or that which Midway Solar had or would have site control over. The proposed solar facility, which would occupy approximately 911 acres, would be located 8.5 miles south of Fountain, Colorado, and 0.5 mile west of I-25.

As part of initial conceptual planning and siting of the proposed solar facility, Midway Solar identified several criteria that need to be met, including:

- High solar insolation;
- Sufficient and available land to construct a commercial solar facility;
- Proximity to existing electric infrastructure, like substations and transmission lines;

- Proximity to existing roads for adequate construction and operational access; and
- Proximity to infrastructure that would be considered "industrial" in nature.

The National Renewable Energy Laboratory identified Midway Solar's proposed Project Study Area as possessing approximately 6.0 to 6.5 kW-hours per square meter (m^2) per day average. The Project study area is close to electrical infrastructure (transmission lines and substations) and I-25. Midway Solar owned, and possessed the rights to purchase or obtain lease agreements for a large portion of the land needed for the proposed solar facility. Midway Solar considered multiple other locations in detail.

2.2.2 Proposed Facilities

The proposed Project would consist of ground-mounted PV panels with an anticipated single axis tracking system to allow the solar array to track the sun as the Earth rotates. The proposed Project infrastructure, including PV panels, tracking system, and associated electric power collection system, would occur within the Proposed Solar Facility Area. Midway Solar would establish a light-duty gravel covered service road system throughout the Proposed Solar Facility Area for installation and O&M activities (Figure 2.1).

Solar Field

Various types of solar technology could be utilized on the proposed Project. Polycrystalline panels are very common and widely used on solar projects in various geographies. If polycrystalline panels were used for the Project, the proposed solar array would consist of over 300,000 PV panels on a single axis tracking system supported on steel posts. If other technologies such as thin film were incorporated, more panels would be needed; although the panels are smaller, the same overall area would be occupied by the proposed Project. Solar arrays would be positioned nearly three feet above ground level and extend up to 10 ft in height.

Electrical Collection System

The PV panels would be organized into electrical divisions or blocks. Each block would span approximately 15 acres and be capable of producing 1.67-MW each. Each block would require their own electrical collection equipment, including power inverters to convert power from direct current (DC) to alternating current (AC), switchgear, transformers to step up the low voltage produced in the panels to voltage more efficient for transmitting, and conductors. The size of each block would be dependent on the type and size of inverter and may be subject to change in response to other electrical design factors that may arise.

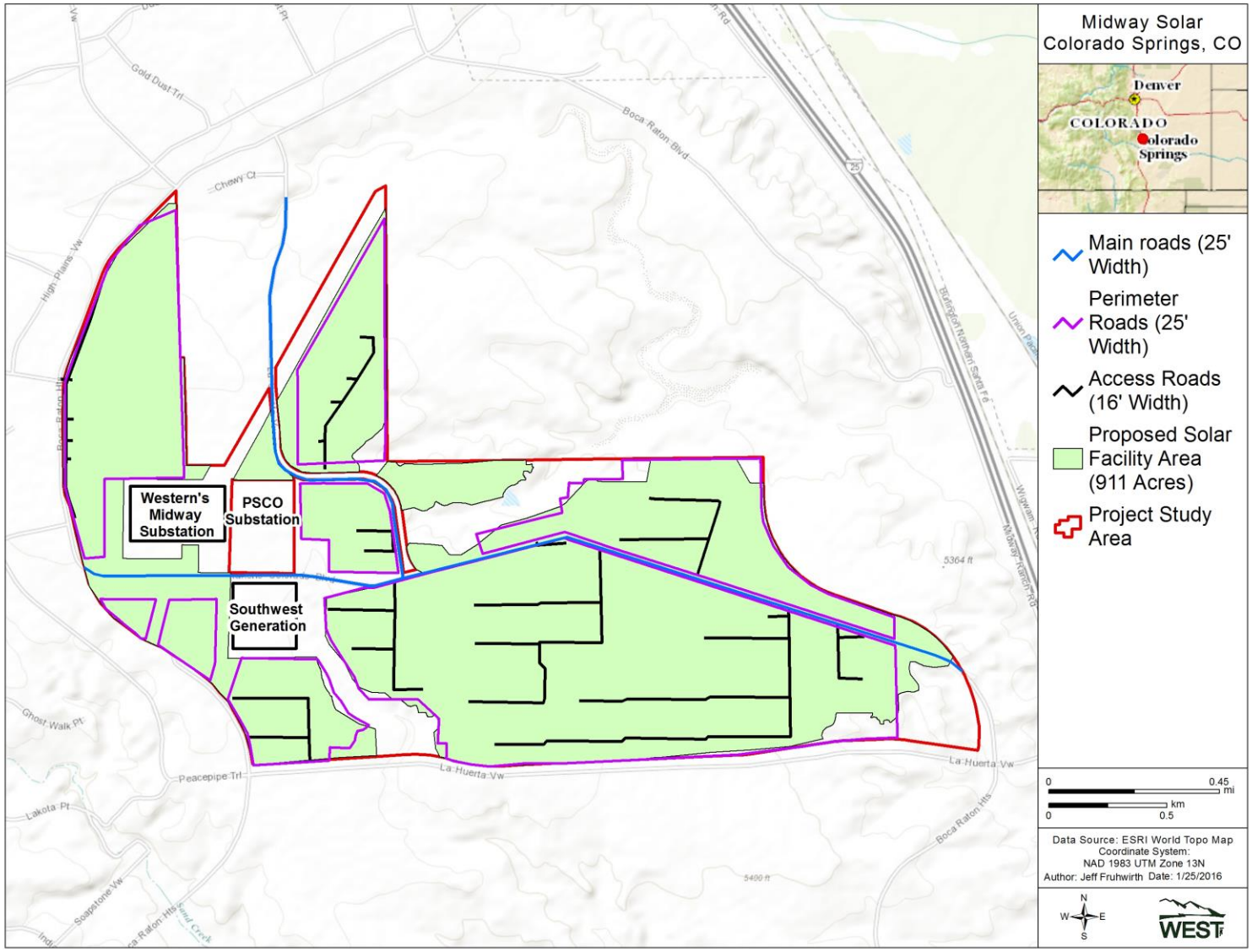


Figure 2.1 Access roads around the perimeter of the Midway Solar Interconnection Project and between solar blocks.

Solar Facility Collection Substation

In general, PV electric generation produces low voltage DC electricity, of which inverters convert the electrical current to AC and finally the transformers step up the voltage to 34.5-kV medium voltage within the solar field. In order to transmit the power more efficiently, the voltage needs to be stepped up further. Prior to conveying the electricity produced to WAPA or PSCo's system, an on-site solar facility collection substation would be required to step up the voltage to 230-kV. The solar facility collection substation component of the proposed Project would require about a three acres and would include, but not be limited to, the following major system equipment:

- 34.5-kV medium voltage bus and associated switching apparatus;
- 230-kV bus and switching apparatus,
- 230- to 34.5-kV transformer,
- Medium voltage capacitors,
- Steel support structures with foundations,
- Grounding grid,
- Control building,
- Security and perimeter fence, and
- Rain or contaminant containment.

Generation Intertie Transmission Line

In addition to the solar facility, the proposed Project would also include building, operating, and maintaining a gen-tie line to connect the proposed solar facility with the electric grid for distribution. The gen-tie line would deliver the generated electricity to either the existing WAPA Midway Substation or PSCo's Substation. The power line, a 230-kV transmission line, would originate at the proposed solar facility collection substation and terminate at WAPA or PSCo's Substation.

Roads, Fencing, and Security

The proposed Project would need approximately 20 miles of access roads around the perimeter of the facility and between solar blocks (Figure 2.1). Midway Solar would utilize these access roads for O&M activities such as equipment inspections, cleaning panels, lubricating tracking equipment, and security patrols. Access roads would be compacted earth or graveled, if needed, to comply with fugitive dust issues.

Site security structures would include perimeter security fencing, controlled access points, signage, lighting and cameras. Perimeter fencing would be 10 ft high and consist of chain-link fence with barbed-wired security strands across the top. Controlled access gates would allow maintenance and security personnel access to all portions of the facilities.

2.2.3 Construction

Midway Solar estimated that phased construction would require approximately 10 months to complete. Midway Solar's construction would occur in phases of approximately 1.67-MW blocks on approximately 15 acres. Peak construction activities may require as many 400 people on site including road construction workers, solar array installation personnel, agency or third party construction monitors and various other subcontractors and support personnel. In general, the average number of personnel would be substantially less. Midway Solar would use traditional earthmoving equipment such as bulldozers, motor graders, disking equipment, compacters, water trucks, cement trucks, and other normal heavy construction equipment. Midway Solar would utilize standard industry BMPs to stabilize soils and minimize dust during construction. Midway Solar would require approximately one AF of water during construction.

Solar Field

Site preparation and construction would require Midway Solar to mow surrounding vegetation. Disking and rolling may be performed across the entire Proposed Solar Facility Area to create a level surface for solar panel installation. Minimal grading and re-contouring of approximately 25% of the site would be performed to provide site access and best utilize the land for solar energy production. Midway Solar would install PV panels on an anticipated single axis, tracking system. The tracking system would be attached to steel support structures with footings embedded below grade. Geotechnical studies would be performed and foundation recommendations made based on existing subsurface soil conditions.

Detailed design layout and construction methods would be developed as part of the final solar facility engineering, however some construction procedures are standard operating practices. The general course of actions for construction of 1.67-MW blocks would include vegetation mowing and removal, disking and rolling, grading as necessary, installation of the AC collection system, installation of the majority of the fencing, installation of posts, installation of the AC and DC collection system, installation of racking, installation of PV panels, and completion of the electrical collection systems. Midway Solar would follow this series of events until the maximum build out for the site has been achieved. Temporary fencing would be installed around active disturbance areas during construction, including parking areas, laydown yards, solar field, and the solar facility collection substation. Permanent fencing would be installed once construction activities have been completed.

Solar Facility Collection Substation

The solar facility collection substation would include a control building, transformers, capacitors, circuit breakers, metering equipment, protection equipment, and other electrical apparatus. The solar facility collection substation equipment would be placed on concrete foundations and the entire yard would have a grounding grid installed below grade.

Generation Intertie Transmission Line

Midway Solar would design and construct a gen-tie transmission line originating at the solar facility collection substation and terminating at WAPA's Midway Substation or PSCo's

Substation. All construction vehicles and material staging would occur within the gen-tie line ROW. Installation of gen-tie line structures would proceed after clearing of the alignment of any excessive vegetation.

2.2.4 Operation and Maintenance

The proposed Project would be designed with a minimum 30-year operational life expectancy. Operation of the solar facility would include periodic maintenance, overhaul, and replacement of facility equipment in general accordance with manufacturer's recommended schedules. Routine cleaning of the PV panels with water would be required to maintain desired system efficiencies. Routine replacement of PV panels would be needed within the 30-year operational life of the facility. After all spare panels have been utilized, any additional panel replacement would potentially incorporate the latest technology that is compatible with the operational systems in place at that time.

Maintenance activities at the solar facility would include periodically checking electrical performance parameters, maintenance of transformers and inverters, vegetation maintenance, dust control, PV panel cleaning, driveway and access road maintenance, and general inspections of the facility. Transformers (which contain mineral oil) and inverters (which may contain cooling fluid) pose the potential to introduce contaminants to the environment. To minimize this potential, Midway Solar would develop a Spill Prevention, Control, and Countermeasure (SPCC) plan in accordance with federal Oil Pollution Prevention regulations (40 Code of Federal Regulations [CFR] 112). Detailed design layout and construction methods of site drainage, retention, and contaminant containment would be identified in the SPCC. The SPCC would be developed and finalized at the time of the final solar facility engineering.

Midway Solar's personnel or properly trained or certified contractors would conduct systematic inspections of the solar facility collection substation and the gen-tie transmission line. Inspection intervals would be set by applicable federal, state, or local regulations and codes specific to electrical utility reliability standards. Inspections may also be based on industry standards that exceed the regulatory guidelines and standards. Infrastructure such as transformers, inverters, gen-tie line structures, and circuit breakers, would be replaced based on manufactures' recommendations or as inspections identify deficiencies in operational standards of the equipment.

2.2.5 Decommissioning

Midway Solar completely expects a full operational life of the solar facility and considers an operational life beyond original design expectations to be a realistic outcome. If individual PV panel output does not produce at threshold levels, PV panels would be replaced. Current industry warrantees range from 20 to 25 years, which coincides with the informal rule of thumb that a PV panel would lose less than 1% of its output per year. However, modern PV panels (produced after 2000) have been tested and appear to have less degradation over time. In any case, prior to end of the 30-year operational life sequence, a percentage of the PV panels would be removed and replaced with the latest available compatible technology that may extend the operational life of the Midway Solar facility. Furthermore, if the facility is viable and demand for

the facility continues into the future, Midway Solar may plan and execute facility upgrades to continue the operation of the solar facility beyond 30 years.

Eventually, the proposed Project would reach a point whereby it would not be a viable operation and would need to be decommissioned. When decommissioning is determined to be appropriate, PV panels, support structures, and electric equipment would be removed from the site. In general, decommissioning and demolition would proceed in four steps:

- Dismantling and demolition of above grade structures;
- Removal of concrete features (slabs, foundations, or below grade walls) to a depth of three ft. below final grade;
- Removal of below grade utilities and support equipment (cable trays, communication cables, or grounding equipment) to a depth of three ft. below final grade; and
- Excavation and removal of soils and final site grading to match the surrounding area.

Where applicable, equipment and materials that are removed would be salvaged, recycled or disposed of in accordance with regulations governing such debris at the time of the decommissioning. Midway Solar does not expect to encounter contaminated soils during decommissioning or through the operational life of the Project. However, in the event that soil contamination is discovered, Midway Solar would conduct soil removal or follow the recommendations produced after a thorough subsurface soils analysis is performed by a third party to meet regulatory cleanup requirements for the protection of soils and groundwater in the vicinity of the proposed solar facility. Furthermore, Midway Solar would backfill any resulting excavation with certified clean fill soils of a permeability and texture determined by geotechnical analysis to closely match surrounding soils and compacted to recommended density. After surface disturbing activities are complete and final grade and contours are established, Midway Solar would revegetate the area with native seed, as appropriate.

2.2.6 Midway Solar's Resource Protection Measures

Industry standard BMPs would be followed to minimize soil erosion and siltation of nearby waterways during any surface disturbing activities on the solar facility or the gen-tie transmission line. In addition, Midway Solar would enact dust control measure during all phases of construction and operation of the Project. Dust control measures would follow the guidelines prescribed by El Paso County or the State of Colorado. Portions of the Project Study Area would be seeded with an approved seed blend. Revegetating the exposed soils would aid in dust and erosion control, but would also minimize the spread of non-native plant species. Midway Solar would also prepare and institute a SPCC plan to limit the potential for on-site contaminants to migrate off site. Finally, Midway Solar would follow any and all environmental-, natural resource-, or cultural resource-based requirements set forth as a condition of any construction or operational permit necessary to build, operate, or maintain the solar facility.

2.2.7 Other Decisions/Approvals Needed

In addition to WAPA's decision described previously, approvals from other governing bodies would be required in order for the solar facility and gen-tie line to be constructed. Midway Solar would need to apply for and obtain a building permit from El Paso County Development Services Department. Design and construction of the proposed Project would be required to follow the El Paso County Land Code, which regulates the use, occupancy, and location, of electric utility infrastructure in the county. Additional permits and authorization may be required at the local and state level. Midway Solar would pursue all additional requisite permits and authorizations once the solar facility engineering and layout design are complete.

2.3 No Action Alternative

Under the No Action Alternative, WAPA would not execute an interconnection agreement with Midway Solar and the Project would not be constructed or interconnected to WAPA's transmission system. WAPA would continue to operate the Midway Substation, however the construction activities associated with the Proposed Action would not occur. Midway Solar could continue to pursue the Project by applying for an interconnection with another transmission provider. For the purpose of this EA, which discusses WAPA's Proposed Action, the No Action Alternative is considered to result in the Project not being constructed, and thus provides a baseline against which the Proposed Action and proposed Project can be evaluated.

3.0 AFFECTED ENVIRONMENT, ENVIRONMENTAL IMPACTS, AND CONSERVATION MEASURES

3.1 Introduction

This chapter describes the affected environments and the environmental impacts of the Proposed Action, proposed Project, and No Action Alternatives. The affected environment consists of the physical area that bounds the environmental, sociological, economic, or cultural resources of interest that would likely have been impacted by the alternatives. The affected environment is described for each resource analyzed based on primary and secondary data sources, and for some resources, field observations. The affected environment also serves as the baseline from which to evaluate likely changes, or impacts (beneficial or adverse) resulting from the Proposed Action, proposed Project, and No Action Alternatives.

Environmental impacts were defined as modifications to the affected environment brought about by implementing the Proposed Action, proposed Project, or the No Action Alternative. Impacts can be beneficial or adverse, result from the action directly or indirectly, and can be short-term, long-term, permanent, or cumulative in nature. The impact analysis was conducted on either a quantitative or qualitative basis, depending on available data or the nature of the impact, and established the severity of impact in the context of the affected environment.

The approach to impacts analysis and descriptions of impact intensity was conducted for this EA. WAPA used an accumulative approach for the impact assessments, which assumed a greater intensity of impacts resulted from a greater change in conditions. Impact intensity in this analysis varied from negligible to minor, moderate, and major impacts. These descriptions of impact intensity primarily evaluated changes in mapped habitat or vegetation communities.

- Negligible: Effects would be at the lowest levels of detection, barely measurable, with no perceptible consequences.
- Minor: Effects result in a detectable change, but the change would be slight.
- Moderate: Effects would result in a clearly detectable change, with measurable effects.
- Major: Effects would be readily apparent with substantial consequences.

3.2 Resources Considered but Not Evaluated

In accordance with NEPA regulations, some resources were eliminated from evaluation because they were not present in or near the Project Study Area and would not be affected by the Proposed Action, proposed Project, or No Action Alternatives (Table 3.1).

Table 3.1 Resources considered but not analyzed.

Resource	Rationale for Exclusion from Analysis
Prime or Unique Farmland	None of the soils that occur in the Project study area were classified as prime or unique farmland[1].
Floodplains	WAPA would not locate features within or impact designated floodplains. No designated floodplains occur within or adjacent to the Project study area[2].
Wetlands/Riparian Areas	No wetlands or riparian areas occurred within the Project Study Area[3].
Wild and Scenic Rivers	No wild and scenic rivers were within or near the Project Study Area. The only river with wild and scenic designation in Colorado is the Cache la Poudre, which was over 100 miles from the Project Study Area.
State or National Parks, Forest, Conservation Areas, or Recreation areas of	No state or national park, forest, conservation, or recreational area exists within five miles of the Project Study Area.
Natural Resources: Timber, Minerals, Fish, and Aquifer	No sufficient water is located on site to sustain fish. No sufficient stands of commercial viable tree are located within the Project Study Area. Known aquifers in southern El Paso County are at a depth of 2,000−4,500 ft. Due to aquifer depth and minimal surface disturbances, impacts to aquifers are highly unlikely. No federal mineral rights are located within the Project Study Area[4].
Recreation	WAPA did not identify any designated recreation opportunities within or near the Project study area.
Rangeland	Midway Solar would fence the perimeter of the Project Study Area, which would exclude livestock grazing opportunities.
Environmental Justice	Residential development adjacent to the Project study area and west of La Questa View was limited to 2.5 acre lots, where existing housing prices average over $200,000; this indicates the Project would not disproportionally affect low income populations. While the nearby community of Fountain has the highest concentration of minorities in El Paso County (15.1% of the population is Hispanic or Latino)[5], the Project would not disproportionally affect any minority population.

[1] US Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS) 2015
[2] Federal Emergency Management Agency (FEMA) 1997
[3] Western EcoSystems Technology (WEST) 2015
[4]Personal communication with Martin Weimer, NEPA Coordinator Front Range District Office Bureau of Land Management March 31, 2016
[5] El Paso County, no date.

3.3 Cumulative Impact Methodology

3.3.1 Past, Present, and Reasonably Foreseeable Future Actions

Cumulative impacts are those effects that may result from the incremental impacts of an action when added to the impacts of other past, present, and reasonably foreseeable future actions. Cumulative impacts are considered regardless of the agency or person undertaking the other actions and can result from the combined effects of actions that are minor when considered individually over a period of time.

Spatial Boundary of Evaluation

The spatial boundary is the physical area that comprises the region of influence for the cumulative effects analysis. The spatial boundary evaluated for this cumulative effects analysis was defined as those areas in the immediate vicinity, up to one mile, of the proposed Project Study Area and west of I-25 (Figure 3.1). The interstate was considered a limiting factor and large hindrance for the natural flow of resources (i.e., wildlife and vegetation), and therefore was considered the eastern border for cumulative effects. This spatial boundary was chosen to encompass similar existing land uses and zoning as the Project Study Area with the potential to affect similar resources, soil types and geology, cultural resources, vegetative communities, regional air quality, etc., as the Proposed Action and proposed Project. The spatial boundary was defined by land uses rather than by geographic features because of the rural, undeveloped nature of this portion of El Paso County. Including areas beyond the one-mile boundary and east of the interstate would have encompassed lands of significantly different use and resources. The spatial boundary would be the same for the resources evaluated in detail, unless otherwise specified, such as visual resources impacts.

Temporal Boundary of Evaluation

A temporal boundary is the timeframe over which the cumulative analysis occurs. The temporal parameters for this cumulative effects analysis followed the anticipated lifespan of the proposed Project, beginning as early as 2016 with initial construction activities, and included energy production extending out at least 30 years, which is the minimum life expectancy of Midway Solar's proposed Project.

For the cumulative impact analysis, effects of the Proposed Action, proposed Project and other past, present, and reasonably foreseeable future actions were evaluated in context with inventoried resources within the vicinity. A list of past, present, and reasonably foreseeable future activities within the defined spatial boundary and within the temporal limits are included in Table 3.2.

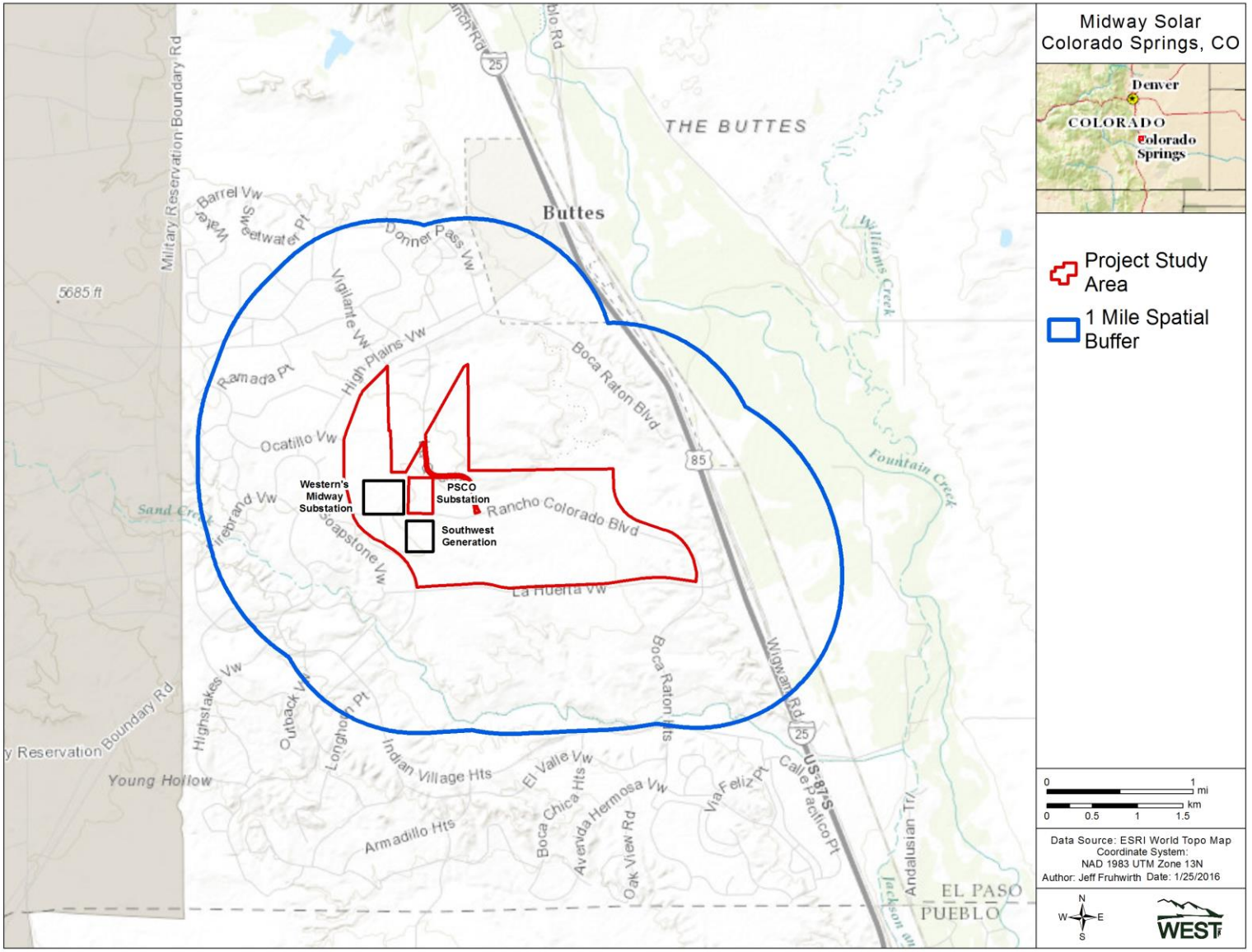


Figure 3.1. Spatial Boundary used for cumulative impacts analysis.

Table 3.2 Past, present, and reasonably foreseeable future actions considered in the cumulative effects evaluation.

Name or Owner	General Descriptions	Type of Activities	Temporal Status
Residential development	Single-family homes and ranchette development.	Grading, excavations, and other ground disturbing activities. Residential wells and septic systems.	Past, present, and future.
Off-highway vehicle (OHV) use	General OHV use.	General recreation.	Past, present, and future
El Paso County Department of Transportation	County road maintenance.	General transportation maintenance.	Past, present, and future.
El Paso County Landfill	Residential waste landfill operations.	Grading, excavation, and other ground disturbing activities. Burial of residential waste.	Past, present, and future.
WAPA Midway Substation	Routine substation operation and maintenance.	General electric utility operation and maintenance.	Past, present, and future.
Public Service Company of Colorado (PSCo) Midway Substation	Routine substation operation and maintenance.	General electric utility operation and maintenance.	Past, present, and future.
Southwest Generation Fountain Valley generation facility	Routine natural gas fueled electric generation operation and maintenance.	General electric utility operation and maintenance.	Past, present, and future.
WAPA transmission lines	Electric transmission line operation and maintenance.	General electric utility operation and maintenance.	Past, present, and future.
PSCo transmission lines	Electric transmission line operation and maintenance.	General electric utility operation and maintenance.	Past, present, and future.
Southwest Generation transmission lines	Electric transmission line operation and maintenance	General electric utility operation and maintenance	Past, present, and future
GCC tire storage.	Storage of used tires for future fuel sources.	Excavation of tire storage pits.	Past, present, and future.
Midway Gravel	Excavation and processing of sand and gravel.	Excavation of gravel and material processing. Storage and hauling of material. Equipment storage, use, and maintenance.	Past, present, and future.
Cactus Creek Ranch	Horse boarding and guest ranch.	Boarding and training of horses with guest facilities. Horse trail rides.	Past, present, and future

Name or Owner	General Descriptions	Type of Activities	Temporal Status
Corvette Center of Colorado Springs	Automotive restoration and sales facility.	General automotive repairs and maintenance. Automotive restorations, performance upgrades, and sales. Storage of automotive fluids, including used oil. Retail sales.	Past, present, and future

3.4 Land Use

3.4.1 Affected Environment

The land uses within the Project Study Area were described as vacant or undeveloped. Land uses near the Project Study Area included residential developments to the immediate west and northwest of the Project Study Area, with Fort Carson further west. Immediately south of the Project Study Area was a landfill operation and undeveloped lands. East of the Project Study Area were gravel quarrying operations and a horse boarding facility with the I-25 corridor approximately 0.25 mile from the southeastern corner of the Project Study Area. The interstate in the area generally stretched from southeast to northwest towards Fountain, Colorado. Lands to the north and northwest of the Project Study Area were generally undeveloped. Some lands in the area had restricted water rights, which minimized the amount of residential development that was possible.

El Paso County Colorado has several land use and land planning policies, plans, and regulations for unincorporated lands. El Paso County Master Plan was a collection of nine small area plans that cover all of the county's unincorporated lands. The county plan that applied to the Proposed Action and proposed Project, the South Central Comprehensive Plan (El Paso County 1988), provided land use policies for these lands in general terms. The Land Development Code of El Paso County implemented the small area plans as the Master Plan for unincorporated portions of the county, and was applicable to buildings, structures and uses of land in those unincorporated area. El Paso County Development Services Department developed and maintained zoning designation maps for the entire county.

El Paso County Development Services Department zoning designation maps were reviewed for land zoning information associated with the Project Study Area. The majority of the site was zoned RR-2.5, a classification defined as rural, single family, and residential dwellings on parcels of approximately 2.5 acres. Parcels in the vicinity of the proposed Project were also zoned RR-5, which includes rural, single family, residential dwellings on parcels of approximately five acres. Generally, lands mapped as RR-2.5 or RR-5 in the Project vicinity were undeveloped and vacant. One exception was a single parcel on the southeast corner of the Project, where an outdoor storage yard was previously established. Finally, a small parcel to the west and south of WAPA's Midway Substation was zoned I-3 for heavy industrial or manufacturing, and supported a Southwest Generation natural gas-fueled electric generation unit.

Chapter 4 (*Special Purpose Overlay and Obsolete Districts, Section 4.3.5*) of the El Paso County Land Development Code identified an overlay district for wind or solar energy generation that would be needed for the Midway Solar's proposed Project. As stated in Section 4.3.5 of the El Paso County Land Development Code (El Paso County 2013), the overlay district was applicable for all zoning but the regulations identify a need for an application to rezone the Propose Solar Facility Area. Furthermore, Appendix B of the Land Development Code, *Guidelines and Regulations for Areas and Activities of State Interest* (also called 1041 Regulations), required County review and permitting for the solar electric generation facility, solar facility collection substation, and gen-tie line, including initial site selection.

3.4.2 Environmental Impacts

Impacts of WAPA's Proposed Action

In order to accommodate an interconnection with Midway Solar, WAPA proposes to construct a new 230-kV bay and associated infrastructure to their Midway Substation. The Midway Substation was already in operation and constructed prior to El Paso County's land use regulations were developed. WAPA would not need to pursue any new zoning overlay or permit to expand its operations in the existing Midway Substation, assuming the upgrades take place within the existing footprint.

WAPA would need to install the gen-tie line entry structure for the 230-kV substation bay. WAPA proposes to locate this structure outside the existing substation footprint, but within WAPA's existing transmission line ROW. The gen-tie line entry structure would not require rezoning; however, the structure may require 1041 Regulation review and permitting. El Paso County 1041 Regulations stipulated that a permit (and presumably County review) is required to construct or locate any electric transmission line and appurtenant facility used to transmit electricity at 115-kV or more voltage within unincorporated El Paso County. As WAPA's Proposed Action would be limited to their existing substation and ROW, WAPA's actions would not affect land use in the vicinity of the proposed Project or in El Paso County on a larger scale and a permit would not be required. Continued operation of the Midway Substation by WAPA would have no effect on land use in the Project vicinity or within El Paso County.

Impacts of Midway Solar's Proposed Project

The lands in the Project vicinity were zoned RR-2.5, RR-5, or I-3. All three zoning designations would allow for a solar electric generating facility; however, Midway Solar would be required to file for rezoning for a solar energy generation plan overlay district with El Paso County. Midway Solar would also be required to conform to El Paso County 1041 Regulations for the siting, construction, and operation of the solar facility.

Midway Solar would proceed with permitting and application for rezoning of the Proposed Solar Facility Area, and the proposed Project would comply with El Paso County's land use codes, plans, and regulations. The development of parcels zoned rural residential and industrial lands would remove these parcels from future residential or industrial uses. The conversion of rural residentially-zoned lands would have negligible to possibly minor effects on land use in the vicinity of the Project. Though hundreds of additional acres of RR-5 zoned lands are available in

the area, there are no additional RR-2.5 zoned lands in the vicinity. Operation and maintenance of the proposed solar facility would not impact the zoned land use in the vicinity of the proposed Project, nor would it affect land use in El Paso County.

Impacts of the No Action Alternative

The No Action Alternative would result in the proposed Project not being constructed, and therefore the land use impacts associated with the Proposed Action and proposed Project as described above would not occur.

Cumulative Impacts

The proposed Project and other past, present, and reasonably foreseeable future projects would result in the removal of lands available for other uses. The overwhelming majority of the lands in the area were zoned rural residential with a density of one home site every 2.5 acre or 5.0 acres. Heavy industrial and agricultural zoned lands also existed in the vicinity. The Southwest Generation natural gas-fueled electric generation facility occupied portions of the heavy industrial zoned lands, as mentioned above. Agricultural zoned lands in the immediate area were used for the landfill operation to the south, a used tire storage facility to the southeast, and a horse boarding facility and automotive restoration and sales facility on the east edge of the Project Study Area. Past and present actions have previously shaped the zoning and land use of the area. Future actions will likely remove land from potential other uses, but would not influence future land use or the zoning of land in the vicinity of the Proposed Action or proposed Project study area or El Paso County.

3.5 Air Quality and Climate Change

3.5.1 Affected Environment

Air Quality

The Clean Air Act (CAA) requires the US Environmental Protection Agency (EPA) to establish National Ambient Air Quality Standards (NAAQS; see US EPA 2012a) for six criteria pollutants: ground-level ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide, particulate matter (PM10 [Particulate Matter between 2.5 and 10 microns in size] and PM 2.5 [Particulate Matter less than or equal to 2.5 microns in size), and lead. These standards regulate the amount of contaminants in the air due to all sources. The EPA designates areas that do not meet the NAAQS as nonattainment areas, and provides a specified amount of time to achieve compliance (US EPA 2012b). The EPA gives special protection to certain areas from air quality degradation through the use of more stringent requirements. The EPA designates these areas as Class I and includes some, but not necessarily all, national parks, monuments, wilderness areas, and certain tribal lands (US EPA 2012b).

The EPA designates most areas within the US as Class II, meaning standard pollution control requirements apply. The Project Study Area was within a designated Class II area. According to the Colorado Department of Public Health and Environment, sources of air pollution within a 6.2-mile radius of the proposed Project included: Midway Sand and Gravel (particulate matter), Colorado Energy Tire Recyclers (particulate matter), Midway Landfill (particulate matter, carbon

monoxide, and volatile organic compounds), and Fountain Valley Power (particulate matter, carbon monoxide, nitrogen oxides, sulfur dioxide, and volatile organic compounds). Other sources of air pollution near the Project Study Area included vehicles traveling along I-25 and the many miles of unpaved roads.

Climate

El Paso County has a generally mild climate, with an average of 17 inches (43 centimeters [cm]) of precipitation per year and low levels of humidity. Most of the precipitation occurs from late-April to late-September. Summer precipitation on the Colorado plains occurs largely from thunderstorms and the precipitation is sometimes extremely heavy. Strong winds occur frequently in winter and spring. The Rocky Mountains to the west intercept much of the precipitation from Pacific storms during the winter. On average, there are 247 sunny days per year in El Paso County. The July high is approximately 83 degrees Fahrenheit (°F; degrees Celsius [°C]) and the January low is 15 °F (-9.4 °C).

Climate Change

The EPA agrees with scientific research that human activity has changed the composition of the Earth's atmosphere as greenhouse gases including carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and hydrofluorocarbons have been on the rise. All of these greenhouse gases have heat-trapping properties (US EPA 2013). Throughout Colorado, no consistent long-term trends in annual precipitation have been detected as variability of precipitation is high, which makes detection of trends difficult. Climate model projections do not agree whether annual mean precipitation would increase or decrease by mid-century (Lukas et al. 2014). Climate models, however, predict Colorado would warm by 4 °F (-15 °C) by 2050, relative to the 1950-1999 baseline (Lukas et al. 2014).

3.5.2 Environmental Impacts

Impacts of WAPA's Proposed Action

WAPA's Proposed Action would generate minimal, localized, short-term emissions from vehicles and equipment during construction of the interconnection facilities. Over the long-term, minimal vehicular emissions associated with O&M of Midway Substation or its transmission lines would be released. WAPA's Proposed Action would have minimal temporary effects on air quality in the Project Study Area and El Paso County.

Impacts of Midway Solar's Proposed Project

The proposed Project would generate minimal, localized, short-term emissions from vehicles and equipment during construction of the solar and gen-tie facilities. Localized short-term dust pollution from ground-disturbing activities associated with construction is likely, but would not affect ambient air quality attainment status designated by the EPA. Midway Solar plans to use water for dust abatement during construction, and construction vehicles and equipment would have state-required air emissions control devices. Because of the limited time associated with proposed Project construction and the use of dust suppression practices, impacts associated with construction on air quality would be minimal and temporary.

Over the long-term, minimal vehicular emissions associated with O&M would be released. The O&M vehicles and equipment would have state-required air emissions control devices. Permanent impacts to air quality associated with the O&M of the solar facility would be negligible to minimal.

Beneficial long-term impacts to air quality and climate change would occur through the implementation of the proposed Project in that solar development would likely lead to a reduction in the reliance on the production of electricity from pollution-generating fossil fuels. No greenhouse gases are associated with the generation of electricity from solar energy. However, emissions are associated with the manufacturing, transportation of materials, and decommissioning of solar energy facilities (Union of Concerned Scientists of the United States of America [UCSUSA] 2013).

Impacts of the No Action Alternative

The No Action Alternative would result in the proposed Project not being constructed, and therefore air quality and climate impacts associated with the Proposed Action and proposed Project as described above would not occur.

Cumulative Impacts

In general, the extent of cumulative impacts on air quality depends on emission source characteristics, pollutant types, emission rates, and meteorological and topographic conditions. For the proposed Project, the air pollutant emissions would primarily occur during construction. The potential for Project-related air quality effects, combined with air quality effects from other nearby sources, would be short-term and minimal.

3.6 Soils and Geology

3.6.1 Affected Environment

The proposed Project was located within the Colorado Piedmont, a sub-province of the Great Plains Physiographic province (USDA NRCS 2015). The surficial soil deposits mapped within the boundary of the Project Study Area consisted of eolian deposits, older gravels, and alluviums of Quaternary age, approximately 2.6 million years old to present (USDA NRCS 2015). The dominant soil series within the Project Study Area was the Wilid silt loam soil unit, which forms as windblown deposits on plains and between stream valleys. Approximately 71% of the Project Study Area was covered in this very deep and well-drained soil type (USDA NRCS 2015). Wilid soils on site were generally described as being on slopes of zero to 8% and as had a moderately high-to-high hydraulic conductivity. Within a 2-mile radius of the Project Study Area, the Wilid soil series was found to be the dominant soil type present, covering approximately 22% of the land area (USDA NRCS 2015).

