APPENDIX I

Biological Resources

I.1 Wildlife Movement and Desert Tortoise Habitat Connectivity

I.2 Cumulative Impacts

APPENDIX I.1
Wildlife Movement and Desert Tortoise Habitat Connectivity

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DOCKET	
09-AFC-7	
DATE	MAY 14 2010
RECD.	MAY 19 2010

May 17, 2010

Alan Solomon
Project Manager
California Energy Commission
1516 Ninth Street
Sacramento, CA 95814

RE: **Palen Solar Power Project, Docket No. 09-AFC-7**
Desert Tortoise Connectivity Letter
Technical Area: Biological Resources

Dear Mr. Solomon:

Attached please find the following *Desert Tortoise Connectivity Letter.*

If you have any questions on this submittal, please feel free to contact me directly.

Sincerely,

Alice Harron
Senior Director, Development

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Wildlife Movement and Desert Tortoise Habitat Connectivity

Palen Solar Power Project

Docket No. 09-AFC-7

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May 14, 2010

Ms. Susan Sanders
California Energy Commission
1516 Ninth Street
Sacramento, California 95814

Subject: Wildlife Movement and Desert Tortoise Habitat Connectivity, Palen Solar Power Project (PSPP) Docket No. 09-AFC-7

Dear Ms. Sanders:

The purpose of this letter is to present findings of surveys and analysis of wildlife movement along the Interstate 10 (I-10) corridor in the vicinity of the Palen Solar Power Project (PSPP or Project), and also to evaluate the potential effects of the PSPP on desert tortoise (*Gopherus agassizii*) movement and population connectivity. Mark Massar with the Bureau of Land Management (BLM) requested the wildlife movement analysis on March 25, 2010. Per the request of the BLM, AECOM, Inc. (AECOM) surveyed all potential wildlife underpasses on I-10 between the Desert Center exit to the west and the Wiley Wells Road exit to the east (32 miles). It was requested that each of these 24 crossings be evaluated in terms of suitability for use by different classes of wildlife (i.e., large mammal, small mammal, reptile). A memorandum summarizing the survey findings was prepared and delivered to BLM under separate cover on April 13, 2010. No comments have been received from BLM to date.

Introduction

The proposed PSPP is located approximately 10 miles east of Desert Center, and 0.5 mile north of the I-10 corridor in eastern Riverside County, California. The Project would be located within a 5,212-acre right-of-way (ROW) owned by the Federal government and administered by the BLM. Environmental analysis of the Project presented in the Staff Assessment/Draft Environmental Impact Statement (SA/DEIS) determined there would be adverse effects to wildlife movement and genetic connectivity, particularly to species with normal dispersal distances smaller than the area of the project, including desert tortoise.

Methods

Based on direction received from BLM, opportunities for wildlife species to cross under I-10 were inventoried along a 32-mile segment of the freeway running from Desert Center to Wiley Well (Figure 1). Underpasses were evaluated for potential wildlife use by AECOM wildlife biologists Dana Morin and Michael Anguiano on April 5, and April 6, 2010.

All potential underpasses were recorded using Geographical Positioning System (GPS) equipment. Each potential crossing was then accessed by hiking from truck trails south of I-10. The type of underpass (e.g., box culvert, bridge, etc.) was recorded and the four corners of each underpass structure were recorded with GPS. The length (distance from the southern approach to the northern approach) and width (distance between the walls of an

underpass) were calculated using Geographical Information System (GIS) software. In addition, the minimum height of each underpass was measured. The minimum height was used because many crossings were over washes with a natural substrate bottom and height varied with erosion through the underpass. These measurements were used to calculate an openness ratio for each underpass ([width x height]/length). An openness ratio indicates the relative openness of a structure. Larger openness ratios are typically more conducive to wildlife use. Existing ROW fencing at each underpass was evaluated to determine if fencing along I-10 could prevent wildlife access to underpasses.

Photographs were taken at each underpass of the southern and northern approaches. All photographs taken are included in the attached CD. Any animal sign detected in the immediate vicinity of an approach or in an underpass was recorded and additional notes were taken if an approach would not be suitable for a specific wildlife species. Factors that may increase or restrict potential use of a wildlife underpass were also recorded. Examples of such factors would be presence of desert dandelion (*Malacothrix glabrata*), a known forage species for desert tortoise, or if there was evidence of human presence.

Vegetation cover was estimated for the southern approach, the middle of the crossing, and the northern approach. Surveys were conducted during spring when annual cover was high, but only perennial species were used to estimate cover. Cover was estimated visually using the following categories:

- Bare = 0%
- Sparse = 5% - 15%
- Moderate = 15% - 30%
- Medium = 30% - 60%
- Dense = 60% - 85%

Dominant perennial species were identified to genus and listed for the southern approach, middle of the crossing, and northern approach of each crossing.

Results

The location of each underpass is shown in Figure 1. Variables for each underpass are listed in the GIS database included on the CD with this submittal. A total of 24 underpasses were surveyed over 30 miles along I-10. Twenty-one of the 24 underpasses are open span bridges with openings in the median and wash habitat throughout. Sizes of the open span bridges varied from 10.7 to 59.4 meters in width, 2.2 to 4.5 meters in height, and 56.7 to 97.8 meters in length. Openness ratio for the open span bridges varied from 0.5 to 3.4, all of which indicate potential use for all wildlife species in the area.

Overall, two types of fencing were present along the I-10 ROW: 5-strand barbed wire and fencing with square netting chicken wire (openings 6 inches by 6 inches) at the bottom and 2 to 3 strands of barbed wire from 1.5 meters to the top of the fence. Both fencing types were approximately 2 meters in height. At most underpasses fencing is either cut away for the

width of the crossing or cut away for at least one 3-meter segment at each approach. In addition, the fencing is not suitable to prevent access to the roadway as wildlife can easily move over or under it and the fencing does not funnel wildlife to the underpass openings, but allows access to the roadway. In addition, fencing in the openings between spans is often missing or in disrepair and thus allows access to the median and roadway.

Wildlife species detected at the undercrossings included lizards, rodent (*Peromyscus* sp., *Dipodomys* sp., *Neotoma* sp.), rabbit (*Sylvilagus* sp.), roadrunner (*Geococcyx californianus*), ground squirrel (*Spermophilus* sp.), fox, and coyote (*Canis latrans*). Bobcat (*Lynx rufus*) and mule deer (*Odocoileus hemionus*) sign were detected to the south of several underpasses to the west of PSPP.

In general, the washes on the western side of the 32-mile survey segment have greater cover and diversity with more distinct hydrology than those to the east. The northern approaches to the east were often dominated by grasses and mustard species, providing little protection for wildlife. Dominant perennial plant species identified at underpasses includes cheesebush (*Hymenoclea salsola*), brickellbush (*Brickellia* sp.) scorpion weed (*Phacelia* sp.), *Psorothamnus* sp., cattle saltbush (*Atriplex polycarpa*), brittlebush (*Encelia farinosa*), white bursage (*Ambrosia dumosa*), creosote (*Larea tridentata*), mesquite, ironwood (*Olneya tesota*), and palo verde.

Five underpasses (10, 11, 12, 13, and 14) were surveyed in the immediate vicinity of the PSPP (Figure 2). Figure 2 also includes the boundary of the proposed PSPP and the Reconfigured Alternative disturbance area and DT observations gathered during protocol surveys conducted by AECOM in 2009 and 2010. All five underpasses in the vicinity of the PSPP are open span bridges with openings in the median and wash habitat throughout.

Underpass 10 (Figure 1, Sheet 3) is located to the southwest of the PPSP. It is 3.0 meters in height, 30.1 meters wide, and 60.3 meters in length resulting in an openness ratio of 1.5, suitable for all wildlife species in the area. There is 5-strand barbed-wire fencing between spans on the median, but the fencing has been cut at either approach. In addition, the fencing is not suitable to prevent access to the roadway as wildlife can easily move over or under it. There is moderate vegetative cover in the wash to the south and between spans including *Psorothamnus* sp. and cheesebush (*Hymenoclea salsola*). Additionally, there is ironwood (*Olneya tesota*), mesquite (*Prosopsis glandulosa*), and palo verde (*Cercidium floridum*) in the wash to the north. Coyote (*Canis latrans*) and rodent (*Peromyscus* sp.) tracks were found through the underpass.

Underpass 11 (Figure 1, Sheet 4) is located south of the PSPP. It is 3.3 meters in height, 24.3 meters wide, and 58.4 meters in length resulting in an openness ratio of 1.4, suitable for all wildlife species in the area. The 5-strand barbed-wire fencing has been cut at both approaches and is not suitable to prevent access to the roadway as wildlife can easily move over or under it. There is no ROW fence between spans, and the western side of the underpass between spans slopes gently up to the roadway, providing easy access to all wildlife species. The southern approach and area between the spans has dense vegetative

cover including cheesebush, *Psorothamnus* sp., creosote (*Larea tridentata*), and palo verde. The northern approach to the wash has moderate vegetative cover including *Psorothamnus* sp. cheesebush and ironwood. Coyote, rodent, rabbit (*Sylvilagus* sp.), lizard, and roadrunner (*Geococcyx californianus*) tracks were found through the underpass.

Underpass 12 (Figure 1, Sheet 4) is located to the south of the PSPP. It is 3.3 meters in height, 17.3 meters wide, and 57.8 meters in length resulting in an openness ratio of 1.0, suitable for all wildlife species in the area. The 5-strand barbed-wire fencing has been cut at either approach and is not suitable to prevent access to the roadway as wildlife can easily move over or under it. There is no ROW fence between spans. The southern approach contains moderate, diverse shrub cover including cheesebush, cattle saltbush (*Atriplex polycarpa*), and white bursage (*Ambrosia dumosa*). Between spans is sparsely vegetated with cheesebush and creosote and the northern approach has moderate cover including cheesebush and mesquite. Coyote, rodent, rabbit (*Sylvilagus* sp.), and lizard tracks were found through the underpass.

Underpass 13 (Figure 1, Sheet 5) is located to the southeast of the PSPP. It is 3.0 meters in height, 23.2 meters wide, and 56.9 meters in length resulting in an openness ratio of 1.2, suitable for all wildlife species in the area. The 5-strand barbed-wire fencing has been cut at either approach and is not suitable to prevent access to the roadway as wildlife can easily move over or under it. There is no ROW fence between spans. The southern approach contains moderate shrub cover including cheesebush, white bursage, and mesquite. There is sparse cover between spans including *Psorothamnus* sp. and cheesebush. The northern approach is open with a few large *Psorothamnus* sp. and mesquite. Coyote, rodent, rabbit, ground squirrel (*Ammospermophilus* sp.) and lizard tracks were found through the underpass.

Underpass 14 (Figure 1, Sheet 5) is located to the southeast of the PSPP beyond the eastern border of the Project footprint. The location of underpass 14 is in an area where the distance between the Palen Mountains and habitat to the south of I-10 is shortest, representing an area with a relatively high likelihood of movement between these areas. It is 4.5 meters in height, 10.7 meters wide, and 60.1 meters in length resulting in an openness ratio of 0.8, suitable for all wildlife species in the area. The 5-strand barbed-wire fencing extends across the southern approach but has been cut at the northern approach. The fencing is not suitable to prevent access to the roadway as wildlife can easily move over or under it. There is no ROW fence between spans. The southern approach contains moderate shrub cover including cheesebush and *Psorothamnus* sp. The wash is bare and sandy between spans and the northern approach is open with a few large *Psorothamnus* sp., palo verde and mesquite. Coyote, rodent, roadrunner, and lizard tracks were found through the underpass.

Conclusions

While current underpasses are located at washes for hydrological reasons, all habitat to the north and south of I-10 is suitable for wildlife habitation and movement. Thus, these

underpasses provide connectivity and safe movement corridors between the habitat to the north and south of the I-10 corridor. However, there is likely attempted movement in upland areas as well. Current fencing does not keep wildlife from accessing I-10 or funnel animals to the underpasses.

Implementation of the PSPP would not affect undercrossings in the project vicinity. All would remain open and DT could still cross under I-10. No evidence of DT use of the undercrossings was detected during the survey. There are 24 underpasses occurring along the existing washes in the 32-mile stretch between Wiley Wells Road and Desert Center that could facilitate movement of a migrating DT in a north-south direction (see Figure 1). Although DT are more likely to utilize movement corridors to the west and east of the PSPP (discussed in more detail below), the proposed DT-proof fencing along the perimeter of the solar fields, as required by conditions proposed in the SA/DEIS, could impede DT movement. The Applicant therefore proposes to install a large box culvert underneath the project access road to facilitate the movement of DT and other wildlife (see location on Figure 2). The culvert will connect the undercrossings south of the PSPP with open areas to the west.

The shortest distance between higher value habitat in the Palen and Chuckwalla Mountains is to the east of the Project disturbance area. Results of 2010 DT buffer surveys, which were conducted further east than in 2009 near the base of the Palen Mountains, suggest greater DT activity in this area as compared to the PSPP study area. Additionally, the shortest distance to higher value habitat likely near the Eagle and Coxcomb Mountains is west of the Project disturbance area. Underpasses to the west and east of the Project disturbance area would continue to facilitate movement to these areas despite project implementation (see Figure 1).

It was determined that there are many points along I-10 suitable for wildlife undercrossing, including by desert tortoise. The proposed PSPP would place a barrier a short distance north of two of these crossings. Examining these particular undercrossings in a regional context, however, suggests that they may be less important than other available undercrossings to the east and west of the PSPP. As was discussed in the draft SA/DEIS, the PSPP site is located on the margins of a sand transport zone. To the north of the site sand dunes occur with increasing frequency as a result of the northwest to southeast orientation of the sand transport system. Further north is the Palen Dry Lake which is inhospitable for tortoises. While desert tortoises will cross desert pavement and dunes, areas of heavy dune concentration and areas consisting purely of dunes offer little in the way of forage and make burrowing difficult. These areas are likely not a regular part of tortoises' home ranges.

The need to retain routes providing opportunities for movement of tortoises between populations south of I-10 and areas further north is understood. This movement, ultimately providing connection and exchange of genetic material between desert tortoise populations, would likely occur, assuming suitable climatic conditions, through the combination of juvenile dispersal and gradual northerly and/or southerly expansion of the home ranges of succeeding generations of tortoises. The placement of the PSPP does not block areas important for this home range expansion. Tortoises moving north from south of I-10 would

confront an obstacle in the form of dunes and the Palen Dry Lake. The same features provide a barrier to tortoises moving south from northern portions of the Chuckwalla Valley. Tortoises seeking to establish new home ranges in this region would be forced into the bajada to the west of the proposed PSPP or to areas at the foot of the Palen Mountains to the east of the dunes. The placement of the PSPP, surrounded by tortoise fencing, simply places a more definitive barrier further south in an area that likely does not function as an effective desert tortoise movement corridor due to physiographic features. Additionally, the shortest distance between higher value habitat in the Palen and Chuckwalla Mountains is several miles to the east of the Project disturbance area. The shortest distance between the Chuckwalla Mountains to higher value habitat likely near the Eagle and Coxcomb Mountains is west of the Project disturbance area.

The placement of the PSPP north of I-10 will not significantly impact desert tortoise movement and population connectivity. Such movement, and the resultant connectivity, would occur via routes to the east and west of the PSPP due to the presence of extensive dune systems and Palen Dry Lake. Ample undercrossings (more than 20), completely unaffected by the proposed PSPP, exist to facilitate this movement across I-10. As an additional measure to facilitate desert tortoise movement, the applicant agrees to install a concrete box culvert under the access road leading to the site from the Corn Springs interchange (see Figure 2). This will prevent tortoises from becoming enclosed in an area bounded by the highway and the PSPP tortoise fence.

Sincerely,

Mr. William Graham
Principal
AECOM

Enclosures: Figure 1. I-10 Wildlife Crossing Analysis in the Project Vicinity
Figure 2. Desert Tortoise Observations and Wildlife Connectivity
CD. Photos of underpasses, Shapefiles and Metadata

cc: Alan Solomon, CEC
Larry LePre, Bureau of Land Management
Alice Harron, Solar Millennium

Wildlife Connectivity Letter to CEC

Desert Center

Sheet 1

Sheet 2

Sheet 3

Sheet 4

Sheet 5

Sheet 6

Sheet 7

Sheet 8

Sheet 9

Wiley's Well

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

Map Location

Legend

- Project Disturbance Area
- Access Routes
- Crossings Under I-10
- Map Extent

Source: ESRI 2010; AECOM 2010

1 inch = 2 miles

Miles 0 1 2 4

Palen Solar Power Project
Figure 1
I-10 Wildlife Crossing Analysis in the Project Vicinity

AECOM

Date: April 2010

Path: P:\60090808081 Sol Mil Palen 6.0 GIS\6.3 Layout\Reports\CEC_Staff_Assessment\PSPP_CrossingsUnder110_Overview.mxd, 04/13/10, SteinB

Map Location

Legend

- Crossings Under I-10
- Washes Within 500-feet of Crossing
- Access Routes

Source: ESRI 2010; AECOM 2010

N
W E
S

1 inch = 1,000 feet

0 1,000 2,000 Feet

Palen Solar Power Project
Figure 1
I-10 Wildlife Crossing Analysis in the Project Vicinity

Sheet 1

AECOM

Date: April 2010

Path: P:\2009\09080081 Sol Mil Palen\6.0 GIS\6.3 Layout\Reports\CEC_Staff_Assessment\PSPP_CrossingsUnderI10_Detail.mxd, 04/13/10, SteinB

Map Location

Legend

- Crossings Under I-10
- Washes Within 500-feet of Crossing
- Access Routes

Source: ESRI 2010; AECOM 2010

N
W E
S

1 inch = 1,000 feet

0 1,000 2,000 Feet

Palen Solar Power Project
Figure 1
I-10 Wildlife Crossing Analysis in the Project Vicinity

Sheet 2

AECOM

Date: April 2010

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Figure 1

Map Location

Legend

- Crossings Under I-10
- Washes Within 500-feet of Crossing
- Access Routes

Source: ESRI 2010; AECOM 2010

N
W
E
S

1 inch = 1,000 feet

0 1,000 2,000 Feet

Palen Solar Power Project
Figure 1
I-10 Wildlife Crossing Analysis in the Project Vicinity

Sheet 3

AECOM

Date: April 2010

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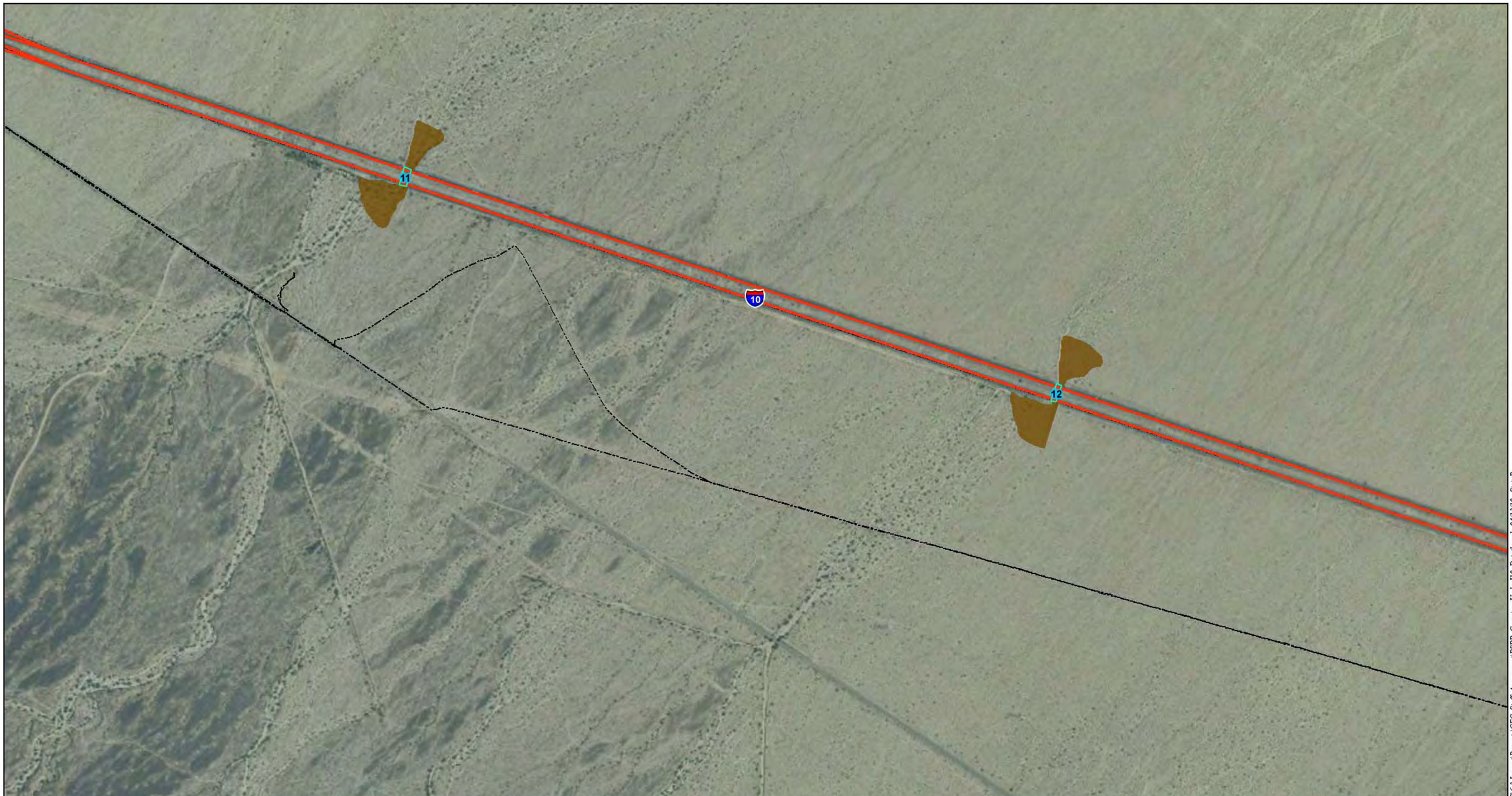

Map Location

Legend

- Crossings Under I-10
- Washes Within 500-feet of Crossing
- Access Routes

Source: ESRI 2010; AECOM 2010

N W E S

1 inch = 1,000 feet

0 1,000 2,000 Feet

Palen Solar Power Project
Figure 1
I-10 Wildlife Crossing Analysis in the Project Vicinity

Sheet 4

AECOM

Date: April 2010

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Map Location

Legend

- Crossings Under I-10
- Washes Within 500-feet of Crossing
- Access Routes

Source: ESRI 2010; AECOM 2010

N
W E
S

1 inch = 1,000 feet

0 1,000 2,000 Feet

Palen Solar Power Project
Figure 1
I-10 Wildlife Crossing Analysis in the Project Vicinity