The Fort soil series comprised the second largest soil type mapped in the Project Study Area with around 15% coverage (USDA NRCS 2015). Fort soils were also very deep, well-drained soils with a moderately high hydraulic conductivity. Fort soils within the Project Study Area were generally found in flat areas of the 1% to 5% slopes on the east, south, and central portions (ibid).

The third-most common soil series in the Project Study Area was the Kim series (USDA NRCS 2015). Kim soils were well drained and considered very deep and moderately permeable. Kim soils were also found in relatively flat (1% to 8% slope) areas in the northeastern and southeastern portions of the Project Study Area. Kim soil series only composed about 7.5% of the surficial soils on the Project Study Area, but made up nearly 16% of soils within two miles (ibid).

The final surface soil mapped on-site was the Schamber-Razor complex (USDA NRCS 2015). This soil complex was found on the steep banks (8% to 50% slope) of erosion features and ephemeral washes in the Project Study Area (ibid). These well-drained soils covered about 5.5% of the Project Study Area and approximately 11% of the area coverage within two miles of the proposed solar facility (ibid).

Soil disturbances near the Project Study Area were the result of road grading, residential, commercial, and industrial development and activities. Graded roads in the Project Study Area included Rancho Colorado Boulevard, La Huerta View, Boca Raton Heights, and La Questa View. There were three existing electrical infrastructure facilities in the proposed Project vicinity, including WAPA's Midway Substation, a PSCo substation east of WAPA's Midway Substation, and a small peaker generation facility owned by Southwest Generation to the south of the PSCo substation. On the northeast corner of the Project Study Area a single parcel contained a horse boarding facility and an automotive maintenance, restoration, and sales operation located on the west frontage road of I-25. This single parcel was identified by El Paso County Assessor's Office as having at least 38 permitted improvements on the property, including but not limited to: an automotive center, numerous utility buildings, livestock barns/sheds, horse arenas, residential dwellings, offices, and stables. Between the proposed Project and I-25 was a small-scale quarry operation just north of Rancho Colorado Boulevard. The quarry operations appeared to be directly influencing approximately 37 acres of the 152.77-acres parcel. South of the proposed solar facility was the Midway Landfill and GCC's used tire storage facility. GCC appeared to have disturbed approximately 43.5 acres as part of their used tire storage operation, while Midway Landfill had impacted over 260 acres. Further south beyond the landfill and to the west and northwest were numerous rural residential lots, both vacant and occupied, with associated dirt roads.

An area of disturbance and debris had been documented near the intersection of Rancho Colorado Boulevard and La Huerta View near the southeast corner of the Project Study Area. This area was identified as a former outside storage facility and included a dirt road, abandoned vehicles and trailers, soil stockpiles, and debris. Two Phase I Environmental Site Assessments (Phase I) were performed by Terracon Consulting Engineers and Scientist (Terracon) in support

of Midway Solar's proposed solar facility, included the area of disturbance. Terracon identified four potential Recognized Environmental Conditions (RECs) in the area of disturbance and recommended "additional investigation to evaluate and characterize the identified RECs" (Terracon 2014). Recognized environmental conditions identified included gold mill tailings, stained 5-gallon buckets and 55-gallon drums, piles of building debris, and piles of unknown debris. Midway Solar intends to avoid the area for development of the proposed Project.

3.6.2 Environmental Consequences

Impacts of WAPA's Proposed Action

WAPA's Proposed Action would be limited to existing disturbances within the footprint of Midway Substation and WAPA's transmission line ROW. Because of this, WAPA's Proposed Action would have negligible, if any, effect to native undisturbed soils. WAPA maintains a bare-earth standard within, and a 5-ft bare earth apron around, their substations, so impacts to soils would not occur within Midway Substation. Ground disturbance associated with the installation of WAPA's gen-tie substation entry structure within their existing ROW would likely minimally affect soil resources by slightly increasing the exposure of less than an acre of soil to water or wind erosion.

Impacts of Midway Solar's Proposed Project

The construction of the proposed Project would require disking and rolling of the entire Proposed Solar Facility Area, which would result in disrupting the top few inches of the soil profile. Construction would occur in a phased approach that would reduce the amount of soil that would be exposed to wind and water erosion at any given time during construction activities. Midway Solar would incorporate industry standard BMPs to minimize soil erosion potential during construction activities and promote an on-site vegetative community compatible with the proposed solar facility's operation for the duration of operations at the facility. This may include the use of dust palliatives, the implementation of an integrated vegetation management strategy, or other techniques and technologies that are readily available.

Midway Solar's construction traffic, including passenger vehicles and heavy equipment, may cross all portions of the Proposed Solar Facility Area during construction, damaging or destroying plants and compacting surface soils. Soil compaction may occur prior or post disking and rolling; however, the natural climatic and geologic cycles would return soil conditions to their natural state over the course of time after construction is complete. Soils within the Proposed Solar Facility Area that would not be disturbed tend to be at least slightly plastic and sticky, minimizing the potential for wind erosion; these same soils are also generally well drained, minimizing the risk of runoff during periods of rain (USDA NRCS 2015). Additionally, areas that would be graded or disked to achieve acceptable surface or proper elevation for solar array installation and associated equipment operation would be revegetated with an approved ground cover seed mix as part of the Midway Solar's revegetation plan. Since proposed construction would occur in less than one year, Midway Solar would use industry standard BMPs to stabilize soils to allow time for revegetation of disturbed areas to occur. Initial soil stabilization practice may include use of hydro mulch or erosion control mats. The BMPs would be decided once final engineering and Project layout has been determined. Total area with the potential to be

temporarily disturbed by construction activities, the Proposed Solar Facility Area, is approximately 911 acres. Areas of permanent impacts to soils include O&M access roads, solar array pylons or posts, gen-tie line structures, and the area of disturbance for the solar facility collection substation, and account for approximately 52 acres.

Areas identified within Phase I reports on the southeast corner of the Project Study Area and that have possible RECs would not be disturbed. Current preliminary site layouts and future final designs would only utilize this portion of the Project Study Area for access via Rancho Colorado Boulevard.

Impacts of the No Action Alternative

The No Action Alternative would result in the proposed Project not being constructed, and therefore the impacts to soils associated with the Proposed Action and proposed Project as described above would not occur.

Cumulative Impacts

The area of cumulative analysis for soil resources includes the soil map units associated with the Project Study Area. Past, present, and reasonably foreseeable future projects within the region would likely add to cumulative effects to soil resources, though impacts to soil resources are generally localized and do not result in regional cumulative effects. Soil types and conditions vary significantly over short distances, effectively limiting the geographic range of impacts on soil resources. The implementation of the proposed Project along with other past, present, and reasonably foreseeable future projects would have minimal cumulative impacts to soil resources.

3.7 Water Resources

3.7.1 Affected Environment

Water resources were very limited within the Project Study Area. An on-site survey for waterbodies was conducted to determine if any waterbodies regulated under the Clean Water Act (WEST 2015) were present. Areas were investigated that would likely, topographically, drain water but none of these drainages had physical features of flowing water, such as a bed, bank, or ordinary high water mark. One drainage was dammed to create a stock pond in the north-central part of the Project Study Area (Figure 3.2). The stock pond contained water at the time of the survey, as well as an unvegetated, muddy shoreline (Figure 3.3). No other surface water features occurred in the Project Study Area.

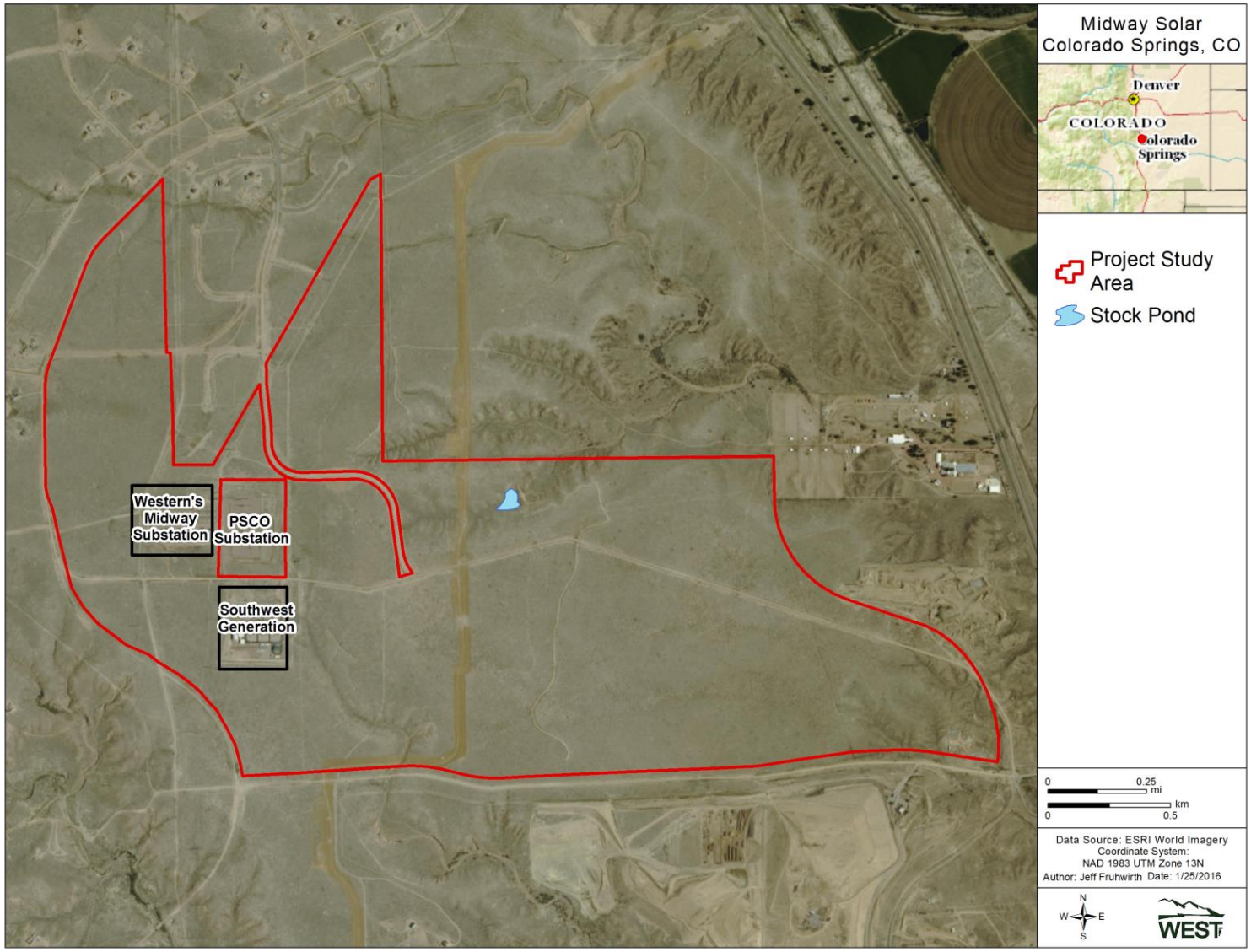


Figure 3.2 Location of a dammed waterway in the proposed Midway Solar Interconnection Project.

Figure 3.3 Stock pond at the proposed Midway Solar Interconnection Project.

According to the US Geological Survey (USGS) topographic map for the area, the nearest named drainage, located south of the Project Study Area, was Sand Creek. Sand Creek flows east to Fountain Creek, which flows to the south along the east side of I-25 to Pueblo, where it joins the Arkansas River.

According to the Phase I Environmental Site Assessments conducted for the proposed Project, the estimated depth to first occurrence of groundwater in the Project Study Area was 20 to 40 ft deep (Terracon 2013, 2014). The Web Soil Survey reported the depth to water table as "more than 6.5 ft" for the four soil series that occurred in the Project Study Area (USDA NRCS 2015). The hydrogeological gradient (i.e., the groundwater flow direction) was inferred to be parallel to the topographic gradient, which is primarily to the east. El Paso County Policy Plan (EPCPP) identified these shallow first occurrences of ground water as sporadic and not proven to be dependable sources of water. The EPCPP suggested that reliable aquifers in the Project Study Area are only available at depths of 2,000−4,500 ft (El Paso County 1997).

3.7.2 Environmental Consequences

Impacts of WAPA's Proposed Action

Because no surface water resources were located in or near the footprint of WAPA's Midway Substation and transmission line ROW, no surface waters would be impacted. In the event of a spill or leak during construction or operation of the substation, impacts to groundwater would be

unlikely because the depth to groundwater is at least six ft, and potentially up to 2,000 to 4,500 ft. WAPA also abides by their Construction Standard 13, Environmental Quality Protection (Appendix B). This Standard, specifically Standard 13.11, outlines measures that WAPA would commit to take to prevent spills of pollutants and respond immediately if a spill occurs. With no surface water observed within or near the footprint of WAPA's Midway Substation or transmission line ROW and the implementation of BMPs, impacts to water resources would be negligible.

Impacts of Midway Solar's Proposed Project

The documented stock pond located within the Study Area was excluded from the Proposed Solar Facility Area due to its slope. Because no other surface water resources were documented within the Proposed Solar Facility Area, no surface waters would likely be impacted due to Midway Solar's proposed Project (Figures 1.3 and 3.2). Midway Solar estimated use of up to one AF of water during construction. The primary use for this water would be for dust control; therefore, none of this water would enter or impact waterbodies in or near the Project Study Area. Areas where the topography would allow water to drain from the Project Study Area in the event of a large storm (these areas otherwise have no surface water or physical features of flowing water) have been excluded from development based on their slope (Figure 1.3). Surface runoff from the Project Study Area would likely enter these drainages in response to a large storm event, and potentially reach Sand Creek and waterbodies downstream (e.g., Fountain Creek and the Arkansas River) or the stock pond. In the event of a large storm, surface runoff would contain particulate matter from exposed soil during construction or from dust on the solar panels during operation. In such an event, however, impacts would be minimized by Midway Solar's commitment to BMPs and preparation and implementation of an associated Storm Water Pollution Prevention Plan (SWPPP).

In the event of a spill or leak of a substance that could potentially pollute water resources at Midway Solar's proposed Project, it is likely to have negligible effects on surface or ground water resources. No surface water is present within the Proposed Solar Facility Area and the first occurrences of ground water is at least six ft, and potentially up to 20 to 40 ft below the surface. Furthermore, El Paso County has suggested that the depth to consistent aquifers ranges from 2,000−4,500 ft (EPCPP; El Paso County 1997). Additionally, Midway Solar would implement a SWPPP and BMPs to further minimize potential impacts on water resources.

Impacts of the No Action Alternative

The No Action Alternative would result in the proposed Project not being constructed, and therefore any potential impacts to water resources associated with the Proposed Action and proposed Project as described above would not occur.

Cumulative Impacts

The Proposed Action and proposed Project would not demonstrably impact surface or groundwater, and Project-related impacts would be negligible when added cumulatively to water resource impacts from other past, present, and reasonably foreseeable future actions.

3.8 Vegetation

3.8.1 Affected Environment

The dominant vegetation type found within the Project Study Area was short-grass prairie as indicated by the USGS National Land Cover Database (NLCD). The primary cover type found within the Project Study Area was grassland/herbaceous with a small area of scrub/shrub (USGS NLCD 2011, Homer et al. 2015). The scrub/shrub classification included areas dominated by shrubs less than 16 ft tall with a shrub canopy cover typically greater than 20% of total vegetation. This class included true shrubs, young trees in an early successional stage, or trees stunted from environmental conditions. During a June 10, 2015, site visit, cane cholla (*Cylindropuntia imbricata*) was observed to be common throughout most of the grassland in the Project Study Area, and juniper (*Juniperus scopulorum*) trees were observed scattered in some of the drainages in the northwest portion of the Project Study Area (WEST 2015).

The vegetation observed within the Project Study Area has been affected by past and current land use practices, such as livestock grazing, pipelines, power lines, WAPA's Midway Substation, PSCo's existing substation, and Southwest Generation's power generation station. The roads around and through the Proposed Solar Facility Area also affect the existing vegetation both directly and indirectly (e.g., vehicles often transport seeds, including weedy species). Weedy species were observed along some of the roads and in some of the drainages, notably along La Huerta View along the southern border of the Project Study Area.

3.8.2 Environmental Consequences

Impacts of WAPA's Proposed Action

WAPA's Proposed Action would be limited to disturbances within the footprint of the Midway Substation and WAPA's transmission line ROW. WAPA maintains a bare earth standard within, and a 5-ft bare earth apron around, their substations, so no new direct impacts to vegetation would occur within and around Midway Substation. Indirect impacts, such as the introduction of weed seeds on equipment and vehicles associated with the installation of WAPA's gen-tie substation entry structure within their existing ROW, could potentially occur. However, these potential impacts would be negligible because WAPA's Construction Standard 13.6 states that WAPA maintains a "clean vehicle policy" while entering and leaving construction areas to prevent transport of noxious weed plants or seeds (Appendix B). WAPA transports only construction vehicles that are free of mud and vegetation debris to staging areas and the Project ROW. Furthermore, if weeds become established, Standard 13.6 also provides for noxious weed control in compliance with federal, state and local noxious weed control regulations. If weed control would be needed, an El Paso County Forestry and Noxious Weed Inspector can provide technical assistance for determining appropriate noxious weed control methods. Because of WAPAs bare earth standard and their Construction Standard 13.6, impacts from WAPAs Proposed Action would be negligible.

Impacts of Midway Solar's Proposed Project

The entire Proposed Solar Facility Area would be disked and rolled to accommodate the installation of solar panels. Midway Solar would incorporate industry standard BMPs to minimize

soil erosion potential and promote an on-site vegetative community compatible with the proposed solar facility's operation. This may include the use of hydro mulching, planting cover vegetation, and the implementation of an integrated vegetation management strategy. The entire Proposed Solar Facility Area, 911 acres, has the potential to be temporarily disturbed by construction activities. Areas of permanent impacts to soils include O&M access roads, solar array pylons or post, gen-tie line structures and the area of disturbance for the solar facility collection substation, an area of approximately 52 acres. The area of temporary impacts would be revegetated under Midway Solar's revegetation plan. The revegetation plan along with other BMPs would be determined after final solar facility engineering and layout is complete.

If weed control were needed, Midway Solar would seek technical assistance for determining appropriate noxious weed control methods from an El Paso County Forestry and Noxious Weed Inspector. Temporary, high-level direct impacts would occur in areas that are graded to achieve proper slope or elevation for solar array installation. These impacts would be considered temporary because graded areas would be revegetated with an approved ground cover seed mix as part of the Midway Solar revegetation plan. Temporary impacts to vegetation would be minimal.

Impacts of the No Action Alternative

The No Action Alternative would result in the proposed Project not being constructed, and therefore the vegetation impacts associated with the Proposed Action and proposed Project as described above would not occur.

Cumulative Impacts

The proposed Project would contribute minimally to the effects of past, present, and foreseeable future projects, resulting in additional ground disturbance and vegetation loss. Ground disturbance creates opportunity for noxious and invasive weeds, thus weeds in the area would likely increase, along with the cost of their control. Impacts from noxious and invasive weeds would be minimal.

3.9 Wildlife

3.9.1 Affected Environment

Wildlife resources that may occur in the grassland habitat found in the Project Study Area included pronghorn antelope (*Antilocapra americana*), mule deer (*Odocoileus hemionus*), coyote (*Canis latrans*), gray fox (*Urocyon cinereoargenteus*), ground squirrels (e.g., Sciuridae: *Spermophilus* and *Tamius* spp.), snakes, lizards, mice, and black-tailed prairie dog (*Cynomys ludovicianus*; El Paso County 1988). Black-tailed prairie dogs were observed during a habitat assessment conducted in the Project Study Area in June 2015 (WEST 2015). Bird species that could likely occur included raptors, such as Swainson's hawk (*Buteo swainsoni*), red-tailed hawk (*Buteo jamaicensis*), ferruginous hawk (*Buteo regalis*), prairie falcon (*Falco mexicanus*), American kestrel (*Falco sparverius*), northern harrier (*Circus cyaneus*), great horned owl (*Bubo virginianus*), and golden eagle (*Aquila chrysaetos*); game birds such as pheasant (*Phasianus colchicus*) and quail (e.g., *Callipepla* spp.); and numerous species of song birds (El Paso County 1988).

Habitat within the Project Study Area was relatively undisturbed compared to habitats on adjacent lands, which appeared disturbed by developments such as the landfill, the gravel pit, housing, transmission line and pipeline infrastructure, and others. Activities associated with Project development, such as traffic, also affect the quality of the habitat in the vicinity. The stock pond in the north part of the Project Study Area was likely to attract wildlife, and the scattered trees likely provided shelter or perching opportunities. The prairie dog population, located in the north-central portion of the Project Study Area, likely attracted predators, such as coyotes and raptors, and their burrows had the potential to provide habitat for burrowing owls (*Athene cunicularia*). Potential Project effects to burrowing owl, a state threatened species, is addressed in the following section.

3.9.2 Environmental Consequences

Impacts of WAPA's Proposed Action

The impacts of WAPA's Proposed Action to wildlife would be negligible. No wildlife habitat occurs at WAPA's Midway substation as vegetation there has been previously cleared. However, during construction, noise and activity might temporarily displace individual animals near the Project Study Area. This displacement of wildlife would have a temporary negligible impact on wildlife with no long-term effects on wildlife.

Impacts of Midway Solar's Proposed Project

The impacts of disking and rolling the Proposed Solar Facility Area would temporarily remove habitat for burrowing and ground-nesting species. During construction, wildlife that occupied or used the Project Study Area would likely be displaced. Some individuals that are unable to avoid construction equipment could be harmed or killed, but such impacts would be minimal since most individuals are likely to avoid construction equipment. Although grass and forb cover would recover after construction, the quality of habitat would be diminished due to the presence of the solar panels. Small ground-dwelling species might continue to use the habitat available under the panels, but larger predators would likely avoid the Project Study Area. For example, the panels would prevent raptors from hunting in the Proposed Solar Facility Area. Midway Solar would maintain a plant community that is devoid of taller plants such as cholla and junipers. This would eliminate opportunities for perching by birds, and shelter for small mammals and other species. As a result of diminished habitat quality and quantity, species abundance may decline. Impacts to wildlife from the proposed Project include loss of grassland habitat, displacement and disturbance, and potential for direct mortality.

Birds and bats would also likely be impacted directly through potential collisions with the gen-tie line, solar panels, and other proposed Project structures. The risk of collision is highest during times of poor visibility and near areas where high numbers of birds either take off or land, such as roost sites, ponds, or concentrated food sources. The Project Study Area does not have features that might attract high numbers of birds, except for the stock pond in the northern portion of the Project Study Area. Because the pond has been excluded from development due to its slope (Figure 2.1), birds using the pond are unlikely to collide with Project features. Electrical components can create an electrocution risk to birds. Multiple transmission lines enter/exit the Midway Substation or PSCo substation, and the gen-tie lines would be routed in

the same area. Siting multiple transmission lines near each other can reduce collision risk by creating a greater visual cue for birds and bats to avoid. If the clearance between energized and grounded components on the gen-tie line is greater than the wingspan of birds, the potential for electrocution is greatly reduced (Avian Power Line Interaction Committee [APLIC] 2006). The potential impacts on birds and bats related to collision risk would likely be negligible as a result of existing electrical infrastructure in the vicinity. A more detailed discussion of potential impacts with solar panels and potential "lake effect hypothesis," is included in Section 3.10.2 below; however, impacts with solar panels by birds or bats would be minimal.

Impacts of the No Action Alternative

The No Action Alternative would result in the proposed Project not being constructed, and therefore the impacts on wildlife associated with the Proposed Action and proposed Project as described above would not occur.

Cumulative Impacts

The proposed Project would contribute incrementally to the effects of past, present, and foreseeable future projects on area wildlife. Loss of grassland habitat and disturbance from increased human activity would prompt avoidance of the Proposed Solar Facility Area and surrounding area by some wildlife. The potential impacts on birds and bats related to collision risk would likely be negligible as a result of existing electrical infrastructure in the vicinity.

3.10 Special Status Species

Species that are federally listed as threatened or endangered are protected by the Endangered Species Act of 1973 as amended (ESA, 16 US Code [USC] 1531 et seq.). In accordance with the ESA, projects with a federal action that have a potential effect on federally-listed species or their habitats require a consultation under Section 7 of the ESA with the US Fish and Wildlife Service (Service or USFWS). Effects to candidate species are not required to undergo a Section 7 consultation unless the species becomes listed during project planning and construction.

Colorado state law (Colorado Revised Statutes [CRS] Annotated [Ann.] §§ 33-2-102-106), requires that the State maintain a list of species that have been determined to be endangered or threatened within the State. Colorado State Statute 33 authorizes the Colorado Division of Parks and Wildlife (CPW) to regulate and protect the State's listed wildlife species. Additionally, Colorado Senate Bill 40 (SB40) requires that any state agency obtain a wildlife certificate from the CPW if an agency plans construction or maintenance activities that may impact the bed or banks of a stream or its tributaries (CRS §§ 33-5-101-107).

The Fish and Wildlife Coordination Act (16 USC §§ 661-667e) requires consultation between the agency in charge of the federal action and the CPW as it relates to the conservation of species of concern resources for federal projects that results in changes to specific features of a body of water. State-listed species would also be considered should any consultation occur.

3.10.1 Affected Environment

Special status species evaluated in this EA included federal and state listed threatened and endangered species that had the potential to occur or were known to occur in El Paso County, and state species of special concern (Table 3.3). The list of species evaluated was based on correspondence between Midway Solar, the Service and CPW. In their response letter dated July 29, 2014 (Appendix C), the Service suggested an on-site habitat assessment for federally listed species be completed; this assessment was conducted in June 2015 by WEST for Midway Solar (WEST 2015). The assessment consisted of a survey of the Project Study Area to determine the habitat types present, and if habitats present in the Project Study Area might support listed threatened, endangered, and species of special concern (Table 3.4). The survey was conducted by walking transects and driving roads in and around the Project Study Area and making observations. The substation properties in the middle of the Project Study Area were included in the visual evaluation.

Table 3.3 Federal and state threatened, endangered, and species of special concern listed for El Paso County, Colorado.

Common Name	Scientific Name	State Status[1]	Federal Status[2]
Mexican spotted owl	*Strix occidentalis lucida*	Endangered	Threatened
Arkansas darter	*Etheostoma cragini*	Threatened	Candidate Threatened
greenback cutthroat trout	*Oncorhynchus clarki stomias*	Threatened	Threatened
Ute ladies'-tresses	*Spiranthes diluvialis*	None	Threatened
Pawnee montane skipper	*Hesperia leonardus montana*	None	Threatened
black-footed ferret	*Mustela nigripes*	Endangered	EXP*
North American wolverine	*Gulo gulo luscus*	Endangered	Proposed Threatened
Preble's meadow jumping mouse	*Zapus hudsonius preblei*	Threatened	Threatened
least tern	*Sterna antillarum*	Endangered	Endangered
piping plover	*Charadrius melodus*	Threatened	Threatened
whooping crane	*Grus americana*	Endangered	Endangered
pallid sturgeon	*Scaphirhynchus albus*	None	Endangered
plains sharp-tailed grouse	*Tympanuchus phasianellus jamesii*	Endangered	None
burrowing owl	*Athene cunicularia*	Threatened	None
lesser prairie-chicken	*Tympanuchus pallidicinctus*	Threatened	Proposed Threatened
river otter	*Lontra canadensis*	Threatened	None
prairie dog	*Cynomys* spp.	Species of Special Concern	None (black-tailed prairie dog)
swift fox	*Vulpes velox*	Species of Special Concern	None

Common Name	Scientific Name	State Status[1]	Federal Status[2]
mountain plover	*Charadrius montanus*	Species of Special Concern	None
Townsend's big-eared bat	*Corynorhinus townsendii*	Species of Special Concern	None
northern leopard frog	*Lithobates pipiens*	Species of Special Concern	None

* Experimental

[1] Colorado Natural Heritage Program (2014)

[2] USFWS Endangered Species Mountain Prairie Region (USFWS 2015)

Table 3.4 Impacts to sensitive species from WAPA's Proposed Action and Midway Solar's Proposed Project.

Common Name	State Status	Federal Status	Impacts from WAPA's Proposed Action	Impacts from Midway Solar's Proposed Project
Mexican spotted owl	Endangered	Threatened	No impact: potential habitat is not present in the Project study area.	No impact: potential habitat is not present in the Project study area.
Arkansas darter	Threatened	Candidate Threatened	No impact – potential habitat is not present in the Project study area.	No impact: potential habitat is not present in the Project study area.
greenback cutthroat trout	Threatened	Threatened	No impact: potential habitat is not present in the Project study area.	No impact: potential habitat is not present in the Project study area.
Ute ladies'-tresses	None	Threatened	No impact: potential habitat is not present in the Project study area.	No impact: potential habitat is not present in the Project study area.
Pawnee montane skipper	None	Threatened	No impact: the Project is outside of the range of the species and habitat is not present.	No impact: the Project is outside of the range of the species and habitat is not present.
black-footed ferret	Endangered	Experimental	No impact: El Paso County has been block-cleared by the Service[1].	No impact: El Paso County has been block-cleared by the Service[1].
North American wolverine	Endangered	Proposed Threatened	No impact: potential habitat is not present in the Project study area.	No impact: potential habitat is not present in the Project study area.
Preble's meadow jumping mouse	Threatened	Threatened	No impact: potential habitat is not present in the Project study area.	No impact: potential habitat is not present in the Project study area.
least tern	Endangered	Endangered	Unlikely to impact: nesting habitat is not present, but there is the potential for individuals to fly over the Project study area during migration. There is a minor collision risk with the substation equipment.	Unlikely to impact: nesting habitat is not present, but there is the potential for individuals to fly over the Project study area during migration. There is a minor collision risk with the gen-tie line and solar panels.
piping plover	Threatened	Threatened	Unlikely to impact: nesting habitat is not present, but there is the potential for individuals to fly over the Project study area during migration. There is a minor collision risk the with substation equipment.	Unlikely to impact: nesting habitat is not present, but there is the potential for individuals to fly over the Project study area during migration. There is a minor collision risk with the gen-tie line and solar panels.
whooping crane	Endangered	Endangered	Unlikely to impact: nesting habitat is not present, but there is the potential for individuals to fly over the Project study area during migration. There is potential for collision with substation equipment.	Unlikely to impact: nesting habitat is not present, but there is the potential for individuals to fly over the Project study area during migration. There is a minor collision risk with the gen-tie line and solar panels.

Common Name	State Status	Federal Status	Impacts from WAPA's Proposed Action	Impacts from Midway Solar's Proposed Project
pallid sturgeon	None	Endangered	No impact: potential habitat is not present in the Project study area.	No impact: potential habitat is not present in the Project study area.
plains sharp-tailed grouse	Endangered	None	Unlikely to impact: preferred habitat features are not present in the Project study area, but individuals have the potential to occur. Potential for collision with substation equipment or vehicles is possible.	Unlikely to impact: preferred habitat features are not present in the Project study area, but individuals have the potential to occur. Potential for collision with Project facilities or vehicles is possible.
burrowing owl	Threatened	None	Unlikely to impact: nesting habitat is not present at WAPA's substation. There is a minor risk of collision with substation equipment or vehicles if individuals occur in the area.	Potential for impact if nesting at the on-site prairie dog town during construction. Compliance with CPW survey protocols and actions would minimize potential for direct impact to nesting owls. There is a minor risk of collision with Project facilities or vehicles if individuals occur in the area. Potential nesting habitat would be lost with removal of prairie dogs and their burrows.
lesser prairie-chicken	Threatened	Proposed Threatened	Unlikely to impact: preferred habitat features are not present in the Project study area, but individuals have the potential to occur. There is potential for collision with the substation equipment or vehicles.	Unlikely to impact: preferred habitat features are not present in the Project study area, but individuals have the potential to occur. Potential for collision with Project facilities or vehicles is possible.
river otter	Threatened	None	No impact: potential habitat is not present in the Project study area.	No impact: potential habitat is not present in the Project study area
prairie dog	Species of Special Concern	None (black-tailed prairie dog)	Unlikely to impact: black-tailed prairie dogs occur near WAPA's substation where Project -related activities would occur, but these activities are unlikely to impact black-tailed prairie dogs.	Likely to impact: black-tailed prairie dogs occur in the Project study area and would be impacted by Project construction. CPW recommends they be either moved alive to another location or humanely killed before earth-moving occurs.

Common Name	State Status	Federal Status	Impacts from WAPA's Proposed Action	Impacts from Midway Solar's Proposed Project
swift fox	Species of Special Concern	None	Unlikely to impact: Project-related activities that would occur at WAPA's existing substation are unlikely to impact swift fox because the substation is fenced and swift fox is very unlikely to occur there.	Likely to impact habitat: the Project study area includes habitat suitable for swift fox, including denning habitat in the prairie dog burrows. Removal of prairie dogs and their burrows would eliminate denning habitat and Project construction would eliminate up to 911 acre of suitable habitat. Individuals would likely be displaced if they occur in the Project study area.
mountain plover	Species of Special Concern	None	Unlikely to impact: Project-related activities that would occur at WAPA's existing substation are unlikely to impact mountain plover because the substation is not suitable habitat. There is a minor risk of collision with substation equipment or vehicles if individuals occur in the area.	Likely to impact habitat: the Project study area has the potential to be used by mountain plover, although the habitat is not high-quality due to vegetative cover and structure. Up to 911 acre of low-quality habitat would be eliminated. Individuals would likely be displaced if they occur in the Project study area, and there is the potential for collision with the gen-tie line and solar panels.
Townsend's big-eared bat	Species of Special Concern	None	Unlikely to impact: roosting habitat is not present in the Project study area. Bats are unlikely to occur at or near WAPA's substation where upgrades associated with the Project would occur because no habitat features exist that are likely to attract them (such as water). There is a minor risk of collision with substation equipment if individuals occur in the area.	Unlikely to impact: roosting habitat is not present in the Project study area. The species is known to occur within a 5-mile radius of the Project and individuals could potentially use the Project study area for foraging or water (stock pond). The stock pond would not be affected by the Project and would continue to provide foraging opportunities and a water source. Impact to bats is unlikely.
northern leopard frog	Species of Special Concern	None	No impact: the Project is outside of the range of the species and potential habitat is not present.	No impact: the Project is outside of the range of the species and potential habitat is not present.

3.10.2 Environmental Consequences

Impacts of WAPA's Proposed Action

The impacts of WAPA's Proposed Action to species of concern would be negligible. No suitable habitat for the species identified above occurs at WAPA's Midway Substation. The addition of a new 230-kV bay at Midway Substation would not likely affect any threatened, endangered, or special status species.

Impacts of Midway Solar's Proposed Project

The concern over injuries and deaths of water birds at solar facilities is centered on the theory that these species may potentially mistake the extensive solar arrays for water features on which the birds can land; this theory has been coined the "lake effect hypothesis." Such collisions, which also occur at features like parking lots and train yards, both of which resemble water bodies at night; often do not result in direct mortality because the angle of the collision is relatively shallow. However, birds may not be able to take off after collisions because they are adapted to take off from water, not dry land, or because they may suffer injuries from the collision. A study of a southern California solar PV facility (Kagan et al. 2014) suggested a link between panel-related impact trauma and predation of birds that make their primary habitat on water. However, Kagan et al. (2014) and other studies (Argonne National Laboratories [Argonne] 2015, WEST 2014) have inferred that the presence of open water ponds in the vicinity of the PV facility may have influenced the results, identifying a smaller percentage of water bird mortality at other solar facilities without open water available to waterfowl and shorebirds. Argonne (2015) further suggested waterfowl that are more dependent on water for their landing surface, such as grebes, coots, and loons, are more likely to be susceptible to collisions with solar panels. Recent studies have concluded that no empirical evidence exists that PV facilities lead to distinct changes in water bird or waterfowl risk or mortality and that additional structured studies of utility scale PV facilities are necessary before a statistically significant conclusions about avian risk and mortality can be drawn (Argonne 2015, WEST 2014).

The normal habits and behaviors of these birds would likely reduce the tendency for piping plovers (*Charadrius melodus*), least terns (*Sterna antillarum*), and whooping cranes (*Grus americana*) to experience impacts with Project PV panels. The flight behaviors of shorebirds such as killdeer (*Charadrius vociferus*), sandpipers, and plovers, are such that these birds typically use solid ground for their landing and take-off surface, minimizing the risk of traumatic impacts with the PV solar panels due to the lake effect. When plovers do land in water, it is in the shallows, as the bird makes a low and slow approach before making contact with the muddy or sandy bottom of the water body where they are landing. Similarly, gulls and terns generally land and take off from solid ground or the shallows of water bodies. The least tern does have a feeding habit similar to gulls in that the tern will plunge into water to capture small fish; however, least terns identify their prey first and do not blindly dive into the water. The behavior of locating their prey prior to dipping into the water will reduce the potential of least terns colliding with Project panels in attempts to capture prey. Whopping cranes are not dependent on water for landing and take-off. Like other crane species, whopping cranes can often be found feeding in

grain fields and are well adapted to land, loaf, and depart from solid ground. Even when cranes do land on water, their long legs require the crane approach slowly and touchdown in the shallows, with the crane's feet touching the solid substrate below the water's surface as the bird remains standing. The general behavior of terns, plovers, and cranes to land on solid ground or shallow water requires these birds to approach slowly and identify the substrate they will touch upon, which would greatly reduce the potential for these species to impact PV panels. The least tern's general conduct of identifying fish before diving into water to feed will further limit the likelihood of the least turn blindly crashing into the proposed solar arrays. According to CPW, whooping cranes have not been documented in Colorado since 2005. While this is not to say the species is not present in the state, it does support the assumption that if low numbers of whooping cranes are present, low enough not be documented in a decade, then there is likely a very low probability for impacts on whooping cranes as a result of Midway Solar's proposed Project. Finally, as noted in Table 3.4 above, WEST did not observed suitable nesting habitat for least terns, piping plovers, and whopping cranes during visits to the Project Study Area. In general, a low number of waterfowl/shorebird species would use the area near the proposed Project during any part of the year, whether for breeding or during migration. Therefore, even if there was a potential for lake effect hypothesis impacts to occur at the Midway Solar PV solar facility, the proposed Project would pose a low risk to least terns, piping plovers, and whopping cranes, as well as other birds.

Impacts of the No Action Alternative

The No Action Alternative would result in the proposed Project not being constructed, and therefore the impacts on species status species, including least terns, piping plovers, and whooping cranes, would not occur.

Cumulative Impacts

The Proposed Action and proposed Project would contribute incrementally to the effects of past, present, and foreseeable future projects on habitat loss, including some habitat used by listed threatened, endangered, or special status species. The listed species mostly likely to be affected cumulatively include black-tailed prairie dog, burrowing owl, swift fox (*Vulpes velox*), and mountain plover (*Charadrius montanus*); habitat for these species is present in the Project Study Area. The proposed Project would result in loss of this habitat, and if other past, present, and foreseeable future projects also result in habitat loss for these species, the effect would be a cumulative loss in the general region. All of these species have large ranges, so the cumulative loss of habitat in and near the Project Study Area would not likely affect the status of these species.

3.11 Cultural Resources

This section describes the area of potential effects (APE), as defined in 36 CFR 800.16, for cultural resources and examines the potential effects including damage, loss, degradation, or other disturbance to cultural resources under the Proposed Action, proposed Project and No Action Alternative. The term "cultural resources," refers to broad category of resources that may include prehistoric or historic artifacts, sites, structures (whole or partial), and landscape features such as dams, berms, terraces, or canals. It can also refer to items or places

associated with advancements in technology, science, art, historical figures, or activities. Cultural resources can also reference places or items of significant traditional or religious meaning of a culture or community.