Sheet 5

AECOM

Date: April 2010

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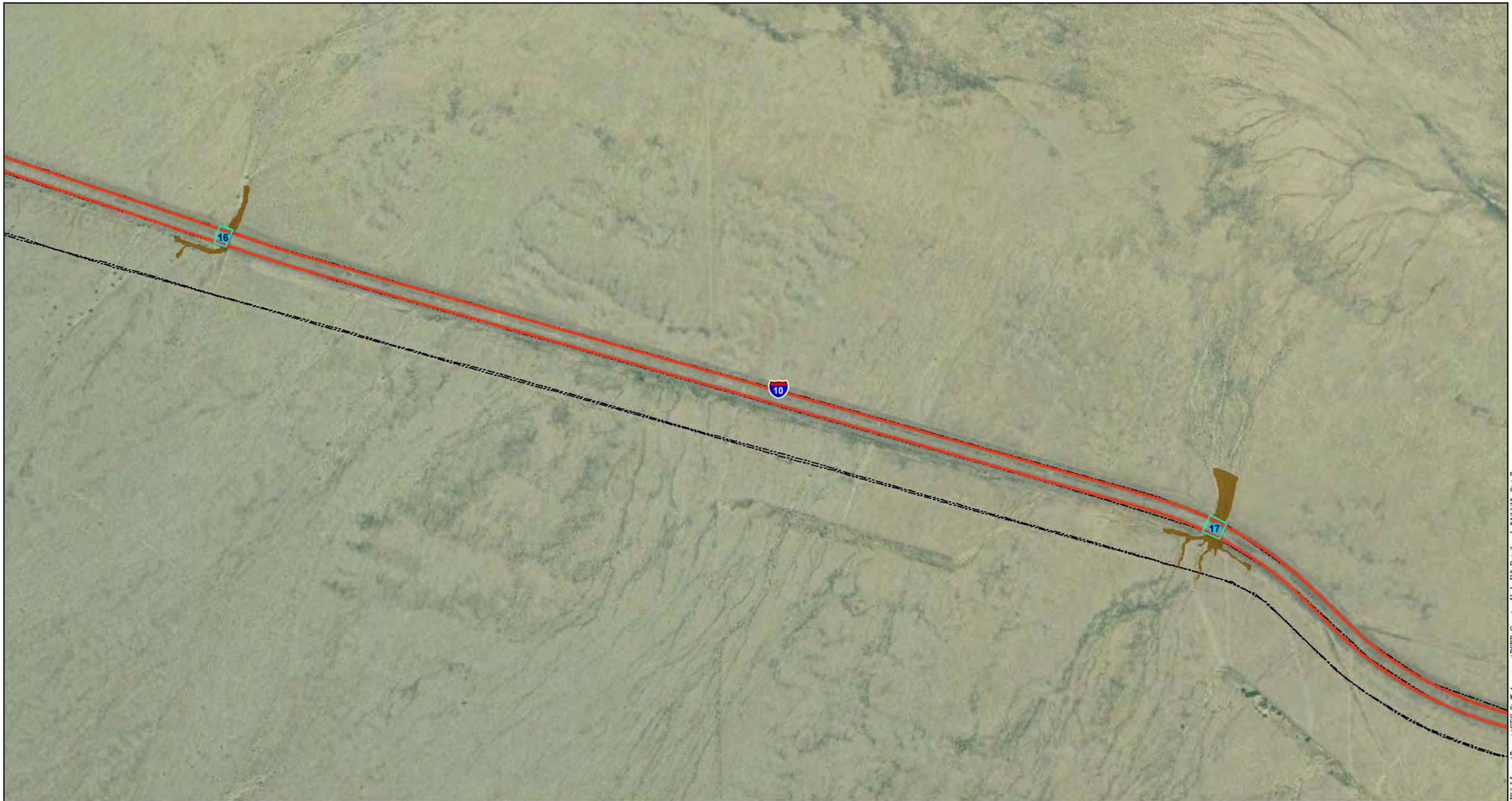

Map Location

Legend

- Crossings Under I-10
- Washes Within 500-feet of Crossing
- Access Routes

Source: ESRI 2010; AECOM 2010

N W E S

1 inch = 1,000 feet

0 1,000 2,000 Feet

Palen Solar Power Project
Figure 1
I-10 Wildlife Crossing Analysis in the Project Vicinity

Sheet 6

AECOM

Date: April 2010

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Map Location

Legend

- Crossings Under I-10
- Washes Within 500-feet of Crossing
- Access Routes

Source: ESRI 2010; AECOM 2010

N W E S

1 inch = 1,000 feet

0 1,000 2,000 Feet

Palen Solar Power Project
Figure 1
I-10 Wildlife Crossing Analysis in the Project Vicinity

Sheet 7

AECOM

Date: April 2010

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Map Location

Legend

- Crossings Under I-10
- Washes Within 500-feet of Crossing
- Access Routes

Source: ESRI 2010; AECOM 2010

N
W E
S

1 inch = 1,000 feet

0 1,000 2,000 Feet

Palen Solar Power Project
Figure 1
I-10 Wildlife Crossing Analysis in the Project Vicinity

Sheet 8

AECOM

Date: April 2010

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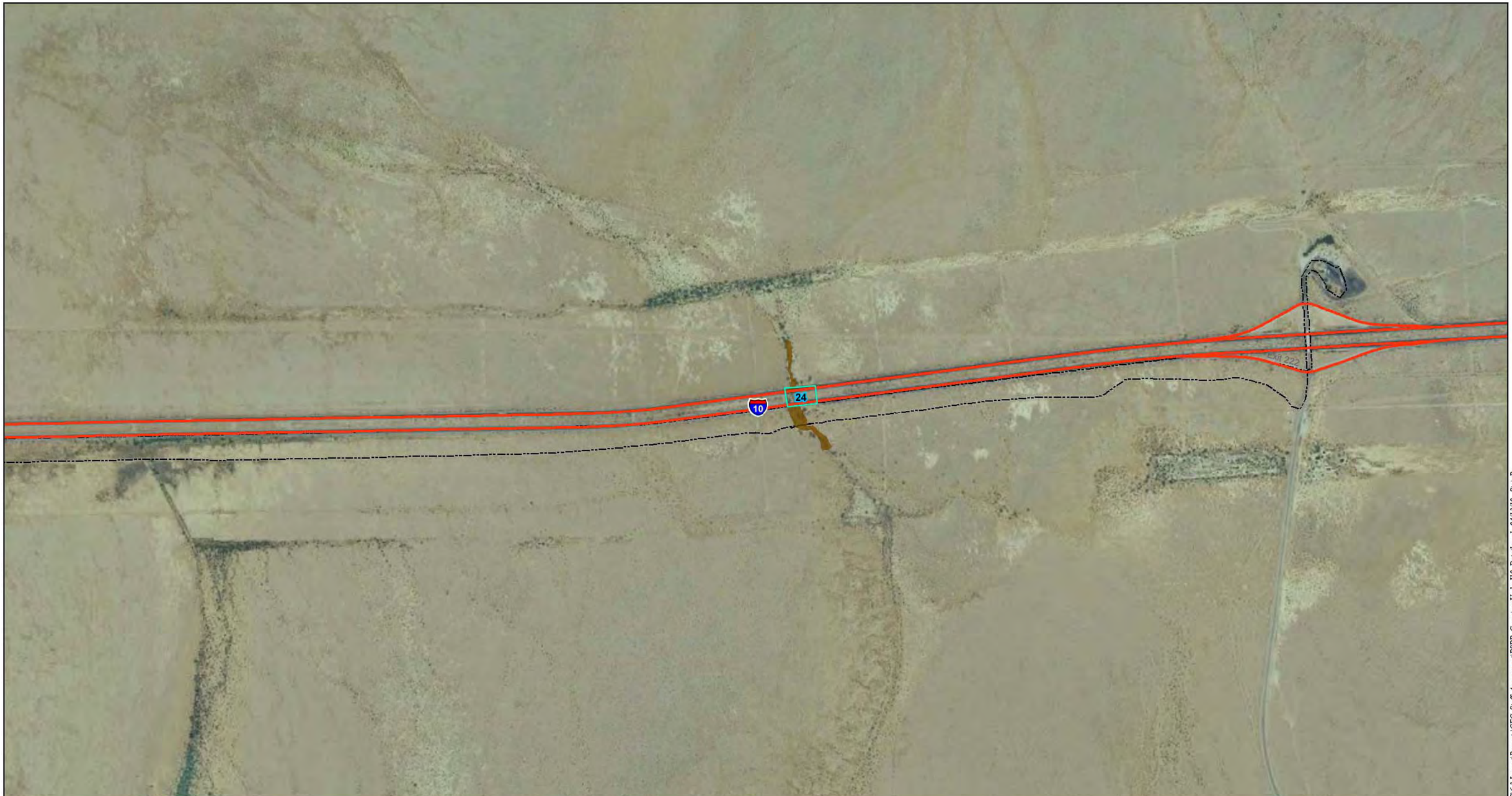

Map Location

Legend

- Crossings Under I-10
- Washes Within 500-feet of Crossing
- Access Routes

Source: ESRI 2010; AECOM 2010

N
W E
S

1 inch = 1,000 feet

0 1,000 2,000 Feet

Palen Solar Power Project
Figure 1
I-10 Wildlife Crossing Analysis in the Project Vicinity

Sheet 9

AECOM

Date: April 2010

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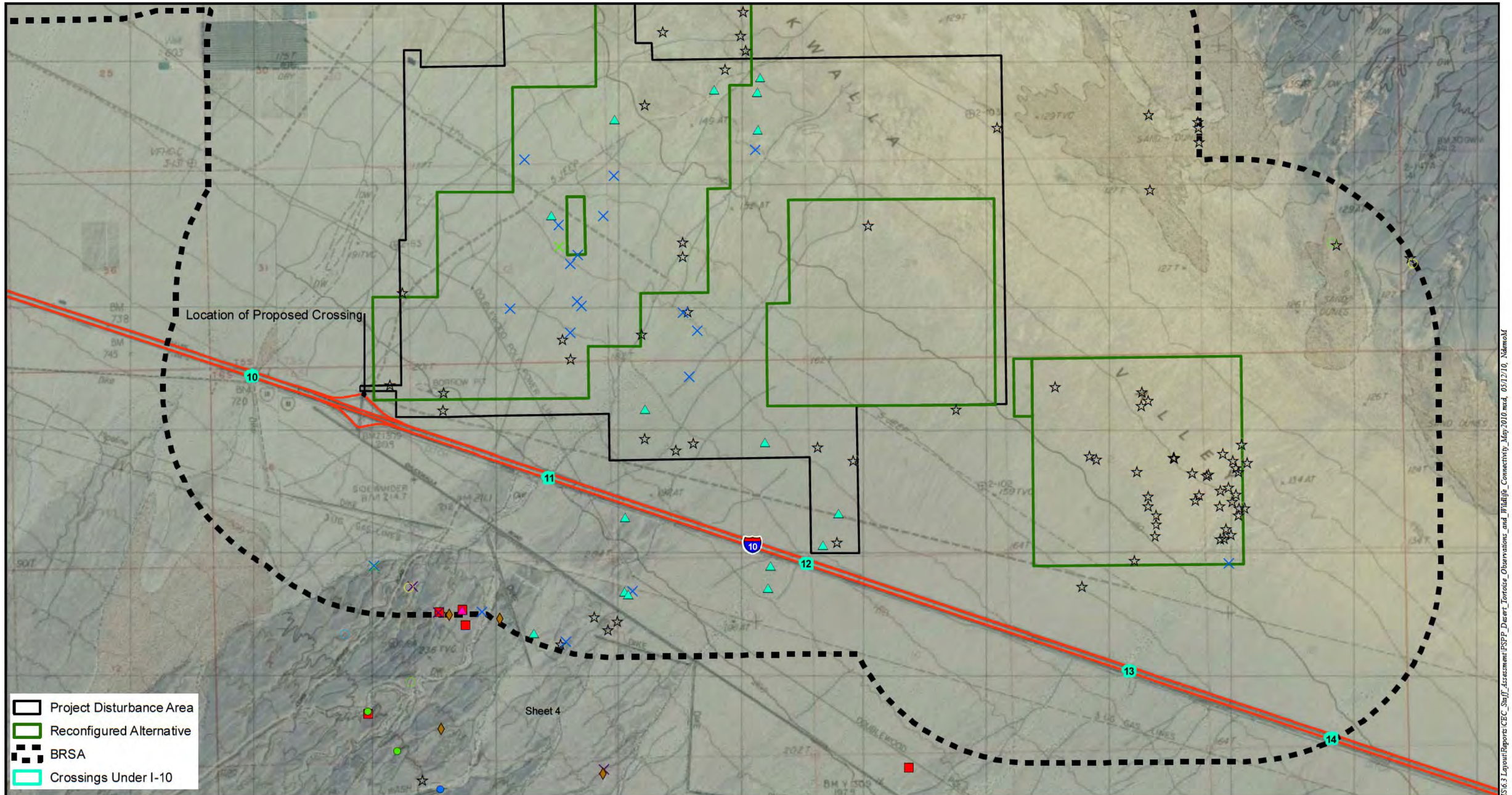

Map Location

Legend

DETO Observations
(as of May 11, 2010)

- Adult Tortoise
- Juvenile Tortoise
- Tortoise Burrow (Active) - Class 1
- Tortoise Burrow - Class 2
- Tortoise Burrow - Class 3
- Tortoise Burrow - Class 4 or 5
- Tortoise Scat - Class 1
- Tortoise Scat - Class 2
- Tortoise Scat - Class 3
- Tortoise Scat - Class 4
- Tortoise Carcass - Class 3
- Tortoise Carcass - Class 4
- Tortoise Pallet (Active) - Class 1
- Tortoise Pallet - Class 4 or 5
- Tortoise Tracks
- Tortoise Bone Fragment - Mineralized
- Tortoise Bone Fragment - Not Mineralized

Source: ESRI 2010; AECOM 2010

N W E S

1 inch = 2,500 feet

0 2,500 5,000 Feet

Palen Solar Power Project

Figure 2
Desert Tortoise Observations and Wildlife Connectivity

AECOM

Date: May 2010

Path: P:\60960808081 Sol Mil Palen 6.0 GIS\6.3 Layout\Reports\CEC_Staff_Assessment\PSPP_Desert_Tortoise_Observations_and_Wildlife_Connectivity_May2010.mxd, 05/12/10, NdemoM

STATE OF CALIFORNIA
ENERGY RESOURCES CONSERVATION AND DEVELOPMENT COMMISSION

In the Matter of: **APPLICATION FOR CERTIFICATION for the *PALEN SOLAR POWER PROJECT***	**Docket No. 09-AFC-7** **PROOF OF SERVICE** ***(Revised 5/14/2010)***

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DECLARATION OF SERVICE

I, Carl Lindner, declare that on, May 17, 2010, I served and filed copies of the attached **Palen Desert Tortoise Connectivity Report,** dated May 14, 2010 The original document, filed with the Docket Unit, is accompanied by a copy of the most recent Proof of Service list, located on the web page for this project at:
[http://www.energy.ca.gov/sitingcases/solar_millennium_palen].
The document has been sent to the other parties in this proceeding (as shown on the Proof of Service list) and to the Commission's Docket Unit, in the following manner:

(*Check all that Apply*)

For service to all other parties:

_____ sent electronically to all email addresses on the Proof of Service list;

__X__ by personal delivery or by overnight delivery service or depositing in the United States mail at Camarillo, California with postage or fees thereon fully prepaid and addressed as provided on the Proof of Service list above to those addresses **NOT** marked "email preferred."

AND

For filing with the Energy Commission:

__X_ sending an original paper copy and one electronic copy, mailed respectively, to the address below (preferred method);

OR

_____ depositing in the mail an original and 12 paper copies, along with 13 CDs, as follows:

CALIFORNIA ENERGY COMMISSION
Attn: Docket No. 09-AFC-7
1516 Ninth Street, MS-4
Sacramento, CA 95814-5512

docket@energy.state.ca.us

I declare under penalty of perjury that the foregoing is true and correct.

Carl E. Lindner

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APPENDIX I.2
Cumulative Impacts

1. Introduction

1.1 Definitions

Regulations of the Council on Environmental Quality (CEQ) define cumulative effects as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such actions" (40 CFR 1508.7). Together, these actions comprise the cumulative scenario, which forms the basis of the cumulative impact analysis. As explained in Section 6.8.3 of BLM NEPA Handbook H-1790-1 (Jan. 2008), "The purpose of cumulative effects analysis is to ensure that Federal decision-makers consider the full range of consequences of actions (the proposed action and alternatives, including the No Action alternative)." See also CEQ, *Considering Cumulative Effects Under the National Environmental Policy Act* (Jan. 1997). Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time" (40 CFR §1508.7). Under NEPA, both context and intensity are considered. When considering intensity of an effect, we consider "whether the action is related to other actions with individually minor but cumulatively significant impacts. Significance cannot be avoided by terming an action temporary or by breaking it down into small component parts" (40 CFR §1508.27(b)(7)).

1.2 Methodology

The following steps were used to develop the cumulative effects analysis described in this Appendix I:

1. Biological resources to be considered in the analysis were identified based on a review of the direct and indirect impacts of the proposed action and alternatives that might contribute to a cumulative impact (see, Section 4.17, *Impacts on Vegetation Resources*, and Section 4.21, *Impacts on Wildlife Resources*);
2. The geographic study area and timeframe within which the biological resource-related impacts of past, present and reasonably foreseeable future actions could combine with impacts of the proposed action and alternatives for each resource was determined;
3. The current health and historical context for each resource was described;
4. Other projects in the cumulative scenario were identified that could affect each resource;
5. Cumulative effects to biological resources were analyzed;
6. Results were reported; and
7. The need for mitigation was assessed.

1.3 Making Conclusions about the Severity of the Effect

"No net loss" does not necessarily mean there are no cumulative impacts; the analysis of each resource also describes the indirect and cumulative effects that cannot be quantified through a Geographic Information System (GIS) analysis of habitat impacts. Similarly, even seemingly minor impacts can be significant if they affect an extremely rare or limited resource; the cumulative impact may be substantial.

For each cumulative effect, the following questions were considered in making conclusions about the severity or significance of an effect:

1. The health, status or condition of the resource as a result of past, present and reasonably foreseeable impacts;

2. The contribution of the project to the overall cumulative impact to the resource;

3. The project's mitigated effect, when added to the effects of these planned future projects, and

4. Impact avoidance and minimization: any project design changes that were made or additional opportunities that could be taken to avoid or minimize potential impacts in light of cumulative impact concerns.

1.4 Analytical Tools and Study Limitations

This cumulative effects analysis employed a combination of quantitative and qualitative analyses: a Geographic Information System (GIS)-based quantitative analysis for assessing the direct cumulative effects to habitat loss, and a qualitative analysis of the cumulatively considerable indirect effects, based on consultations with agency biologists and regional experts, as well as a literature review of the threats to species and their habitats.

The GIS-based analysis of direct habitat loss was used for this cumulative effects analysis to:

1. Identify the overlap between existing and future projects and various biological data layers (e.g., landforms, soils, species occurrences, hydrographic data, vegetation mapping, wildlife habitat models, ownership and management layers);

2. Compile digital map information about each resource for purposes of display and analysis; and

3. Create statistical tables to summarize the direct impacts to these resources from existing and anticipated future projects, and the project's contribution to those effects.

Information on the datasets used, the sources of the data, and any limitations of the data, are provided in each biological resource section.

The large renewable projects proposed on BLM-administered and private land used in the cumulative analysis for Biological Resources (Table I-1, *Projects Considered in Biological Resources Cumulative Effects Analysis*, below) represent the projects that had applications to the BLM or the California Energy Commission as of February 5, 2010. The project list changes frequently; updates to the data used are presented below and in Section 4, *Projects Included in the Cumulative Scenario***.** As stated in the Cumulative Scenario, not all of the projects shown on the table will complete the environmental review, and not all projects will be funded and constructed. At the same time, new applications may be submitted in the near future that will affect biological resources. Alternatively, it is possible—even likely—that new projects will be proposed in the near future that are not reflected in this analysis.

GIS is a widely used and effective tool for analyzing large amounts of spatial data, for documenting and quantifying assumptions about direct habitat loss, and the value of the habitat (where habitat models are available). However, the indirect impacts of projects are not easily captured in GIS and thus were only addressed qualitatively. The following indirect effects were considered in assessing the significance of cumulative impacts: habitat fragmentation and its effects on population viability; increased vehicle-related mortality; disturbance from noise, lighting and increased human activity; increase in predators such as ravens; spread of invasive non-native plants; downwind effects of facilities and wind fencing on sand transport corridors; bird collisions and electrocutions; climate change and its accompanying increased risk of drought, fire and exotics; indirect impacts to wildlife movement and connectivity, the downstream effects of channel diversions on fluvial sediment transport and riparian vegetation, and the long-term effects of groundwater pumping on groundwater-dependent vegetation. This qualitative analysis relied in part on the professional opinions of agency biologists and regional experts, and a review of literature and databases.

Finally, the GIS-based analysis requires the use of datasets that encompass the entire geographic scope of the analysis; the project-specific survey data could not be compared against data for the region that was derived from different methodologies. Consequently, the GIS analysis of impacts to plant communities, landforms and habitats is based on region-wide datasets for those resources (primarily NECO datasets), and not on project survey data. Acreages listed in the analysis below, for example, desert wash woodland or sand dunes, will not match the project-specific survey results. Notwithstanding the challenges presented by comparing region-wide and project-specific datasets, the GIS-based datasets for vegetation and landforms provide a powerful tool for conducting region-wide analyses.

2. Geographic and Temporal Scope

This cumulative impact analysis makes a broad, regional evaluation of the impacts of existing and reasonably foreseeable future projects that threaten plant and animal communities within the context or geographic scope of the Northern and Eastern Colorado Desert Coordinated Management Plan (NECO) (BLM-CDD 2002). The NECO planning area is located in the southeastern California Desert Conservation Area (CDCA). It occurs primarily in the Sonoran Desert region but includes a small portion of the southern Mojave Desert region. For some biological resources, a different geographic scope was warranted, such as the use of watershed boundaries to analyze cumulative effects to desert washes and desert dry wash woodland, or the Chuckwalla Valley for locally significant populations and dune systems restricted to that geographic area. Where the geographic scope is different than the NECO planning area, it is noted in Section 5.

Project impacts related to biological resources could occur during the 39-month construction period, the planned 30-year operational life of the PSPP, and decommissioning. This analysis considers these timeframes.

3. Existing Regional Conditions

This overview of regional impacts is followed by a more detailed discussion of the effects of past, present, and future projects to biological resources of the Project vicinity, with an emphasis on resources found within the Chuckwalla Valley of eastern Riverside County.

The California Desert remained a desolate area for the first few decades of the 20th century. Disturbance was more or less restricted to highways, railroad, and utility corridors, scattered mining, and sheep grazing. In the 1940s, several large military reservations were created for military training, testing, and staging areas. The deserts of eastern Riverside County comprise 40% of the County's land area but less than 1% of its population. Outside of the small urban-agricultural center of Blythe, near the Colorado River and Arizona border, there are only a few scattered, small residential and agricultural areas between Indio (to the west) and Blythe; most of the lands are in BLM ownership.

Populations of many of the desert's sensitive plants and animals were considered relatively stable until recently, as the push for renewable energy development has placed many populations at risk. Energy providers have submitted project applications that would collectively cover more than one million acres of the region. However, renewable energy development has its own ecological consequences and portions of the Sonoran and Mojave deserts of California are bearing the brunt of these effects. Poorly planned development could contribute to habitat loss and fragmentation and barriers to species movement and gene flow. Although project permitting and regional planning evaluate basic environmental impacts of such projects, rarely do they consider impacts on connectivity, conduct thorough cumulative effects analyses, or implement regional monitoring of effects or the efficacy of mitigation.

In the areas identified for renewable energy development in eastern Riverside County, some of the many sensitive biological resources at risk include: desert washes and desert dry wash woodland, desert tortoise, Mojave fringe-toed lizard, western burrowing owl, fragile dune ecosystems, dry lakes, a wide variety of special-status wildlife, and the sensitive plants Las Animas colubrina and Harwood's milk-vetch. Approximately 209.5 acres of the southwestern corner of the Project overlaps the northern boundary of the Chuckwalla Desert Tortoise Critical Habitat Area. The Project also lies within a proposed Wildlife Habitat Management Area (Palen-Ford Wildlife Habitat Management Area), and is immediately northeast of the Chuckwalla Desert Wildlife Management Area.