The National Historic Preservation Act of 1966, as amended (NHPA; 16 USC 470 et seq.), declares that historic preservation is a national policy and authorizes the Secretary of the Interior to expand and maintain a National Register of Historic Places (NRHP) that includes properties of national, state and local historical significance. It also established the Advisory Council on Historic Preservation (ACHP) and State Historic Preservation Offices (SHPOs). Section 106 of the NHPA requires that federal agencies consider the effects of their actions on *historic properties*, properties that are listed in or eligible for listing in the NRHP; that they consult with the SHPO; and that they afford the ACHP with the opportunity to comment on proposed Project. In addition to the NHPA, a number of other federal regulations afford protection to cultural resources. These regulations include, but are not limited to the American Indian Religious Freedom Act of 1978, the Archaeological Resources Protection Act of 1979, the Native American Graves Protection and Repatriation Act (NAGPRA) of 1990, and Executive Order 13007 of 1996.

For inclusion on the NRHP, a property must meet the criteria set forth within 36 CFR 60.4.

- Criteria A: associated with events that have made a significant contribution to the broad patterns of history; or
- Criteria B: associated with the lives of persons significant in our past; or
- Criteria C: embodies the distinctive characteristics of a type, period, or method of construction, or that represents the work of a master, or that possess high artistic values, or that represents a significant and distinguishable entity whose components may lack individual distinction; or
- Criteria D: that yields, or likely to yield, information in prehistory or history.

In addition, a property must maintain its significance through the retention of specific aspects of integrity, such as location, design, materials, setting, workmanship, feeling, and association. In general, properties less than 50 years of age, unless of exceptional importance, are not eligible for listing in the NRHP.

The Colorado Office of Archeology and Historical Preservation (OAHP) and the Colorado Council of Professional Archeologists have produced a series of guidance documents for historic and prehistoric context. The documents suggest pertinent research themes and deficiencies in existing historic and prehistoric databases. Sites possessing traits that may yield information about the identified research themes and that have suitable physical integrity are highly likely to be considered eligible for the NRHP.

3.11.1 Affected Environment

Centennial Archeology (CA) performed an intensive Class III Cultural Resources Inventory of the Midway Solar Project Study Area (CA 2015). The area of the Class III Cultural Resources Inventory investigation was limited to the Midway Solar portion of the Project Study Area as shown in Figure 1.2, excluding existing electrical infrastructure present. The survey resulted in the identification of six sites and 32 isolated finds; all six sites were newly recorded by CA. The isolated finds were considered prehistoric in nature and consisted of either single occurrences or small quantities of debitage. Debitage is defined as the material produced as the result of manufacturing chipped stone tools and lithics reduction. Two sites, 5EP7625 and 5EP7632, were determined by CA to be potentially eligible for listing on the NRHP. However, these two sites needed more data and CA recommended that these sites be avoided by Project activities. The remaining four sites and isolated finds were deemed ineligible by CA for NRHP listing, and CA recommended no further investigation of these items.

At the request of WAPA, an additional 2-mile radial buffer was assessed around the Project Study Area as part of the Class I file review and analysis. This additional analysis was to assess the potential visual impacts to NRHP-listed or potentially eligible cultural resources within two miles of the Proposed Action of WAPA and the proposed Project. This analysis evaluated potential impacts to standing structures or landmarks near the Project Study Area. Results of the additional analysis are discussed below under *Impacts of Midway Solar's Proposed Project.*

3.11.2 Environmental Consequences

Impacts of WAPA's Proposed Action

WAPA's Proposed Action would be limited to the approval of the interconnection, a new 230-kV substation bay within existing footprint of the Midway Substation, and the gen-tie entry structure located outside the substation but within the WAPA's existing ROW. WAPA may also need to modify existing transmission lines entering and exiting the Midway Substation to accommodate the gen-tie line. If this is deemed necessary after final Project design and engineering, WAPA would design and construct any modifications to be within their existing ROW, similarly to the gen-tie entry structure.

Access to WAPA's Midway Substation was not granted to CA for safety reasons and CA was therefore unable to assess the footprint of the substation for the cultural resources investigation. WAPA purchased the land for Midway Substation in 1965, and the substation was constructed between 1965 and 1966. This pre-dates NEPA (signed into law in January 1970), but the construction of the substation may not have pre-dated the NHPA (signed into law in October 1966), therefore it is possible that a cultural resources review and clearance was obtained prior to construction. Furthermore, during the construction of a substation, substantial ground disturbing activities are necessary. Installation of structural foundations for control buildings, bus work, and transformers, cable trays, underground conduits, grounding mesh or grid, and other electrical infrastructure all required some level of ground disturbance. According to CA's Class I records search (C. Kinneer, CA, pers. comm., September 9, 2015), the most recent cultural resources survey that included WAPA's Midway Substation was a 2011 investigation performed

by Tetra Tech, Inc. (Tetra Tech). Tetra Tech's survey report, *Midway to Geesen OPGW Installation Project Class III Cultural Resources Inventory*, suggests only minimal debitage was found near WAPA's Midway Substation. Furthermore, Tetra Tech classified these debitages as isolated finds requiring no further action for Tetra Tech's clients. CA investigated the areas immediately surrounding the Midway Substation, including WAPA's existing transmission line ROW, as part of the Class III inventory which revealed no NRHP-listed or eligible cultural resources within these areas.

Therefore, WAPA's Proposed Action would not result in impacts to cultural resources. Additionally, WAPA's Proposed Action would result in no visual impacts to cultural sites within the 2-mile buffer around the substation as assessed in the Class I file review.

Impacts of Midway Solar's Proposed Project

The Cultural Resource Inventory completed for the Project Study Area documented six sites and 32 isolated finds (CA 2015); sites, 5EP7625 and 5EP7632, were determined to be potentially eligible. CA concluded that the proposed Project's current design, these two sites would not be impacted, so additional testing was not recommended. However, if the Project design changes and either of the sites would be unavoidably disturbed, CA suggested additional testing of these sites be performed to more thoroughly assess potential subsurface archeological deposits for NRHP eligibility.

In general, CA recommended cultural resources clearance for all actions outside the Midway Substation, assuming cultural sites 5EP7625 and 5EP7632 are avoided (C. Kinneer, pers. comm.). However, in the event that previously undocumented cultural resources are encountered during construction, all work would cease in the immediate area, and the items discovered would be protected until a qualified archaeologist can assess their cultural or historical significance.

In letter dated September 11, 2015 (Appendix D), the State Historic Preservation Officer (SHP Officer) concurred with CA findings and conclusions that sites 5EP7625 and 5EP7632 are potentially eligible for listing; however, the SHP Officer requested further information as to how these resources would be preserved in place as simple avoidance of a site is not the same as preservation. Midway Solar proposed the following measures that the SHPO accepted in a letter dated December 1, 2015 (Appendix D):

- A permanent fence would be erected around the boundaries of the solar array facility. Sites 5EP7625 and 5EP7632 would be excluded from the disturbance area with this fenceline.
- No construction or ground disturbing activities would occur within 100 feet of the site boundaries.
- WAPA would provide a map that graphically shows the locations of the proposed permanent fence and sites 5EP7625 and 5EP7632.

- Archaeological monitoring would occur during construction of the facility boundary fence to assure that the sites are not impacted.
- Post construction, the project proponent would instruct their operations and maintenance staff to avoid the buffered site areas.

With these assurances, the proposed Project would have no impact to known protected cultural resources.

In addition to the Class III inventory for the Project, CA analyzed the potential visual impacts to NRHP-listed or potentially eligible cultural resources within two miles of the proposed solar facility (CA 2015). Six resources, including five linear resources (5EP1003.8, 5EP2181.10, 5EP3936.2, 5EP3937.2, and 5EP6911.1) and one prehistoric site (5EP4726) were identified in the visual impact area. However, no standing structures or landmarks were identified in this analysis, so no impacts to these features would occur.

Impacts of the No Action Alternative

The No Action Alternative would result in the proposed Project not being constructed, and therefore the impacts on cultural resources associated with the Proposed Action and proposed Project would not occur. Midway Solar's agreement to protect two cultural resources sites would also not occur allowing for the possibility of future actions at the Project Study Area to impact these sites.

Cumulative Impacts

The Proposed Action and proposed Project, as described above, would not contribute to the cumulative impacts of cultural resources in the region. Midway Solar would avoid identified cultural features and would work with WAPA and Colorado SHPO to properly preserve two sites located within the Project Study Area.

3.12 Visual Resources

This section addresses the affected environment associated with visual resources, including visual resource management objectives, observation points, and visibility related to the construction, operation, and maintenance of the Proposed Actions and proposed Project. The visual resource analysis addresses the potential visual effects of the Proposed Action and proposed Project on landscape scenic quality and observation points, with respect to distance zones; foreground/middleground (zero to three miles) and background (three to five miles).

The El Paso County South Central Comprehensive Plan was reviewed for general land use regulation and limitation, including visual resources. The South Central Comprehensive Plan identified visual quality as an overall goal for development in this portion of El Paso County (El Paso County 1988). Specifically, the plan called attention to transmission lines and recommends that major visual intrusions should be consolidated as much as possible (El Paso County 1988). The plan further stated that new facilities should be sited to minimize visual effects to existing residential developments or to mountain views (El Paso County 1988).

3.12.1 Affected Environment

Project Setting

The Project Study Area was within the Piedmont Plains and Tablelands level IV ecoregion of the Southwestern Tableland level III ecoregion of Colorado (Chapman et. al. 2006). The Piedmont Plains and Tablelands ecoregion is a vast area of irregular and dissected plains of shortgrass prairie consisting of buffalo grass (*Bouteloua dactyloides*), blue grama (*Bouteloua gracilis*), western wheatgrass (*Pascopyrum smithii*), sand dropseed (*Sporobolus cryptandrus*), sideoats grama (*Bouteloua curtipendula*), and yuccas (Yucca spp.) (Chapman et. al. 2006). Timber Mountain is located 9.8 miles west of the proposed Project with Booth Mountain and Blue Mountain 10.5 miles southwest and 14.5 miles northwest of the Project, respectively. Anthropomorphic influences on the natural landscape include electrical infrastructure, roads, residential developments, I-25, and various agricultural, commercial and industrial developments. These modifications contribute to the aesthetics and visual setting of the Project Study Area.

Residential Views

There were approximately 25 residential viewers dispersed within a mile of the existing WAPA's Midway Substation; all residents were located to the west and north of the substation. Residential viewers were considered potentially sensitive due to long-viewing durations. Typical residences would have relatively level, but screened, views of the new 230-kV bay within the Midway Substation (see Section 2.1.1) due to low vegetation and flat topography observed with the area; however, the existing substation and electrical utility infrastructure would lie between residences and the proposed new 230-kV substation bay. These views of the Proposed Action were considered in the foreground-to-middleground for local residences.

There were approximately 110 residential viewers dispersed within one mile of the Proposed Solar Facility Area with most residents located to the west and north. Residences within one mile of the Proposed Solar Facility Area would have level-to-downgradient or -upgradient, and an unobstructed-to-screened view of the proposed solar facility due to variable vegetation, topography, and existing infrastructure within the 1-mile radius of the Proposed Solar Facility Area. Residential views of the proposed Project were considered in the foreground-to-middleground for local residences.

Travel Route Views

Travelers heading north and south along I-25, at a moderate-to-high rate of speed (I-25 has a 75-mile per hour (mph) speed limit), would have little-to-minimal concern with changes in the landscape as they travel this corridor. Travelers on I-25 would have an obstructed view, if any view at all, of WAPA's Midway Substation or the Proposed Solar Facility Area as a ridgeline generally ran adjacent to the highway at an elevation 40 to 70 ft higher than I-25's pavement grade. There were a few breaks in the ridgeline, such as at Cactus Creek Horse boarding facility, where views of the Proposed Solar Facility Area for travelers may be observed in the foreground-to-middleground; however, at speeds in excess of 70 mph, these views would be very short in duration.

There were several local roads in the vicinity of the Project Study Area (Figure 2.1) including Rancho Colorado Boulevard, Boca Raton Heights, La Huerta View, and La Questa View. Travelers on these roads would have a minimal-to-moderate concern with changes in the landscape, due to travelers' potential exposure to views while traveling at the posted speed limit of 30 mph (El Paso County 1996). Travelers' views of the Proposed Action and proposed Project would vary greatly depending on the individual's driving route and construction or operational phase at the time. Views may be in the foreground to the middleground, unobscured-to-fully screened, and at-grade to above or below grade. The size of the proposed solar facility coupled with over 8.5 miles of local roads in the immediate vicinity, would likely result in visual impacts being variable for local drivers.

The proposed Project would alter the visual character of the landscape by introducing solar panels and associated electrical utility infrastructure to the area. The effects of these changes on the visual environment are described below. The primary viewpoints of the proposed Project would be from residences and vehicle traffic in the vicinity of the Project Study Area.

3.12.2 Environmental Consequences

Impacts of WAPA's Proposed Action

WAPA's proposed construction would occur within the existing substation or transmission line corridors, which would be in general conformance with the South Central Comprehensive Plan's recommendation to consolidate utility infrastructure (see El Paso County 1988). Construction activities would also be temporary, lasting only a few months.

During construction, equipment, generally larger than the average passenger vehicle, would be used at the substation for the installation of proposed equipment. This construction equipment may draw the attention of local residents and vehicle traffic in the immediate vicinity. The closest resident was located approximately 0.5 mile northwest of the substation and topographically slightly upgradient. The new substation bay would likely be installed on the south side of the existing Midway Substation. Furthermore, WAPA's construction would take place during normal business hours, while residents would be at their places of work. With the residents' locations, timing of constructions, and existing substation infrastructure acting as a man-made screen, WAPA's construction activities at the existing Midway Substation would be minimally observed by local residents.

Vehicular traffic near the Project Study Area would be able to view WAPA's construction activities. The closest road to the proposed WAPA construction was Rancho Colorado Boulevard, roughly 0.10 mile south of the substation. La Questa View was approximately 0.26 mile northwest of the substation and Boca Raton Heights was about 0.37 mile west. Vehicles on Rancho Colorado Boulevard would presumably have the best view of construction as they travel on the south side of the substation where the new substation bay would be constructed. Construction at the substation, however, would likely appear to the casual driver and passengers as normal routine electrical system maintenance. Vehicles traveling on either Boca Raton Heights or La Questa View would be over 1,000 ft from the proposed construction and existing substation infrastructure would shield the views. Vehicular observations of the proposed

construction at Midway Substation would be minimal. In general, the temporary visual impacts associated with WAPA's proposed construction activities from either residents or vehicles would be minimal.

O&M practices at Midway Substation would not change measurably because of the proposed additional 230-kV bay. WAPA's proposed new substation bay, associated substation infrastructure and gen-tie entry structure would be located in or immediately adjacent to the existing substation. The proposed new 230-kV substation bay would not be noticeably different in appearance to the general public in comparison to existing substation infrastructure, regardless of their view. WAPA's Proposed Action would result in weak contrast for residential and traveler viewers of the proposed solar facility. The proposed gen-tie entry structure and new substation bay introduced into the landscape would be similar in size, shape, and color to existing structures and would be seen in the context of the existing transmission lines and substation facilities, thus lowering visual impacts. WAPA's Proposed Action would have a negligible-to-minimal impact to visual resources of the area.

Impacts of Midway Solar's Proposed Project

During construction, equipment, generally larger than the average passenger vehicle, would be used to grade portions of the Proposed Solar Facility Area and remove excessive vegetation. In addition, the installation of solar panels and gen-tie line support structures would require specialized equipment to secure these support structures in the ground. Finally, excavation for foundations of solar facility collection substation equipment would require the use of excavation-specific machinery. This construction equipment would likely draw the attention of local residents and vehicle traffic in the immediate vicinity. The closest resident would be less than 300 ft away from the west edge of the Proposed Solar Facility Area with four other residents within 500 ft. Vehicle traffic in the vicinity of the Proposed Solar Facility Area would likely to be able to view the construction activities as Midway Solar intended to extend the proposed solar facility up to road ROWs in the area. Construction would take place during normal business hours, while most residents would also be at their places of work and residential traffic in the area would be light; however, after construction activities end for a day or week, construction equipment would be parked and visible after hours and over weekends. Considering the size of the proposed disturbance and the close proximity of some residents and local roads in the area, a limited number of people may be affected by the change in the view resulting from construction activities. These potential impacts would occur only during construction activities and would be temporary.

Localized impacts on the visual character of the area around the proposed Project would occur from the development of the PV panel fields, substation, and perimeter fencing. The solar field would consist of 8-ft long glass PV panels mounted on steel structures and would be enclosed by 6-ft high chain link fencing with security barbed wire stretched across the top of the fencing. The 3-acre solar facility collection substation would include a number of components, including a control building and approximately 40-ft high steel support structures. From the solar facility collection substation, a 230-kv gen-tie line would interconnect the Midway Solar facility to

WAPA's Midway Substation. For assessing visual impacts, each element of the solar facility is analyzed individually below.

Midway Solar's solar facility collection substation would likely be east of the existing WAPA Midway Substation and PSCo substation. The solar facility collection substation would be three acres in area while the two existing substation encompass nearly 21 acre. In addition, the Southwest Generation natural gas fueled electric generation facility, located to the south of the existing substations, occupies over 11 acres. The solar facility collection substation would be most obvious to travelers on La Questa View, while viewers west of the Project Study Area may not even recognize the new infrastructure through the screening of the existing substations. The solar facility collection substation would be consistent in appearance with infrastructure in the immediate area with no discernable contrast with the surroundings. Negligible-to-minor impacts to the visual resources would result from the solar facility collection substation for both residential and traveler viewers of the proposed Project.

The gen-tie line, as described previously, would be a slightly less than one mile long transmission line connecting the proposed solar facility to WAPA's Midway Substation. The gen-tie line would be located within existing transmission line corridors and in close proximity to existing transmission lines. This co-locating of the gen-tie line with transmission lines complies with the South Central Comprehensive Plan's recommendation to consolidate utility infrastructure (El Paso County 1988). The inclusion of a new overhead power line near existing transmission lines would have a negligible impact on the visual resources of the Project Study Area.

While these developments, the gen-tie line and solar facility collection substation, represent a substantial visual change over existing undeveloped conditions, these changes would likely be viewed as negligible to minimal compared to the altered state of the existing substations, transmission line corridors, and natural gas fueled electric generation facilities in the area. The overwhelming majority of the proposed Project, however, includes the development of 911 acres of solar field. The solar field would consist of 8-ft high glass PV panels mounted on steel structures and would be enclosed by 6-ft high chain link fencing. The proposed solar field would span over two miles east to west and nearly 1.5 miles north to south. The solar field would not be a homogenous rectangle of panels, but would include a large surface area that would be visible for a considerable distance. The solar field would be located in the vicinity of existing electric utility infrastructure, but the size of the solar field would far exceed the current visual limits of the existing infrastructure. Furthermore, solar panels can have a highly reflective surface depending on the technology used for the system. Based on the size of the proposed solar facility, proximity of residents and passenger traffic, and the potential for solar panels to be highly reflective, Midway Solar's proposed solar field would have a minor-to-moderate impact on the views and visual resources.

Glare

Glare can be defined as a semi-continuous and sustained presence of light that may appear to sparkle from viewing locations. The effects of glare can vary from insignificant, momentary

blinding, to temporary seeing spots or after images, or if intense enough or of a long enough duration, glare can cause permanent vision damage. The potential glare hazard of the proposed PV arrays to vehicular traffic in the vicinity was analyzed using Sandia National Laboratories' (Sandia) Solar Glare Hazard Analysis Tool (SGHAT; Sandia 2015; WEST 2015). The proposed solar facility would likely use a single axis tracking system to align the solar arrays. The Project is located in the Mountain Time zone or minus seven hours from Coordinated Universal Time (UTC). The general locations of the proposed solar arrays were diagramed for the SGHAT. However, due to several unknowns concerning specific project engineering and technology, WEST made several assumptions for the analysis. Based on common solar array design, the panels would likely be on a 35° tilt and the tracking system would point the panels due south at solar noon. Other assumptions included maximum panel height, shape and texture of the panels, and observational height. Panel height was determined to be a maximum of 13 feet. Furthermore, an example of a solar field constructed by Midway Solar in Georgia showed the use of smooth glass panels without an arc (Figure 3.4), so this design feature too was used for the proposed application. Finally, Sandia's analysis requested observational locations and heights to determine potential glare hazards. As the elevation and location of residents in their homes would be highly variable, depending on individual's height, finished floor elevations, furniture size, possible window locations, etc., WEST chose to the use the SGHAT for only vehicular traffic. WEST reviewed the roof heights of four commonly sold sedans in 2015: Honda Accord, Toyota Camry, Ford Taurus, and Chevrolet Impala. WEST averaged the roof heights of these four vehicles and subtracted 10 inches below the exterior average roofline to be the observational height of four ft above road elevation. WEST then needed to choose several observation locations for the analysis. Assessing only vehicular traffic, two I-25 locations were selected (one southbound and one northbound), the intersection of Rancho Colorado Boulevard and La Huerta View, the intersection of Rancho Colorado Boulevard and La Questa View, the intersection of Boca Raton Heights and Indian Village Heights, the intersection of Boca Raton Heights and Ocatillo View and finally two observational points at the intersection of Boca Raton Heights and La Huerta View were identified.

Figure 3.4 Example of smooth glass solar panels without an arc.

Sandia's SGHAT results (Appendix E) indicated only one observation point at the indicated height to have a potential for after image or causing the effect of seeing spots due to glare. The intersection of Rancho Colorado Boulevard and La Questa View had the potential in mid-April and mid-August to be impacted by temporary after-image glare at approximately 6:30 AM. As no residential or commercial development was located on Rancho Colorado Boulevard and the few residential developments off La Questa View were located north of this intersection, traffic in general at the intersection of these two roads would be light as there was no obvious need to travel this corridor by a large number of drivers. Furthermore, vehicle traffic at this intersection would be low at 6:30 AM. Remaining locations were identified to have a low potential for temporary after-image glare as a result of the proposed solar field. The Sandia SGHAT results suggest glare associated with the proposed solar facility would have a negligible to minor impact on vehicle traffic near Project Study Area.

Impacts of the No Action Alternative

The No Action Alternative would result in the proposed Project not being constructed, and therefore the impacts to visual resources associated with the Propose Action and Project as described above would not occur.

Cumulative Impacts

Implementation of the proposed Project would introduce new electrical infrastructure into the region. Visually, some features, such as the gen-tie line, solar facility collection substation, and new substation bay, would have little contrast to existing conditions including existing electric utility infrastructure and therefore would not impact views in the area. The potential installation of 911 acres of new solar arrays would alter the visual resources of the area noticeably. Future

additional visual impacts within the area would most likely be associated with residential home building; however, development of residential lands in the area would likely occur one home at a time, which would slowly influence the views of the region. While additional electric utility infrastructure development may occur in the vicinity of the Proposed Action and proposed Project in the future, it would likely blend in with the existing and proposed infrastructure, thus limiting future utilities impacts on visual resources. When considering current visual setting and future development that potentially would influence the visual character of the area, WAPA's Proposed Action and the proposed Project would have minor-to-moderate impacts on the visual quality in the vicinity.

3.13 Transportation

3.13.1 Affected Environment

Exit 119 off I-25 provided primary access to the proposed solar facility, which is located approximately 0.25 miles east of the Project Study Area. The remaining access routes to the Project vicinity were unpaved but county-maintained roads, including Ranch Colorado Boulevard, La Huerta View, La Questa View, and Boca Raton Heights.

The Burlington Northern/Santa Fe and Denver and Rio Grande railway ran parallel to I-25 approximately 0.5 miles east of the proposed Project Study Area. The closest airport to the proposed Project was the Butts Army Air Field on Fort Carson, approximately 7.5 miles north/northwest, while the nearest airport to offer commercial commuter service was Peterson Field in Colorado Springs, approximately 15.5 miles north/northeast of the proposed Project. The South Central Comprehensive Plan (El Paso County 1988) identified the County's goal was a well-integrated and balanced transportation system, and the plan sought to maximize efficiency, comfort, safety, and economy in the County's transportation planning.

3.13.2 Environmental Consequences

Impacts of WAPA's Proposed Action

Minimal impacts to traffic through implementation of WAPA's Proposed Action would occur. A negligible temporary increase in traffic volume of up to 10 round trips per day on existing transportation facilities may occur during construction and maintenance of facilities at Midway Substation, but would require no upgrades or improvements to transportation facilities. Road closures would not be required during construction.

Impacts of Midway Solar's Proposed Project

Negligible-to-minimal impacts to traffic would occur through implementation of the proposed Project. A temporary increase in traffic volume of up to 200 round trips per day on existing transportation facilities would occur during construction of the proposed solar facility components. An increase in traffic volume up to 10 round trips per day on existing transportation facilities would occur during O&M of the facility. The Project would not require improvements to existing transportation facilities nor are any road closures necessary. Midway Solar would construct or improve existing roads within the Project Study Area. Once constructed or improved, Midway Solar would regularly maintain access roads associated with the proposed

Project. The exact number, locations, and length of those roads would be determined during final engineering and site layout design. Midway Solar, at the time of this report, was planning 28 different access road segments totaling over 20 miles of roadways (Figure 2.1).

No impacts to rail service or air traffic would occur as a result of the Midway Solar's proposed Project.

Impacts of the No Action Alternative

The No Action Alternative would result in the proposed Project not being constructed, and therefore the impacts on transportation associated with the Proposed Action and Project would not occur.

Cumulative Impacts

Growth in El Paso County, specifically around Colorado Springs, had increased traffic congestion along I-25 in the years prior to this report. The South Central Comprehensive Plan (see El Paso County 1988) suggested that El Paso County was committed to maintaining a level of service, efficiency, comfort, and safety on all county roads to the benefit its residents' quality of life as well as travelers' safety. The proposed Project along with identified past, present, and reasonably foreseeable future developments would result in negligible to minor cumulative effects to traffic and transportation as construction traffic would be temporary and permanent impacts to traffic would only increase incrementally as a result of the proposed Project.

3.14 Public Health and Safety

3.14.1 Affected Environment

The El Paso County Sheriff's Office would provide law enforcement for the proposed Project, as they patrolled the unincorporated areas of the County and coordinate with the City of Fountain Police Department, the closest incorporated city to the Project Study Area. The Hanover Fire Protection District would provide fire and emergency services for the proposed Project.

The El Paso County Office of Emergency Management (OEM) provided coordination and direction of activities relating to disaster prevention, preparedness, response, and recovery to protect the lives of the citizens in the community. The Board of County Commissioners established the Local Emergency Planning Commission (LEPC) to assist in the development and review of chemical emergency response plans and to collect information about the use and storage of hazardous chemicals in El Paso County. The LEPC used this information to help fire and hazardous materials (HAZMAT) officers plan and safely respond to HAZMAT incidents, and to help citizens exercise their rights under the Federal Emergency Planning and Community Right-to-Know Act. Since mid-2013, 24 local governments have worked together to update and improve the El Paso County Hazard Mitigation Plan (HMP) under the coordination of the OEM and the Board of County Commissioners. The updated 2015 El Paso County HMP was a multi-jurisdictional plan that represents the concerns of the unincorporated county, as well as those of

participating incorporated municipalities and special districts (El Paso County 2015). The HMP was a tool to help a community reduce its risk from natural and human-caused hazards.

Electric and Magnetic Fields

The presence of high voltage electrical equipment tends to increase public concerns related to electric and magnetic fields (electromagnetic fields, or EMFs). These EMFs are physical fields produced by electrically charged objects. Both electric and magnetic fields occur together with the flow of electricity and thus considered together in terms of exposure. All electrical devices and equipment, including common household appliances, computers, and cell phones, produce EMFs that decrease rapidly with distance from the source. The nearest potential receptors of EMFs were residences to the west, approximately 260 ft to 360 ft from proposed solar arrays.

Different types of electricity produce different types of magnetic fields. Alternating current (AC), or electricity that oscillates directions, produces *power frequency* magnetic fields. The type of electricity that flows into our homes and powers most of our electrical appliances inside the home is AC. Direct current (DC), or electricity that flows in only one direction, produces magnetic fields that are referred to as *static* magnetic field, because they do not oscillate or change over time. DC is the electric energy associated with batteries, and occasionally with ultra-high voltage transmission lines (usually 500-kV or higher in the US) that transmit electricity over long distances. Direct current is also the electricity produced by PV solar panels. An important difference in magnetic fields is that power frequency magnetic fields, if sufficiently strong enough to induce an electrical current in humans, while static magnetic fields do not. Since static magnetic fields cannot induce a current in humans, static magnetic fields are generally considered not be a health concern.

The International Commission on Non-Ionizing Radiation Protection (ICNIRP) established a continuous magnetic field exposure limit of 833 milliGauss (mG) for AC power frequency magnetic fields, four million mG for DC static magnetic fields, and a continuous electric field exposure limit of 4.2-kV per meter (kV/m) for members of the general public (ICNIRP 2009). No federal or Colorado state laws or policies regulate exposure levels of EMF.

Hazardous Material

Colorado Department of Public Health and Environment, the agency that manages hazardous waste in Colorado (under the authority of CRS 25-15 Parts1-3), defines hazardous waste and the applicable regulations for Colorado. Construction, operation, maintenance, and decommissioning of the Project would utilize current industry standards and practices and would adhere to all regulatory codes, regulations, and guidelines applicable.

Two Phase I assessments were performed by Terracon for a large portion of the proposed Project, including the southeast corner where a former outdoor storage facility was located (Terracon 2013, 2014). In the Phase I that addressed this area, Terracon identified four potential recognized environmental conditions (as defined by ASTM standard E1527-13) or RECs and recommended additional investigation to evaluate and characterize the identified RECs. The four RECs identified included: gold mill tailings; stained 5-gallon buckets and 55-

gallon drums, piles of building debris, and piles of unknown debris. Midway Solar would avoid the southeast corner area for development of the proposed solar facilities.

Intact solar panels emit no hazardous waste. However, hazardous materials potentially housed and used during the construction, operation, or maintenance include small quantities (less than 55 gallons, 500 pounds, or 200 cubic ft (ft^3) of janitorial supplies, office supplies, laboratory supplies, paint, degreasers, herbicides, refrigerant or air conditioning fluids, fuels, and hydraulic fluid. These materials would be stored in the facility control building or stored off site. Furthermore, flammable materials (e.g., paints and solvents) kept on-site would be stored in flammable material storage cabinet(s).

3.14.2 Environmental Consequences

Impacts of WAPA's Proposed Action

WAPA's Proposed Action would be limited to a new 230-kV substation bay within the existing footprint of the Midway Substation and the gen-tie entry structure located outside the substation but within the WAPA's existing ROW. WAPA may also need to modify existing transmission lines entering and exiting the Midway Substation to accommodate the gen-tie line. If deemed necessary after final Project design and engineering, WAPA would design and construct any modification to lie within their existing ROW, similarly to the gen-tie entry structure.

All construction activities would be performed by licensed, experienced contractors and would be carried out in compliance with Occupational Safety and Health Administration (OSHA) and WAPA Construction Standards (Appendix B) to minimize the risk of construction-related accidents or injuries. Possible scenarios that have the potential to expose personnel to injury during construction included, but are not limited to, electrocution, the movement of construction vehicles, equipment, and materials, and accidents (such as slips, trips, or falls). The risk of construction-related injury would be minimized through careful safety planning, regular safety training and meetings, and use of appropriate safety equipment.

WAPA construction activities would be temporary. The installation of substation infrastructure, bus work, transformers, metering, etc., would be confined to WAPA's existing Midway Substation. The single gen-tie line entry structure would be erected in WAPA's existing ROW and require relative little disturbance. The primary conceivable threat to public health comes from particulate matter, dust, and emissions from vehicles and equipment. Construction emissions can vary from day-to-day depending on the level of activity, the specific operations, and the prevailing meteorological conditions. These emissions would be primarily fugitive dust emissions from earthmoving and construction vehicle exhaust emissions. WAPA would abide by their construction standards and would maintain dust-control measures to minimize fugitive dust. Furthermore, equipment and vehicles to be used during construction would be properly maintained to limit emissions during construction. Lastly, the nearest public receptors for potential health impacts are generally located west of WAPA's Proposed Action. Prevailing winds generally blow out of the west, which would help further minimize public impacts due to fugitive dust and vehicle and equipment emissions.

Public health and safety concerns associated with operation of the proposed solar facility were associated with electric and magnetic fields, hazardous materials management, and employee safety. Operations at the WAPA's Midway Substation would not change demonstrably after construction of the Proposed Action and proposed Project. As a result, there would be no additional demand from emergency services. Any potential additional hazardous material that may be required as a result of the new substation bay construction would be addressed in a revised WAPA SPCC plan. Additionally, EMF effects would be address through engineering controls to provide sufficient distance between new substation equipment and potential public access outside the substation to allow EMFs to subside. Furthermore, there are no receptors, houses, schools, offices, etc., within nearly 2,000 ft of the Midway Substation.

WAPA's Proposed Action would result in negligible public health and safety impacts associated with EMFs, worker safety, or hazardous materials due to the temporary timeframe of construction activities. Over the long term, minimal vehicular emissions associated with maintenance and repair of substation equipment would be released. Short-term construction activities or subsequent operation and maintenance associated with WAPA's Proposed Action would not measurably affect public health.

Impacts of Midway Solar's Proposed Project

The construction phase for the proposed Project would last far longer and involve more activity than construction activities associated with WAPA's proposed Action. Impacts associated with Midway Solar's construction activities would include fugitive dust and vehicle and equipment emissions. Dust and exhaust would likely temporarily degrade local air quality during construction and local sensitive receptors (e.g., hospitals, schools, etc.), the elderly, infants, and people with pre-existing respiratory issues may experience additional difficulties breathing as a result of construction. The severity of the impacts would depend on the health of the individuals affected. Construction crews would use water trucks to minimize fugitive dust and equipment would meet emission standards set by the State.

Licensed, experienced contractors would construct the proposed solar facility and carried out construction in accordance with OSHA Administration, WAPA Construction Standards (Appendix B), and the standard operating procedures of the selected construction firm to minimize the risk of construction-related accidents or injuries. Again, possible situations that may expose personnel to injury during construction included, but was not limited to, electrocution, the movement of construction vehicles, equipment, and materials, and accidents (such as slips, trips, or falls). The risk of construction-related injury would be minimized through careful safety planning, regular safety training and meetings, and use of appropriate safety equipment. While construction crews may vary in size and tasks, construction of the proposed Project would not place an unreasonable additional demand on police or emergency services.

As previously mentioned, Terracon identified four potential RECs and recommended additional investigation to evaluate and characterize the identified RECs. Midway Solar intends to avoid the southeast corner area for development of the proposed solar facilities. Additionally, hazardous materials would not be stored on site during construction until a secure location can

be established; however, fuels, lubricants, coolants, insulating materials, fireproofing, degreaser, and other potentially hazardous materials may be used or may be present during construction. All waste streams generated, including potential hazardous materials, would be disposed of off-site at a material-appropriate facility or recycled in accordance with federal, state, and local regulations, or according to manufacturers' recommendations.

The operation of the proposed Project would require at least one person on site monitoring daily operations. In general, the operation of this proposed facility would negligibly affect workers health and should not place additional demand on police or public emergency resources. Site maintenance and other requisite visits would result in negligible additional vehicle emissions or fugitive dust releases. Potential additional hazardous materials that may be stored or used on site would be addressed in a SPCC plan.

Intact solar panels emit no hazardous waste; however, cracked or broken panels have the potential to leech carcinogenic chemicals depending on the PV technology selected. All waste streams generated during operation and maintenance of the solar facilities would be disposed of off-site at a material-appropriate facility or recycled in accordance with federal, state, and local regulations, or in accordance with manufacturers' recommendations.

Operation of solar arrays and associated equipment, electrical collections systems, the gen-tie line, and Midway Solar's solar facility collection substation would generate EMFs. Potential EMFs associated with electrical equipment is directly associated to the voltage and current of the specific electrical source. The 230-kV gen-tie line, acting similarly to a 230-kV transmission line, would generate a maximum magnetic field magnitude of approximately 118 mG (Public Service Commission of Wisconsin [PSCW] 2013) and an electric field magnitude of approximately 2.1-kV/m (US EPA 1980) as measured at the center of the right-of-way. At approximately 50 ft away from a 230-kVtransmission line, electric field magnitude drops to about 40 mG (PSCW 2013), a reduction of 66%. Magnetic field magnitude drops more dramatically to about 0.4 kV/m (US EPA 1980), or around 80%, at 50 ft from the source. As indicated above, the ICNIRP has established a continuous magnetic field exposure limit of 833 mG and a continuous electric field exposure limit of 4.2 kV/m for members of the general public (ICNIRP 2009). The closest possible receptors for EMFs are residential properties located 250 ft to 360 ft to the west of the Project Study Area. As the distance from the source fields increases, the magnitudes of those fields decrease dramatically. At 250 ft away, the distance to the closest residential property, EMFs from a 230-kV transmission line would be negligible if distinguishable at all from background EMF levels, similar to the EMF emitted from a dishwasher at two ft (PSCW 2013). In addition, the 230-kV gen-tie line and solar facility collection substation would be located in close proximity to WAPA's Midway Substation, over 1,000 ft, to the nearest sensitive receptors and further weakening the effects of new EMFs on residential occupants.

Electrical assets in closest proximity to residences would consist of solar panels and inverters. Solar panels, again depending on technology used for this application, only produce in the order of 12 to 48 volts per panel as a maximum, far less than the 230-kV or 230,000 volts transferred through the proposed gen-tie line. In addition, current produced in the solar arrays would be DC.

Direct currents produce a different kind of magnetic field, a *static* field, since the current is not fluctuating. In most circumstances, static magnetic fields do not induce electric current in humans and are not generally considered a health concern. Studies performed by Pacific Gas and Electric in cooperation with the DOE, suggests a solar array would produce less than one mG of static magnetic field at the back of the array (array output of 11-15 kW; Chang and Jennings 1994). The ICNRP suggested constant exposure limit for static magnetic field magnitude of four million mG for the general public. As a result, EMFs produced by solar panels would not be considered a public health concern (Chang and Jennings 1994).

Inverters are used to take the low-voltage DC produced by the solar panels and convert that power to AC, while simultaneously stepping up the voltage to a level efficient to transmit to the associated solar facility collection substation. Inverters typically produce the strongest potential magnitude EMF within a solar field. Again, as exact technology to be used at the Midway Solar facility was not known at the time of this report, the specification of the inverters, including potential EMF, is unknown at this time. Based on published data by the Good Company in cooperation with the Oregon Department of Transportation (Good Company 2010), inverters used at the West Linn Solar Highway Project were determined to theoretically produce a magnetic field of 344 mG at a distance of three ft. This magnetic field was further estimated to maintain a magnitude of 3.0 mG at a distance of 10 ft. Assuming similar magnetic fields can be generated from inverters used at Midway Solar's solar facility, magnetic fields of 344 mG is less than half of the ICNIRP exposure limit guidelines for the public. Additionally, as described previously, the nearest receptors at residences are over 200 ft from the Project Study Area, further minimizing the magnitude of the magnetic fields. If inverters used in solar facilities can produce a magnetic field of 3.0 mG at a distance of 10 ft, the magnitude of that field would likely be negligible if discernable at all from background EMF at residential dwelling 250 to 360 ft away from the inverters.