The introduction of non-native plant species and increases in predators such as ravens has also contributed to population declines and range contractions for many special-status plant and animal species (Boarman 2002a). Combined with the effects of historical grazing and military training, and fragmentation of habitat and interruption of wildlife movement from highway and aqueduct construction, the proposed wind and solar energy projects have the potential to further reduce and degrade native plant and animal populations. In the context of this large scale habitat loss, the PSPP would contribute, at least incrementally, to the cumulative loss and degradation of habitat for desert plants and wildlife, including desert tortoise and Mojave fringe-toed lizards, in the Chuckwalla Valley and NECO planning area.

4. Projects Included in the Cumulative Scenario

This analysis evaluates the impacts of the proposed action and alternatives in addition to the current baseline of past effects, present (existing) projects, and reasonably foreseeable or probable future projects in the I-10 corridor as well as the greater NECO planning area. Figure 4.1-1 illustrates the numerous proposed renewable projects on BLM, State and private land in the I-10 corridor between Desert Center and the Colorado River, near Blythe, in eastern Riverside County. Table I-1 lists the existing and foreseeable future projects (proposed) that were included in the quantitative analysis of cumulative effects; these projects are illustrated spatially in Figure 4.21-1. See Figure 4.1-1 and Table I-1 for descriptions of these existing and future proposed projects. The GIS layer for foreseeable future projects used in the cumulative effects analysis was based largely on the BLM GIS data for renewable solar and wind projects available on February 5, 2010. Updates to the BLM projects data since February 5, 2010 are provided below.

4.1 Project Information Updates

Three updates occurred since the cumulative scenario projects list was developed for biological resources (see Table I-1):

1. The Altera Black Hills project included in the impact calculations has been denied by the BLM.

2. The LightSource Renewables – Mule Mountain II project, which is an active application in to the BLM, was not included in the impact calculations.

3. The Pacific Solar Investments – Ogilby project has refined the project boundaries from those used in the impact calculations

4.2 Cumulative Projects

Past, present and reasonably foreseeable future projects considered in this cumulative effects analysis are identified in Table I-1.

5. Analysis of Cumulative Effects to Biological Resources

5.1 Waters of the State

The geographic scope for the analysis of cumulative impacts to desert washes (including intermittent and ephemeral washes) included: 1) Palen watershed, and 2) the entire NECO planning area. The primary hydrologic feature in the Palen watershed is Corn Springs Wash; several branches of the wash pass through or around the site, some of which abate before reaching Palen Dry Lake. This dry lake is the receiving basin for the 1,496 miles of desert washes that drain the watershed (USGS 2010). Most of the desert washes that pass through the Project site are distributary channels of the alluvial fan—or bajada—that drains the northeastern flank of the Chuckwalla Mountains. Cumulative effects were analyzed within the context of the watershed because this relatively small watershed will be affected by several proposed solar projects: Palen

TABLE I-1
PROJECTS CONSIDERED IN BIOLOGICAL RESOURCES CUMULATIVE EFFECTS ANALYSIS

Existing Projects (analyzed quantitatively)	ROW Area[1] (acres)	Foreseeable Future Projects[1] [Proposed] (analyzed quantitatively)	ROW Area[1] (acres)
Chuckwalla State Prison	1044	Palen Solar Power Project (PSPP)[2]	3001
Ironwood State Prison	681	Blythe Solar Power Project[2]	7239
Eagle Mountain Pumping Plant (MDWSC)	378	NextEra Energy – McCoy (solar)	20560
Kaiser Mine	5772	Genesis Solar Energy Project[2]	1768
I-10 Corridor (200-ft freeway buffer from CL)	6494	Bull Frog Green Energy – Big Maria Vista (solar)	22663
State highways (50-ft highway buffer from CL)	2640	Chuckwalla Solar 1	4091
DPV2 transmission line and existing access roads (100ft T-line Tower Buffer; 20-ft road width)	2861	Rice Solar Energy Project	3859
Landfills(BLM NECO dataset)		Desert Quartzite (solar)	7530
Blythe Energy Project I	153	Desert Sunlight (solar)	5119
BLM Campgrounds – Wiley's Well, Coon Hollow, Cottonwood Spring, and Midland Long-Term Visitor Area	8042	EnXco 1 (solar)	1325
BLM Off-Road Vehicle- authorized/designated routes in Meccacopia SRMS. (BLM NECO Human Use LTVAs dataset)	3031	Chuckwalla Valley Raceway	493
Blythe area urban and agricultural lands (GAP Analysis vegetation dataset)	88,317	Mule Mountain Solar Project	6618
Desert Center area urban and agricultural lands (2005 NAIP imagery)	8424	Eagle Mountain Pumped Storage Project	252
Pipeline (NECO pipelines dataset)	4392		
Projects Considered Qualitatively	**Area (acres)**		
Existing			
BLM Grazing – Cattle and sheep allotments (Lazy Daisy, Chemehuevi, Rice Valley, and Ford Dry Lake (recently closed)	n/a	Paradise Valley (residential "new town" development)	6724
BLM Multiple Use – Intensive multiple-use classes	n/a	Blythe Airport Solar I Project	639
General Patton military training areas	n/a	Eagle Mountain Landfill	1633
Colorado Aqueduct – open portions	n/a	Blythe Energy Project II	153
Chocolate Mountains Aerial Gunnery Range	n/a	DPV2 proposed roads (2-foot width) and towers (100 sq ft/tower)	256
Four approved commercial and 12 residential developments near Blythe	n/a	Genesis Solar Project access road	29
Solar projects at Arizona border	n/a	Blythe Energy Project transmission line towers	148
BLM renewable energy study areas (future, proposed)	n/a	Genesis Solar Project gas line (100-ft width)	85
BLM transmission corridors	n/a	EnXco 2 Mule Mountain	~2021
		Red Bluff Substation – for Palen Solar Power Project	90
		Colorado Substation – for Blythe Solar Power Project	44
Total Future Projects[1,3] – 02/05/2010			**339,704 acres**
Total Existing Disturbances[1,3]			**134,750 acres**

NOTES:
1 Not all of the projects depicted here will complete the environmental review, not all projects will be funded and constructed, and many will not use the entire ROW area.
2 Acreage impacts depicted reflect the project footprint only; not the entire ROW. The unused portions of the ROW would be returned to BLM and not included in the final ROW grant
3 There is some overlap between existing and future project acreages as some future projects are proposed on disturbed lands; the numbers shown above subtracted for overlap and represent the acreages used in this cumulative effects analysis.

SOURCE: CEC SA/DEIS, 2010 (Biological Resources Table 9)

Solar Power Project; First Solar Desert Sunlight; enXco 2, and Chuckwalla Solar 1 (see Figures3.18-4, 3.18-5, 4.1-1, and 4.21-1). Existing impacts to desert washes in the Palen watershed include: urban and agricultural lands around Desert Center, segments of the I-10 and Highway 177 corridors, Kaiser Mine, and various transmission corridors (gas and electric).

The watershed area analysis was based on the USGS National Hydrographic Dataset (2010) within the watershed boundary as defined by the California Interagency Watershed Map of 1999 (California Interagency Watershed Mapping Committee 1999) (Figure 3.18-5).

Table I-2, *Desert Washes in Palen Watershed – Cumulative Effects*, summarizes the direct loss of desert washes that would result from anticipated future projects within the Palen watershed, using lineal feet of affected washes as the metric. These effects are also illustrated spatially in Figure 3.18-5. The contribution of the proposed action to cumulative effects from future projects is provided as the sum of all drainages within the project site boundaries, and expressed as a percentage of all future projects effects.

TABLE I-2
DESERT WASHES IN PALEN WATERSHED – CUMULATIVE EFFECTS

Total Desert Washes[1] in Palen Watershed	Impacts to Habitat from Existing Projects[2] (percent of total watershed)	Impacts to Habitat from Foreseeable Future Projects[3] (percent of total watershed)	Contribution of PSPP to Future Cumulative Impacts (percent of total impacts from future projects)
1,496 mi.	34 mi. (2.3%)	40 mi. (2.7%)	5.3 mi. (13%) (based on USGS dataset)

NOTES:
1 Based on the USGS National Hydrographic Dataset (2010) and CalWater Version 2.2.1 (California Interagency Watershed Mapping Committee 1999), each as cited in the CEC SA/DEIS, 2010.
2 Includes only those existing projects for which GIS-based spatial data was available at the time of the analysis; see Table I-1.
3 Includes only BLM Renewables that had submitted a Plan of Development at the time of the analysis and those additional future projects listed in Table I-1.

SOURCE: CEC SA/DEIS, 2010 (Biological Resources Table 10)

The cumulative effects of channel diversions from all projects within the Palen watershed (40 miles of desert washes) are significant and the proposed action itself would be a major contributor to those effects (13%, or 5.3 miles of desert washes). The direct effects of all projects are compounded by the fact that they also cause impairment of hydrologic, geochemical, geomorphic, and habitat function and values of the remaining reaches downstream of the impact.

This GIS analysis does not reflect the extensive existing impacts to desert washes north of I-10. The highway roadbed and a series of collector ditches south of I-10 permanently have diverted stream flows into a few primary features and deprived flows from many miles of smaller washes. Standing dead ironwood trees, stunted, drought-stressed creosote bushes and other shrubs, sparse cover and very low diversity seen north of I-10 in the Palen watershed are a testament to the downstream effects that channel diversions can have on both upland and riparian plant communities. For the proposed action, these effects would be minimized somewhat by the

proposed redistribution of flows below the project at many discharge points but it is unclear to what extent sediment transport in the diverted channels would be affected.

Indirect effects of all future projects that cannot be adequately addressed with this GIS analysis but are expected to be cumulatively significant include: impacts to water quality and sediment transport from the numerous channel diversions, culverts and road crossings, fragmentation of the habitat and the corresponding loss of habitat function and values, including wildlife movement, and the effects of interrupted fluvial sand transport on the Chuckwalla Valley dune system. Impacts to connectivity and wildlife movement from these diversions are discussed in more detail later in this cumulative effects analysis.

Implementation of the mitigation measures imposed by the CEC as Condition of Certification would reduce the PSPP's contribution to cumulative effects, including BIO-21 (acquisition of desert washes within or adjacent to the Palen watershed); BIO-7 (monitoring and reporting requirements); and BIO-8 (impact avoidance and minimization measures). However, minor residual impacts to fluvial sediment transport may remain that could contribute to cumulative impacts. The larger washes that would be diverted around the PSPP site contribute fresh sediment into the wind-sand transport corridor and contribute to the maintenance of the dunes. It is unclear to what extent sediment transport in the diverted channels would be affected and how significant the effect would be.

Table I-3, *Cumulative Effects: Desert Washes in the NECO Planning Area*, and Figure 3.18-4 illustrate the potential cumulative impacts to all desert washes within the entire NECO planning area, as depicted in the USGS National Hydrographic Dataset (USGS 2010) and cited in the CEC SA/DEIS. The cumulative impairment or loss of desert washes from channel diversion from all future projects within NECO are significant. Implementation of PSPP-specific mitigation measures would reduce the contribution of the proposed action or an alternative, including BIO-21 (acquisition of desert washes within or adjacent to the Palen watershed); BIO-7 (monitoring and reporting requirements); and BIO-8 (avoidance and minimization measures). Residual cumulative impacts are not anticipated. Impacts of the PSPP's stream diversions on wildlife movement are discussed later in this cumulative effects analysis.ss

TABLE I-3
CUMULATIVE EFFECTS: DESERT WASHES IN THE NECO PLANNING AREA

Total Desert Washes[1] in NECO	Impacts to Habitat from Existing Projects[2] (percent of total washes in NECO)	Impacts to Habitat from Foreseeable Future Projects[3] (percent of total washes in NECO)	Contribution of PSPP to Future Cumulative Impacts (percent of total impacts from future projects)
18,596 mi.	190 mi. (1.0%)	1,122 mi. (6.0%)	5.3 mi. (0.5%) (based on USGS dataset)

NOTES:
1 Based on the USGS National Hydrographic Dataset (USGS 2010), as cited in the CEC SA/DEIS, 2010.
2 Includes only those existing projects for which GIS-based spatial data was available at the time of the analysis; see Table I-1.
3 Includes only BLM Renewables that had submitted a Plan of Development at the time of the analysis and those additional future projects listed in Table I-1.

SOURCE: CEC SA/DEIS, 2010 (Biological Resources Table 11)

5.2 Special-Status Wildlife

5.2.1 Desert Tortoise

This analysis addresses cumulative impacts to desert tortoise as defined by the current USGS Desert Tortoise Habitat Model (Nussear et al. 2009, as cited in CEC SA/DEIS, 2010). It is a predictive model for mapping the potential distribution of desert tortoise habitat and is useful tool for evaluating different land-use issues that tortoises face at a landscape scale. Figure 3.23-1 is a spatial representation of the predicted habitat potential index values for desert tortoise, based on the 2009 model. Table I-4, *Cumulative Effects: Desert Tortoise Habitat*, summarizes the results of this habitat model applied across the NECO planning area. The results are stratified by habitat value and are presented in acres of habitat and expressed as a percentage of all habitat affected. The model is not intended to be used, or viewed, as a substitute for ground-based and site-specific field surveys. Model scores reflect a hypothesized habitat potential given the range of environmental conditions where tortoise occurrence was documented. Nussear et al. (2009, p. 15, as cited in CEC SA/DEIS, 2010) specifically states:

> *As such, there are likely areas of potential habitat for which habitat potential was not predicted to be high, and likewise, areas of low potential for which the model predicted higher potential. Finally, the map of desert tortoise potential habitat that we present does not account either for anthropogenic effects, such as urban development, habitat destruction, or fragmentation, or for natural disturbances, such as fire, which might have rendered potential habitat into habitat with much lower potential in recent years.*

GIS-based files for the boundaries of the Eastern and Northern Colorado Recovery Units from the 1994 Desert Tortoise Recovery Plan were not available from the USFWS and the proposed new boundaries as depicted in the USFWS 2008 Draft Revised Recovery Plan had not been adopted as of the time of this analysis. Consequently, the NECO planning area boundary was used for this analysis. The NECO boundary closely approximates the boundaries of the two USFWS recovery units; however, the USFWS boundaries extend slightly to the north and west of the NECO boundary.

The PSPP's unmitigated effects to desert tortoise habitat (based on the 2009 USGS habitat model) are quantified below in Table I-4 (and Figure 3.23-1). Most of the proposed projects in the NECO area would impact moderate- to low-quality desert tortoise habitat. The PSPP's contribution to cumulative habitat loss, even for moderate-to low-quality desert tortoise habitat, is considered substantial, given the species' decline and its present and future threats.

The PSPP also would make substantial contributions to loss of desert tortoise connectivity between the Chuckwalla and Chemehuevi DWMAs and critical habitat areas. One of the objectives for desert tortoise recovery in the NECO is to "mitigate effects on desert tortoise populations and habitat outside DWMAs to provide connectivity between DWMAs." Maintaining connectivity is particularly important given the threats posed by global climate change, according to the USFWS 2008 Draft Revised Recovery Plan, as cited in the CEC SA/DEIS (2010). Probable desert tortoise linkages between the Chuckwalla and Chemehuevi critical habitat areas and DWMAs are shown in Figure 3.23-2. The linkages depicted represent areas of the best habitat quality for tortoises between the DWMAs and critical habitat, and therefore represent the most

TABLE I-4
CUMULATIVE EFFECTS: DESERT TORTOISE HABITAT[1]

Habitat Value[1]	Total Desert Tortoise Habitat[1] in NECO	Impacts to Habitat from Existing[2] Projects (percent of total in NECO)	Impacts to Habitat from Foreseeable Future[3] Projects (percent of total in NECO)	Contribution of PSPP to Future Cumulative Impacts (percent of total impacts from future projects)
0	243,679 acres	67,028 acres 27.5%	21,774 acres 8.9%	0 acres
0.1	233,260 acres	9,094 acres 3.9%	25,937 acres 11.0%	0 acres
0.2	373,170 acres	9,288 acres 2.5%	44,595 acres 12.0%	66 acres 0.15%
0.3	628,960 acres	11,987 acres 1.9%	38,163 acres 6.1%	1,422 acres 3.7%
0.4-0.5	787,882 acres	15,885 acres 2.0%	61,163 acres 7.8%	1,498 acres 2.5%
0.6-0.7	1,381,024 acres	10,279 acres 0.7%	94,944 acres 6.9%	16.4 acres 0.02%
0.8-0.9	1,868,475 acres	9,233 acres 2.8%	53,074 acres 2.8%	0 acres
1.0	30,883 acres	71 acres 0.2%	55 acres 0.2%	0 acres

NOTES:
1 Based on the USGS Desert Tortoise Habitat Model (Nussear et al. 2009, cited in CEC SA/DEIS, 2010).
2 Includes only those existing projects for which GIS-based spatial data was available at the time of the analysis; see Table I-1.
3 Includes only BLM Renewables that had submitted a Plan of Development at the time of the analysis and those additional future projects listed in Table I-1.

SOURCE: CEC SA/DEIS, 2010 (Biological Resources Table 12)

probable linkages and most important areas to protect to maintain connectivity between the Chemehuevi and Chuckwalla DWMAs. The identified linkages are based on a review of information on existing vegetation and landform data (NECO datasets and PSPP-specific survey data), and depicted in the USGS habitat model. The location of private lands in "probable" linkages is a useful tool for identifying potential acquisition lands for desert tortoise mitigation, and for evaluating different land-use issues that tortoises face at a landscape scale. Figure 3.23-2 identifies these linkages based on the areas of moderate and high quality habitat between management areas for a qualitative analysis of cumulative effects; however, the impacts are not quantified here as the linkages have not been formalized or created as shape layers suitable for GIS analysis. Along with the linkages depicted in Figure 3.23-2, additional linkages through areas currently considered lower quality habitat that could be restored may also be important for long-term connectivity between the Chemehuevi and Chuckwalla DWMAs.

With implementation of recommended mitigation measure BIO-12 (acquisition of desert tortoise compensation lands), the PSPP-specific contribution to the cumulative loss of desert tortoise habitat would be substantially reduced. Mitigation measure BIO-12 specifies that compensation habitat acquisitions occur within the Colorado Desert Recovery Unit in areas that have potential to contribute to desert tortoise habitat connectivity and build linkages between desert tortoise designated critical habitat, known populations of desert tortoise, and/or other preserve land. Other desert-tortoise-specific mitigation measures recommended to address the PSPP's contribution to

cumulative effects include the impact avoidance and minimization measures BIO-1 through BIO-11, monitoring and reporting requirements (BIO-7), and desert tortoise compliance verification (BIO-11).

Some residual effects could remain. These include fragmentation, impaired connectivity, and degradation of the function and values of remaining habitat from predators, invasive plants, fire, and disease. These residual cumulative effects can be addressed only through a regional and coordinated planning effort aimed at preserving and enhancing large, intact expanses of wildlife habitat and linkages, including maintaining connections between wildlife management areas and other movement corridors. Ongoing collaborative efforts by federal and state agencies to develop a Desert Renewable Energy Conservation Plan and BLM's Solar Energy Development Programmatic EIS offer an appropriate forum for such planning.

5.2.2 Nelson's Bighorn Sheep

The distribution and extent of the NECO-designated bighorn sheep WHMAs (occupied and unoccupied range) and connectivity corridors, overlaid with past and foreseeable future projects within the NECO planning area, are quantified in Table I-5, *Cumulative Effects: Bighorn Sheep WHMAs and Connectivity Corridors*, and illustrated in Figure 3.23-11. The GIS analysis of the NECO bighorn sheep WHMAs and connectivity corridors indicates that occupied and unoccupied ranges are relatively unaffected by past and future projects (from habitat conversion), due largely to their position in wilderness areas and at higher elevations. However, large-scale renewable energy development could significantly impact gene flow between sheep populations through significant cumulative impacts to connectivity corridors, potentially decreasing the viability of the metapopulation of bighorn sheep. The PSPP itself, however, has no direct contribution to the loss of habitat within the identified connectivity corridors or the WHMAs.

TABLE I-5
CUMULATIVE EFFECTS: BIGHORN SHEEP WHMAS AND CONNECTIVITY CORRIDORS

Bighorn sheep WHMAs & Connectivity Corridors[1]	Total WHMA or Connectivity Corridor[1] in NECO	Impacts to WHMAs & Connectivity Corridors from Existing[2] Projects (percent of all WHMAs or corridors in NECO)	Impacts to WHMAs & Connectivity Corridors from Foreseeable Future[3] Projects (percent of all WHMAs or corridors in NECO)	Contribution of PSPP to Future Cumulative Impacts (percent of total impacts from future projects)
Total in NECO	2,552,074 acres	4,945 acres 0.2% of total NECO	93,295 acres 3.7% of total NECO	0 acres
Occupied Range	1,718,254 acres	4,312 acres 0.3% of total Occupied range	51,508 acres 2.3% of total Occupied range	0 acres
Unoccupied Range	232,506 acres	92 acres 0.04% of total Unoccupied range	8,134 acres 3.5% of total Unoccupied range	0 acres
Connectivity Corridors	601,313 acres	540 acres 0.9% of total Connectivity corridor	33,653 acres 5.6% of total Connectivity corridor	0 acres

NOTES:
1 Based on the BLM NECO Bighorn Sheep WHMAs dataset (BLM CDD 2002).
2 Includes only those existing projects for which GIS-based spatial data was available at the time of the analysis; see Table I-1.
3 Includes only BLM Renewables that had submitted a Plan of Development at the time of the analysis and those additional future projects listed in Table I-1.

SOURCE: CEC SA/DEIS, 2010 (Biological Resources Table 13)

Another consideration of this analysis was whether the proposed future projects would cumulatively and significantly affect bighorn sheep through the loss of spring forage on the upper bajadas adjacent to occupied range. Staff analyzed the impact of development within a one-mile buffer from the base of occupied ranges (or potentially restored populations in unoccupied ranges) to evaluate the potential impacts to bighorn foraging habitat. No direct or cumulative effects to bighorn sheep WHMAs or spring foraging habitat would result from the PSPP, and thus no mitigation measures relating to bighorn sheep are recommended.

The PSPP is located within the proposed Palen-Ford multi-species WHMA (BLM CDD 2002; map 2-21); however, bighorn sheep are not expected to use the I-10 box culvert undercrossing of Corn Springs Wash. Further, NECO identifies I-10 as a barrier to bighorn sheep movement (BLM CDD 2002). Although the PSPP is expected to affect wildlife movement and connectivity with important wildlife areas north and south of I-10, it is not expected to substantially affect—directly, indirectly, or cumulatively—bighorn sheep movement.

5.2.3 Mojave Fringe-Toed Lizard

The geographic scope for the first of two cumulative effects analyses for Mojave fringe-toed lizard is the entire NECO planning area; the second analysis looked only at the habitat for the Chuckwalla Valley population. The NECO dataset for Mojave fringe-toed lizard habitat includes all but the highest portions of the mountain ranges and thus it considerably over-represents the amount or extent of suitable habitat. The dataset was refined to more accurately represent the species restriction to sandier substrates. Using the NECO landforms dataset, this analysis was based on a simple habitat model created by selecting the following sandy landforms: crescentic dunes; longitudinal dunes; undifferentiated dunes; sandy dissected fans; sandy plains, and dry playas (which often have at least a veneer of sand). The selected landforms were overlaid with documented occurrences of Mojave fringe-toed lizard from CNDDB and the detailed field survey data from four renewable energy projects within the Chuckwalla Valley. The occurrence data was in considerable agreement with the selected landforms; no corrections were necessary and no attempt was made to rank habitat value. Table I-6, *Cumulative Effects: Special-status Species Habitat*, presents the results of the Mojave fringe-toed lizard habitat model applied across the NECO planning area and overlaid with the existing and future projects layers to quantify the cumulative loss of habitat.