Potential EMF impacts would further be minimized by design modifications, such as arrangement of conductors, transformers, and inverters. Therefore, there would be negligible differences in EMF magnitudes in the immediate area of potential receptors, namely residential properties. The magnitude of EMFs on site during operations and maintenance would be measureable. However, individuals working at the solar facility would not be required to remain within areas of higher EMFs for extended periods of time, thereby reducing their potential exposure to these fields. Effects caused by EMFs for the general public and workers at the solar facility would be negligible.

Impacts of the No Action Alternative

The No Action Alternative would result in the proposed Project not being constructed, and therefore the public health and safety impacts associated with the Proposed Action and Project as described above would not occur.

Cumulative Impacts

Construction activities, combined with an increase in traffic in the county, would exacerbate the public health impacts resulting from new development. However, due to the rural nature of the

proposed Project and distance to population centers in the county, the proposed Project would have negligible to minimal impacts, combined with past, present, and future development.

Collectively, the impacts associated with the construction, operation, and maintenance of the proposed solar facility would not cause or contribute to cumulative effects relating to hazardous materials management. This is because of the nature of the materials proposed, the Project's compliance with applicable laws and regulations, and the engineering and administrative controls that WAPA and Midway Solar would implement to prevent and control accidental releases of hazardous materials. Proper facility design and the development and implementation of safe material handling programs for the solar facility would reduce the potential for cumulative impacts from release of hazardous materials on the environment. Each reasonably foreseeable future project would be required to comply independently with hazardous materials regulations, depending on the circumstances of each project.

Cumulative impacts to public health and safety would occur only if impacts of the proposed Project, combined with impacts of the foreseeable future projects, occurred at the same time and in close proximity. Due to the negligible and temporary nature of the impacts of the Proposed Action and proposed Project, such events are unlikely. Therefore, the Proposed Action and proposed Project would not result in cumulative impacts to public health and safety.

3.15 Intentional Destructive Acts

3.15.1 Affected Environment

The DOE Office of NEPA Policy and Compliance issued guidance calling for explicit consideration of intentional acts of destruction (e.g., sabotage, terrorism, vandalism) within NEPA documents (US DOE 2006). The nation's power grid has been identified as critical infrastructure and a possible target of intentional acts of destruction. Possible agitators included terrorists who may target energy facilities to cause disruption and fear in the region or the country as a whole, or activists protesting the facility, company, or other reasons. The most likely scenario would be acts of copper theft, vandalism and opportunity, such as the shooting of insulators, conductors, or solar panels.

3.15.2 Environmental Consequences

Impacts of WAPA's Proposed Action

WAPA's transmission system and substation facilities near and within the Midway Substation may be the target of intentional acts of destruction. Intentionally destroying or damaging transmission line structures, conductors, or substation apparatus has the potential to disrupt electrical service to utility customers and end users, but the extent and duration of the outage would be dependent upon the degree and type of damage incurred. As opposed to terroristic acts, vandalism and theft are far more likely destructive acts. While sometimes costly and time consuming to repair, vandalism and theft does not usually result in long-term disruption of service or have apparent environmental consequences.

Federal and other utilities use physical deterrents, such as fencing, cameras, warning signs, and rewards, to help prevent theft, vandalism, and unauthorized access to facilities. In addition, through its Crime Witness Program, WAPA offers up to $25,000 for information that leads to the arrest and conviction of individuals committing crimes against WAPA facilities. Anyone having such information can call WAPA's Crime Witness Hotline at (800) 209-8962. The line is confidential and rewards are issued in such a way that the caller's identity remains confidential.

An incident of intentional destruction has the potential to occur at the WAPA's existing substation and transmission line facilities. If any such incident were to happen, it would likely only result in negligible-to-minor environmental impacts. The Proposed Action is not likely to increase the potential for intentional destructive acts being carried out against WAPA's Midway Substation as the existing substation is currently a target of opportunity for vandals and theft.

Impacts of Midway Solar's Proposed Project

Similar to any electric grid infrastructure, intentional destructive acts have the potential to be directed at the proposed solar facility or gen-tie line. Similar to the environmental impacts associated with WAPA's Proposed Action described above, the destruction of electrical equipment of any sort may result in temporary disturbance of electrical service to customers or end users. The extent and duration of the service interruption would be contingent on the type of equipment damaged and the degree of damage inflicted. Again, while a terrorist attack is possible, destruction due to vandalism and theft is far more probable. While it would likely be costly to repair, intentional destructive acts would not likely have substantial effects on the environment.

The proposed Project would likely increase the likelihood for intentional acts of destruction, as new infrastructure, namely hundreds of acres of solar panels, would increase prospective targets of opportunity.

Impacts of the No Action Alternative

The No Action Alternative would result in the proposed Project not being constructed, and therefore the potential for intentional destructive acts rendered against the proposed solar facility would not occur.

Cumulative Impacts

Under the No Action Alternative, WAPA's Midway Substation, PSCo's substation, Southwest Generation's natural gas fueled electric generation facility, and the associated transmission and distribution electrical lines in the vicinity would remain potential targets for intentional destructive acts. In addition, the small (less than 4,200 ft^2) Mountain States Telephone and Telegraph Company facility east of the substations may also be targeted for intentional acts of vandalism or destruction. However, the electrical and telecommunication facilities have some degree of security to deter such acts from occurring.

Implementation of the proposed Project would introduce new infrastructure into the region that would likely be viewed as a target for destructive acts. However, the solar facility would also include security measures to assist in deterring these intentional destructive acts from occurring.

4.0 LIST OF PREPARERS

Table 4.1 Summary of the preparers of this document.

Name	Agency or Company	Title
Andrew Montaño	Western Area Power Administration	NEPA Project Manager
Scott Zeimetz	Front Range-Midway Solar Project LLC	
James Tervo	Front Range-Midway Solar Project LLC	
Amber Zuhlke	Front Range-Midway Solar Project LLC	
Christopher Kinneer	Centennial Archaeology	Project Manager/Principal Investigator
Todd Mattson	WEST Inc.	Senior Project Manager
Gretchen Norman	WEST Inc.	Project Manager
Elizabeth Lack	WEST Inc.	Ecologist
David Taylor	WEST Inc.	Ecologist

5.0 List of Agencies Contacted

This section identifies the agencies that were contacted during the preparation of this EA.

5.1 Federal

US Department of the Army, Fort Carson Colorado

US Department of Energy Western Area Power Administration Rocky Mountain Region, P.O. Box 3700, Loveland Colorado

US Fish and Wildlife Service, Ecological Services, Colorado Field Office, Denver Colorado

5.2 Tribal

Northern Arapaho Tribe of the Wind River Reservation, Ms. Darlene Conrad Tribal Historic Preservation Officer, P.O. Box 396, Fort Washakie, Wyoming

Northern Arapaho Tribe of the Wind River Reservation, Honorable Darryll O'Neal , Sr., Northern Arapaho Business Council, P.O. Box 396, Fort Washakie, Wyoming

Shoshone Tribe, Honorable Darwin St. Clair Jr. Chairman, Shoshone Business Council, P.O. Box 538, Fort Washakie, Wyoming

Shoshone Tribe, Mr. Wilford Ferris III Tribal Historic Preservation Officer, P.O. Box 538Fort Washakie, Wyoming

Southern Ute Indian Tribe, Honorable Jimmy Newton, Jr. Chairman, 356 Ouray Drive, Ignacio, Colorado

Southern Ute Indian Tribe, Mr. Alden B. Naranjo NAGPRA Coordinator, P.O. Box 737, Ignacio Colorado

Ute Indian Tribe, Betsy Chapoose Director of Cultural Rights and Protection, P.O. Box 190, Fort Duchesne, Utah

Ute Indian Tribe, Honorable Gordon Howell Chairman, Uintah and Ouray Tribal Business Committee, P.O. Box 190, Fort Duchesne, Utah

Ute Mountain Ute Tribe, Chairman Gary Hayes, P.O. Box 248 Towaoc, Colorado

Ute Mountain Ute Tribe, NAGPRA Representative / THPO, P.O. Box 468, Towaoc, Colorado

5.3 State

Colorado Department of Parks and Wildlife, Southeast Region, 4255 Sinton Road Colorado Springs, Colorado

History Colorado, 1200 Broadway, Denver Colorado

5.4 Local

El Paso County Administration, 200 South Cascade Ave, Suite 100, Colorado Springs, Colorado

El Paso County Attorney Lori Seago, 200 South Cascade Avenue, Suite 200, Colorado Springs, Colorado

El Paso County Commissioner District 2 Any Lathen, 200 South Cascade Avenue, Colorado Springs, Colorado

El Paso County Commissioner District 4 Dennis Hisey, 200 South Cascade Avenue, Colorado Springs, Colorado

El Paso County Development Services, 2880 International Circle, Suite 110, Colorado Springs, Colorado

6.0 LITERATURE CITED

6.1 References

Argonne National Laboratories (Argonne). 2015. A Review of Avian Monitoring and Mitigation Information at Existing Utility-Scale Solar Facilities. April 2015. Available online at: http://www.evs.anl.gov/downloads/ANL-EVS_15-2.pdf

Avian Power Line Interaction Committee (APLIC). 2006. Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006. Public Interest Energy Research Program (PIER) Final Project Report CEC-500-2006-022. Edison Electric Institute, APLIC, and the California Energy Commission. Washington D.C. and Sacramento, California.

Centennial Archaeology (CA). 2015. A Class III Cultural Resources Inventory for the Front Range Midway Solar Project in El Paso County, Colorado (Draft). July 2015.

Chang, G. J. and C. Jennings. 1994. Magnetic Field Survey at PG&E Photovoltaic Sites. Pacific Gas and Electric Research and Development Department Report 007.5-94.6. August 1994.

Chapman, S.S., Griffith, G.E., Omernik, J.M, Price, A.B., Freeouf, J., and Schrupp, D.L. 2006. Ecoregions of Colorado (color poster with Map, descriptive text, summary tables, and photographs); Reston, Virginia, US Geological Survey (map scale 1:1,200,000).

Colorado Department of Public Health and Environment. 2015. Colorado Department of Public Health and Environment website. Accessed October 2014. Information available online at: https://www.colorado.gov/cdphe

Colorado Natural Heritage Program. 2014. Tracked Species. Updated September 2014. Bird species list: http://www.cnhp.colostate.edu/download/list/birds.asp; mammals: http://www.cnhp.colostate.edu/download/list/mammals.asp; amphibians and reptiles: http://www.cnhp.colostate.edu/download/list/amphibians_reptiles.asp; fish: http://www.cnhp.colostate.edu/download/list/fish.asp; arthropods and insects: http://www.cnhp.colostate.edu/download/list/arthropods_insects.asp; vascular plants: http://www.cnhp.colostate.edu/download/list/vascular.asp

El Paso County. 1988. El Paso County Land Use Department, South Central Comprehensive Plan. . El Paso County, Colorado. November 15, 1988.

El Paso County. 1996. Ordinance No. 96- 1: The Board of County Commissioners of the County of El Paso, Colorado an Ordinance Pertaining to the Control and Regulation of the Movement and Parking of Motor Vehicles on Public Property in the Unincorporated Territory of El Paso County. Effective 1996. Available online at: http://car2.elpasoco.com/clerkboard/doc/96-1.htm

El Paso County. 1997. EL Paso County Policy Plan. Accessed March 31, 2016. Avaialble online at: http://adm2.elpasoco.com/Planning/Policy-plan/page4.htm

El Paso County. 2013. El Paso County Development Services Department Land Development Code. Accessed August 4, 5, and 14, 2015. Available online at: http://adm.elpasoco.com/Development%20Services/Pages/LandDevelopmentCode.aspx

El Paso County. 2015. El Paso County Multi-Jurisdictional Hazard Mitigation Plan. Prepared by El Paso County, Colorado Public Services Department, Office of Emergency Management.

El Paso County. No date. El Paso County, Colorado, Consolidated Plan 2012-2016: A Five Year Housing and Community Development Strategy. Prepared by El Paso County, Colorado, Budget and Economic Development Department.

ESRI. 2015. Geographic Information System (GIS) Online Topographic Base Map and World Imagery Map. ESRI, producers of ArcGIS software. Redlands, California.

Federal Emergency Management Agency (FEMA). 1997. Flood Insurance Rate Map: El Paso County, Colorado and Incorporated Areas. Map No. 08041C1170F.

Good Company. 2010. Scaling Public Concerns of Electromagnetic Fields Produced by Solar Photovoltaic Arrays. Prepared for the Oregon Department of Transportation's West Linn Solar Project. Information available online at: http://www.oregon.gov/ODOT/HWY/OIPP/pages/slr_westlinn.aspx; Good Company report available at: http://www.oregon.gov/ODOT/HWY/OIPP/docs/emfconcerns.pdf

Homer, C. G., J. A. Dewitz, L. Yang, S. Jin, P. Danielson, G. Xian, J. Coulston, N. D. Herold, J. D. Wickham, and K. Megown. 2015. Completion of the 2011 National Land Cover Database for the Conterminous United States-Representing a Decade of Land Cover Change Information. Photogrammetric Engineering and Remote Sensing 81(5): 345-354. Available online from: http://www.mrlc.gov/nlcd2011.php

International Commission on Non-Ionizing Radiation Protection (ICNIRP). 2009. ICNIRP Statement on the "Guidelines for Limiting Exposure to Time-Varying Electric, Magnetic, and Electromagnetic Fields (up to 300 GHz)". Published in Health Physics. 2009. 97(3):257-258. Available online at: http://www.icnirp.org/cms/upload/publications/ICNIRPStatementEMF.pdf

Kagan, R. A., T. C. Viner, P. W. Trail, and E. O. Espinoza. 2014. Avian Mortality at Solar Energy Facilities in Southern California: A Preliminary Analysis. National Fish and Wildlife Forensics Laboratory, US Fish and Wildlife Service (USFWS), Ashland, Oregon. April 2014. Available online at: http://docketpublic.energy.ca.gov/publicdocuments/09-afc-07c/tn202538_20140623t154647_exh_3107_kagan_et_al_2014.pdf

Lukas, J., J. Barsugli, N. Doesken, I. Rangwala, and K. Wolter. 2014. Climate Change in Colorado: A Synthesis to Support Water Resources Management and Adaptation. A Report for the Colorado Water Conservation Board. Western Water Assessment.

North American Datum (NAD). 1983. NAD83 Geodetic Datum.

Public Service Commision of Wisconsin (PSCW). 2013. EMF Electric and Magnetic Fields. Availabe at: http://psc.wi.gov/thelibrary/publications/electric/electric12.pdf . Accessed April 11, 2016.

Sandia National Laboratories (Sandia). 2015. Solar Glare Hazard Analysis Tool (SGHAT). Sandia National Laboratories, managed and operated by Sandia Corporation, a wholly owned subsidiary of Lockheed Martin Corporation, for the US Department of Energy (DOE) National Nuclear Security Administration, DE-AC04-94AL85000. Sandia, Livermore, California. Available online from: http://www.sandia.gov/

Terracon Consulting Engineers and Scientist (Terracon). 2013. Phase I Environmental Site Assessment, Front Range-Midway Solar Project, LLC. Easement Property 9070 and 9310 Rancho Colorado Boulevard, Fountain, El Paso County, Colorado. Terracon Project No. 23137729. December 3, 2013.

Terracon Consulting Engineers and Scientist (Terracon). 2014. Phase I Environmental Site Assessment, Front Range-Midway Solar Project, LLC. Easement Property 9070 and 9310 Rancho Colorado Boulevard, Fountain, El Paso County, Colorado. Terracon Project No. 23147702. February 5, 2014.

Tetra Tech, Inc. (Tetra Tech). 2011. Midway to Geesen OPGW Installation Project Class III Cultural Resources Inventory. Tri-State G&T, Midway to Geesen OPGW Installation Project El Paso County, Colorado. July 2011.

Union of Concerned Scientists of the United States of America (UCSUSA). 2013. Environmental Impacts of Solar Power. Last revised March 5, 2013. Available online at: http://www.ucsusa.org/clean_energy/our-energy-choices/renewable-energy/environmental-impacts-solar-power.html#.VjlQiWtp5Zg

US Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS). 2015. Web Soil Survey. Accessed August 5 and 6, 2015. Available online at: http://websoilsurvey.nrcs.usda.gov

US Department of Energy (US DOE). 2006. Need to Consider Intentional Destructive Acts in NEPA Documents. US DOE Office of NEPA Policy and Compliance. Accessed August 5, 2015. Available online at: http://energy.gov/nepa/downloads/need-consider-intentional-destructive-acts-nepa-documents

US Environmental Protection Agency (US EPA).1980. Electric Fields Under Power Lines (Supplement to "An Examination of Electric Field Under EHV Overhead Power tansmission Lines). Information available at: http://nepis.epa.gov/Exe/ZyNET.exe/9100FL3V.TXT?ZyActionD=ZyDocument&Client=EPA&Index=1976+Thru+1980&Docs=&Query=&Time=&EndTime=&SearchMethod=1&TocRestrict=n&Toc=&TocEntry=&QField=&QFieldYear=&QFieldMonth=&QFieldDay=&IntQFieldOp=0&ExtQFieldOp=0&XmlQuery=&File=D%3A%5Czyfiles%5CIndex%20Data%5C76thru80%5CTxt%5C00000015%5C9100FL3V.txt&User=ANONYMOUS&Password=anonymous&SortMethod=h%7C-&MaximumDocuments=1&FuzzyDegree=0&ImageQuality=r75g8/r75g8/x150y150g16/i425&Display=p%7Cf&DefSeekPage=x&SearchBack=ZyActionL&Back=ZyActionS&BackDesc=Results%20page&MaximumPages=1&ZyEntry=1&SeekPage=x&ZyPURL# . Accessed on April 11, 2016.

US Environmental Protection Agency (US EPA). 2012a. National Ambient Air Quality Standards (NAAQS). Air and Radiation. US EPA, Washington, D.C. Updated December 14, 2012. Information available online at: http://www.epa.gov/air/criteria.html

US Environmental Protection Agency (US EPA). 2012b. Regulatory Impact Analysis for the Final Revisions to the National Ambient Air Quality Standards for Particulate Matter. EPA-452/R-12-005. US EPA, Office of Air Quality Planning and Standards, Health and Environmental Impacts Division, Research Triangle Park, North Carolina. December 2012.

US Environmental Protection Agency (US EPA). 2013. The 2011 National Emissions Inventory. Version 1 (released September 30, 2013). Technology Transfer Network, Clearinghouse for Inventories and Emissions Factors. US EPA, Washington, D.C. Available online at: http://www.epa.gov/ttnchie1/net/2011inventory.html

US Fish and Wildlife Service (USFWS). 2015. Endangered Species. Region 6, Mountain-Prairie Region: Montana, Wyoming, Utah, Colorado, North Dakota, South Dakota, Nebraska, and Kansas. USFWS, Denver, Colorado. Updated April 15, 2015. Information available online at: http://www.fws.gov/mountain-prairie/es/endangered.php

US Geological Survey (USGS). 2011. National Land Cover Database 2011 (NLCD 2011). Multi-Resolution Land Characteristics Consortium (MRLC), National Land Cover Database (NLCD). USGS Earth Resources Observation and Science (EROS) Center, Sioux Falls, South Dakota. Information available online at: http://www.mrlc.gov/nlcd2011.php; Legend information available at: http://www.mrlc.gov/nlcd11_leg.php

USA Topo. 2015. USA Topo Maps. US Geological Survey (USGS) topographical maps for the United States. ArcGIS. ESRI, producers of ArcGIS software. Redlands, California.

Warren, Bradley S, Senior Vice President and Regional Manager. 2015. Memeorandum to Carol M Borgstrom, GC-54, Washinton, DC Director, Office of NEPA Policy and Compliance. Subject: Environemtnal Assesment for teh Front Range Midway Solar Project, LLC.

Western EcoSystems Technology, Inc. (WEST). 2014. Sources of Avian Mortality and Risk Factors Based on Empirical Data from Three Photovoltaic Solar Facilities. Technical report prepared for First Solar. June 2014.

Western EcoSystems Technology, Inc. (WEST). 2015. Front Range Midway Solar Project Wetlands, Waterbodies, and Threatened, Endangered, and Species of Special Concern Survey Report. Prepared for Front Range Midway Solar, LLC. July 23, 2015.

6.2 Laws, Acts, and Regulations

16 United States Code (USC) 470 et seq. 1966. Title 16 - Conservation; Chapter 1a - Historic Sites, Buildings, Objects, and Antiquities; Subchapter II - National Historic Preservation; Sections (§§) 470 et seq. 16 USC 470 et seq.

16 United States Code (USC) 661-667e. 1958. Title 16 - Conservation; Chapter 5a - Protection and Conservation of Wildlife; Subchapter I - Game, Fur-Bearing Animals, and Fish; Sections (§§) 661-667e. 16 USC 661-667e. [Act of March 10, 1934; Chapter (Chap.) 55; 48 Statute (Stat.) 401, as amended by the Act of June 24, 1936, Ch. 764, 49 Stat. 913; the Act of August 14, 1946, Ch. 965, 60 Stat. 1080; the Act of August 5, 1947, Ch. 489, 61 Stat. 770; the Act of May 19, 1948, Ch. 310, 62 Stat. 240; Public Law (P.L.) 325, October 6, 1949, 63 Stat. 708; P.L. 85-624, August 12, 1958, 72 Stat. 563; and P.L. 89-72, 79 Stat. 216, July 9, 1965.].

16 United States Code (USC) 1531-1544. 1973. Title 16 - Conservation; Chapter 35 - Endangered Species; Sections (§§) 1531-1544. 16 USC 1531-1544.

36 Code of Federal Regulations (CFR) 60.4. 2011. Title 36 - Parks, Forests, and Public Property; Chapter I - National Park Service, Department of the Interior; Part 60 - National Register of Historic Places; Section 60.4 - Criteria for Evaluation. 36 CFR 60.4. Available online at: http://www.gpo.gov/fdsys/pkg/CFR-2012-title36-vol1/pdf/CFR-2012-title36-vol1-sec60-4.pdf

36 Code of Federal Regulations (CFR) 800.16. 2000. Title 36 - Parks, Forests, and Public Property; Chapter VIII - Advisory Council on Historic Preservation; Part 800 - Protection of Historic Properties; Subpart C - Program Alternatives; Section 800.16 - Definitions. 36 CFR 800.16. [65 Federal Register (FR) 77725, December 12, 2000, as amended at 69 FR 40555, July 6, 2004]. Available online at: http://www.gpo.gov/fdsys/pkg/CFR-2011-title36-vol3/pdf/CFR-2011-title36-vol3-sec800-16.pdf

40 Code of Federal Regulations (CFR) 112. 1973. Title 40 - Spill Prevention Control and Countermeasure Plans: Part 112 - Oil Pollution Prevention. 40 CFR 112. [33 United States Code (USC) 1251 et seq. 38 Federal Register (FR) 34165, December 11, 1973, unless otherwise noted.]. Available online at: http://www.ecfr.gov/cgi-bin/text-idx?SID=c66ae9c672de1d7813795d85d426b757&mc=true&node=pt40.22.112&rgn=div5

American Indian Religious Freedom Act. 1978. Title 42 - the Public Health and Welfare; Chapter 21 - Civil Rights; Subchapter I - Generally; Section 1996 - Protection and Preservation of Traditional Religions of Native Americans. 42 United States Code (USC) 1996. [Pub. L. 95-341, §1, Aug. 11, 1978, 92 Stat. 469.]. Available online at: http://www.gpo.gov/fdsys/pkg/USCODE-2010-title42/pdf/USCODE-2010-title42-chap21-subchapI-sec1996.pdf

Archaeological Resources Protection Act (ARPA). 1979. 16 United States Code (USC) §§ 470aa-470mm. October 31, 1979.

Clean Air Act (CAA). 1970. 42 United States Code (USC) §§ 7401-7671q.

Clean Water Act. 1972. 33 United States Code § 1251-1387. October 18, 1972.

Colorado Revised Statutes (CRS) 25-15, Parts 1-3. 1979. Title 25. Health; Article 15. Hazardous Waste; Parts 1-3. CRS 25-15, Parts 1-3. Information available online at: http://www.lexisnexis.com/hottopics/Colorado/

Colorado Revised Statutes (CRS) 33-2-101. 1985. Title 33. Parks and Wildlife; Article 2. Nongame and Endangered Species Conservation; Section 101. Colorado Nongame, Endangered, or Threatened Species Conservation Act. CRS 33-2-101. [L. 84: Entire article R&RE, p. 862, § 1, effective January 1, 1985.]. Information available online at: http://www.lexisnexis.com/hottopics/Colorado/

Colorado Revised Statutes (CRS) 33-5-101-107. 1963. Title 33. Parks and Wildlife; Article 5. 5. Protection of Fishing Streams; §§ 101-107. CRS 33-2-101 - 107. [L. 69: p. 458, § 7. CRS 1963: § 62-14-7]. Information available online at: http://www.lexisnexis.com/hottopics/Colorado/

Colorado State Statute 33. Title 33. Parks and Wildlife. Colorado Revised Statutes (CRS) Annotated (Ann.). CRS 33, Articles 1-60. Information available online at: http://www.lexisnexis.com/hottopics/Colorado/

Colorado Revised Statutes (CRS) 33-2-102 -106. 1985. Title 33. Parks and Wildlife; Article 2. Nongame and Endangered Species Conservation; §§ 102-106. CRS 33-2-102 - 106. [L. 84: Entire article R&RE, p. 862, § 1, effective January 1, 1985.]. Information available online at: http://www.lexisnexis.com/hottopics/Colorado/

Colorado Senate Bill 40 (SB40). Senate Bill 40: Colorado Revised Statutes (CRS) 33-5-101-107, as amended.

Endangered Species Act (ESA). 1973. 16 United States Code (USC) §§ 1531-1544, Public Law (PL) 93-205, December 28, 1973, as amended, PL 100-478 [16 USC 1531 *et seq.*]; 50 Code of Federal Regulations (CFR) 402.

Executive Order 13007. 1996. Indian Sacred Sites. 61 Federal Register (FR) 104. May 24, 1996.

Federal Emergency Planning and Community Right-to-Know Act. 1986. Title 42 - the Public Health and Welfare; Chapter 116 - Emergency Planning and Community Right-to-Know. 42 United States Code (USC) 116. [Pub. L. 99–499, Title III, §301, October 17, 1986, 100 Stat. 1729.]. Available online at: http://www.gpo.gov/fdsys/pkg/USCODE-2010-title42/html/USCODE-2010-title42-chap116.htm

Federal Power Act. 1920. Federal Regulation and Development of Power, June 10, 1920. 16 United States Code (USC) 12 §§ 791-828c; Chapter 285, June 10, 1920; 41 Statute [Stat.] 1063.) as amended by: Chapter 129, March 3, 1921; 41 Stat. 1353.; Chapter 572, June 23, 1930; 46 Stat. 799.; Chapter 687, August 26, 1935; 49 Stat. 803.; Chapter 782, October 28, 1949; 63 Stat. 954.; Public Law (P.L.) 247, October 31, 1951; 65 Stat. 701.; P.L. 87-647, September 7, 1962; 76 Stat. 447.; P.L. 95-617, November 9, 1978; 92 Stat. 3117.; P.L. 96-294, June 30, 1980; 94 Stat. 611.; P.L. 97-375, December 21, 1982; 96 Stat. 1819.; P.L. 99-495, October 16, 1986; 100 Stat. 1243.; P.L. 102-486, October 24, 1992; 106 Stat. 3097.; P.L. 103-347, November 2, 1994; 108 Stat. 4585.; P.L. 104-66, December 21, 1995; 109 Stat. 718.

Land Development Code of El Paso County, Colorado. Authority including, but not limited to the CRS §§22-32-124 et seq. (Zoning, Planning and Building Code Duties of School Boards); §§ 24-65-101-106 et seq. (Colorado Planning Act) Repealed June 1, 2005; §§ 24-65.1-101 et seq. (Areas of State Interest); §§ 24-67-101 et seq. (Planned Unit Development); §§ 24.68-101 et seq. (Vested Rights); §§ 29-20-101 et seq. (Local Government and Land Use Control Enabling Act); §§ 30-11-101 et seq. (County Powers and Functions); §§ 30-15-101 et seq. (County Regulations Under Police Powers); §§ 30-20-100.5 et seq. (Solid Wastes Disposal Sites and Facilities); §§ 30-28-101 et seq. (County Planning, Zoning, Subdivision); §§ 31-12-101 et seq. (Municipal Annexation); §§ 32-1-101 et seq. (Special District Act/Provisions); §§ 33-1-101 et seq. (Wildlife); §§ 33-2-101 et seq. (Endangered Species Conservation); §§ 34-1-301 et seq. (Preservation of Commercial Mineral Deposits); §§ 38-30.5-101 et seq. (Conservation Easements); §§ 41-4-101 et seq. (Airports); §§ 43-2-101 et seq. (Highways). Updated October 2015. Available online at: http://adm.elpasoco.com/Development%20Services/Pages/LandDevelopmentCode2015.aspx

Land Development Code of El Paso County, Colorado. Guidelines and Regulations for Areas and Activities of State Interest. Authority Colorado Regulatory Statutes (CRS) §§24-65.1-101 et seq.; CRS §§ 30-28-101 et seq.; CRS §§ 30-28-201 et seq.; CRS §§ 29-20-101 et seq. Adopted June 6, 2013. Available online at: http://adm.elpasoco.com/Development%20Services/Documents/1041%20Regulations/4-8-15%20Areas%20Activities%20State%20Int.pdf

National Environmental Policy Act (NEPA). 1970. 42 United States Code (USC) 4321-4370h. Public Law 91–190, § 2, January 1, 1970, 83 Statute 852.

National Historic Preservation Act (NHPA). 1966. 16 United States Code §§ 470 et seq. October 15, 1966.

Native American Graves Protection and Repatriation Act (NAGPRA). 1990. 25 United States Code (USC) §§ 3001-3013. November 16, 1990.

Appendix A: Front Range Midway Solar Project Community Announcement and Information Guide

Front Range-Midway Solar, LLC &
Tradewind Energy, Inc.

Contact Us:

Front Range-Midway Solar Project, LLC.
c/o Tradewind Energy, Inc.

Learn more at www.tradewindenergy.com

For more information from the project developer:

Scott Zeimetz
Development Manager
913-956-4080
szeimetz@tradewindenergy.com

To provide comments to Western on the NEPA process, please email or submit written comments to:

MidwaySolarScoping@west-inc.com

WEST, Inc.

Attn: Front Range-Midway Solar Project Scoping

415 W. 17th Street, Suite 200

Cheyenne, WY 82001

Comments must be submitted by September 10, 2015

WEST, Inc. is the third party contractor assisting Western and Front Range-Midway Solar, LLC in preparation of the EA.

Front Range-Midway Solar Project, LLC.
16105 W 113th Street STE 105
Lenexa, KS 66219

The Front Range-Midway Solar Project

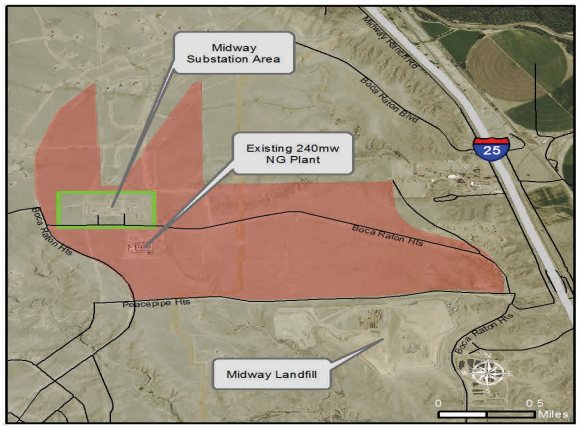
Community Announcement and Information Guide

The Front Range-Midway Solar Project, LLC, a subsidiary of Tradewind Energy, Inc. is planning a 100-megawatt solar array in southern El Paso County and is seeking your feedback.

tradewind energy

Basic Facts about the Front Range-Midway Project:

- **Energy Output:** 100 MW of Solar Energy
- **Project Area:** Approximately 1,000 Acres
- **Location:** El Paso County, approximately 10 mi south of Fountain, CO
- **Technology:** Ground-mounted photovoltaic (PV) panels, up to 10 feet in height
- **New Infrastructure:** PV panels, electric collection system, substation, and power line
- **Power Interconnection:** Existing Western Area Power Administration or PSCo Substations located adjacent to Project Area.
- **Timeline:** Construction anticipated for a 2016 commercial operation date
- **Water Friendly Energy:** Solar energy uses a fraction of the water that conventional sources need to generate power



Land being studied as part of NEPA process

Project Benefits

The project will generate revenues for the local community in the form of property tax and landowner payments and will create both temporary construction jobs as well as several full-time employee positions

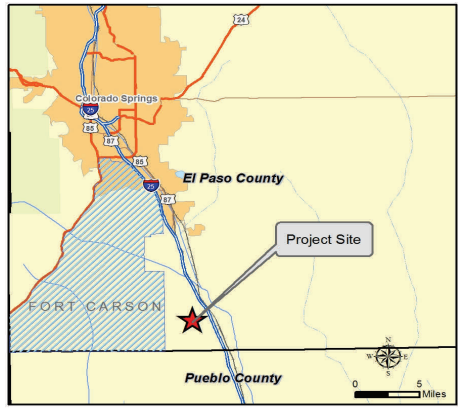
- **4 Full Time Jobs**
- **200 Construction Jobs**
- **Over $8 Million in tax revenue will be created from the facility. A large portion of these dollars will flow to the local school district.**

About Front Range-Midway Solar

- **Sustainable energy for all:** The company developing this project is one of the largest wind and solar project development companies in the U.S. We deliver long-term projects that tap into nature's resources to produce sustainable energy for our nation - real power that keeps our energy costs low.
- **Beyond the business:** We strive to be a committed partner to the communities where we work. Our projects are not just investments in sustainable electricity generation; they are investments in towns, counties, and the amazing people we have the privilege to work with.

National Environmental Policy Act and Public Input

- **Interconnection:** Front Range-Midway Solar is working with Western Area Power Administration to obtain an interconnection agreement
- **NEPA:** As a Federal power-marketing agency, Western must comply with the National Environmental Policy Act (NEPA)
- **Environmental Assessment:** Preparation of an Environmental Assessment (EA) is a requirement of the NEPA process
- **Public Input:** In preparing the EA, Front Range-Midway Solar and Western are seeking public comments on the Project which will be incorporated into the EA. In addition, a Draft EA will be released for public review and comment late in 2015. Notice of the Draft EA's availability for comment will be published in the Colorado Springs Gazette.
- **Comments:** Comments from the public help in identifying issues and concerns about the proposed project
- **Comment Deadline:** Comments must be submitted via mail or email by September 10, 2015 using the contact information located on the **Contact Us** page of this brochure.



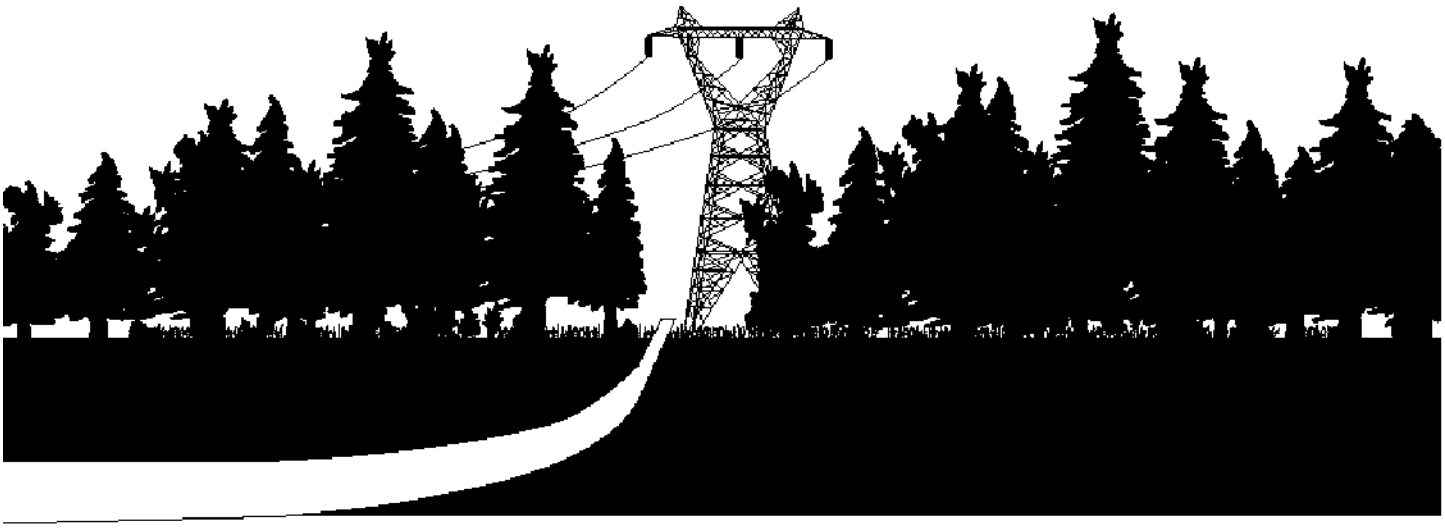
Appendix B: Western Area Power Administration's Construction Standards, Standard 13 Environmental Quality Protection

Western
AREA POWER
ADMINISTRATION

CONSTRUCTION STANDARDS

STANDARD 13

ENVIRONMENTAL QUALITY PROTECTION



July 2009

SAFETY
A HABIT TO LIVE BY

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SECTION 13.1--CONTRACTOR FURNISHED DATA

1. RECYCLED MATERIAL QUANTITY REPORT: Submit quantities for recycled material listed in Section 13.6, "Recycled Material Quantities", to the COR after completion and prior to submittal of final invoice.

2. RECOVERED MATERIAL AND BIOBASED PRODUCTS REPORT: Provide the COR the following information for purchases of items listed in Section 13.7, "Use of Recovered Material And Biobased Products":

   (1) Quantity and cost of listed items with recovered or biobased material content and quantity and cost of listed items without recovered or biobased material content after completion and prior to submittal of final invoice.

3. RECLAIMED REFRIGERANT RECEIPT: A receipt from the reclaimer stating that the refrigerant was reclaimed, the amount and type of refrigerant, and the date shall be submitted to the COR after completion and prior to submittal of final invoice in accordance with Section 13.8.5, —Refrigerants And Receipts".

4. WASTE MATERIAL QUANTITY REPORT: Submit quantities of total project waste material disposal as listed below to the COR after completion and prior to submittal of final invoice in accordance with Section 13.8.8, —Waste Material Quantity Report".

   (1) Sanitary Wastes: Volume in cubic yards or weight in pounds.

   (2) Hazardous or Universal Wastes: Weight in pounds.

   (3) PCB Wastes: Weight in pounds.

   (4) Other regulated wastes (e.g., lead-based paint or asbestos): Weight in pounds (specify type of waste in report).