Anticipated cumulative effects to Mojave fringe-toed lizard that are not reflected in this quantitative GIS-based analysis of habitat conversion include: impacts to sand transport systems and the maintenance of dunes from renewable energy projects (wind fencing and the obstruction of sand-carrying winds and water-deposited sands); premature stabilization of dunes by the spread of noxious weeds, which also fuel wildfires; increased risk of fire from transmission lines and increased vehicle use; the effects of past and future grazing and off-road vehicle use; fragmentation of the remaining habitat and reduced gene flow; and an increase in predation by ravens and other predators from an increase in perching structures. Obstructions to the wind-sand transport corridor from structures and wind-fencing, and the indirect effects of the obstruction to the maintenance of dunes downwind of the obstruction, are expected to be significant, and would result in an additional—and significant—loss of Mojave fringe-toed lizard habitat. The direct and

indirect effects of the PSPP on the sand transport corridor are discussed in Section 4.14, *Impacts to Soils Resources*.

Table I-6 and Figure 3.23-3 illustrate the significant cumulative effects of habitat loss from existing and foreseeable future projects to Mojave fringe-toed lizards in the NECO planning area; future (proposed) projects alone will cumulatively cause a loss of over 16% of all Mojave fringe-toed lizard habitat.

Within Chuckwalla Valley (Table I-6 and Figure 3.23-4), approximately 13% of the Mojave fringe-toed lizard habitat would be directly impacted by the construction of all proposed projects, and the PSPP is a major contributor to that effect (8.8% of all future impacts. These effects are even more significant when combined with the expected indirect effects to Mojave fringe-toed lizard habitat, including: interruption of aeolian (wind-deposited) sand transport processes from projects and their wind fencing; diversions of desert washes and interruption of fluvial transport of sand that contribute to the maintenance of habitat; an increase in avian predators from the new perching structures provided by these projects, and the continuing spread of Sahara mustard.

These cumulative direct and indirect effects are considerable within the NECO planning area and for the Chuckwalla Valley Mojave fringe-toed lizard population. The cumulative impact of all the proposed projects would be to increase the already fragmented distribution of the Mojave fringe-toed lizards, and to increase the risk of extirpation of isolated populations within the Chuckwalla Valley.

5.2.4 Golden Eagle

Three different analyses of cumulative effects were evaluated on golden eagle foraging habitat: 1) the entire NECO planning area; 2) a 10-mile radius area centered on the nearest known nest site 95.5 miles from the PSPP site); and 3) foraging habitat within 10 miles of the base of all mountain landforms within the NECO planning area. All analyses used the NECO plant communities dataset to map and quantify cumulative effects on foraging habitat (Figures 3.23-7 and 3.23-8). Table I-7, *Cumulative Effects: Golden Eagle Foraging Habitat*, summarizes the analysis of foraging habitat within 10 miles of all mountains within NECO (using the NECO landforms dataset) and foraging habitat within 10 miles of the nearest known/documented nest. For an analysis of foraging habitat within the entire NECO planning area (Figure 3.23-8), please refer to Table I-7: Plant Communities in NECO; all habitat types were considered potential foraging habitat but the analysis in Table I-9 defines the habitat by plant community. The NECO plant communities dataset is based on the 1996 California Gap Analysis Project conducted by the Biogeography Lab at the University of California, Santa Barbara and coordinated through the USGS Biological Resources Division (Davis et al. 1998, cited in CEC SA/DEIS, 2010). The accuracy and resolution of the GAP mapping was improved for the NECO plant communities dataset (BLM CDD 2002; Appendix H), primarily to more accurately represent sensitive communities such as desert dry wash woodland, but should not be viewed as a substitute for site-specific habitat mapping.

Figure 3.23-7 depicts the locations of known and documented golden eagle nest locations and illustrates potential cumulative effects to foraging habitat within 10 miles of currently known

TABLE I-6
CUMULATIVE EFFECTS: SPECIAL-STATUS SPECIES HABITAT

Special-status Species Habitat	Total Habitat in NECO (or other study area)	Impacts to Habitat from Existing[1] Projects (percent of total habitat)	Impacts to Habitat from Foreseeable Future[2] Projects (percent of total habitat)	Contribution of PSPP to Future Cumulative Impacts (percent of total future impacts)
Mojave fringe-toed lizard habitat[3] (all NECO)	630,121 acres	14,541 acres 2.3%	103,604 acres 16.4%	1,136 acres 0.9%
Mojave fringe-toed lizard habitat[3] (Chuckwalla Population)	99,657 acres	8,290 acres 8.3%	12,845 acres 12.9%	1,136 acres 8.8%
American badger and desert kit fox habitat[4]	4,795,631 acres	134,750 acres 2.8%	339,704 acres 7.1%	3,001.5 acres 0.9%
Burrowing owl habitat[4]	4,795,631 acres	134,750 acres 2.8%	339,704 acres 7.1%	3,001.5 acres 0.9%
LeConte's thrasher habitat[5]	3,718,357 acres	47,078 acres 1.3%	300,139 acres 8.1%	3001.5 acres 1.0%
Burro deer range[6]	637,453 acres	10,236 acres 1.6%	47,640 acres 7.5%	5.4 acres 0.01%
Couch's spadefoot toad range[6]	1,548,597 acres	88,992 acres 5.7%	115,218 acres 7.4%	0 acres
Harwood's milk-vetch habitat[7]	1,555,915 acres	29,195 acres 1.9%	170,048 acres 10.9%	1,136 acres 0.7%

NOTES:
1 Includes only those existing projects for which GIS-based spatial data was available at the time of the analysis; see Table I-1
2 Includes only BLM Renewables that had submitted a Plan of Development (POD) at the time of the analysis and those additional future projects listed in Table I-1
3 Total habitat based on the BLM NECO Landforms dataset (BLM CDD 2002), selecting following values: undifferentiated dunes; crescentic dunes, longitudinal dunes; sandy plains; sandy dissected fans. Does not include impacts from the transmission line and substation sites.
4 Total habitat based on the BLM NECO Landforms dataset (BLM CDD 2002), excluding mountains, playas, badlands, and lava flows
5 Total habitat based on NECO dataset for Le Conte's thrasher habitat (BLM CDD 2002)
6 Total habitat based on NECO dataset for burro deer range (BLM CDD 2002)
7 Total habitat based on the BLM NECO Landforms dataset (BLM CDD 2002), selecting following values: undifferentiated dunes; sandy plains; sandy dissected fans; undifferentiated plains

SOURCE: CEC SA/DEIS, 2010 (Biological Resources Table 14)

(documented) nests. The source of this information include the "nest card" database--helicopter surveys conducted in 1978 and 1979 desert-wide—and locations depicted in a 1984 BLM California Desert Conservation Area (CDCA) map of "Sensitive, Rare, Threatened and Endangered Fish and Wildlife" that were digitized for this analysis (BLM, 1999). It is unknown whether these nests are still active and/or present; this analysis assumes that they could be active and, at a minimum, that the site is suitable for nesting. The nest locations depicted are approximate (with a margin of error +/- 1-2 miles) and the map should not be viewed as a substitute for site-specific nest surveys to assess project impacts.

The PSPP's contribution to the cumulative loss of foraging habitat is greater when combined with the reasonably foreseeable indirect effects of habitat fragmentation from the construction of proposed future projects. The USFWS and others (see, USFWS 2009b and Kochert et al. 2002, each cited in CEC SA/DEIS, 2010) estimate there are approximately 30,000 golden eagles in the western U.S., down from an estimated 100,000 in the late 1970s. Survey data from 2003 and

TABLE I-7
CUMULATIVE EFFECTS: NATURAL COMMUNITIES IN NECO

Plant Community[1]	Total Plant Communities[1]in NECO	Impacts to Habitat from Existing[2] Projects(percent of all community type in NECO)	Impacts to Habitat from ForeseeableFuture[3] Projects(percent of all community type in NECO)	Contribution of PSPP to Future Cumulative Impacts(percent of total impacts from future projects)
Mojave Creosote Bush Scrub	805,832 acres	6,233 acres 0.8%	43,320 acres 5.4%	0 acres
Sonoran	3,829,999 acres	22,815 acres	228,363 acres	3,422 acres[4]
Creosote Bush		0.6%	5.9%	1.5%
Scrub				
Desert Dry Wash Woodland	682027	8,457 acres 1.2%	48,167 acres 7.1%	148 acres50.3%
Playa/Dry Lake	88,110 acres	961 acres 1.1%	18,634 acres 21.1%	0 acres[4]
Sand Dunes	62,140 acres	14 acres 0.02%	175 acres 0.3%	285acres100%[4]
Chenopod Scrub	2,113 acres	480 acres 22.7%	0 acres	0 acres
Agriculture, Developed	94,187 acres	n/a	1,017 acres 1.1%	0 acres
Pinyon-Juniper Woodland	1,928 acres	0 acres	0 acres	0 acres

NOTES:
1 Based on the BLM NECO Plant Communities dataset (BLM CDD 2002)conducted by the Biogeography Lab at the University of California, Santa Barbara and coordinated through the USGS Biological Resources Division UC Santa Barbara GAP Analysis (1996), updated during the NECO planning effort (see Appendix H of the NECO (BLM and CDD 2002)
2 Includes only those existing projects between Desert Center and the Colorado River for which GIS-based spatial data was available at the time of the analysis; see Table I-1
3 Includes only BLM Renewables that had submitted a Plan of Development (POD) at the time of the analysis and those additional future projects listed in Table I-1
4 – From Solar Millennium 2010b. The 285-acre sand dune value reflects the ground-based and field-verified delineation of natural communities (Solar Millennium 2010b). Differences in the methodology and accuracy of ground-based delineations versus aerial photo interpretation (as used in the NECO dataset) accounts for the discrepancy

- Reflects the field-verified, ground-based delineation of desert wash woodland (Galati and Blek 2009b)

SOURCE: CEC SA/DEIS, 2010 (Biological Resources Table 17)

2006-2008 indicate a decline of 26% since 2003. Climate change is also expected to impact golden eagle by increasing drought severity, and the CO2 concentrations are expected to exacerbate the spread of invasive weeds, which displace native species and habitats, fuel wild fires and alter fire regimes. Additionally, the proposed transmission lines for this and other proposed future projects are also expected to increase raptor collisions and electrocutions.

Proposed future projects within 10 miles of all mountains in the NECO planning area would cumulatively displace over 300,000 acres of Sonoran and Mojave creosote bush scrub and desert dry wash woodland. The Project's contribution to the cumulative loss of foraging habitat within the NECO planning area would be minimized to level less than significant through mitigation measures for acquisition of 4,737 acres of Sonoran creosote bush scrub habitat, as specified in mitigation measure BIO-12. While acquisition does not address the net loss of foraging habitat in the immediate future, it is expected to prevent future losses of habitat by placing a permanent conservation easement and deed restrictions on private lands that could otherwise be converted for urban or agricultural uses or energy development.

In Figure 3.23-7, the analysis was based on a 10-mile swath around the base of all mountain landforms, as mountains were considered the most likely areas to support golden eagle nests; this analysis used both the NECO landforms and plant communities datasets.

The cumulative impacts to foraging habitat within 10 miles of the nearest known nest (south of the PSPP boundary in the Chuckwalla Mountains) amounts to a loss of 6,435 acres of Sonoran creosote bush scrub, and the PSPP is responsible for almost half of that impact (see, Table I-8 and Figure 3.23-7); if the nest were active, the pair of golden eagles nesting at the site would lose 3.8% of potential foraging grounds from all proposed projects. The BLM has no information as to whether the golden eagle nest 5.5 miles from the PSPP site is currently active, but the absence of any observations of golden eagles during the avian point counts and other field surveys conducted in spring 2009 does not provide an adequate basis for conclusions about golden eagle use of the project site, nor was information available about prey abundance relative to other foraging habitat available to eagles in the area. Since golden eagles are known to rely on ground squirrels as an important dietary component when available (Kochert et al. 2002, cited CEC SA/DEIS, 2010), the abundance of round-tailed ground squirrels in more sandy areas of the PSPP site suggests the project could eliminate important foraging habitat. The habitat loss from the PSPP contributes considerable impacts to golden eagles in the Chuckwalla Valley and the NECO planning area, and adds incrementally to the overall loss, fragmentation and degradation of foraging habitat for golden eagles.