5. SPILL PREVENTION NOTIFICATION AND CLEANUP PLAN (Plan): Submit the Plan as described in Section 13.10.2, "Spill Prevention Notification and Cleanup Plan", to the COR for approval 14 days prior to start of work. Approval of the Plan is for the purpose of determining compliance with the specifications only and shall not relieve the Contractor of the responsibility for compliance with all Federal, State, and Local regulations.

6. TANKER OIL SPILL PREVENTION AND RESPONSE PLAN: Submit the Plan as described in Section 13.10.3, "Tanker Oil Spill Prevention and Response Plan", to the COR for approval 14 days prior to start of work. Approval of the Plan is for the purpose of determining compliance with the specifications only and shall not relieve the Contractor of the responsibility for compliance with all Federal, State, and Local regulations.

7. PESTICIDE USE PLAN: Submit two copies of a pesticide use plan as described in Section 13.11.3, —Pesticide Use Plan", to the COR for approval 14 days prior to use. Approval of the plan is for the purpose of determining compliance with the specifications only and shall not relieve the Contractor of the responsibility for compliance with all Federal, State, and Local regulations. Within seven days after application, submit a written report in accordance with Standard 2 – Sitework, Section 2.1.1.5, —Soil-Applied Herbicide".

8. TREATED WOOD POLE AND MEMBERS RECYCLING CONSUMER INFORMATION RECEIPT: Submit treated wood pole and members consumer receipt forms to the COR after completion and prior to submittal of final invoice (see 13.12, —Treated Wood Poles and Members Recycling or Disposal").

9. PREVENTION OF AIR POLLUTION: Submit a copy of permits, if required, from Federal, State, or local agencies to the COR 14 days prior to the start of work.

10. ASBESTOS LICENSES OR CERTIFICATIONS: Submit a copy of licenses and/or certifications for asbestos work as described in 13.14, —Handling and Management of Asbestos Containing Material" paragraph a., to the COR prior to work. Submit copies of certificates of disposal and/or receipts for waste to the COR after completion and prior to submittal of final invoice.

11. LEAD PAINT NOTICES: Submit a copy of lead paint notices as described in 13.15, —Material with Lead-based Paint" paragraph b., to the COR upon completion and prior to submittal of final invoice. Submit copies of certificates of disposal and/or receipts for waste to the COR after completion and prior to submittal of final invoice.

12. WATER POLLUTION PERMITS: Submit copies of any water pollution permits as described in 13.16, —Prevention of Water Pollution" paragraph b., to the COR prior to work.

13. PCB TEST REPORT: Submit a PCB test report as described in 13.17, —Testing, Draining, Removal, and Disposal of Oil-filled Electrical Equipment" paragraph b., prior to draining, removal, or disposal of oil or oil-filled equipment that is designated for disposal.

14. OIL AND OIL-FILLED ELECTRICAL EQUIPMENT RECEIPT: Obtain and submit a receipt for oil and oil-filled equipment transported and disposed, recycled, or reprocessed as described in 13.17, —Testing, Draining, Removal, and Disposal of Oil-filled Electrical Equipment", to the COR upon completion and prior to submittal of final invoice.

15. OSHA PCB TRAINING RECORDS: Submit employee training documentation records to the COR 14 days prior to the start of work as described in 13.18.1.

16. CLEANUP WORK MANAGEMENT PLAN: Submit a Cleanup Work Management Plan as described in 13.18, —Removal of Oil-contaminated Material" paragraph b., to the COR for approval 14 days prior to the start of work. Approval of the plan is for the purpose of determining compliance with the specifications only and shall not relieve the Contractor of the responsibility for compliance with all Federal, State, and Local regulations.

17. POST CLEANUP REPORT: Submit a Post-Cleanup Report as described in 13.18, —Removal of Oil-contaminated Material" paragraph g., to the COR upon completion and prior to submittal of final invoice.

SECTION 13.2--ENVIRONMENTAL REQUIREMENTS

Comply with Federal, State, and local environmental laws and regulations. The sections in this Standard further specify the requirements.

SECTION 13.3--LANDSCAPE PRESERVATION

1. GENERAL: Preserve landscape features in accordance with the contract clause titled —Protection of Existing Vegetation, Structures, Equipment, Utilities, and Improvements.‖

2. CONSTRUCTION ROADS: Location, alignment, and grade of construction roads shall be subject to the COR's approval. When no longer required, construction roads shall be restored to their original condition. Surfaces of construction roads shall be scarified to facilitate natural revegetation, provide for proper drainage, and prevent erosion. If re-vegetation is required, use regionally native plants.

3. CONSTRUCTION FACILITIES: Shop, office, and yard areas shall be located and arranged in a manner to preserve trees and vegetation to the maximum practicable extent and prevent impact on sensitive riparian areas and flood plains. Storage and construction buildings, including concrete footings and slabs, shall be removed from the site prior to contract completion. The area shall be re-graded as required so that all surfaces drain naturally, blend with the natural terrain, and are left in a condition that will facilitate natural revegetation, provide for proper drainage, and prevent erosion or transport of sediment and pollutants. If re-vegetation is required, use regionally native plants.

SECTION 13.4--PRESERVATION OF CULTURAL AND PALEONTOLOGICAL RESOURCES

1. GENERAL: Do not remove or alter cultural artifacts or paleontological resources (fossils). Cultural artifacts may be of scientific or cultural importance and include bones, pottery, glass, projectile points (arrowheads), other stone or metal tools, historic buildings, and features. Paleontological resources can be of scientific importance and include mineralized animals and plants or trace fossils such as footprints. Both cultural and paleontological resources are protected by Federal Regulations during Federal construction projects. Contractor must always stay within Western's right-of-way and/or easement.

2. KNOWN CULTURAL OR PALEONTOLOGICAL SITES: Following issuance of notice to proceed, Western will provide two sets of plan and profile drawings showing sensitive areas located on or immediately adjacent to the transmission line right-of-way and/or facility. These areas shall be considered avoidance areas. Prior to any construction activity, the avoidance areas shall be marked on the ground in a manner approved by the COR. Instruct employees, subcontractors, and others that vehicular or equipment access to these areas is prohibited. If access is absolutely necessary, first obtain approval from the COR. Western will remove the markings during or following final cleanup. For some project work, Western will require an archaeological, paleontological or tribal monitor at or near cultural or paleontological site locations. The contractor shall work with the monitor to insure that sensitive locations are avoided. Where monitors are required, the monitor shall meet with the crew each morning to go over the day's work. The monitor will also conduct awareness training for all contractors prior to any work in the field. Untrained personnel shall not be allowed in the construction area. For areas designated as sensitive and requiring a monitor, the contractor may not access those areas without a monitor being present.

3. UNKNOWN CULTURAL OR PALEONTOLOGICAL SITES: On rare occasions cultural or paleontological sites may be discovered during excavation or other earth-moving activities.

   (1) Reporting: If evidence of a cultural or paleontological site is discovered, cease work in the area immediately and notify the COR of the location and nature of the findings. If a monitor is present, the monitor should also be notified. Stop all activities within a 200-foot radius of the discovery and do not proceed with work within that radius until directed to do so by the COR.

   (2) Care of Evidence: Protect the area. Do not remove, handle, alter, or damage artifacts or fossils uncovered during construction.

SECTION 13.5--NOXIOUS WEED CONTROL

1. GENERAL: Comply with Federal, state, and local noxious weed control regulations. Provide a "clean vehicle policy" while entering and leaving construction areas to prevent transport of noxious weed plants and/or seed. Transport only construction vehicles that are free of mud and vegetation debris to staging areas and the project right-of-way.

SECTION 13.6--RECYCLED MATERIAL QUANTITIES

1. GENERAL: Record quantities of the following material by category that is salvaged, recycled, reused, or reprocessed:

   (1) Transformers, Breakers: Weight without oil.

   (2) Electrical Conductors: Length in feet and Type (for example, ACSR, Copper, and gauge).

   (3) Steel: Weight in pounds or tons.

   (4) Aluminum: Weight in pounds or tons

   (5) Copper: Weight in pounds or tons..

   (6) Other Metals: Weight in pounds or tons.

   (7) Oil: Gallons (separate by type - less than 2 ppm PCB, 2 to 50 ppm PCB, and 50 or greater ppm PCB).

   (8) Gravel, Asphalt, Or Concrete: Weight in pounds or tons.

   (9) Batteries: Weight in pounds.

   (10) Wood Poles and Crossarms: Weight in pounds.

   (11) Wood construction material: Weight in pounds.

   (12) Cardboard: Weight in pounds.

   (13) Porcelain insulators: Weight in pounds.

2. RECYCLED MATERIAL QUANTITY REPORT: Submit quantities for recycled material listed above to the COR after completion and prior to submittal of final invoice.

SECTION 13.7--USE OF RECOVERED MATERIAL AND BIOBASED PRODUCTS

1. RECOVERED MATERIAL PRODUCTS: If the products listed below are obtained as part of this project, purchase the items with the highest recovered material content possible unless recovered material products are not available: 1) competitively within a reasonable time frame; 2) meeting reasonable performance standards as defined in the Standards or Project Specifications; or 3) at a reasonable price.

   (1) Construction Products:

      1) Building Insulation Products.

      2) Carpet.

      3) Carpet cushion.

      4) Cement and concrete containing coal fly ash, ground granulated blast furnace slag, cenospheres, or silica fume.

      5) Consolidated and reprocessed latex paint.

      6) Floor Tiles.

      7) Flowable fill.

      8) Laminated Paperboard.

      9) Modular threshold ramps.

      10) Nonpressure pipe.

      11) Patio Blocks.

      12) Railroad grade crossing surfaces.

      13) Roofing materials.

      14) Shower and restroom dividers/partitions.

      15) Structural Fiberboard.

   (2) Landscaping Products:

      1) Compost made from yard trimmings or food waste.
      2) Garden and soaker hoses.
      3) Hydraulic Mulch.
      4) Lawn and garden edging.
      5) Plastic lumber landscaping timbers and posts.

   (3) Non-paper Office Products:

      1) Binders, clipboards, file folders, clip portfolios, and presentation folders.
      2) Office furniture.
      3) Office recycling containers.
      4) Office waste receptacles.
      5) Plastic desktop accessories.

6) Plastic envelopes.
7) Plastic trash bags.
8) Printer ribbons.
9) Toner cartridges.

(4) Paper and Paper Products:

1) Commercial/industrial sanitary tissue products.
2) Miscellaneous papers.
3) Newsprint.
4) Paperboard and packaging products.
5) Printing and writing papers.

(5) Park and Recreation Products:

1) Park benches and picnic tables.
2) Plastic fencing.
3) Playground equipment.
4) Playground surfaces.
5) Running tracks.

(6) Transportation Products:

1) Channelizers.
2) Delineators.
3) Flexible delineators.
4) Parking stops.
5) Traffic barricades.
6) Traffic cones.

(7) Vehicular Products:

1) Engine coolants.
2) Rebuilt Vehicular Parts.
3) Re-refined lubricating oils.
4) Retread tires.

(8) Miscellaneous Products:

1) Awards and plaques.
2) Bike racks.
3) Blasting grit.
4) Industrial drums.
5) Manual-grade strapping.
6) Mats.
7) Pallets.
8) Signage.
9) Sorbents.

(9) For a complete listing of products and recommendations for recovered content, see http://www.epa.gov/cpg/products.htm

2. BIOBASED PRODUCTS: If the products listed below are obtained as part of this project, purchase the items with the highest biobased content possible and no less than the percent indicated for each product unless biobased products are not available: 1) competitively within a reasonable

time frame; 2) meeting reasonable performance standards as defined in the Standards or Project Specifications; or 3) at a reasonable price.

(1) Mobile Equipment Hydraulic Fluids (minimum 24% biobased content).

(2) Urethane Roof Coatings (minimum 62% biobased content).

(3) Water Tank Coatings (minimum 62% biobased content).

(4) Diesel Fuel Additives (minimum 93% biobased content).

(5) Penetrating Lubricants (minimum 71% biobased content).

(6) Bedding, Bed Linens, and Towels (minimum 18% biobased content).

(7) Adhesive and mastic removers 58%.

(8) Plastic insulating foam for residential and commercial construction 7%.

(9) Hand cleaners and sanitizers.

1) Hand cleaners—64 %
2) Hand sanitizers (including hand cleaners and sanitizers)—73 %

(10) Composite panels.

1) Plastic lumber composite panels—23 %
2) Acoustical composite panels—37 %
3) Interior panels—55 %
4) Structural interior panels—89 %
5) Structural wall panels—94 %

(11) Fluid-filled transformers.

1) Synthetic ester-based fluid-filled transformers—66 %
2) Vegetable oil-based fluid-filled transformers—95 %

(12) Disposable containers 72%.

(13) Fertilizers 71%.

(14) Sorbents 89%.

(15) Graffiti and grease removers 34%.

(16) 2-Cycle engine oils 34%.

(17) Lip care products 82%.

(18) Films (used in packaging, wrappings, linings, and other similar applications).

1) Semi-durable films—45%
2) Non-durable films—85%

(19) Stationary equipment hydraulic Fluids 44%.

(20) Disposable cutlery 48%.

(21) Glass cleaners 49%.

(22) Greases.

1) Food grade grease—42%
2) Multipurpose grease—72%
3) Rail track grease—30%
4) Truck grease—71%
5) Greases not elsewhere specified—75%

(23) Dust suppressants 85%.

(24) Carpets 7%.

(25) Carpet and upholstery cleaners.

1) General purpose cleaners—54%
2) Spot removers—7%

(26) Bathroom and spa cleaners 74%.

(27) Concrete and asphalt release fluids 87%.

(28) General purpose de-icers 93%.

(29) Firearm lubricants 49%.

(30) Floor strippers 78%.

(31) Laundry products.

1) Pretreatment/spot removers—46%
2) General purpose laundry products—34%

(32) Metalworking fluids.

1) Straight oils—66%
2) General purpose soluble, semisynthetic, and synthetic oils—57%
3) High performance soluble, semisynthetic, and synthetic oils—40%

(33) Wood and concrete sealers.

1) Penetrating liquids—79%
2) Membrane concrete sealers—11%

For additional information regarding biobased products, see **http://www.biobased.oce.usda.gov**

3. RECOVERED MATERIAL AND BIOBASED PRODUCTS REPORT: Provide the COR the following information for purchases of those items listed above:

(1) Quantity and cost of listed items with recovered or biobased material content and quantity and cost of listed items without recovered or biobased material content after completion and prior to submittal of final invoice.

(2) Written justification 7 work days prior to purchase of listed items if recovered material or biobased products are not available: 1) competitively within a reasonable time frame; 2) meeting reasonable performance standards as defined in the Standards or Project Specifications; or 3) at a reasonable price.

SECTION 13.8--DISPOSAL OF WASTE MATERIAL

1. GENERAL: Dispose or recycle waste material in accordance with applicable Federal, State and Local regulations and ordinances. In addition to the requirements of the Contract Clause —Cleaning Up‖, remove all waste material from the construction site. No waste shall be left on Western property, right-of-way, or easement. Burning or burying of waste material is not permitted.

2. HAZARDOUS, UNIVERSAL, AND NON-HAZARDOUS WASTES: Manage hazardous, universal, and non-hazardous wastes in accordance with State and Federal regulations.

3. USED OIL: Used oil generated from the Contractor activities shall be managed in accordance with used oil regulations.

4. RECYCLABLE MATERIAL: Reduce wastes, including excess Western material, by recycling, reusing, or reprocessing. Examples of recycling, reusing, or reprocessing include reprocessing of solvents; recycling cardboard; and salvaging scrap metals.

5. REFRIGERANTS AND RECEIPTS: Refrigerants from air conditioners, water coolers, refrigerators, ice machines and vehicles shall be reclaimed with certified equipment operated by certified technicians if the item is to be disposed. Refrigerants shall be reclaimed and not vented to the atmosphere. A receipt from the reclaimer stating that the refrigerant was reclaimed, the amount and type of refrigerant, and the date shall be submitted to the COR after completion and prior to submittal of final invoice.

6. HALONS: Equipment containing halons that must be tested, maintained, serviced, repaired, or disposed must be handled according to EPA requirements and by technicians trained according to those requirements.

7. SULFUR HEXAFLOURIDE (SF_6): SF_6 shall be reclaimed and not vented to the atmosphere.

8. WASTE MATERIAL QUANTITY REPORT: Submit quantities of total project waste material disposal as listed below to the COR after completion and prior to submittal of final invoice.

   (1) Sanitary Wastes: Volume in cubic yards or weight in pounds.

   (2) Hazardous or Universal Wastes: Weight in pounds.

   (3) PCB Wastes: Weight in pounds.

   (4) Other regulated wastes (e.g., lead-based paint or asbestos): Weight in pounds (specify type of waste in report).

SECTION 13.9--CONTRACTOR'S LIABILITY FOR REGULATED MATERIAL INCIDENTS

1. GENERAL: The Contractor is solely liable for all expenses related to spills, mishandling, or incidents of regulated material attributable to his actions or the actions of his subcontractors. This includes all response, investigation, cleanup, disposal, permitting, reporting, and requirements from applicable environmental regulation agencies.

2. SUPERVISION: The actions of the Contractor employees, agents, and subcontractors shall be properly managed at all times on Western property or while transporting Western's (or previously owned by Western) regulated material and equipment.

SECTION 13.10--POLLUTANT SPILL PREVENTION, NOTIFICATION, AND CLEANUP

1. GENERAL: Provide measures to prevent spills of pollutants and respond appropriately if a spill occurs. A pollutant includes any hazardous or non-hazardous substance that when spilled, will contaminate soil, surface water, or ground water. This includes any solvent, fuel, oil, paint, pesticide, engine coolants, and similar substances.

2. SPILL PREVENTION NOTIFICATION AND CLEANUP PLAN (Plan): Provide the Plan to the COR for approval 14 days prior to start of work. Approval of the plan is for the purpose of determining compliance with the specifications only and shall not relieve the Contractor of the responsibility for compliance with all Federal, State, and Local regulations. Include the following in the Plan:

   (1) Spill Prevention measures. Describe the work practices or precautions that will be used at the job site to prevent spills. These may include engineered or manufactured techniques such as installation of berms around fuel and oil tanks; Storage of fuels, paints, and other substances in spill proof containers; and management techniques such as requiring workers to handle material in certain ways.

   (2) Notification. Most States and the Environmental Protection Agency require by regulation, that anyone who spills certain types of pollutants in certain quantities notify them of the spill within a specific time period. Some of these agencies require written follow up reports and cleanup reports. Include in the Plan, the types of spills for which notification would be made, the agencies notified, the information the agency requires during the notification, and the telephone numbers for notification.

   (3) Employee Awareness Training. Describe employee awareness training procedures that will be implemented to ensure personnel are knowledgeable about the contents of the Plan and the need for notification.

   (4) Commitment of Manpower, Equipment and Material. Identify the arrangements made to respond to spills, including the commitment of manpower, equipment and material.

   (5) If applicable, address all requirements of 40CFR112 pertaining to Spill Prevention, Control and Countermeasures Plans.

3. TANKER OIL SPILL PREVENTION AND RESPONSE PLAN: Provide a Tanker Oil Spill Prevention and Response Plan as required by the Department of Transportation if oil tankers with volume of 3,500 gallons or more are used as part of the project. Submit the Tanker Oil Spill Prevention and Response Plan to the COR for approval 14 days prior to start of work. Approval of the plan is for the purpose of determining compliance with the specifications only and shall not relieve the Contractor of the responsibility for compliance with all Federal, State, and Local regulations.

SECTION 13.11--PESTICIDES

1. GENERAL: The term —pesticide" includes herbicides, insecticides, rodenticides and fungicides. Pesticides shall only be used in accordance with their labeling and applied by appropriately certified applicators.

2. ENVIRONMENTAL PROTECTION AGENCY REGISTRATION: Use EPA registered pesticides that are approved for the intended use.

3. PESTICIDE USE PLAN: The plan shall contain: 1) a description of the pesticide to be used, 2) where it is to be applied, 3) the application rate, 4) a copy of the label, and 5) a copy of required applicator certifications. Submit two copies of the pesticide use plan to the COR for approval 14 days prior to the date of intended application. Approval of the plan is for the purpose of determining compliance with the specifications only and shall not relieve the Contractor of the responsibility for compliance with all Federal, State, and Local regulations. Within seven days after application, submit a written report, including the pesticide applicators report, in accordance with Standard 2 – Sitework, Section 2.1.1.5, —Soil-Applied Herbicide".

SECTION 13.12--TREATED WOOD POLES AND MEMBERS RECYCLING OR DISPOSAL

Whenever practicable, treated wood poles and members removed during the project shall be recycled or transferred to the public for some uses. Treated wood poles and members transferred to a recycler, landfill, or the public shall be accompanied by a written consumer information sheet on treated wood as provided by Western. Obtain a receipt form, part of the consumer information sheet, from the recipient indicating that they have received, read, and understand the consumer information sheet. Treated wood products transferred to right-of-way landowners shall be moved off the right-of-way. Treated wood product scrap or poles and members that cannot be donated or reused shall be properly disposed in a landfill that accepts treated wood and has signed Western's consumer information sheet receipt. Submit treated wood pole and members consumer receipt forms to the COR after completion and prior to submittal of final invoice.

SECTION 13.13--PREVENTION OF AIR POLLUTION

1. GENERAL: Ensure that construction activities and the operation of equipment are undertaken to reduce the emission of air pollutants. Submit a copy of permits, if required, from Federal, State, or local agencies to the COR 14 days prior to the start of work.

2. MACHINERY AIR EMISSIONS: The Contractor and subcontractor machinery shall have, and shall use the air emissions control devices required by Federal, State or Local Regulation or ordinance.

3. DUST ABATEMENT: Dust shall be controlled. Oil shall not be used as a dust suppressant. Dust suppressants shall be approved by the COR prior to use.

SECTION 13.14--HANDLING AND MANAGEMENT OF ASBESTOS CONTAINING MATERIAL

1. GENERAL: Obtain the appropriate Federal, State, Tribal or local licenses or certifications prior to disturbing any regulated asbestos-containing material. If a building or portion of a building will be demolished or renovated, obtain an Asbestos Notice of and Permit for Demolition and Renovation from the State or Tribal Department of Environmental Quality, Division of Air Quality (or equivalent). The building(s) shall be inspected by a State-Certified or Tribal accepted Asbestos Building Inspector and the inspector shall certify the presence and condition of asbestos on site as directed on the State or Tribal Demolition and Renovation Notice/Permit. The inspections shall be performed and notifications shall be submitted whether asbestos is present or not. Submit a copy of licenses, certifications, Demolition and Renovation Notifications and Permits for asbestos work to the COR 14 days prior to work. Ensure: 1) worker and public safety requirements are fully implemented and 2) proper handling, transportation, and disposal of asbestos containing material.

2. TRANSPORTATION OF ASBESTOS WASTE: Comply with Department of Transportation, Environmental Protection Agency, and State and Local requirements when transporting asbestos wastes.

3. CERTIFICATES OF DISPOSAL AND RECEIPTS: Obtain certificates of disposal for waste if the waste is a hazardous waste or receipts if the waste is a non-hazardous waste. Submit copies to the COR after completion and prior to submittal of final invoice.

SECTION 13.15--MATERIAL WITH LEAD-BASED PAINT

1. GENERAL: Comply with all applicable Federal, State and local regulations concerning work with lead-based paint, disposal of material painted with lead-based paint, and management of these material. OSHA and General Industry Standards apply to worker safety and right-to-know issues. Federal EPA and State agencies regulate waste disposal and air quality issues.

2. TRANSFER OF PROPERTY: If lead-based paint containing equipment or material is to be given away or sold for reuse, scrap, or reclaiming, a written notice shall be provided to the recipient of the material stating that the material contains lead-based paint and the Hazardous Waste regulations may apply to the waste or the paint in some circumstances. The new owner must also be notified that they may be responsible for compliance with OSHA requirements if the material is to be cut, sanded, abraded, or stripped of paint. Submit a copy of lead paint notices to the COR upon completion and prior to submittal of final invoice.

3. CERTIFICATES OF DISPOSAL AND RECEIPTS: Obtain certificate of disposals for waste if the waste is a hazardous waste or receipts if the waste is a non-hazardous waste. Submit copies to the COR after completion and prior to submittal of final invoice.

SECTION 13.16--PREVENTION OF WATER POLLUTION

1. GENERAL: Ensure that surface and ground water is protected from pollution caused by construction activities and comply with applicable regulations and requirements. Ensure that streams, waterways and other courses are not obstructed or impaired unless the appropriate Federal, State or local permits have been obtained.

2. PERMITS: Ensure that:

   (1) A National Pollutant Discharge Elimination System (NPDES) permit is obtained from the US Environmental Protection Agency or State as appropriate if the disturbed construction area equals 1 acre or more. Disturbed areas include staging, parking, fueling, stockpiling, and any other construction related activities. Refer to www.epa.gov/npdes/stormwater for directions and forms.

   (2) A dewatering permit is obtained from the appropriate agency if required for construction dewatering activities.

   (3) Copies of permits and plans, approved by the appropriate regulating agencies, are submitted to the COR 14 days prior to start of work.

3. EXCAVATED MATERIAL AND OTHER CONTAMINANT SOURCES: Control runoff from excavated areas and piles of excavated material, construction material or wastes (to include truck washing and concrete wastes), and chemical products such as oil, grease, solvents, fuels, pesticides, and pole treatment compounds. Excavated material or other construction material shall not be stockpiled or deposited near or on streambanks, lake shorelines, ditches, irrigation canals, or other areas where run-off could impact the environment.

4. MANAGEMENT OF WASTE CONCRETE OR WASHING OF CONCRETE TRUCKS: Do not permit the washing of concrete trucks or disposal of excess concrete in any ditch, canal, stream, or other surface water. Concrete wastes shall be disposed in accordance with all Federal, State, and local regulations. Concrete wastes shall not be disposed on any Western property, right-of-way, or easement; nor on any streets, roads, or property without the owner's consent.

5. STREAM CROSSINGS: Crossing of any stream or other waterway shall be done in compliance with Federal, State, and local regulations. Crossing of some waterways may be prohibited by landowners, State or Federal agencies or require permits.

SECTION 13.17--TESTING, DRAINING, REMOVAL, AND DISPOSAL OF OIL-FILLED ELECTRICAL EQUIPMENT

1. SAMPLING AND TESTING OF INSULATING OIL FOR PCB CONTENT: Sample and analyze the oil of electrical equipment (which includes storage tanks) for PCB's. Use analytical methods approved by EPA and applicable State regulations. Decontaminate sampling equipment according to documented good laboratory practices (these can be contractor developed or EPA standards). Use only laboratories approved by Western. The COR will furnish a list of approved laboratories.

2. PCB TEST REPORT: Provide PCB test reports that contain the information below for disposing of oil-filled electrical equipment. Submit the PCB test report prior to draining, removal, or disposal of oil or oil-filled equipment that is designated for disposal.

   (1) Name and address of the laboratory.

   (2) Description of the electrical equipment (e.g. transformer, breaker).

   (3) Serial number for the electrical equipment.

   (4) Date sampled.

   (5) Date tested.

   (6) PCB contents in parts per million (ppm).

   (7) Unique identification number of container into which the oil was drained (i.e., number of drum, tank, tanker, etc.)

3. OIL CONTAINING PCB: Comply with the Federal regulations pertaining to PCBs found at Title 40, Part 761 of the U.S. Code of Federal Regulations (40 CFR 761).

4. REMOVAL AND DISPOSAL OF INSULATING OIL AND OIL-FILLED ELECTRICAL EQUIPMENT: Once the PCB content of the oil has been identified from laboratory results, the oil shall be transported and disposed, recycled, or reprocessed according to 40 CFR 761 (if applicable), Resource Conservation and Recovery Act (RCRA) —used oil", and other applicable regulations. Used oil may be transported only by EPA-registered used oil transporters. The oil must be stored in containers that are labeled —Used Oil." Use only U.S. transporters and disposal sites approved by Western.

5. OIL AND OIL-FILLED ELECTRICAL EQUIPMENT RECEIPT: Obtain and submit a receipt for oil and oil-filled equipment transported and disposed, recycled, or reprocessed to the COR upon completion and prior to submittal of final invoice.

SECTION 13.18--REMOVAL OF OIL-CONTAMINATED MATERIAL

1. GENERAL: Removing oil-contaminated material includes excavating, stockpiling, testing, transporting, cleaning, and disposing of these material. Personnel working with PCBs shall be trained in accordance with OSHA requirements. Submit employee training documentation records to the COR 14 days prior to the start of work.

2. CLEANUP WORK MANAGEMENT PLAN: Provide a Cleanup Work Management Plan that has been approved by applicable Federal, State, or Local environmental regulation agencies. Submit the plan to the COR for approval 14 days prior to the start of work. Approval of the plan is for the purpose of determining compliance with the specifications only and shall not relieve the Contractor of the responsibility for compliance with all Federal, State, and Local regulations. The plan shall address on-site excavation of contaminated soil and debris and include the following:

   (1) Identification of contaminants and areas to be excavated.
   (2) Method of excavation.
   (3) Level of personnel/subcontractor training.
   (4) Safety and health provisions.
   (5) Sampling requirements including quality control, laboratory to be used.
   (6) Management of excavated soils and debris.
   (7) Disposal methods, including transportation to disposal.

3. EXCAVATION AND CLEANUP: Comply with the requirements of Title 40, Part 761 of the U.S. Code of Federal Regulations (40 CFR 761).

4. TEMPORARY STOCKPILING: Excavated material, temporarily stockpiled on site, shall be stored on heavy plastic and covered to prevent wind and rain erosion at a location designated by the COR.

5. SAMPLING AND TESTING: Sample contaminated debris and areas of excavation to ensure that contamination is removed. Use personnel with experience in sampling and, in particular, with experience in PCB cleanup if PCBs are involved. Use analytical methods approved by EPA and applicable State regulations.

6. TRANSPORTION AND DISPOSAL OF CONTAMINATED MATERIAL: The Contractor shall be responsible and liable for the proper loading, transportation, and disposal of contaminated material according to Federal, State, and local requirements. Use only U.S. transporters and disposal sites approved by Western.

7. POST CLEANUP REPORT: Provide a Post-Cleanup Report that describes the cleanup of contaminated soils and debris. Submit the report to the COR upon completion and prior to submittal of final invoice. The report shall contain the following information:

   (1) Site map showing the areas cleaned.

   (2) Description of the operations involved in excavating, storing, sampling, and testing, and disposal.

   (3) - Sampling and analysis results including:

      1) Name and address of the laboratory;
      2) sample locations;
      3) sample dates;
      4) analysis dates;
      5) contents of contaminant (e.g., PCB or total petroleum hydrocarbons) in parts per million (ppm).

(4) Certification by the Contractor that the cleanup requirements were met.

(5) Copies of any manifests, bills of lading, and disposal certificates.

(6) Copies of correspondence with regulatory agencies that support completion of the cleanup.

SECTION 13.19--CONSERVATION OF NATURAL RESOURCES

1. GENERAL: Federal law prohibits the taking of endangered, threatened, proposed or candidate wildlife and plants, and destruction or adverse modification of designated Critical Habitat. Federal law also prohibits the taking of birds protected by the Migratory Bird Treaty Act, and the Bald and Golden Eagle Protection Act. —Take‖ means to pursue, hunt, shoot, wound, kill, trap, capture or collect a protected animal or any part thereof, or attempt to do any of those things. The Contractor will take reasonable precaution to avoid harming other wildlife species. Contractor must always stay within Western's right-of-way and/or easement.

2. KNOWN OCCURRENCE OF PROTECTED SPECIES OR HABITAT: Following issuance of the notice to proceed, and prior to the start of construction, Western will provide training to all contractor and subcontractor personnel involved in the construction activity. Untrained personnel shall not be allowed in the construction area. Western will provide two sets of plan and profile drawings showing sensitive areas located on or immediately adjacent to the transmission line right-of-way and/or facility. These areas shall be considered avoidance areas. Prior to any construction activity, the avoidance areas shall be marked on the ground in a manner approved by the COR. If access is absolutely necessary, the contractor shall first obtain permission from the COR, noting that a Western and/or other government or tribal agency biologist may be required to accompany personnel and equipment. Ground markings shall be maintained through the duration of the contract. Western will remove the markings during or following final inspection of the project.

3. UNKNOWN OCCURRENCE OF PROTECTED SPECIES OR HABITAT: If evidence of a protected species is found in the project area, the contractor shall immediately notify the COR and provide the location and nature of the findings. The contractor shall stop all activity in the vicinity of the protected species or habitat and not proceed until directed to do so by the COR.

Appendix C: US Fish and Wildlife Service (Service) Response Letter, Dated July 29, 2014

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ecological Services
Colorado Field Office
P.O. Box 25486, DFC (65412)
Denver, Colorado 80225-0486

IN REPLY REFER TO:
ES/CO: Solar Energy / El Paso County / Front Range-Midway Solar Project
TAILS: 06E24000-2014-TA-0805

JUL 2 9 2014

Ida Kitchen-Greenwell
Trade Wind Energy Inc.
16150 West 113th Street suite 105
Lenexa, KS 66219

Dear Ms. Kitchen-Greenwell:

Thank you for your email and letter to the U.S. Fish and Wildlife Service (Service) received July 16, 2014, regarding Trade Wind Energy's proposed Front Range-Midway solar photovoltaic (PV) project (project) located west of I-25 about 20 miles south of downtown Colorado Springs in El Paso County, Colorado.

Trade Wind Energy proposes to install and operate a solar array with capable of generating up to 100 MW of solar capacity on approximately 800 acres of vacant land, which is currently surrounded by infrastructure, including a regional landfill and a large electrical substation near the town of Fountain.

The PV panels will be affixed to a ground-mounted racking system supported by steel pylons driven into the ground. Light duty gravel service roads will be constructed within the solar array to provide access for ongoing maintenance. The solar array will be approximately 3 feet off ground surface and 1- feet in height, and will cover approximately 80% of the project area.

In preparation for a NEPA process and development of an Environmental Assessment you evaluated potential for threatened and endangered species to occur within the project area. Your report recommends that a habitat assessment be conducted to determine with greater certainty whether any T or E species habitats may be present in the area.

In response to your letter, we provide the following comments regarding:

1. Federally listed species;
2. Migratory birds;
3. Electrical transmission and distribution lines; and
4. State species of special concern, specifically the Gunnison's prairie dog.

The Service provides recommendations for threatened and endangered species under the authority of the Endangered Species Act of 1973 (ESA), as amended (16 U.S.C. 1531 *et seq.*).

Protective measures for migratory birds are provided under the authority of the Migratory Bird Treaty Act of 1918 (MBTA), as amended (16 U.S.C. 703 *et seq.*), and the Bald and Golden Eagle Protection Act of 1940 (BGEPA), as amended (16 U.S.C. 668 *et seq.*). We consider other fish and wildlife resources under the Fish and Wildlife Coordination Act (16 U.S.C. 661 *et seq.*) and the Fish and Wildlife Act (16 U.S.C. 742 *et seq.*).

1. Federally Listed Species

The proposed project is located within a developed area near the town of Fountain, Colorado. The primary vegetation type is grassland/herbaceous, which correlates to short-grass prairie with some scrub/shrub land cover. Given the land cover types, we would agree that an on-site habitat assessment should be conducted.

2. Migratory Birds and Bald and Golden Eagles

Activities associated with solar energy projects often include the removal of vegetation, underground burrows, or other structures used by migratory birds and eagles for nesting, roosting, perching, or foraging. During operation, solar energy facilities and their transmission lines may impact migratory birds by interrupting movements or by killing birds during collisions. Disturbed agricultural areas often provide foraging or ground nesting habitats for several migratory birds, such as the mountain plover (*Charadrius montanus*), and their conversion to solar farms may reduce or fragment available habitats. Therefore, we highlight the relevance of the MBTA and BGEPA to your project and provide recommendations intended to limit your project's impacts on migratory birds and eagles.

The Migratory Bird Treaty Act (MBTA):

The MBTA protects migratory birds, nests, and eggs from possession, sale, purchase, barter, transport, import, export, and take. Under the MBTA, it is unlawful unless permitted by regulations to pursue, hunt, take, capture, kill, or attempt to pursue, hunt, take, capture, or kill any migratory birds by any means or in any manner. The MBTA applies to 1,007 species of migratory birds identified in 50 CFR. § 10.13 and "take" is defined in 50 CFR § 10.12. The MBTA does not require intent to be proven, there is no incidental take statement, and the ESA does not absolve individuals or companies from liability under the MBTA. Unless permitted by the Service, the MBTA prohibits any intentional or unintentional activity that results in the take of migratory birds. Although the MBTA does not protect the habitats of migratory birds, activities that affect habitats and result in take of migratory birds do violate the MBTA.

The Bald and Golden Eagle Protection Act (BGEPA):

The BGEPA prohibits individuals and companies from knowingly, or with wanton disregard for the consequences of the Act, taking any bald or golden eagles or their body parts, nests, chicks, or eggs, which includes collection, molestation, disturbance, or killing. The BGEPA affords eagles additional protections beyond those provided by the MBTA by making it unlawful to "disturb" eagles. "Disturb" means to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, injury to an eagle or decreases its productivity or results in nest abandonment due to interference with breeding, feeding, or sheltering behaviors. A permitting

process provides limited exceptions to the BGEPA's prohibitions and the Service has issued regulations concerning the permit procedures in 50 CFR Part 22.

Removing nests, destroying nests, or causing nest abandonment may constitute a violation of the MBTA and BGEPA. Removal of any active migratory bird nest or nest tree is prohibited. For golden eagles, permits for inactive nests are restricted to activities involving resource extraction for human health and safety. No permits will be issued for any active nest of any migratory bird species, unless removal of the active nest is necessary for reasons of human health and safety. Therefore, if nesting migratory birds are present within or near the project area, timing of activities is a significant consideration and should be addressed in the early phases of project planning. Nest manipulation is not allowed without a permit. If a permit cannot be issued, your project may need to be modified to ensure that take of any migratory bird, eagle, young, eggs, or nests will not occur.

Recommendations for migratory birds and eagles:

To minimize impacts to migratory birds, the Service recommends that construction occur outside the typical breeding season for migratory birds. Although the provisions of the MBTA apply year-round, most nesting activity occurs between April 1 and July 15. However, some migratory birds nest outside of this loosely defined period. If proposed activities must occur during the nesting season, or at any other time that may result in the take of migratory birds or eagles, the Service recommends that qualified biologists conduct pre-work field surveys of the affected habitats or structures, during the nesting season, to verify the presence or absence of migratory birds and eagles. Contact the Service's Colorado Field Office for guidance if surveys identify birds or nests that may be affected by project activities.

Enclosed, please find a copy of Colorado Parks and Wildlife's "Recommended Buffer Zones and Seasonal Restrictions for Colorado Raptors" (2008). We recommend reviewing these guidelines and incorporating the seasonal and buffer restrictions into your project design to avoid and minimize impacts to raptors and other migratory birds protected by the MBTA.

While adoption of these recommendations is voluntary, we remind Trade Wind Energy that the MBTA and BGEPA prohibit the take of migratory birds and eagles unless permitted by regulations. As mandated by our trust responsibilities, we immediately notify the Service's Office of Law Enforcement of any incidents of take at energy facilities.

It is not possible to absolve individuals, companies, or agencies from liability under the MBTA or BGEPA, even if they implement the guidelines or similar protective measures at their facilities. However, the Service's Office of Law Enforcement focuses its resources on investigating and prosecuting individuals and companies that take migratory birds without identifying and implementing all reasonable prudent and effective measures to avoid that take. It remains the applicant's responsibility to minimize the effects of their projects on migratory birds and other resources. For more information on MBTA and BGEPA regulations and their relevance to your project, please contact Craig Hansen of the Colorado Field Office at (303) 236–4749.

3. Electrical Transmission and Distribution Lines:

Solar energy facilities often require the development of new transmission and distribution lines. Overhead electrical lines concern the Service because published studies indicate that power lines can negatively affect wildlife. Collisions with power lines, power poles, and associated infrastructure often electrocute and kill birds, bats, and other wildlife. Projects may also permanently displace wildlife when activities alter or remove key components of important habitats. Early planning, coordination, and the strategic placement of power lines and associated facilities can avoid or reduce these impacts.

The Avian Power Line Interaction Committee (APLIC) developed guidelines and resources intended to address and mitigate electrocutions and collisions between wildlife and power lines. We recommend that you review and consider implementing these guidelines during the construction and operation of your electrical facilities. APLIC resources are available online at the following address:

http://www.aplic.org/mission

In Colorado, electrocutions at power lines are a serious threat to the ferruginous hawk (*Buteo regalis*), the golden eagle (*Aquila chrysaetos*), and other large raptors. In open prairies or agricultural fields, electrical poles often provide suitable perches or nest sites for birds of prey. As birds perch or build nests on power poles, their long wingspans easily touch electrical lines and complete circuits, effectively disrupting electrical service and often fatally electrocuting the bird. Undergrounding electrical lines eliminates the threat of electrocution and avian-caused power outages. Therefore, the Service recommends undergrounding electrical facilities whenever possible.

However, if undergrounding any overhead electrical line is not possible, we recommend that the proponents build overhead electrical lines with at least 10-foot cross arms on 3 phase lines, or at least 5 feet of spacing between electrical phases. Larger distances better accommodate long wingspans and may reduce electrocutions and power outages caused by birds at your power lines. APLIC provides additional recommendations to prevent electrocutions and power outages by discouraging perching and nesting.

4. State Species of Concern:

Our comments address federally listed species, federally designated critical habitats, and migratory birds. Please contact Colorado Parks and Wildlife (CPW) at (303) 297–1192 regarding any State species of special designation in Colorado that are not federally listed and that may occur within your project area. For example, the open areas within your project area may support colonies of the black-tailed prairie dog (*Cynomys ludovicianus*), a State species of special concern in Colorado.

The black-tailed prairie dog is a ground dwelling squirrel that lives in grasslands, including those in urban areas, disturbed right-of-ways, agricultural fields, and road or utility easements. Many grassland species, such as the burrowing owl (*Athene cunicularia*) depend on the underground burrows and colonies built by black-tailed prairie dogs. Due to their important value to the

prairie ecosystem and the many species that rely on them, we strongly encourage the conservation of prairie dogs.

To avoid and minimize impacts to prairie dogs or their dependent species, we recommend conducting preconstruction surveys for prairie dogs and their associated species. Design the project to avoid disturbing active colonies. If the project cannot avoid active colonies, relocate prairie dogs or consider donating them to a black-footed ferret or raptor recovery program. Contact CPW for more information on the regulations and guidelines that address the capture, transportation, and relocation of prairie dogs in Colorado.

The Service appreciates the opportunity to work with Trade Wind Energy on the proposed solar PV project. If we can be of any additional assistance, please contact the Colorado Field Office at 303-236-4773. Thank you for your concern endangered species and other natural resources.

Sincerely,

Susan C. Linner
Colorado Field Supervisor

Enclosure: CPW's recommended buffer zones and guidelines for raptors (2008)
Available online: http://bit.ly/WXJYEh

RECOMMENDED BUFFER ZONES AND SEASONAL RESTRICTIONS FOR COLORADO RAPTORS

Tolerance limits to disturbance vary among as well as within raptor species. As a general rule, Ferruginous Hawks and Golden Eagles respond to human activities at greater distances than do Ospreys and America Kestrels. Some individuals within a species also habituate and tolerate human activity at a proximity that would cause the majority of the group to abandon their nests. Other individuals become sensitized to repeated encroachment and react at greater distances. The tolerance of a particular pair may change when a mate is replaced with a less tolerant individual and this may cause the pair to react to activities that were previously ignored. Responses will also vary depending upon the reproductive stage. Although the level of stress is the same, the pair may be more secretive during egg laying and incubation and more demonstrative when the chicks hatch.

The term "disturbance" is ambiguous and experts disagree on what actually constitutes a disturbance Reactions may be as subtle as elevated pulse rate or as obvious as vigorous defense or abandonment. Impacts of disturbance may not be immediately evident. A pair of raptors may respond to human intrusion by defending the nest, but well after the disturbance has passed, the male may remain in the vicinity for protection rather than forage to feed the nestlings. Golden eagles rarely defend their nests, but merely fly a half mile or more away and perch and watch. Chilling and over heating of eggs or chicks and starvation of nestlings can result from human activities that appeared not to have caused an immediate response.

A 'holistic' approach is recommended when protecting raptor habitats. While it is important for land managers to focus on protecting nest sites, equal attention should focus on defining important foraging areas that support the pair's nesting effort. Hunting habitats of many raptor species are extensive and may necessitate interagency cooperation to assure the continued nest occupancy. Unfortunately, basic knowledge of habitat use is lacking and may require documentation through telemetry investigations or intensive observation. Telemetry is expensive and may be disruptive so a more practical approach is to assume that current open space is important and should be protected.

Although there are exceptions, the buffer areas and seasonal restrictions suggested here reflect an informed opinion that if implemented, should assure that the majority of individuals within a species will continue to occupy the area. Additional factors, such as intervening terrain, vegetation screens, and the cumulative impacts of activities should be considered.

These guidelines were originally developed by CDOW raptor biologist Gerald R. Craig (retired) in December 2002. To provide additional clarity in guidance, incorporate new information, and update the conservation status of some species, the guidelines were revised in January 2008. Further revisions of this document may become necessary as additional information becomes available.

RECOMMENDED BUFFER ZONES AND SEASONAL RESTRICTIONS

BALD EAGLE

Nest Site:

No surface occupancy (beyond that which historically occurred in the area; see 'Definitions' below) within ¼ mile radius of active nests (see 'Definitions' below). Seasonal restriction to human encroachment (see 'Definitions' below) within ½ mile radius of active nests from October 15 through July 31. This closure is more extensive than the National Bald Eagle Management Guidelines (USFWS 2007) due to the generally open habitat used by Colorado's nesting bald eagles.

Winter Night Roost:

No human encroachment from November 15 through March 15 within ¼ mile radius of an active winter night roost (see 'Definitions' below) if there is no direct line of sight between the roost and the encroachment activities. No human encroachment from November 15 through March 15 within ½ mile radius of an active winter night roost if there is a direct line of sight between the roost and the encroachment activities. If periodic visits (such as oil well maintenance work) are required within the buffer zone after development, activity should be restricted to the period between 1000 and 1400 hours from November 15 to March 15.

Hunting Perch:

Diurnal hunting perches (see 'Definitions' below) associated with important foraging areas should also be protected from human encroachment. Preferred perches may be at varying distances from human encroachment and buffer areas will vary. Consult the Colorado Division of Wildlife for recommendations for specific hunting perches.

GOLDEN EAGLE

Nest Site:

No surface occupancy (beyond that which historically occurred in the area) within ¼ mile radius of active nests. Seasonal restriction to human encroachment within ½ mile radius of active nests from December 15 through July 15.

OSPREY

Nest Site:

No surface occupancy (beyond that which historically occurred in the area) within ¼ mile radius of active nests. Seasonal restriction to human encroachment within ¼ mile radius of active nests from April 1 through August 31. Some osprey populations have habituated and are tolerant to human activity in the immediate vicinity of their nests.

FERRUGINOUS HAWK

Nest Site:

No surface occupancy (beyond that which historically occurred in the area) within ½ mile radius of active nests. Seasonal restriction to human encroachment within ½ mile radius of active nests from February 1 through July 15. This species is especially prone to nest abandonment during incubation if disturbed.

RED-TAILED HAWK

Nest Site:

No surface occupancy (beyond that which historically occurred in the area) within 1/3 mile radius of active nests. Seasonal restriction to human encroachment within 1/3 mile radius of active nests from February 15 through July 15. Some members of this species have adapted to urbanization and may

tolerate human habitation to within 200 yards of their nest. Development that encroaches on rural sites is likely to cause abandonment.

SWAINSON'S HAWK

Nest Site:

No surface occupancy (beyond that which historically occurred in the area) within ¼ mile radius of active nests. Seasonal restriction to human encroachment within ¼ mile radius of active nests from April 1 through July 15. Some members of this species have adapted to urbanization and may tolerate human habitation to within 100 yards of their nest.

PEREGRINE FALCON

Nest Site:

No surface occupancy (beyond that which historically occurred in the area) within ½ mile radius of active nests. Seasonal restriction to human encroachment within ½ mile of the nest cliff(s) from March 15 to July 31. Due to propensity to relocate nest sites, sometimes up to ½ mile along cliff faces, it is more appropriate to designate 'Nesting Areas' that encompass the cliff system and a ½ mile buffer around the cliff complex.

PRAIRIE FALCON

Nest Site:

No surface occupancy (beyond that which historically occurred in the area) within ½ mile radius of active nests. Seasonal restriction to human encroachment within ½ mile radius of active nests from March 15 through July 15.

NORTHERN GOSHAWK

No surface occupancy (beyond that which historically occurred in the area) within ½ mile radius of active nests. Seasonal restriction to human encroachment within ½ mile radius of active nests from March 1 through September 15.

BURROWING OWL

Nest Site:

No human encroachment within 150 feet of the nest site from March 15 through October 31. Although Burrowing Owls may not be actively nesting during this entire period, they may be present at burrows up to a month before egg laying and several months after young have fledged. Therefore it is recommended that efforts to eradicate prairie dogs or destroy abandoned towns not occur between March 15 and October 31 when owls may be present. Because nesting Burrowing Owls may not be easily visible, it is recommended that targeted surveys be implemented to determine if burrows are occupied. More detailed recommendations are available in a document entitled "Recommended Survey Protocol and Actions to Protect Nesting Burrowing Owls" which is available from the Colorado Division of Wildlife

Recommended Buffer Zones and Seasonal Restrictions Around Raptor Use Sites

Species and Use	Buffer	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Bald Eagle													
ACTIVE NEST - No Surface Occupancy	¼ Mile												
ACTIVE NEST - No Human Encroachment	½ Mile												
ACTIVE WINTER NIGHT ROOST without a direct line of sight- No Human Encroachment	¼ Mile												
ACTIVE WINTER NIGHT ROOST with a direct line of sight - No Human Encroachment	½ Mile												
HUNTING PERCH - No Human Encroachment	Contact CDOW												
Golden Eagle													
ACTIVE NEST - No Surface Occupancy	¼ Mile												
ACTIVE NEST - No Human Encroachment	½ Mile												
Osprey													
ACTIVE NEST - No Surface Occupancy	¼ Mile												
ACTIVE NEST - No Human Encroachment	¼ Mile												
Ferruginous Hawk													
ACTIVE NEST - No Surface Occupancy	½ Mile												
ACTIVE NEST - No Human Encroachment	½ Mile												
Red-tailed Hawk													
ACTIVE NEST - No Surface Occupancy	1/3 Mile												
ACTIVE NEST - No Human Encroachment	1/3 Mile												
Swainson's Hawk													
ACTIVE NEST - No Surface Occupancy	¼ Mile												
ACTIVE NEST - No Human Encroachment	¼ Mile												
Peregrine Falcon													
ACTIVE NEST - No Surface Occupancy	½ Mile												
ACTIVE NEST - No Human Encroachment	½ Mile												
Prairie Falcon													
ACTIVE NEST - No Surface Occupancy	½ Mile												
ACTIVE NEST - No Human Encroachment	½ Mile												
Northern Goshawk													
ACTIVE NEST - No Surface Occupancy	½ Mile												
ACTIVE NEST - No Human Encroachment	½ Mile												
Burrowing Owl													
ACTIVE NEST - No Human Encroachment	150 feet												
		= time period for which seasonal restrictions are in place.											

DEFINITIONS

Active nest – Any nest that is frequented or occupied by a raptor during the breeding season, or which has been active in any of the five previous breeding seasons. Many raptors use alternate nests in various years. Thus, a nest may be active even if it is not occupied in a given year.

Active winter night roost – Areas where Bald Eagles gather and perch overnight, and sometimes during the day in the event of inclement weather. Communal roost sites are usually in large trees (live or dead) that are relatively sheltered from wind and are generally in close proximity to foraging areas. These roosts may also serve a social purpose for pair bond formation and communication among eagles. Many roost sites are used year after year.

Human encroachment – Any activity that brings humans in the area. Examples include driving, facilities maintenance, boating, trail access (e.g., hiking, biking), etc.

Hunting perch – Any structure on which a raptor perches for the purpose of hunting for prey. Hunting perches provide a view of suitable foraging habitat. Trees are often used as hunting perches, but other structures may also be used (utility poles, buildings, etc.).

Surface occupancy – Any physical object that is intended to remain on the landscape permanently or for a significant amount of time. Examples include houses, oil and gas wells, tanks, wind turbines, roads, tracks, etc.

CONTACT

For further information contact:

David Klute
Bird Conservation Coordinator
Colorado Division of Wildlife
6060 Broadway
Denver, CO 80216
Phone: 303-291-7320
Email: david.klute@state.co.us

REFERENCES

Bechard, M.J., and J.K. Schmutz. 1995. Ferruginous Hawk (*Buteo regalis*). The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/172

Buehler, D.A. 2000. Bald Eagle (*Haliaeetus leucocephalus*), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/506

Call, M. 1979. Habitat management guides for birds of prey. Technical Note No.338, U.S. Bureau of Land Management, Denver Service Center, Denver, CO. 69pp

Energy Research and Development Administration (ERDA). 1977. EIA for CUI Venture application for geothermal loan guarantee (Beryl and Lund, Utah). EIA/GE/77-8. Washington, D.C. 109pp.

England, A.S., M.J. Bechard, and C.S. Houston. 1997. Swainson's Hawk (*Buteo swainsoni*), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/265

Greater Yellowstone Bald Eagle Working Group. 1996. Greater Yellowstone bald eagle management plan: 1995 update. Greater Yellowstone Bald Eagle Working Group, Wyoming Game & Fish Dept., Lander WY 82520. 47p

Grier, J.W., F.J. Gramlich, J. Mattisson, J.E. Mathisen, J.V. Kussman, J.B. Elder, and N.F. Green. 1983. The bald eagle in the northern United States. Bird Cons. 144-66.

Haug, E.A., B.A. Millsap, and M.S. Martell. 1993. Burrowing Owl (*Athene cunicularia*), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/061

Holmes, Tamara L. 1993. Behavioral responses of grassland raptors to human disturbance. MS Thesis. Colo. State Univ., Fort Collins. 62pp.

Holthuijzen, A.M.A., W.G. Eastland, A.R. Ansell, M.N. Kochert, R.D. Williams, and L.S. Young. 1990. Effects of blasting on behavior and productivity of nesting prairie falcons. Wildl. Soc. Bull. 18:270-281.

Kochert, M. N., K. Steenhof, C. L. McIntyre, and E. H. Craig. 2002. Golden Eagle (*Aquila chrysaetos*), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/684

Martin, D.J. 1973. Selected aspects of burrowing owl ecology and behavior. Condor 75:446-456.

Northern States Bald Eagle Recovery Team. 1983. Northern States Bald Eagle Recovery Plan. U.S. Fish and Wildlife Service. 75pp.

Olendorff, R. R., and W.D. Zeedyk. 1978. Land management for the conservation of endangered birds. Pages 419-428 in S.A. Temple, ed. *Endangered birds*. University of Wisconsin Press, Madison, Wisconsin.

Poole, A.F., R.O. Bierregaard, and M.S. Martell. 2002. Osprey (*Pandion haliaetus*), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/683

Preston, C.R., and R.D. Beane. 1993. Red-tailed Hawk (*Buteo jamaicensis*), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/052

Reynolds, R., R.T. Graham, H.M. Reiser. 1992. Management recommendations for the northern goshawk in the southwestern United States. Gen. Tech. Rep. RM-217. Fort Collins, CO. U.S. Dept of Agri., Forest Service, Rocky Mountain Forest and Range Experiment Station. 90pp.

Richardson, C.T. and C.K. Miller. 1997. Recommendations for protecting raptors from human disturbance: a review. Wildl. Soc. Bull. 25(3):634-638.

Rocky Mountain/Southwest Peregrine Falcon Recovery Team. 1984. American peregrine falcon Rocky Mountain/Southwest population recovery plan. U.S. Fish and Wildlife Serv. 105pp.

Squires, J.R., S.H. Anderson, and R. Oakleaf. 1993. Home range size and habitat-use patterns of nesting prairie falcons near oil developments in northeastern Wyoming. J. Field Ornithol. 64:1-10.

Steenhof, Karen. 1998. Prairie Falcon (*Falco mexicanus*), The Birds of North America Online Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/346

Squires, J.R., and R.T. Reynolds. 1997. Northern Goshawk (*Accipiter gentilis*), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/298

Suter, G.W. and J.L. Joness. 1981. Criteria for Golden Eagle, Ferruginous Hawk, and Prairie Falcon nest site protection. J. Raptor Res. 15(1):12-18.

Swenson, J.E. 1979. Factors affecting status and reproduction of ospreys in Yellowstone National Park. J. Wildl. Manage. 43:595-601.

Thomsen, L. 1971. Behavior and ecology of burrowing owls on the Oakland Municipal Airport. Condor 73:177-192.

U.S. Fish and Wildlife Service. 2007. National Bald Eagle Management Guidelines. http://www.fws.gov/migratorybirds/issues/BaldEagle/NationalBaldEagleManagementGuidelines.pdf

White, C.M., N.J. Clum, T.J. Cade, and W.G. Hunt. 2002. Peregrine Falcon (*Falco peregrinus*), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/660

Revised 02/2008

Appendix D: Letters from History Colorado

HISTORY Colorado

September 11, 2015

Stephen Tromley
Federal Preservation Officer and Tribal Liaison
Department of Energy
Western Area Power Administration
Rocky Mountain Region
P.O. Box 281213
Lakewood, Colorado 80228-8213

Re: Midway Solar Project, El Paso County, Colorado (HC #68419)

Dear Mr. Tromley:

Thank you for your correspondence dated September 2, 2015 (received September 4, 2015) regarding the above referenced undertaking.

After review of the documentation provided, we concur with your determination that sites 5EP7625 and 5EP7632 are potentially eligible (need data) for listing to the National Register of Historic Places (National Register) under criterion d for significant information that may be present within buried cultural contexts. We concur with your determination that sites 5EP7621, 5EP7623, 5EP7627 and 5EP7640 are not eligible for listing to the National Register under any criteria. Likewise, we concur with your determination that isolated finds 5EP7613, 5EP7614, 5EP7615, 5EP7616, 5EP7617, 5EP7618, 5EP7619, 5EP7620, 5EP7622, 5EP7624, 5EP7626, 5EP7628, 5EP7629, 5EP7630, 5EP7631, 5EP7633, 5EP7634, 5EP7635, 5EP7636, 5EP7637, 5EP7638, 5EP7639, 5EP7641, 5EP7642, 5EP7643, 5EP7644, 5EP7645, 5EP7646, 5EP7647, 5EP7648, 5EP7649 and 5EP7650 are not eligible for listing to the National Register.

In order for our office to comment on your assessment of effects to historic properties, we request additional information. Specifically and additionally, it is unclear from the provided documentation how Western will ensure preservation in place for sites 5EP7625 and 5EP7632. As noted by the Advisory Council on Historic Preservation within its *Recommended Approach for Consultation of Significant Information from Archaeological Sites* "simple avoidance of a site is not the same as preservation". We look forward to receiving your response.

The consultation process does involve other consulting parties such as local governments and Tribes, which as stipulated in 36 CFR 800.3 are required to be notified of the undertaking. Additional information provided by these and other consulting parties may cause our office to re-evaluate our comments and recommendations. Please note that our compliance letter does not end the 30-day review period provided to other consulting parties.

Thank you for the opportunity to comment. If we may be of further assistance, please contact Mark Tobias, Section 106 Compliance Manager, at (303) 866-4674 or mark.tobias@state.co.us.

Sincerely,

Edward C. Nichols
State Historic Preservation Officer
ECN/mt

HISTORY Colorado

December 1, 2015

Matthew D. Blevins
Acting, Federal Preservation Officer and Tribal Liaison
Department of Energy
Western Area Power Administration
Rocky Mountain Region
P.O. Box 281213
Lakewood, Colorado 80228-8213

Re: Front Range-Midway Solar Project, El Paso County, Colorado (HC #68419) – Finding of No Adverse Effect

Dear Mr. Blevins:

Thank you for your correspondence dated November 23, 2015 (received by our office on November 27, 2015) provided as part of our ongoing Section 106 consultation the above referenced undertaking.

We find acceptable the proposed management recommendations as outlined within your letter for sites 5EP7625 and 5EP7632. Assuming that these measures are implemented as described, we concur that a finding of no adverse effect is appropriate for the proposed undertaking pursuant to 36 CFR 800.5(b)

The Section 106 consultation process does involve other consulting parties such as local governments and Tribes, which as stipulated in 36 CFR 800.3 are required to be notified of the undertaking. Additional information provided by the local government, Tribes or other consulting parties may cause our office to re-evaluate our comments and recommendations. Please note that our compliance letter does not end the 30-day review period provided to other consulting parties.

Should unidentified archaeological resources be discovered in the course of the project, work must be interrupted until the resources have been evaluated in terms of the National Register of Historic Places eligibility criteria (36 CFR 60.4) in consultation with our office.

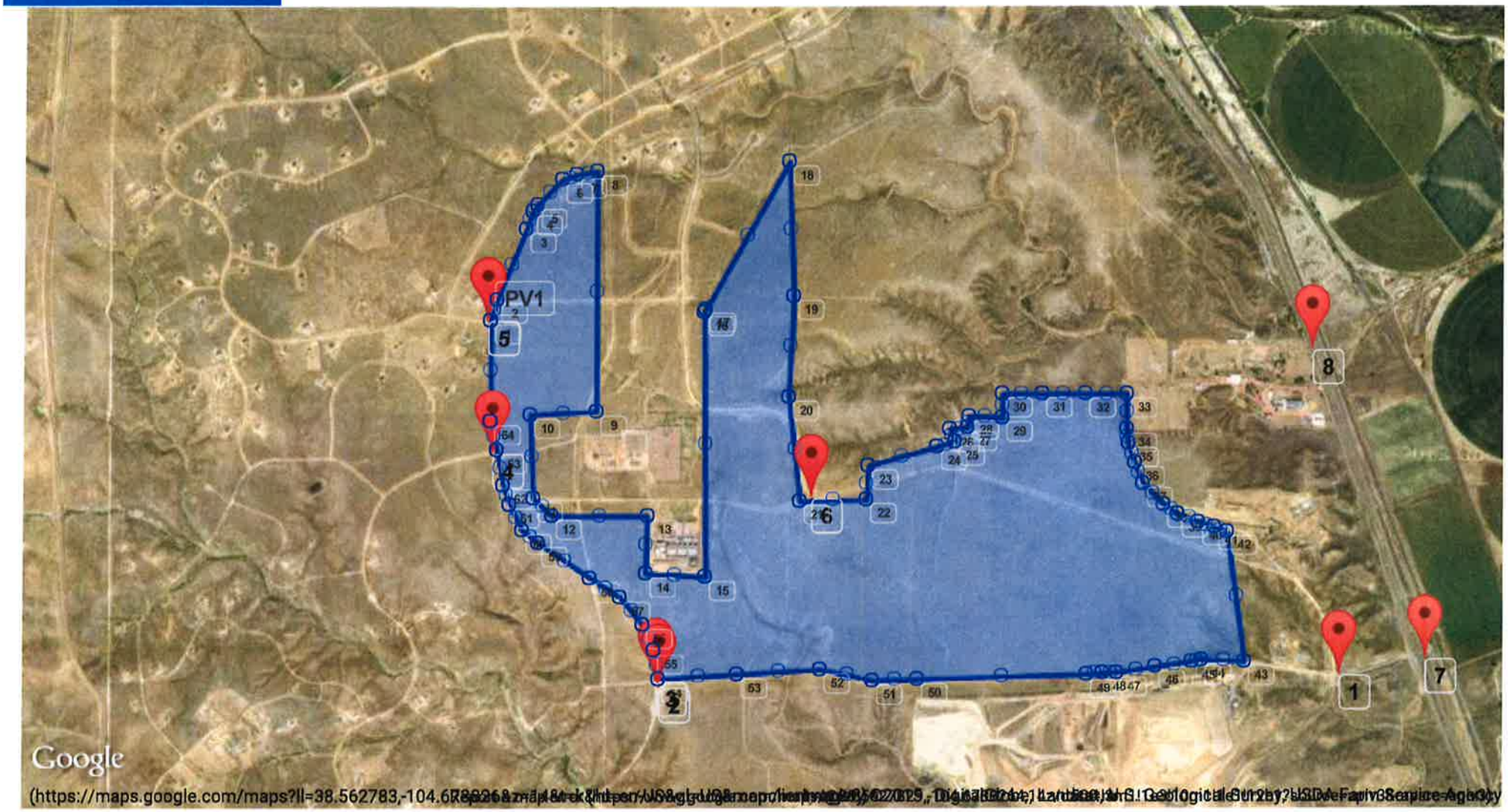
Thank you for the opportunity to comment. If we may be of further assistance, please contact Mark Tobias, Section 106 Compliance Manager, at (303) 866-4674 or mark.tobias@state.co.us.

Sincerely,

for Steve Turner, AIA
State Historic Preservation Officer
ST/mt

Appendix E: Sandia National Laboratories' Solar Glare Hazard Analysis Tool Results

Sandia National Laboratories (http://www.sandia.gov/index.html)



UTC-7:00

PV Array | Observation | Flight Path

Animation >

Submit for analysis

PV Array

Array name

Midway 3.1

Description

minimal PV

Axis tracking

Single

Tilt of tracking axis

35 deg

Orientation of tracking axis

180 deg

Offset angle of module

4 deg

☐ Limit the rotation angle?

Rated power

22 kW

Module surface material

Smooth glass without ARC

☑ Reflectivity varies with incidence angle (view data) (/phlux/sghat/reflectivity-data/)

☑ Correlate slope error to module surface type (view data) (/phlux/sghat/reflectivity-data/)

Vertices click to expand/collapse

id	Latitude	Longitude	Ground Elevation	Height above ground	Total elevation
	deg	deg	ft	ft	ft
1	38.56642	-104.69777	5528.08	10	5538.08
2	38.56733	-104.69742	5528.31	10	5538.31
3	38.57028	-104.69588	5516.47	10	5526.47

4	38.571	-104.69553	5511.01	10	5521.01
5	38.57127	-104.69528	5508.33	10	5518.33
6	38.57233	-104.69386	5483.8	10	5493.8
7	38.57253	-104.69307	5474.81	10	5484.81
8	38.5727	-104.69197	5459.96	10	5469.96
9	38.56256	-104.692	5507.96	10	5517.96
10	38.56248	-104.69561	5522.64	10	5532.64
11	38.55897	-104.69544	5509.51	10	5519.51
12	38.55825	-104.6944	5507.53	10	5517.53
13	38.55824	-104.68928	5491.77	10	5501.77
14	38.55583	104.68934	5505.13	10	5515.13
15	38.55572	-104.68617	5477.86	10	5487.86
16	38.56674	-104.6862	5504.55	10	5514.55
17	38.56691	-104.68611	5503.12	10	5513.12
18	38.57308	-104.68167	5457.9	10	5467.9

19	38.56739	-104.68145	5484.4	10	5494.4
20	38.56323	-104.6817	5483.24	10	5493.24
21	38.55885	-104.68105	5492	10	5502
22	38.55889	-104.67749	5480.2	10	5490.2
23	38.5603	-104.6774	5466.53	10	5476.53
24	38.5611	-104.6737	5445.82	10	5455.82
25	38.56131	-104.6728	5447.03	10	5457.03
26	38.56184	-104.67302	5440.99	10	5450.99
27	38.56192	-104.67207	5446.98	10	5456.98
28	38.5624	-104.67202	5443.84	10	5453.84
29	38.56234	-104.67017	5417.89	10	5427.89
30	38.56337	-104.67021	5401.52	10	5411.52
31	38.56337	-104.66807	5383.15	10	5393.15
32	38.56337	-104.66575	5380.06	10	5390.06
33	38.56335	-104.66348	5354.55	10	5364.55

34	38.56184	-104.6635	5370.4	10	5380.4
35	38.56122	-104.66343	5382.76	10	5392.76
36	38.56045	-104.66309	5384.93	10	5394.93
37	38.55958	-104.66262	5388.12	10	5398.12
38	38.55872	-104.66154	5386.49	10	5396.49
39	38.55833	-104.66071	5383.17	10	5393.17
40	38.55797	-104.65963	5378.57	10	5388.57
41	38.55775	-104.65873	5375.28	10	5385.28
42	38.55758	-104.65807	5372.44	10	5382.44
43	38.55216	-104.65714	5343.16	10	5353.16
44	38.55218	-104.65944	5356.86	10	5366.86
45	38.55213	-104.65994	5364.87	10	5374.87
46	38.55191	-104.66191	5389.95	10	5399.95
47	38.55166	-104.66401	5407.25	10	5417.25
48	38.55166	-104.66476	5411.33	10	5421.33

49	38.55162	-104.66566	5416.83	10	5426.83
50	38.55139	-104.67476	5464.78	10	5474.78
51	38.55132	-104.67711	5466.05	10	5476.05
52	38.55182	-104.67999	5460.94	10	5470.94
53	38.55162	-104.68441	5465.87	10	5475.87
54	38.55142	-104.68866	5472.52	10	5482.52
55	38.5526	-104.68887	5477.23	10	5487.23
56	38.55367	-104.68947	5481.75	10	5491.75
57	38.55481	-104.69067	5496.21	10	5506.21
58	38.55565	-104.69235	5502.95	10	5512.95
59	38.55709	-104.69514	5497.63	10	5507.63
60	38.55763	-104.69599	5502.75	10	5512.75
61	38.5587	-104.69672	5506.94	10	5516.94
62	38.55951	-104.69702	5520.62	10	5530.62
63	38.56099	-104.69741	5521.83	10	5531.83

64	38.56223	-104.69771	5525.89	10	5535.89

Flight Path(s)

Solo Observation Point(s)

name	latitude	longitude	ground elevation	Eye-level height above ground	
	deg	deg	ft	ft	
1	38.55161	-104.65206	5327.01	4	✖
2	38.55105	-104.6886	5470.83	4	✖

3	38.55132	-104.6888	5471.89	4	✖
4	38.56088	-104.69761	5522.48	4	✖
5	38.56642	-104.69794	5528.43	4	✖
6	38.55899	-104.68049	5491.46	4	✖
7	38.55223	-104.64746	5280.31	4	✖
8	38.56525	-104.65356	5303.44	4	✖

Solar Glare Hazard Analysis Report

Generated Aug. 25, 2015, 8:46 a.m.

Glare found

Print

Google Map

Inputs

Analysis name	MIdway 3
PV array axis tracking	single
Tilt of tracking axis (deg)	35.0
Orientation of tracking axis (deg)	180.0
Offset angle of module (deg)	4.0
Limit rotation angle?	False

Rated power (kW)	22.0
Vary reflectivity	True
PV surface material	Smooth glass without ARC

Timezone offset	-7.0
Subtended angle of sun (mrad)	9.3
Peak DNI (W/m^2)	1000.0
Ocular transmission coefficient	0.5
Pupil diameter (m)	0.002
Eye focal length (m)	0.017
Time interval (min)	1
Correlate slope error with material	True
Slope error (mrad)	6.55

PV array vertices

id	Latitude (deg)	Longitude (deg)	Ground Elevation (ft)	Height of panels above ground (ft)	Total elevation (ft)
1	38.5664216099	-104.697765112	5528.08	10.0	5538.08

2	38.5673275866	-104.697421789	5528.31	10.0	5538.31
3	38.5702803204	-104.695876837	5516.47	10.0	5526.47
4	38.5710017085	-104.695533514	5511.01	10.0	5521.01
5	38.5712701301	-104.695276022	5508.33	10.0	5518.33
6	38.5723270305	-104.693859816	5483.8	10.0	5493.8
7	38.5725283431	-104.693065882	5474.81	10.0	5484.81
8	38.5726961032	-104.69197154	5459.96	10.0	5469.96
9	38.5625626922	-104.692003727	5507.96	10.0	5517.96
10	38.5624788003	-104.695608616	5522.64	10.0	5532.64
11	38.5589720348	-104.695436954	5509.51	10.0	5519.51
12	38.5582547208	-104.694396257	5507.53	10.0	5517.53
13	38.5582421362	-104.689278603	5491.77	10.0	5501.77
14	38.5558342574	-104.689342976	5505.13	10.0	5515.13
15	38.5557167979	-104.68616724	5477.86	10.0	5487.86
16	38.5667403808	-104.686199427	5504.55	10.0	5514.55
17	38.5669081544	-104.686113596	5503.12	10.0	5513.12
18	38.5730819499	-104.681671858	5457.9	10.0	5467.9

19	38.5673946955	-104.681446552	5484.4	10.0	5494.4
20	38.5632338232	-104.681704044	5483.24	10.0	5493.24
21	38.5588545804	-104.681049585	5492.0	10.0	5502.0
22	38.5588881388	-104.677487612	5480.2	10.0	5490.2
23	38.5602975787	-104.677401781	5466.53	10.0	5476.53
24	38.5611029606	-104.673700333	5445.82	10.0	5455.82
25	38.5613084993	-104.67279911	5447.03	10.0	5457.03
26	38.561839122	-104.673024416	5440.99	10.0	5450.99
27	38.5619167226	-104.67206955	5446.98	10.0	5456.98
28	38.5624032976	-104.672015905	5443.84	10.0	5453.84
29	38.5623445732	-104.670170546	5417.89	10.0	5427.89
30	38.5633680486	-104.670213461	5401.52	10.0	5411.52
31	38.5633680486	-104.668067694	5383.15	10.0	5393.15
32	38.5633680486	-104.665750265	5380.06	10.0	5390.06
33	38.5633512704	-104.663475752	5354.55	10.0	5364.55
34	38.5618412193	-104.66349721	5370.4	10.0	5380.4

35	38.5612204113	-104.663432837	5382.76	10.0	5392.76
36	38.5604485885	-104.663089514	5384.93	10.0	5394.93
37	38.5595760832	-104.662617445	5388.12	10.0	5398.12
38	38.5587203465	-104.661544561	5386.49	10.0	5396.49
39	38.5583344227	-104.660707712	5383.17	10.0	5393.17
40	38.5579652762	-104.659634829	5378.57	10.0	5388.57
41	38.5577471434	-104.658733606	5375.28	10.0	5385.28
42	38.5575793484	-104.658068419	5372.44	10.0	5382.44
43	38.5521593601	-104.657140374	5343.16	10.0	5353.16
44	38.5521761409	-104.65944171	5356.86	10.0	5366.86
45	38.5521257985	-104.659935236	5364.87	10.0	5374.87
46	38.5519076479	-104.661909342	5389.95	10.0	5399.95
47	38.5516559349	-104.664012194	5407.25	10.0	5417.25
48	38.5516559349	-104.664763212	5411.33	10.0	5421.33
49	38.5516223731	-104.665664434	5416.83	10.0	5426.83
50	38.55138744	-104.674762487	5464.78	10.0	5474.78
51	38.5513203161	-104.677112103	5466.05	10.0	5476.05

52	38.5518237437	-104.679987431	5460.94	10.0	5470.94
53	38.5516223731	-104.684407711	5465.87	10.0	5475.87
54	38.5514210019	-104.68865633	5472.52	10.0	5482.52
55	38.5525956591	-104.688870907	5477.23	10.0	5487.23
56	38.5536696146	-104.689471722	5481.75	10.0	5491.75
57	38.5548106748	-104.690673351	5496.21	10.0	5506.21
58	38.555649678	-104.69234705	5502.95	10.0	5512.95
59	38.5570927407	-104.695136547	5497.63	10.0	5507.63
60	38.5576296869	-104.695994854	5502.75	10.0	5512.75
61	38.5587035672	-104.696724415	5506.94	10.0	5516.94
62	38.5595089669	-104.697024822	5520.62	10.0	5530.62
63	38.5609855096	-104.69741106	5521.83	10.0	5531.83
64	38.5622271243	-104.697711468	5525.89	10.0	5535.89

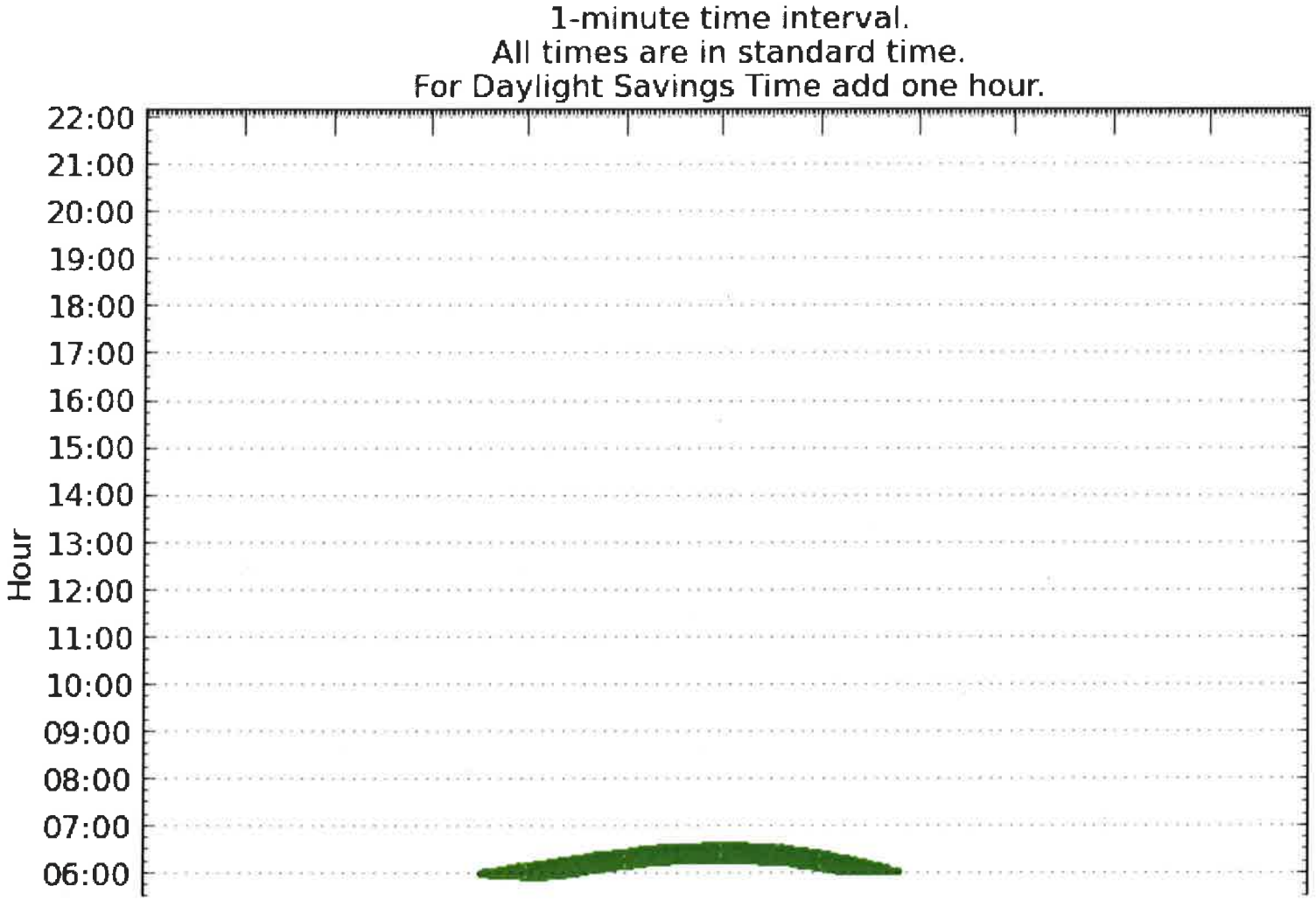
Observation Points

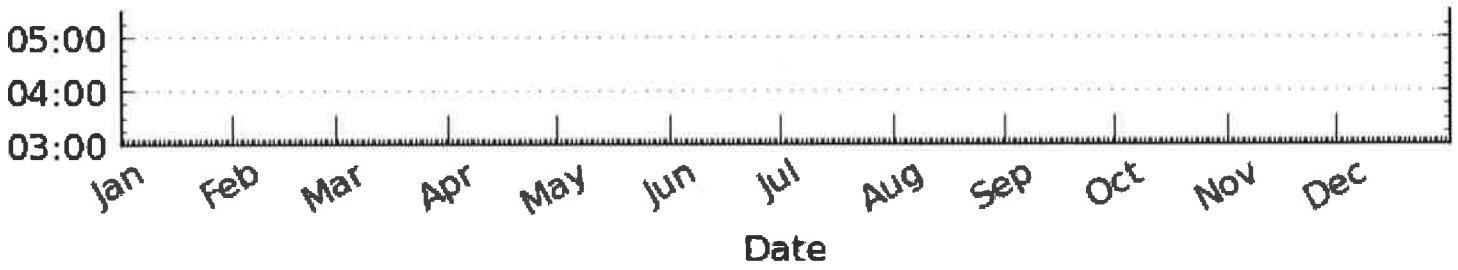
Latitude (deg)	Longitude (deg)	Ground Elevation (ft)	Eye-level height above ground (ft)

1	38.5516055922	-104.65206027	5327.01	4.0

Glare Occurrence Plot

All times are in standard time. For Daylight Savings Time add one hour.





Low potential for temporary after-image
Potential for temporary after-image
Potential for permanent eye damage

Solar Glare Hazard Analysis Report

Generated Aug. 25, 2015, 8:46 a.m.

Glare found

Print

Google Map

Inputs

Analysis name	Midway 3
PV array axis tracking	single
Tilt of tracking axis (deg)	35.0
Orientation of tracking axis (deg)	180.0
Offset angle of module (deg)	4.0
Limit rotation angle?	False

Rated power (kW)	22.0
Vary reflectivity	True
PV surface material	Smooth glass without ARC

Timezone offset	-7.0
Subtended angle of sun (mrad)	9.3
Peak DNI (W/m^2)	1000.0
Ocular transmission coefficient	0.5
Pupil diameter (m)	0.002
Eye focal length (m)	0.017
Time interval (min)	1
Correlate slope error with material	True
Slope error (mrad)	6.55

PV array vertices

id	Latitude (deg)	Longitude (deg)	Ground Elevation (ft)	Height of panels above ground (ft)	Total elevation (ft)
1	38.5664216099	-104.697765112	5528.08	10.0	5538.08

2	38.5673275866	-104.697421789	5528.31	10.0	5538.31
3	38.5702803204	-104.695876837	5516.47	10.0	5526.47
4	38.5710017085	-104.695533514	5511.01	10.0	5521.01
5	38.5712701301	-104.695276022	5508.33	10.0	5518.33
6	38.5723270305	-104.693859816	5483.8	10.0	5493.8
7	38.5725283431	-104.693065882	5474.81	10.0	5484.81
8	38.5726961032	-104.69197154	5459.96	10.0	5469.96
9	38.5625626922	-104.692003727	5507.96	10.0	5517.96
10	38.5624788003	-104.695608616	5522.64	10.0	5532.64
11	38.5589720348	-104.695436954	5509.51	10.0	5519.51
12	38.5582547208	-104.694396257	5507.53	10.0	5517.53
13	38.5582421362	-104.689278603	5491.77	10.0	5501.77
14	38.5558342574	-104.689342976	5505.13	10.0	5515.13
15	38.5557167979	-104.68616724	5477.86	10.0	5487.86
16	38.5667403808	-104.686199427	5504.55	10.0	5514.55
17	38.5669081544	-104.686113596	5503.12	10.0	5513.12
18	38.5730819499	-104.681671858	5457.9	10.0	5467.9

19	38.5673946955	-104.681446552	5484.4	10.0	5494.4
20	38.5632338232	-104.681704044	5483.24	10.0	5493.24
21	38.5588545804	-104.681049585	5492.0	10.0	5502.0
22	38.5588881388	-104.677487612	5480.2	10.0	5490.2
23	38.5602975787	-104.677401781	5466.53	10.0	5476.53
24	38.5611029606	-104.673700333	5445.82	10.0	5455.82
25	38.5613084993	-104.67279911	5447.03	10.0	5457.03
26	38.561839122	-104.673024416	5440.99	10.0	5450.99
27	38.5619167226	-104.67206955	5446.98	10.0	5456.98
28	38.5624032976	-104.672015905	5443.84	10.0	5453.84
29	38.5623445732	-104.670170546	5417.89	10.0	5427.89
30	38.5633680486	-104.670213461	5401.52	10.0	5411.52
31	38.5633680486	-104.668067694	5383.15	10.0	5393.15
32	38.5633680486	-104.665750265	5380.06	10.0	5390.06
33	38.5633512704	-104.663475752	5354.55	10.0	5364.55
34	38.5618412193	-104.66349721	5370.4	10.0	5380.4

35	38.5612204113	-104.663432837	5382.76	10.0	5392.76
36	38.5604485885	-104.663089514	5384.93	10.0	5394.93
37	38.5595760832	-104.662617445	5388.12	10.0	5398.12
38	38.5587203465	-104.661544561	5386.49	10.0	5396.49
39	38.5583344227	-104.660707712	5383.17	10.0	5393.17
40	38.5579652762	-104.659634829	5378.57	10.0	5388.57
41	38.5577471434	-104.658733606	5375.28	10.0	5385.28
42	38.5575793484	-104.658068419	5372.44	10.0	5382.44
43	38.5521593601	-104.657140374	5343.16	10.0	5353.16
44	38.5521761409	-104.65944171	5356.86	10.0	5366.86
45	38.5521257985	-104.659935236	5364.87	10.0	5374.87
46	38.5519076479	-104.661909342	5389.95	10.0	5399.95
47	38.5516559349	-104.664012194	5407.25	10.0	5417.25
48	38.5516559349	-104.664763212	5411.33	10.0	5421.33
49	38.5516223731	-104.665664434	5416.83	10.0	5426.83
50	38.55138744	-104.674762487	5464.78	10.0	5474.78
51	38.5513203161	-104.677112103	5466.05	10.0	5476.05

52	38.5518237437	-104.679987431	5460.94	10.0	5470.94
53	38.5516223731	-104.684407711	5465.87	10.0	5475.87
54	38.5514210019	-104.68865633	5472.52	10.0	5482.52
55	38.5525956591	-104.688870907	5477.23	10.0	5487.23
56	38.5536696146	-104.689471722	5481.75	10.0	5491.75
57	38.5548106748	-104.690673351	5496.21	10.0	5506.21
58	38.555649678	-104.69234705	5502.95	10.0	5512.95
59	38.5570927407	-104.695136547	5497.63	10.0	5507.63
60	38.5576296869	-104.695994854	5502.75	10.0	5512.75
61	38.5587035672	-104.696724415	5506.94	10.0	5516.94
62	38.5595089669	-104.697024822	5520.62	10.0	5530.62
63	38.5609855096	-104.69741106	5521.83	10.0	5531.83
64	38.5622271243	-104.697711468	5525.89	10.0	5535.89

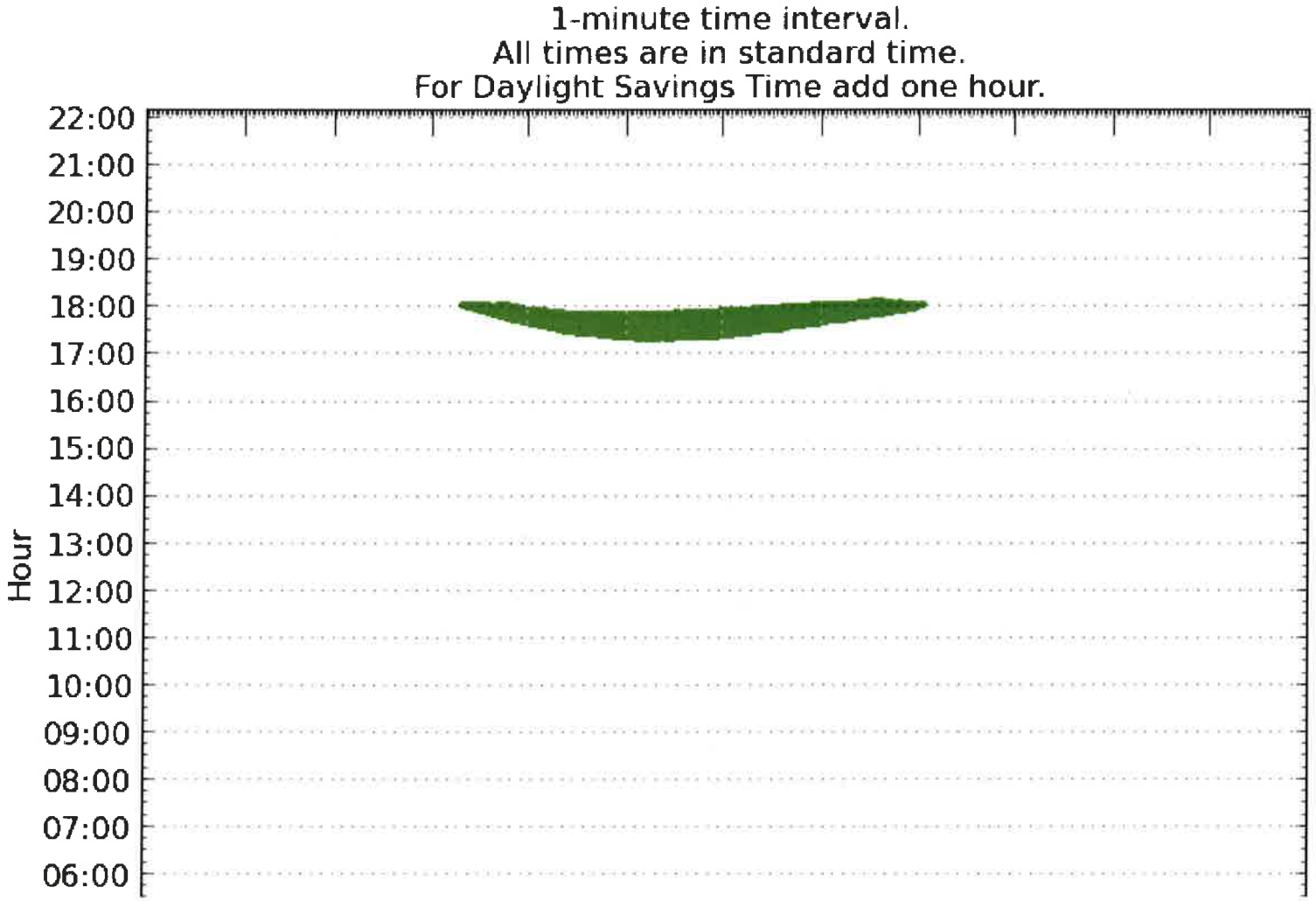
Observation Points

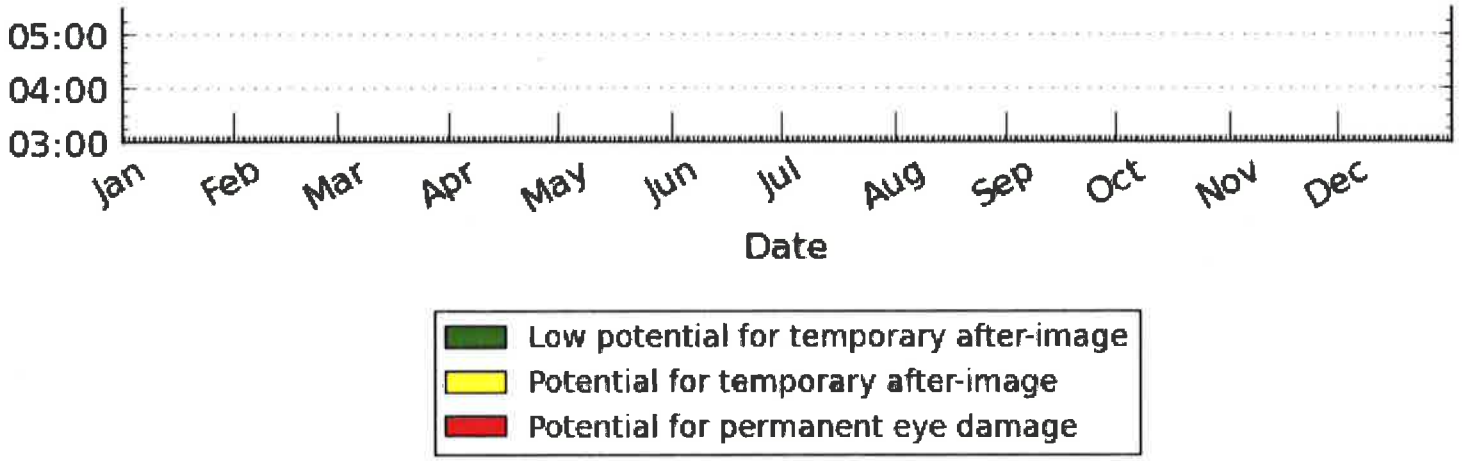
Latitude (deg)	Longitude (deg)	Ground Elevation (ft)	Eye-level height above ground (ft)

2	38.55105182	-104.688602686	5470.83	4.0

Glare Occurrence Plot

All times are in standard time. For Daylight Savings Time add one hour.





Solar Glare Hazard Analysis Report

Generated Aug. 26, 2015, 11:30 a.m.

Glare found

Print

Google Map

Inputs

Analysis name	Midway 3
PV array axis tracking	single
Tilt of tracking axis (deg)	35.0
Orientation of tracking axis (deg)	180.0
Offset angle of module (deg)	4.0
Limit rotation angle?	False

Rated power (kW)	22.0
Vary reflectivity	True
PV surface material	Smooth glass without ARC

Timezone offset	-7.0
Subtended angle of sun (mrad)	9.3
Peak DNI (W/m^2)	1000.0
Ocular transmission coefficient	0.5
Pupil diameter (m)	0.002
Eye focal length (m)	0.017
Time interval (min)	1
Correlate slope error with material	True
Slope error (mrad)	6.55

PV array vertices

id	Latitude (deg)	Longitude (deg)	Ground Elevation (ft)	Height of panels above ground (ft)	Total elevation (ft)
1	38.5664216099	-104.697765112	5528.08	10.0	5538.08

2	38.5673275866	-104.697421789	5528.31	10.0	5538.31
3	38.5702803204	-104.695876837	5516.47	10.0	5526.47
4	38.5710017085	-104.695533514	5511.01	10.0	5521.01
5	38.5712701301	-104.695276022	5508.33	10.0	5518.33
6	38.5723270305	-104.693859816	5483.8	10.0	5493.8
7	38.5725283431	-104.693065882	5474.81	10.0	5484.81
8	38.5726961032	-104.69197154	5459.96	10.0	5469.96
9	38.5625626922	-104.692003727	5507.96	10.0	5517.96
10	38.5624788003	-104.695608616	5522.64	10.0	5532.64
11	38.5589720348	-104.695436954	5509.51	10.0	5519.51
12	38.5582547208	-104.694396257	5507.53	10.0	5517.53
13	38.5582421362	-104.689278603	5491.77	10.0	5501.77
14	38.5558342574	-104.689342976	5505.13	10.0	5515.13
15	38.5557167979	-104.68616724	5477.86	10.0	5487.86
16	38.5667403808	-104.686199427	5504.55	10.0	5514.55
17	38.5669081544	-104.686113596	5503.12	10.0	5513.12
18	38.5730819499	-104.681671858	5457.9	10.0	5467.9

19	38.5673946955	-104.681446552	5484.4	10.0	5494.4
20	38.5632338232	-104.681704044	5483.24	10.0	5493.24
21	38.5588545804	-104.681049585	5492.0	10.0	5502.0
22	38.5588881388	-104.677487612	5480.2	10.0	5490.2
23	38.5602975787	-104.677401781	5466.53	10.0	5476.53
24	38.5611029606	-104.673700333	5445.82	10.0	5455.82
25	38.5613084993	-104.67279911	5447.03	10.0	5457.03
26	38.561839122	-104.673024416	5440.99	10.0	5450.99
27	38.5619167226	-104.67206955	5446.98	10.0	5456.98
28	38.5624032976	-104.672015905	5443.84	10.0	5453.84
29	38.5623445732	-104.670170546	5417.89	10.0	5427.89
30	38.5633680486	-104.670213461	5401.52	10.0	5411.52
31	38.5633680486	-104.668067694	5383.15	10.0	5393.15
32	38.5633680486	-104.665750265	5380.06	10.0	5390.06
33	38.5633512704	-104.663475752	5354.55	10.0	5364.55
34	38.5618412193	-104.66349721	5370.4	10.0	5380.4

35	38.5612204113	-104.663432837	5382.76	10.0	5392.76
36	38.5604485885	-104.663089514	5384.93	10.0	5394.93
37	38.5595760832	-104.662617445	5388.12	10.0	5398.12
38	38.5587203465	-104.661544561	5386.49	10.0	5396.49
39	38.5583344227	-104.660707712	5383.17	10.0	5393.17
40	38.5579652762	-104.659634829	5378.57	10.0	5388.57
41	38.5577471434	-104.658733606	5375.28	10.0	5385.28
42	38.5575793484	-104.658068419	5372.44	10.0	5382.44
43	38.5521593601	-104.657140374	5343.16	10.0	5353.16
44	38.5521761409	-104.65944171	5356.86	10.0	5366.86
45	38.5521257985	-104.659935236	5364.87	10.0	5374.87
46	38.5519076479	-104.661909342	5389.95	10.0	5399.95
47	38.5516559349	-104.664012194	5407.25	10.0	5417.25
48	38.5516559349	-104.664763212	5411.33	10.0	5421.33
49	38.5516223731	-104.665664434	5416.83	10.0	5426.83
50	38.55138744	-104.674762487	5464.78	10.0	5474.78
51	38.5513203161	-104.677112103	5466.05	10.0	5476.05

52	38.5518237437	-104.679987431	5460.94	10.0	5470.94
53	38.5516223731	-104.684407711	5465.87	10.0	5475.87
54	38.5514210019	-104.68865633	5472.52	10.0	5482.52
55	38.5525956591	-104.688870907	5477.23	10.0	5487.23
56	38.5536696146	-104.689471722	5481.75	10.0	5491.75
57	38.5548106748	-104.690673351	5496.21	10.0	5506.21
58	38.555649678	-104.69234705	5502.95	10.0	5512.95
59	38.5570927407	-104.695136547	5497.63	10.0	5507.63
60	38.5576296869	-104.695994854	5502.75	10.0	5512.75
61	38.5587035672	-104.696724415	5506.94	10.0	5516.94
62	38.5595089669	-104.697024822	5520.62	10.0	5530.62
63	38.5609855096	-104.69741106	5521.83	10.0	5531.83
64	38.5622271243	-104.697711468	5525.89	10.0	5535.89

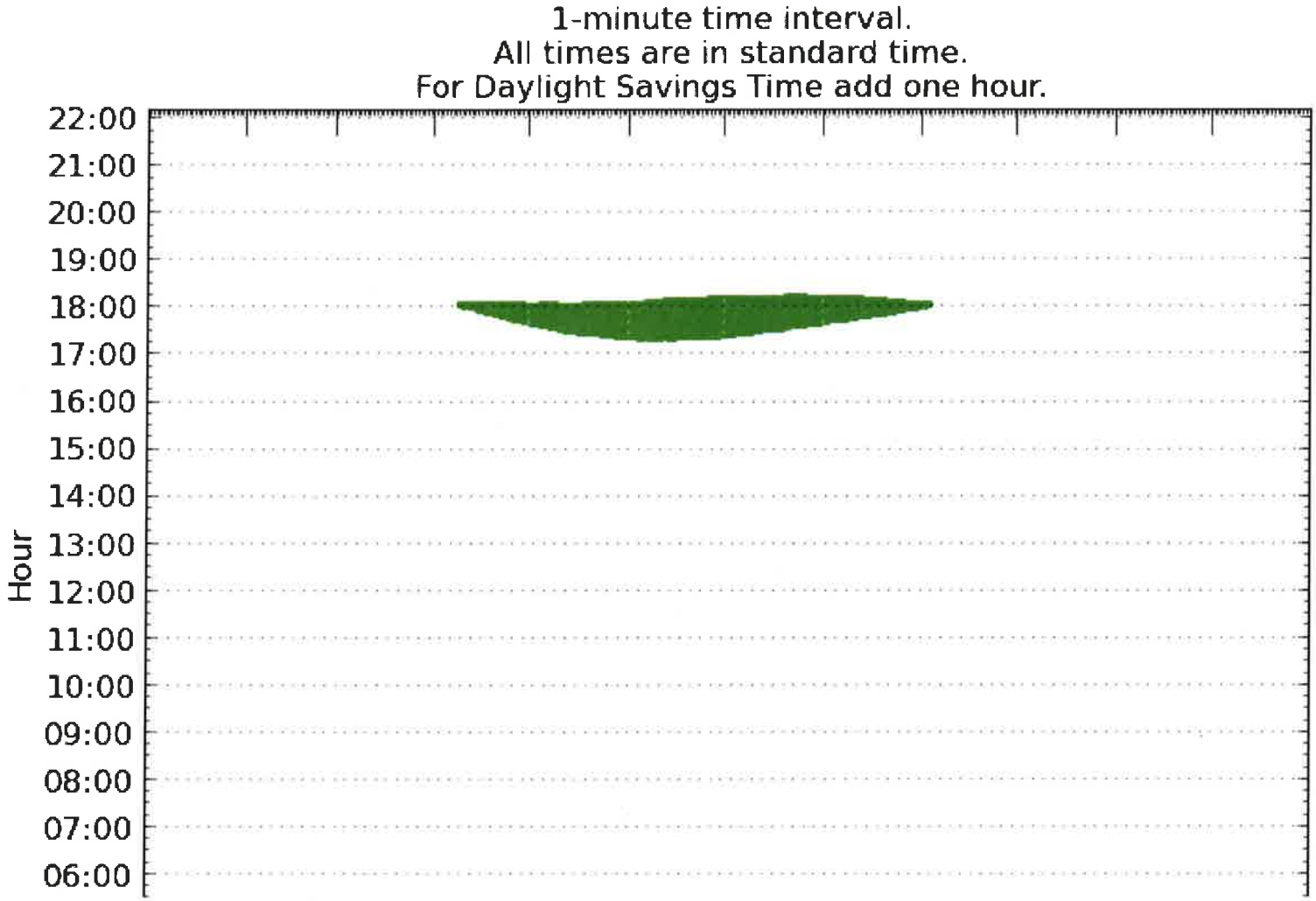
Observation Points

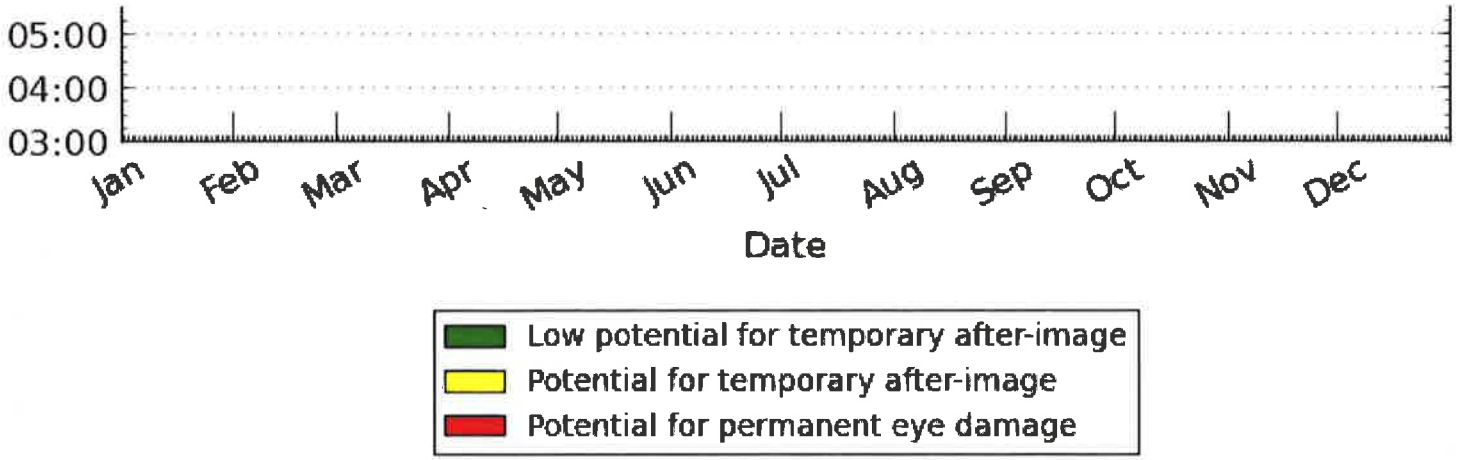
Latitude (deg)	Longitude (deg)	Ground Elevation (ft)	Eye-level height above ground (ft)

3	38.5513203161	-104.688795805	5471.89	4.0

Glare Occurrence Plot

All times are in standard time. For Daylight Savings Time add one hour.





Solar Glare Hazard Analysis Report

Generated Aug. 25, 2015, 8:45 a.m.

Glare found

Print

Google Map

Inputs

Analysis name	Midway 3
PV array axis tracking	single
Tilt of tracking axis (deg)	35.0
Orientation of tracking axis (deg)	180.0
Offset angle of module (deg)	4.0
Limit rotation angle?	False

Rated power (kW)	22.0
Vary reflectivity	True
PV surface material	Smooth glass without ARC

Timezone offset	-7.0
Subtended angle of sun (mrad)	9.3
Peak DNI (W/m^2)	1000.0
Ocular transmission coefficient	0.5
Pupil diameter (m)	0.002
Eye focal length (m)	0.017
Time interval (min)	1
Correlate slope error with material	True
Slope error (mrad)	6.55

PV array vertices

id	Latitude (deg)	Longitude (deg)	Ground Elevation (ft)	Height of panels above ground (ft)	Total elevation (ft)
1	38.5664216099	-104.697765112	5528.08	10.0	5538.08

2	38.5673275866	-104.697421789	5528.31	10.0	5538.31
3	38.5702803204	-104.695876837	5516.47	10.0	5526.47
4	38.5710017085	-104.695533514	5511.01	10.0	5521.01
5	38.5712701301	-104.695276022	5508.33	10.0	5518.33
6	38.5723270305	-104.693859816	5483.8	10.0	5493.8
7	38.5725283431	-104.693065882	5474.81	10.0	5484.81
8	38.5726961032	-104.69197154	5459.96	10.0	5469.96
9	38.5625626922	-104.692003727	5507.96	10.0	5517.96
10	38.5624788003	-104.695608616	5522.64	10.0	5532.64
11	38.5589720348	-104.695436954	5509.51	10.0	5519.51
12	38.5582547208	-104.694396257	5507.53	10.0	5517.53
13	38.5582421362	-104.689278603	5491.77	10.0	5501.77
14	38.5558342574	-104.689342976	5505.13	10.0	5515.13
15	38.5557167979	-104.68616724	5477.86	10.0	5487.86
16	38.5667403808	-104.686199427	5504.55	10.0	5514.55
17	38.5669081544	-104.686113596	5503.12	10.0	5513.12
18	38.5730819499	-104.681671858	5457.9	10.0	5467.9

19	38.5673946955	-104.681446552	5484.4	10.0	5494.4
20	38.5632338232	-104.681704044	5483.24	10.0	5493.24
21	38.5588545804	-104.681049585	5492.0	10.0	5502.0
22	38.5588881388	-104.677487612	5480.2	10.0	5490.2
23	38.5602975787	-104.677401781	5466.53	10.0	5476.53
24	38.5611029606	-104.673700333	5445.82	10.0	5455.82
25	38.5613084993	-104.67279911	5447.03	10.0	5457.03
26	38.561839122	-104.673024416	5440.99	10.0	5450.99
27	38.5619167226	-104.67206955	5446.98	10.0	5456.98
28	38.5624032976	-104.672015905	5443.84	10.0	5453.84
29	38.5623445732	-104.670170546	5417.89	10.0	5427.89
30	38.5633680486	-104.670213461	5401.52	10.0	5411.52
31	38.5633680486	-104.668067694	5383.15	10.0	5393.15
32	38.5633680486	-104.665750265	5380.06	10.0	5390.06
33	38.5633512704	-104.663475752	5354.55	10.0	5364.55
34	38.5618412193	-104.66349721	5370.4	10.0	5380.4

35	38.5612204113	-104.663432837	5382.76	10.0	5392.76
36	38.5604485885	-104.663089514	5384.93	10.0	5394.93
37	38.5595760832	-104.662617445	5388.12	10.0	5398.12
38	38.5587203465	-104.661544561	5386.49	10.0	5396.49
39	38.5583344227	-104.660707712	5383.17	10.0	5393.17
40	38.5579652762	-104.659634829	5378.57	10.0	5388.57
41	38.5577471434	-104.658733606	5375.28	10.0	5385.28
42	38.5575793484	-104.658068419	5372.44	10.0	5382.44
43	38.5521593601	-104.657140374	5343.16	10.0	5353.16
44	38.5521761409	-104.65944171	5356.86	10.0	5366.86
45	38.5521257985	-104.659935236	5364.87	10.0	5374.87
46	38.5519076479	-104.661909342	5389.95	10.0	5399.95
47	38.5516559349	-104.664012194	5407.25	10.0	5417.25
48	38.5516559349	-104.664763212	5411.33	10.0	5421.33
49	38.5516223731	-104.665664434	5416.83	10.0	5426.83
50	38.55138744	-104.674762487	5464.78	10.0	5474.78
51	38.5513203161	-104.677112103	5466.05	10.0	5476.05

52	38.5518237437	-104.679987431	5460.94	10.0	5470.94
53	38.5516223731	-104.684407711	5465.87	10.0	5475.87
54	38.5514210019	-104.68865633	5472.52	10.0	5482.52
55	38.5525956591	-104.688870907	5477.23	10.0	5487.23
56	38.5536696146	-104.689471722	5481.75	10.0	5491.75
57	38.5548106748	-104.690673351	5496.21	10.0	5506.21
58	38.555649678	-104.69234705	5502.95	10.0	5512.95
59	38.5570927407	-104.695136547	5497.63	10.0	5507.63
60	38.5576296869	-104.695994854	5502.75	10.0	5512.75
61	38.5587035672	-104.696724415	5506.94	10.0	5516.94
62	38.5595089669	-104.697024822	5520.62	10.0	5530.62
63	38.5609855096	-104.69741106	5521.83	10.0	5531.83
64	38.5622271243	-104.697711468	5525.89	10.0	5535.89

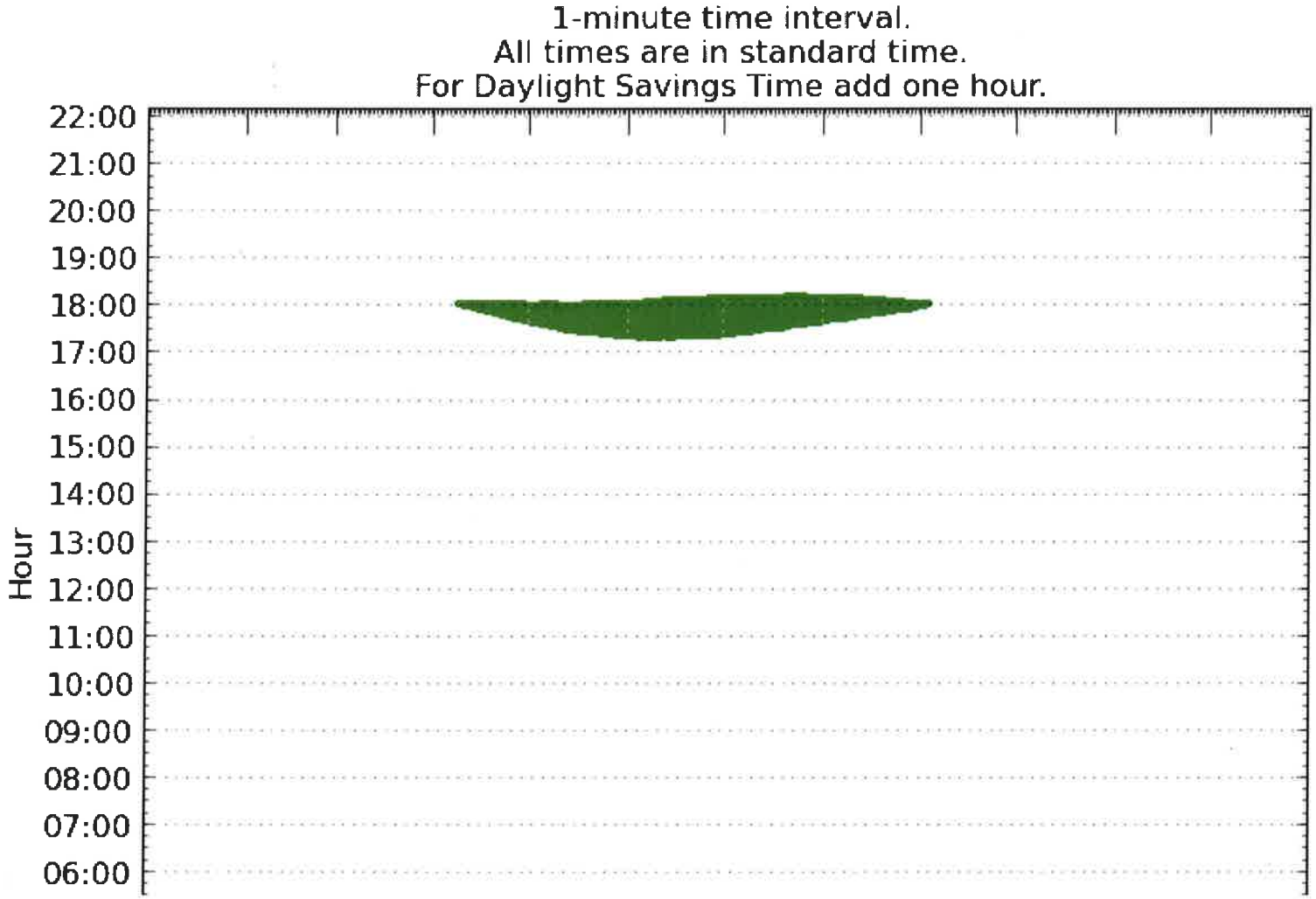
Observation Points

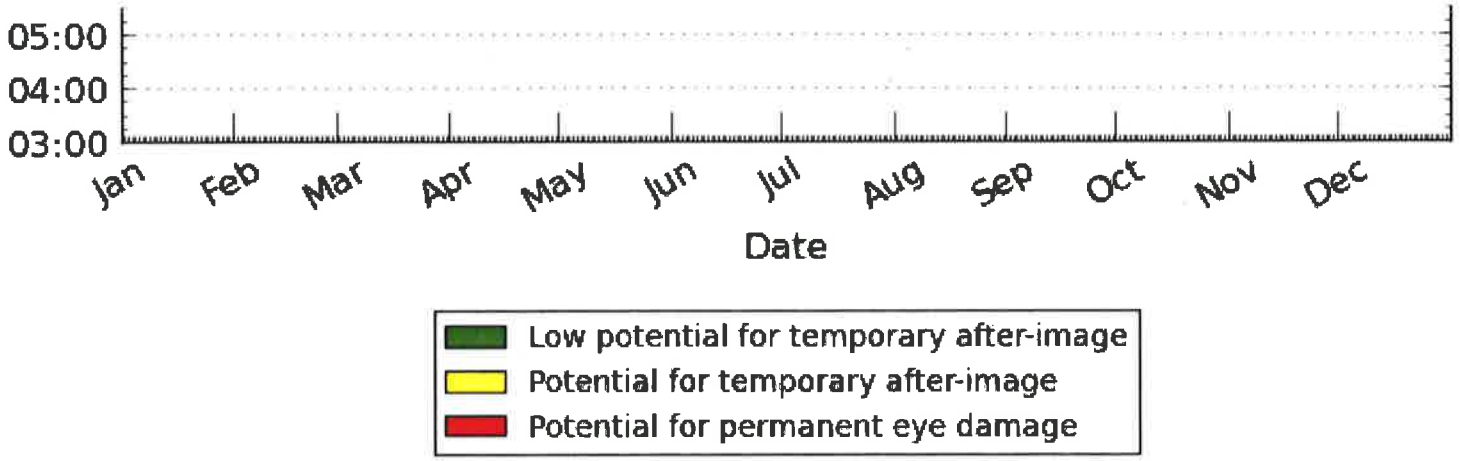
Latitude (deg)	Longitude (deg)	Ground Elevation (ft)	Eye-level height above ground (ft)

4	38.5608848372	-104.697614908	5522.48	4.0

Glare Occurrence Plot

All times are in standard time. For Daylight Savings Time add one hour.





Solar Glare Hazard Analysis Report

Generated Aug. 25, 2015, 8:45 a.m.

Glare found

Print

Google Map

Inputs

Analysis name	MIdway 3
PV array axis tracking	single
Tilt of tracking axis (deg)	35.0
Orientation of tracking axis (deg)	180.0
Offset angle of module (deg)	4.0
Limit rotation angle?	False

Rated power (kW)	22.0
Vary reflectivity	True
PV surface material	Smooth glass without ARC

Timezone offset	-7.0
Subtended angle of sun (mrad)	9.3
Peak DNI (W/m^2)	1000.0
Ocular transmission coefficient	0.5
Pupil diameter (m)	0.002
Eye focal length (m)	0.017
Time interval (min)	1
Correlate slope error with material	True
Slope error (mrad)	6.55

PV array vertices

id	Latitude (deg)	Longitude (deg)	Ground Elevation (ft)	Height of panels above ground (ft)	Total elevation (ft)
1	38.5664216099	-104.697765112	5528.08	10.0	5538.08

2	38.5673275866	-104.697421789	5528.31	10.0	5538.31
3	38.5702803204	-104.695876837	5516.47	10.0	5526.47
4	38.5710017085	-104.695533514	5511.01	10.0	5521.01
5	38.5712701301	-104.695276022	5508.33	10.0	5518.33
6	38.5723270305	-104.693859816	5483.8	10.0	5493.8
7	38.5725283431	-104.693065882	5474.81	10.0	5484.81
8	38.5726961032	-104.69197154	5459.96	10.0	5469.96
9	38.5625626922	-104.692003727	5507.96	10.0	5517.96
10	38.5624788003	-104.695608616	5522.64	10.0	5532.64
11	38.5589720348	-104.695436954	5509.51	10.0	5519.51
12	38.5582547208	-104.694396257	5507.53	10.0	5517.53
13	38.5582421362	-104.689278603	5491.77	10.0	5501.77
14	38.5558342574	-104.689342976	5505.13	10.0	5515.13
15	38.5557167979	-104.68616724	5477.86	10.0	5487.86
16	38.5667403808	-104.686199427	5504.55	10.0	5514.55
17	38.5669081544	-104.686113596	5503.12	10.0	5513.12
18	38.5730819499	-104.681671858	5457.9	10.0	5467.9

19	38.5673946955	-104.681446552	5484.4	10.0	5494.4
20	38.5632338232	-104.681704044	5483.24	10.0	5493.24
21	38.5588545804	-104.681049585	5492.0	10.0	5502.0
22	38.5588881388	-104.677487612	5480.2	10.0	5490.2
23	38.5602975787	-104.677401781	5466.53	10.0	5476.53
24	38.5611029606	-104.673700333	5445.82	10.0	5455.82
25	38.5613084993	-104.67279911	5447.03	10.0	5457.03
26	38.561839122	-104.673024416	5440.99	10.0	5450.99
27	38.5619167226	-104.67206955	5446.98	10.0	5456.98
28	38.5624032976	-104.672015905	5443.84	10.0	5453.84
29	38.5623445732	-104.670170546	5417.89	10.0	5427.89
30	38.5633680486	-104.670213461	5401.52	10.0	5411.52
31	38.5633680486	-104.668067694	5383.15	10.0	5393.15
32	38.5633680486	-104.665750265	5380.06	10.0	5390.06
33	38.5633512704	-104.663475752	5354.55	10.0	5364.55
34	38.5618412193	-104.66349721	5370.4	10.0	5380.4

35	38.5612204113	-104.663432837	5382.76	10.0	5392.76
36	38.5604485885	-104.663089514	5384.93	10.0	5394.93
37	38.5595760832	-104.662617445	5388.12	10.0	5398.12
38	38.5587203465	-104.661544561	5386.49	10.0	5396.49
39	38.5583344227	-104.660707712	5383.17	10.0	5393.17
40	38.5579652762	-104.659634829	5378.57	10.0	5388.57
41	38.5577471434	-104.658733606	5375.28	10.0	5385.28
42	38.5575793484	-104.658068419	5372.44	10.0	5382.44
43	38.5521593601	-104.657140374	5343.16	10.0	5353.16
44	38.5521761409	-104.65944171	5356.86	10.0	5366.86
45	38.5521257985	-104.659935236	5364.87	10.0	5374.87
46	38.5519076479	-104.661909342	5389.95	10.0	5399.95
47	38.5516559349	-104.664012194	5407.25	10.0	5417.25
48	38.5516559349	-104.664763212	5411.33	10.0	5421.33
49	38.5516223731	-104.665664434	5416.83	10.0	5426.83
50	38.55138744	-104.674762487	5464.78	10.0	5474.78
51	38.5513203161	-104.677112103	5466.05	10.0	5476.05

52	38.5518237437	-104.679987431	5460.94	10.0	5470.94
53	38.5516223731	-104.684407711	5465.87	10.0	5475.87
54	38.5514210019	-104.68865633	5472.52	10.0	5482.52
55	38.5525956591	-104.688870907	5477.23	10.0	5487.23
56	38.5536696146	-104.689471722	5481.75	10.0	5491.75
57	38.5548106748	-104.690673351	5496.21	10.0	5506.21
58	38.555649678	-104.69234705	5502.95	10.0	5512.95
59	38.5570927407	-104.695136547	5497.63	10.0	5507.63
60	38.5576296869	-104.695994854	5502.75	10.0	5512.75
61	38.5587035672	-104.696724415	5506.94	10.0	5516.94
62	38.5595089669	-104.697024822	5520.62	10.0	5530.62
63	38.5609855096	-104.69741106	5521.83	10.0	5531.83
64	38.5622271243	-104.697711468	5525.89	10.0	5535.89

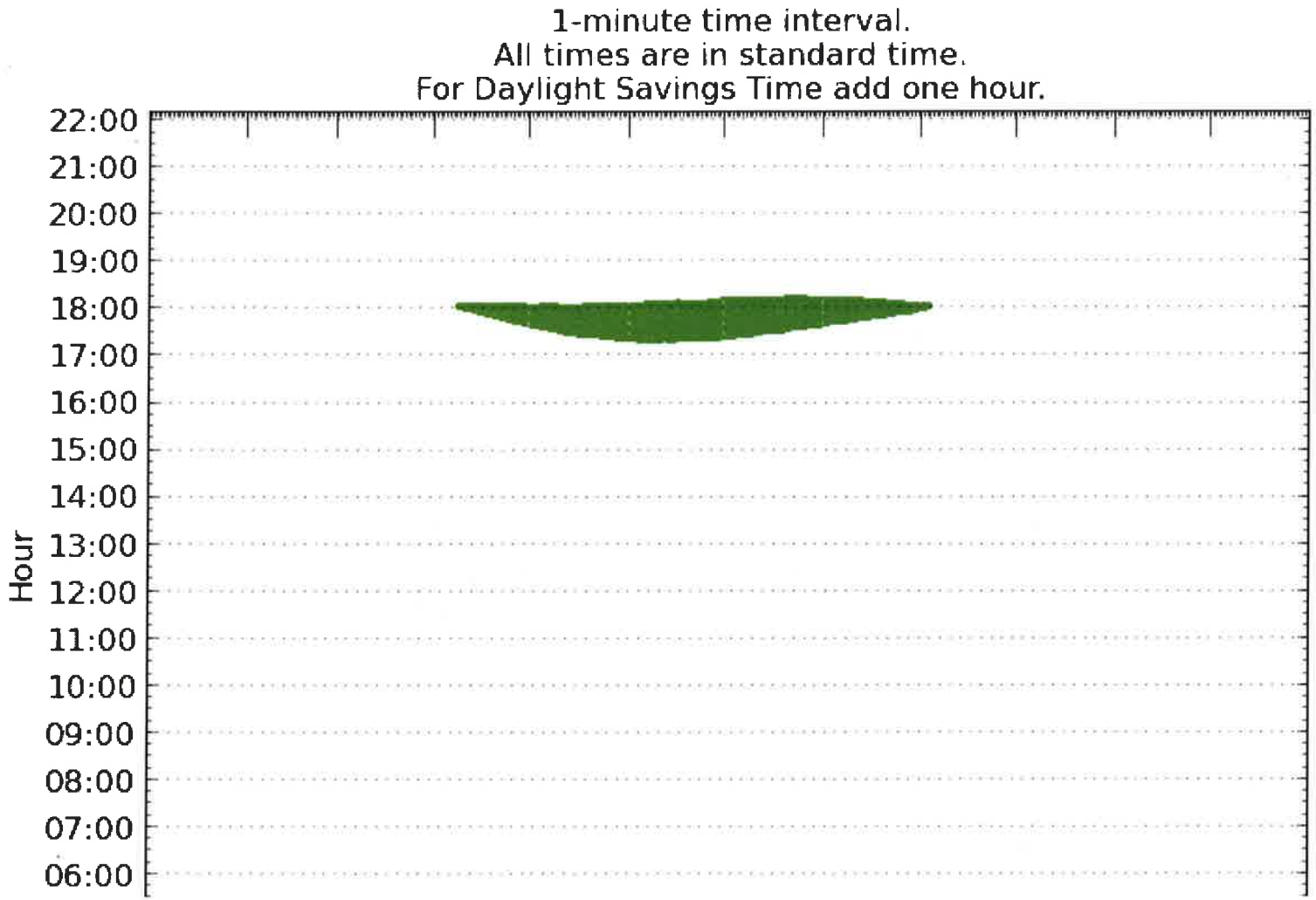
Observation Points

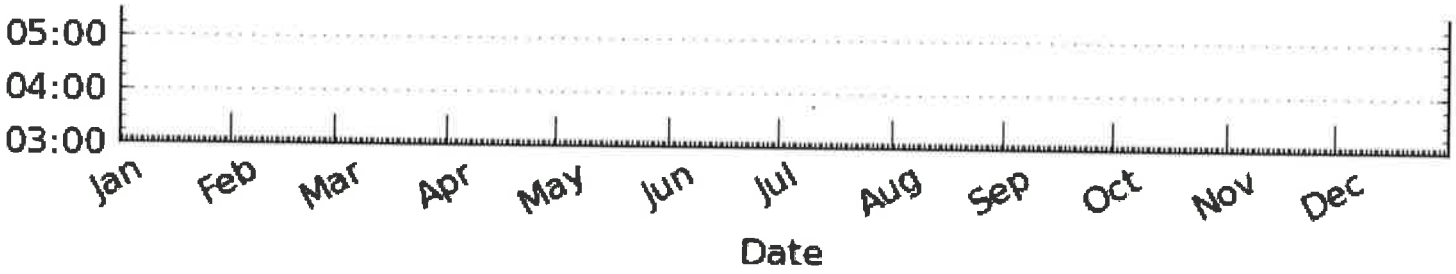
	Latitude (deg)	Longitude (deg)	Ground Elevation (ft)	Eye-level height above ground (ft)

5	38.5664216099	-104.697936773	5528.43	4.0

Glare Occurrence Plot

All times are in standard time. For Daylight Savings Time add one hour.





Solar Glare Hazard Analysis Report

Generated Aug. 25, 2015, 8:45 a.m.

Glare found

Print

Google Map

Inputs

Analysis name	MIdway 3
PV array axis tracking	single
Tilt of tracking axis (deg)	35.0
Orientation of tracking axis (deg)	180.0
Offset angle of module (deg)	4.0
Limit rotation angle?	False

Rated power (kW)	22.0
Vary reflectivity	True
PV surface material	Smooth glass without ARC

Timezone offset	-7.0
Subtended angle of sun (mrad)	9.3
Peak DNI (W/m^2)	1000.0
Ocular transmission coefficient	0.5
Pupil diameter (m)	0.002
Eye focal length (m)	0.017
Time interval (min)	1
Correlate slope error with material	True
Slope error (mrad)	6.55

PV array vertices

id	Latitude (deg)	Longitude (deg)	Ground Elevation (ft)	Height of panels above ground (ft)	Total elevation (ft)
1	38.5664216099	-104.697765112	5528.08	10.0	5538.08

2	38.5673275866	-104.697421789	5528.31	10.0	5538.31
3	38.5702803204	-104.695876837	5516.47	10.0	5526.47
4	38.5710017085	-104.695533514	5511.01	10.0	5521.01
5	38.5712701301	-104.695276022	5508.33	10.0	5518.33
6	38.5723270305	-104.693859816	5483.8	10.0	5493.8
7	38.5725283431	-104.693065882	5474.81	10.0	5484.81
8	38.5726961032	-104.69197154	5459.96	10.0	5469.96
9	38.5625626922	-104.692003727	5507.96	10.0	5517.96
10	38.5624788003	-104.695608616	5522.64	10.0	5532.64
11	38.5589720348	-104.695436954	5509.51	10.0	5519.51
12	38.5582547208	-104.694396257	5507.53	10.0	5517.53
13	38.5582421362	-104.689278603	5491.77	10.0	5501.77
14	38.5558342574	-104.689342976	5505.13	10.0	5515.13
15	38.5557167979	-104.68616724	5477.86	10.0	5487.86
16	38.5667403808	-104.686199427	5504.55	10.0	5514.55
17	38.5669081544	-104.686113596	5503.12	10.0	5513.12
18	38.5730819499	-104.681671858	5457.9	10.0	5467.9

19	38.5673946955	-104.681446552	5484.4	10.0	5494.4
20	38.5632338232	-104.681704044	5483.24	10.0	5493.24
21	38.5588545804	-104.681049585	5492.0	10.0	5502.0
22	38.5588881388	-104.677487612	5480.2	10.0	5490.2
23	38.5602975787	-104.677401781	5466.53	10.0	5476.53
24	38.5611029606	-104.673700333	5445.82	10.0	5455.82
25	38.5613084993	-104.67279911	5447.03	10.0	5457.03
26	38.561839122	-104.673024416	5440.99	10.0	5450.99
27	38.5619167226	-104.67206955	5446.98	10.0	5456.98
28	38.5624032976	-104.672015905	5443.84	10.0	5453.84
29	38.5623445732	-104.670170546	5417.89	10.0	5427.89
30	38.5633680486	-104.670213461	5401.52	10.0	5411.52
31	38.5633680486	-104.668067694	5383.15	10.0	5393.15
32	38.5633680486	-104.665750265	5380.06	10.0	5390.06
33	38.5633512704	-104.663475752	5354.55	10.0	5364.55
34	38.5618412193	-104.66349721	5370.4	10.0	5380.4

35	38.5612204113	-104.663432837	5382.76	10.0	5392.76
36	38.5604485885	-104.663089514	5384.93	10.0	5394.93
37	38.5595760832	-104.662617445	5388.12	10.0	5398.12
38	38.5587203465	-104.661544561	5386.49	10.0	5396.49
39	38.5583344227	-104.660707712	5383.17	10.0	5393.17
40	38.5579652762	-104.659634829	5378.57	10.0	5388.57
41	38.5577471434	-104.658733606	5375.28	10.0	5385.28
42	38.5575793484	-104.658068419	5372.44	10.0	5382.44
43	38.5521593601	-104.657140374	5343.16	10.0	5353.16
44	38.5521761409	-104.65944171	5356.86	10.0	5366.86
45	38.5521257985	-104.659935236	5364.87	10.0	5374.87
46	38.5519076479	-104.661909342	5389.95	10.0	5399.95
47	38.5516559349	-104.664012194	5407.25	10.0	5417.25
48	38.5516559349	-104.664763212	5411.33	10.0	5421.33
49	38.5516223731	-104.665664434	5416.83	10.0	5426.83
50	38.55138744	-104.674762487	5464.78	10.0	5474.78
51	38.5513203161	-104.677112103	5466.05	10.0	5476.05

52	38.5518237437	-104.679987431	5460.94	10.0	5470.94
53	38.5516223731	-104.684407711	5465.87	10.0	5475.87
54	38.5514210019	-104.68865633	5472.52	10.0	5482.52
55	38.5525956591	-104.688870907	5477.23	10.0	5487.23
56	38.5536696146	-104.689471722	5481.75	10.0	5491.75
57	38.5548106748	-104.690673351	5496.21	10.0	5506.21
58	38.555649678	-104.69234705	5502.95	10.0	5512.95
59	38.5570927407	-104.695136547	5497.63	10.0	5507.63
60	38.5576296869	-104.695994854	5502.75	10.0	5512.75
61	38.5587035672	-104.696724415	5506.94	10.0	5516.94
62	38.5595089669	-104.697024822	5520.62	10.0	5530.62
63	38.5609855096	-104.69741106	5521.83	10.0	5531.83
64	38.5622271243	-104.697711468	5525.89	10.0	5535.89

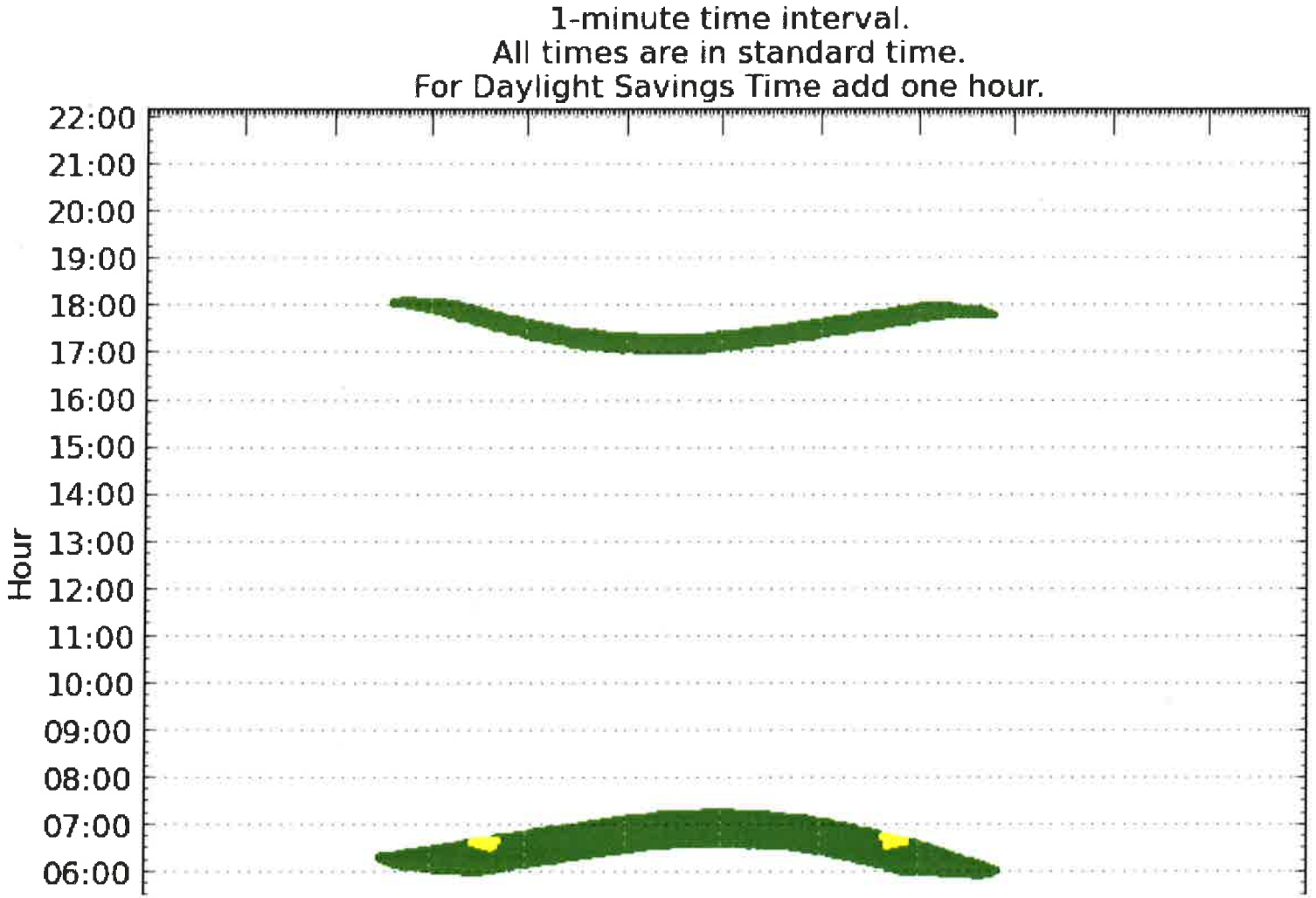
Observation Points

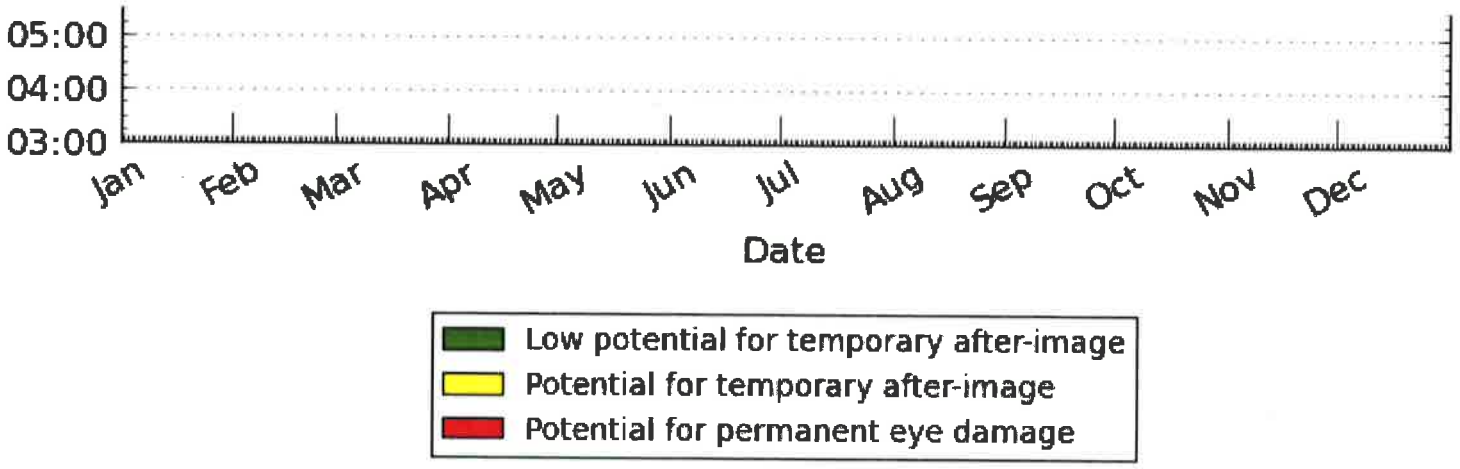
Latitude (deg)	Longitude (deg)	Ground Elevation (ft)	Eye-level height above ground (ft)

6	38.558988814	-104.680491686	5491.46	4.0

Glare Occurrence Plot

All times are in standard time. For Daylight Savings Time add one hour.





Solar Glare Hazard Analysis Report

Generated Aug. 25, 2015, 8:44 a.m.

Glare found

Print

Google Map

Inputs

Analysis name	MIdway 3
PV array axis tracking	single
Tilt of tracking axis (deg)	35.0
Orientation of tracking axis (deg)	180.0
Offset angle of module (deg)	4.0
Limit rotation angle?	False

Rated power (kW)	22.0
Vary reflectivity	True
PV surface material	Smooth glass without ARC

Timezone offset	-7.0
Subtended angle of sun (mrad)	9.3
Peak DNI (W/m^2)	1000.0
Ocular transmission coefficient	0.5
Pupil diameter (m)	0.002
Eye focal length (m)	0.017
Time interval (min)	1
Correlate slope error with material	True
Slope error (mrad)	6.55

PV array vertices

id	Latitude (deg)	Longitude (deg)	Ground Elevation (ft)	Height of panels above ground (ft)	Total elevation (ft)
1	38.5664216099	-104.697765112	5528.08	10.0	5538.08

2	38.5673275866	-104.697421789	5528.31	10.0	5538.31
3	38.5702803204	-104.695876837	5516.47	10.0	5526.47
4	38.5710017085	-104.695533514	5511.01	10.0	5521.01
5	38.5712701301	-104.695276022	5508.33	10.0	5518.33
6	38.5723270305	-104.693859816	5483.8	10.0	5493.8
7	38.5725283431	-104.693065882	5474.81	10.0	5484.81
8	38.5726961032	-104.69197154	5459.96	10.0	5469.96
9	38.5625626922	-104.692003727	5507.96	10.0	5517.96
10	38.5624788003	-104.695608616	5522.64	10.0	5532.64
11	38.5589720348	-104.695436954	5509.51	10.0	5519.51
12	38.5582547208	-104.694396257	5507.53	10.0	5517.53
13	38.5582421362	-104.689278603	5491.77	10.0	5501.77
14	38.5558342574	-104.689342976	5505.13	10.0	5515.13
15	38.5557167979	-104.68616724	5477.86	10.0	5487.86
16	38.5667403808	-104.686199427	5504.55	10.0	5514.55
17	38.5669081544	-104.686113596	5503.12	10.0	5513.12
18	38.5730819499	-104.681671858	5457.9	10.0	5467.9

19	38.5673946955	-104.681446552	5484.4	10.0	5494.4
20	38.5632338232	-104.681704044	5483.24	10.0	5493.24
21	38.5588545804	-104.681049585	5492.0	10.0	5502.0
22	38.5588881388	-104.677487612	5480.2	10.0	5490.2
23	38.5602975787	-104.677401781	5466.53	10.0	5476.53
24	38.5611029606	-104.673700333	5445.82	10.0	5455.82
25	38.5613084993	-104.67279911	5447.03	10.0	5457.03
26	38.561839122	-104.673024416	5440.99	10.0	5450.99
27	38.5619167226	-104.67206955	5446.98	10.0	5456.98
28	38.5624032976	-104.672015905	5443.84	10.0	5453.84
29	38.5623445732	-104.670170546	5417.89	10.0	5427.89
30	38.5633680486	-104.670213461	5401.52	10.0	5411.52
31	38.5633680486	-104.668067694	5383.15	10.0	5393.15
32	38.5633680486	-104.665750265	5380.06	10.0	5390.06
33	38.5633512704	-104.663475752	5354.55	10.0	5364.55
34	38.5618412193	-104.66349721	5370.4	10.0	5380.4

35	38.5612204113	-104.663432837	5382.76	10.0	5392.76
36	38.5604485885	-104.663089514	5384.93	10.0	5394.93
37	38.5595760832	-104.662617445	5388.12	10.0	5398.12
38	38.5587203465	-104.661544561	5386.49	10.0	5396.49
39	38.5583344227	-104.660707712	5383.17	10.0	5393.17
40	38.5579652762	-104.659634829	5378.57	10.0	5388.57
41	38.5577471434	-104.658733606	5375.28	10.0	5385.28
42	38.5575793484	-104.658068419	5372.44	10.0	5382.44
43	38.5521593601	-104.657140374	5343.16	10.0	5353.16
44	38.5521761409	-104.65944171	5356.86	10.0	5366.86
45	38.5521257985	-104.659935236	5364.87	10.0	5374.87
46	38.5519076479	-104.661909342	5389.95	10.0	5399.95
47	38.5516559349	-104.664012194	5407.25	10.0	5417.25
48	38.5516559349	-104.664763212	5411.33	10.0	5421.33
49	38.5516223731	-104.665664434	5416.83	10.0	5426.83
50	38.55138744	-104.674762487	5464.78	10.0	5474.78
51	38.5513203161	-104.677112103	5466.05	10.0	5476.05

52	38.5518237437	-104.679987431	5460.94	10.0	5470.94
53	38.5516223731	-104.684407711	5465.87	10.0	5475.87
54	38.5514210019	-104.68865633	5472.52	10.0	5482.52
55	38.5525956591	-104.688870907	5477.23	10.0	5487.23
56	38.5536696146	-104.689471722	5481.75	10.0	5491.75
57	38.5548106748	-104.690673351	5496.21	10.0	5506.21
58	38.555649678	-104.69234705	5502.95	10.0	5512.95
59	38.5570927407	-104.695136547	5497.63	10.0	5507.63
60	38.5576296869	-104.695994854	5502.75	10.0	5512.75
61	38.5587035672	-104.696724415	5506.94	10.0	5516.94
62	38.5595089669	-104.697024822	5520.62	10.0	5530.62
63	38.5609855096	-104.69741106	5521.83	10.0	5531.83
64	38.5622271243	-104.697711468	5525.89	10.0	5535.89

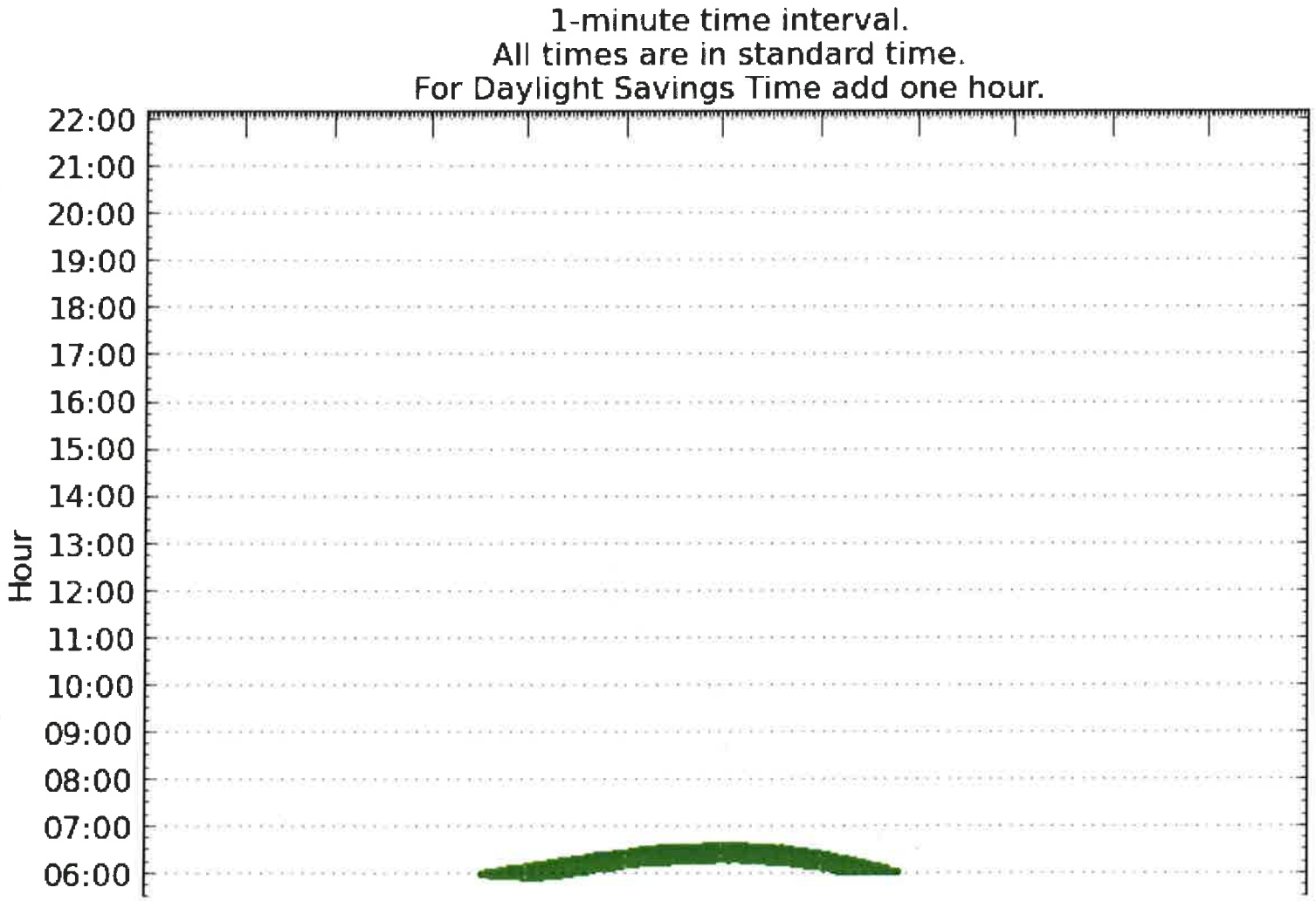
Observation Points

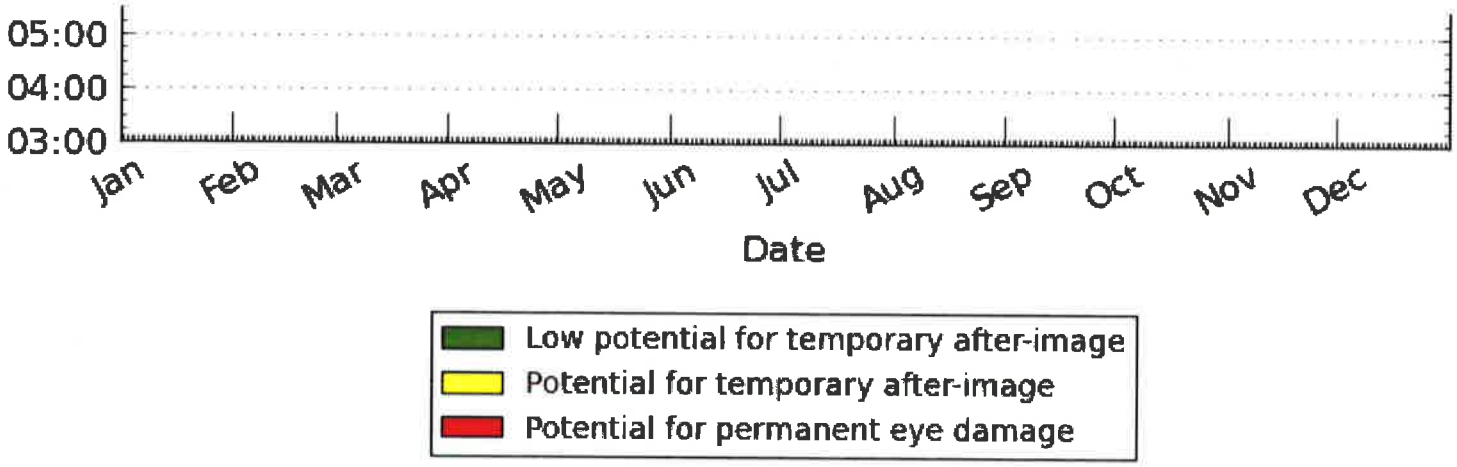
Latitude (deg)	Longitude (deg)	Ground Elevation (ft)	Eye-level height above ground (ft)

7	38.5522264832	-104.6474576	5280.31	4.0

Glare Occurrence Plot

All times are in standard time. For Daylight Savings Time add one hour.





Solar Glare Hazard Analysis Report

Generated Aug. 25, 2015, 8:44 a.m.

Glare found

Print

Google Map

Inputs

Analysis name	MIdway 3
PV array axis tracking	single
Tilt of tracking axis (deg)	35.0
Orientation of tracking axis (deg)	180.0
Offset angle of module (deg)	4.0
Limit rotation angle?	False

Rated power (kW)	22.0
Vary reflectivity	True
PV surface material	Smooth glass without ARC

Timezone offset	-7.0
Subtended angle of sun (mrad)	9.3
Peak DNI (W/m^2)	1000.0
Ocular transmission coefficient	0.5
Pupil diameter (m)	0.002
Eye focal length (m)	0.017
Time interval (min)	1
Correlate slope error with material	True
Slope error (mrad)	6.55

PV array vertices

id	Latitude (deg)	Longitude (deg)	Ground Elevation (ft)	Height of panels above ground (ft)	Total elevation (ft)
1	38.5664216099	-104.697765112	5528.08	10.0	5538.08

2	38.5673275866	-104.697421789	5528.31	10.0	5538.31
3	38.5702803204	-104.695876837	5516.47	10.0	5526.47
4	38.5710017085	-104.695533514	5511.01	10.0	5521.01
5	38.5712701301	-104.695276022	5508.33	10.0	5518.33
6	38.5723270305	-104.693859816	5483.8	10.0	5493.8
7	38.5725283431	-104.693065882	5474.81	10.0	5484.81
8	38.5726961032	-104.69197154	5459.96	10.0	5469.96
9	38.5625626922	-104.692003727	5507.96	10.0	5517.96
10	38.5624788003	-104.695608616	5522.64	10.0	5532.64
11	38.5589720348	-104.695436954	5509.51	10.0	5519.51
12	38.5582547208	-104.694396257	5507.53	10.0	5517.53
13	38.5582421362	-104.689278603	5491.77	10.0	5501.77
14	38.5558342574	-104.689342976	5505.13	10.0	5515.13
15	38.5557167979	-104.68616724	5477.86	10.0	5487.86
16	38.5667403808	-104.686199427	5504.55	10.0	5514.55
17	38.5669081544	-104.686113596	5503.12	10.0	5513.12
18	38.5730819499	-104.681671858	5457.9	10.0	5467.9

19	38.5673946955	-104.681446552	5484.4	10.0	5494.4
20	38.5632338232	-104.681704044	5483.24	10.0	5493.24
21	38.5588545804	-104.681049585	5492.0	10.0	5502.0
22	38.5588881388	-104.677487612	5480.2	10.0	5490.2
23	38.5602975787	-104.677401781	5466.53	10.0	5476.53
24	38.5611029606	-104.673700333	5445.82	10.0	5455.82
25	38.5613084993	-104.67279911	5447.03	10.0	5457.03
26	38.561839122	-104.673024416	5440.99	10.0	5450.99
27	38.5619167226	-104.67206955	5446.98	10.0	5456.98
28	38.5624032976	-104.672015905	5443.84	10.0	5453.84
29	38.5623445732	-104.670170546	5417.89	10.0	5427.89
30	38.5633680486	-104.670213461	5401.52	10.0	5411.52
31	38.5633680486	-104.668067694	5383.15	10.0	5393.15
32	38.5633680486	-104.665750265	5380.06	10.0	5390.06
33	38.5633512704	-104.663475752	5354.55	10.0	5364.55
34	38.5618412193	-104.66349721	5370.4	10.0	5380.4

35	38.5612204113	-104.663432837	5382.76	10.0	5392.76
36	38.5604485885	-104.663089514	5384.93	10.0	5394.93
37	38.5595760832	-104.662617445	5388.12	10.0	5398.12
38	38.5587203465	-104.661544561	5386.49	10.0	5396.49
39	38.5583344227	-104.660707712	5383.17	10.0	5393.17
40	38.5579652762	-104.659634829	5378.57	10.0	5388.57
41	38.5577471434	-104.658733606	5375.28	10.0	5385.28
42	38.5575793484	-104.658068419	5372.44	10.0	5382.44
43	38.5521593601	-104.657140374	5343.16	10.0	5353.16
44	38.5521761409	-104.65944171	5356.86	10.0	5366.86
45	38.5521257985	-104.659935236	5364.87	10.0	5374.87
46	38.5519076479	-104.661909342	5389.95	10.0	5399.95
47	38.5516559349	-104.664012194	5407.25	10.0	5417.25
48	38.5516559349	-104.664763212	5411.33	10.0	5421.33
49	38.5516223731	-104.665664434	5416.83	10.0	5426.83
50	38.55138744	-104.674762487	5464.78	10.0	5474.78
51	38.5513203161	-104.677112103	5466.05	10.0	5476.05

52	38.5518237437	-104.679987431	5460.94	10.0	5470.94
53	38.5516223731	-104.684407711	5465.87	10.0	5475.87
54	38.5514210019	-104.68865633	5472.52	10.0	5482.52
55	38.5525956591	-104.688870907	5477.23	10.0	5487.23
56	38.5536696146	-104.689471722	5481.75	10.0	5491.75
57	38.5548106748	-104.690673351	5496.21	10.0	5506.21
58	38.555649678	-104.69234705	5502.95	10.0	5512.95
59	38.5570927407	-104.695136547	5497.63	10.0	5507.63
60	38.5576296869	-104.695994854	5502.75	10.0	5512.75
61	38.5587035672	-104.696724415	5506.94	10.0	5516.94
62	38.5595089669	-104.697024822	5520.62	10.0	5530.62
63	38.5609855096	-104.69741106	5521.83	10.0	5531.83
64	38.5622271243	-104.697711468	5525.89	10.0	5535.89

Observation Points

Latitude (deg)	Longitude (deg)	Ground Elevation (ft)	Eye-level height above ground (ft)

8	38.5652471786	-104.653562307	5303.44	4.0

Glare Occurrence Plot

All times are in standard time. For Daylight Savings Time add one hour.