5.2.5 American Badger and Desert Kit Fox

The geographic scope for the cumulative impact analysis for these two species encompasses the entire NECO planning area. Using the NECO landforms dataset, the extent of suitable habitat was refined by excluding the following landforms: playas, badlands (steep erosional features), lava flows, and mountains, and then overlaid by existing and foreseeable future projects to quantify cumulative impacts to badger and kit fox habitat (Table I-6 and Figure 3.23-10).

This quantitative analysis of habitat loss does not address use of the PSPP site and adjacent habitat for both foraging and movement pathways. Other reasonably anticipated cumulative effects not quantified here include habitat fragmentation and the diminished habitat values of remaining habitat from increased noise, lighting, exotic plant and wildlife invasion and their ability to fuel wildfires and alter fire regimes, dust and air pollution, an increase in predators, agriculture and urban development (which has eliminated much habitat in the immediate PSPP vicinity), and the consequences of human intrusion into previously undisturbed habitats: hunting, use of rodenticides and other poisons, road kills, trapping, and human disturbance.

An estimated 339,704 acres of American badger and desert kit fox habitat would be displaced by the proposed future projects within the NECO planning area, representing approximately 7% of the total habitat mapped in NECO (based on the simple habitat model described above). The effect, when combined with the anticipated indirect effects to remaining habitat and populations from all future projects, is considerable. The PSPP's contribution to the cumulative loss of habitat would be minimized by implementation of mitigation measure BIO-12 for acquisition of 4,737 acres of desert tortoise habitat, which is expected to contain suitable habitat for badger and desert kit fox. Mitigation measure BIO-21 for the acquisition and protection of desert washes would also

TABLE I-8
CUMULATIVE EFFECTS: GOLDEN EAGLE FORAGING HABITAT

Cumulative Effects: Golden Eagle Foraging Habitat Within 10 miles of Nearest Known Nest (see Figure 3.23-7)

Foraging Habitat[1] (by plant community)	Total Plant Communities[1] within 10-mile Buffer of Nearest Known Nest	Impacts to Foraging Habitat from Existing[2] Projects (percent of all community types in 10-mile buffer)	Impacts to Foraging Habitat from Foreseeable Future[3] Projects (percent of all community types in 10-mile buffer)	Contribution of PSPP to Future Cumulative Impacts (percent of total impacts from future projects)
Sonoran Creosote Bush Scrub	171,088 acres	2,100 acres 1.2%	6,435 acres 3.8%	2,996 acres 46% of all future impacts (1.7% of total community in buffer)

Cumulative Effects: Golden Eagle Foraging Habitat Within 10 Miles of Mountains in the NECO Planning Area (see Figure 3.23-7)

Foraging Habitat[1] (by plant community)	Total Plant Communities[1] within NECO	Impacts to Foraging Habitat from Existing[2] Projects (percent of all community types in 10-mile buffer)	Impacts to Foraging Habitat from Foreseeable Future[3] Projects (percent of all community types in 10-mile buffer)	Contribution of PSPP to Future Cumulative Impacts (percent of total impacts from future projects)
Mojave Creosote Bush Scrub	728,536 acres	1,691 acres 0.2%	33,920 acres 4.7%	0 acres
Sonoran Creosote Bush Scrub	3,571,797acres	22,019 acres 0.6%	228,363 acres 6.4%	2,996 acres 1.3%
Desert Dry Wash Woodland[4]	654,735	8,128 acres 1.2%	48,086 acres 7.3%	5.4 acres[4] 0.01%
Playa/Dry Lake	54,433 acres	961 acres 1.8%	15,713 acres 29%	0 acres
Sand Dunes	60,807 acres	1,465 acres 2.4%	175 acres 0.3%	0 acres
Chenopod Scrub	982 acres	72 acres 7.3%	0 acres	0 acres
Agriculture, Developed	94,187 acres	n/a	1,011 acres 1.3%	0 acres
Pinyon-Juniper Woodland	1,928 acres	0 acres	0 acres	0 acres

NOTES:
1 Based on the BLM NECO Plant Communities dataset (BLM CDD 2002) conducted by the Biogeography Lab at the University of California, Santa Barbara and coordinated through the USGS Biological Resources Division UC Santa Barbara GAP Analysis (1996), updated during the NECO planning effort (see Appendix H of the NECO Management Plan (BLM CDD 2002)
2 Includes only those existing projects for which GIS-based spatial data was available at the time of the analysis; see Table I-1
3 Includes only BLM Renewables that had submitted a Plan of Development (POD) at the time of the analysis and those additional future projects listed in Table I-1.
4 Does not reflect site-specific field delineation of desert dry wash woodland, which totals 141 acres of desert dry wash woodland.

SOURCE: CEC SA/DEIS, 2010 (Biological Resources Table 15)

be expected to benefit badger and kit fox. Cumulative effects of wildlife movement are discussed below. Direct and indirect effects would also be minimized through the badger- and kit fox-specific avoidance and minimization measures in BIO-17.

5.2.6 Western Burrowing Owl

Using the NECO landforms dataset, the extent of suitable habitat for burrowing owl was refined by excluding the following landforms: dunes, mountains, playas, badlands (steep erosional features) and lava flows, and then overlaid by existing and foreseeable future projects to quantify cumulative impacts to burrowing owl habitat (Table I-6 and Figure 3.23-6).

The PSPP's contribution to the cumulative loss of habitat is comparable to the cumulative loss of badger and kit fox habitat, described above. However, the analysis does not quantify expected indirect cumulative effects such as habitat fragmentation, increased road kills, increased risk of fire from weed invasion and ignition sources, and the degradation of remaining habitat function and values. The effects of all proposed future projects (7.1% loss of habitat) is considerable, particularly when combined with the indirect effects described above. The PSPP's contribution to indirect effects and loss of habitat would be reduced through the implementation of the following mitigation measures: BIO-12 for acquisition of 4,737 acres of desert tortoise habitat; BIO-20 for acquisition of Mojave fringe-toed lizard habitat, which includes sandy plains and sand-covered alluvial fans; BIO-21 for the acquisition and enhancement of desert washes and desert wash woodland within the Palen watershed; and the avoidance and minimization measures for burrowing owl contained in BIO-18. The Raven Management Plan (BIO-13) and Weed Management Plan (BIO-14) are also expected to reduce the PSPP's contribution to the indirect effects of increased avian predators and the spread of invasive plants.

5.2.7 Le Conte's Thrasher

The scope of this analysis includes the entire NECO planning area and utilized the NECO Le Conte's thrasher habitat dataset to quantify cumulative effects of habitat loss from existing and foreseeable future projects. The NECO habitat model for this species is applicable to several other special-status bird species that inhabit desert dry wash woodland and adjacent upland habitat, including loggerhead shrike (Table I-6 and Figure 3.23-9). The cumulative indirect impacts to migratory birds not addressed in the quantitative analysis of habitat loss, and expected to be significant include: habitat fragmentation and degradation, and impacts to riparian and groundwater-dependent vegetation from water overdrafts and channel diversions.

The Le Conte's thrasher is showing steep population declines due to loss of habitat resulting from urbanization and water use combined with prolonged drought. Climate change is expected to exacerbate drought and compound the impacts of surface and groundwater use in the desert region. Further loss, fragmentation, and degradation of habitat could cause local extirpations and imperil Le Conte's thrashers in the Mojave and Sonoran deserts (CalPIF 2006, cited in CEC SA/DEIS, 2010). Current research indicates that many desert birds, including Le Conte's thrasher, are highly susceptible to habitat fragmentation and disturbance (Kershner, USFWS, pers comm., cited in CEC SA/DEIS, 2010). The Le Conte's thrasher is typically found in very low densities and has large territories, and is therefore at risk of local extirpation from habitat loss.

The cumulative effects from foreseeable future projects on habitat loss are substantial: 300,139 acres of desert scrubs and desert wash woodland would be lost to future renewable energy development within the NECO planning area alone; this represents 8.1% of all potential habitat in NECO. The PSPP's contribution to the cumulative loss of habitat would be reduced through implementation of recommended mitigation measures BIO-21, which requires acquisition and enhancement of 423 acres of desert dry wash woodland (3:1 mitigation for 141 acres of impacts) and 161 acres (1:1 mitigation) for unvegetated ephemeral washes within the same watershed as the PSPP. Mitigation measure BIO-12 requires compensatory habitat acquisition for desert tortoise habitat, which is also expected to benefit Le Conte's thrasher, and BIO-15 requires pre-construction nesting bird surveys. Mitigation measures BIO-23 and BIO-24 would require monitoring for impacts to groundwater-dependent vegetation around Palen Dry Lake and remedial action if adverse effects are detected. These additional mitigation measures also would reduce the PSPP's contribution to the anticipated cumulative indirect effects to habitat for Le Conte's thrasher habitat and other desert birds occupying similar habitat.

5.2.8 Burro Deer

Burro deer is a subspecies of mule deer found in the Colorado Desert of Southern California, primarily along the Colorado River and in Desert Wash Woodland communities away from the River. During the hot summers, water is critical, and deer concentrate along the Colorado River where water developments have been installed and where the microphyll woodland is dense and provides good forage and cover. Impacts are most important within 0.25 mile of natural or artificial watering sites; the water sources depicted in the bighorn sheep WHMA map, Figure 3.23-11, are based on the NECO dataset.

Table I-6 summarizes the anticipated cumulative effects to burro deer range; these effects are also illustrated in Figure I-1. Using the NECO dataset for burro deer range, approximately 5.4 acres of burro deer range would be displaced by the PSPP. Proposed future projects would cumulatively affect 7.5% of the burro deer range, as documented range in NECO (BLM CDD 2002). Implementation of mitigation measures BIO-21 for acquisition of 643 acres of desert washes within the same watershed as the PSPP, and BIO-12 for compensatory habitat acquisition for desert tortoise habitat, would offset the PSPP's contribution to the cumulative loss of burro deer range. However, wildlife dispersal between the Chuckwalla and Palen mountain ranges over the freeway via large underpasses is a essential to maintain healthy populations for species such as burro deer that depend on mountainous habitat. Impacts of the PSPP would be considerable unless its footprint can be configured to facilitate habitat connectivity, leaving the central wash open and providing access to the I-10 underpass. The cumulative effects of future projects on wildlife movement and connectivity are discussed in more detail below.

The three I-10 bridges south of the PSPP site are rare infrastructure features in the region that provide a safe corridor for wildlife, including large mammals such as burro deer, to pass under the I-10. Burro deer have been documented using the I-10 undercrossings south of the PSPP site, and without access to this safe passage would be expected to experience higher levels of vehicular-related fatalities as they tried to cross the freeway. Diminished access to the I-10 culverts from construction of the PSPP would substantially affect wildlife connectivity. Reconfigured Alternatives 1 and 2 and the Reduced Acreage Alternative would avoid this

significant impact of the proposed action to wildlife connectivity by maintaining the primary wash through the site that provides wildlife access.

5.2.9 Couch's Spadefoot Toad

The NECO dataset for Couch's spadefoot toad range was used in the GIS-based analysis to quantify cumulative impacts to potential habitat (Table I-6 and Figure 3.23-5). Based on the NECO depiction of the range extending only as far east as the Palo Verde basin, the GIS analysis concludes that the PSPP would not contribute to the cumulative loss of habitat within its highly restricted range in California. The PSPP site is over 40 miles west of the known range for this species, and Dimmitt (1977, cited in CEC SA/DEIS, 2010) searched favorable areas in the region encompassing the PSPP and did not find toads. The 1977 Dimmitt report on spadefoot toads indicates the Palen Lake area as being an area of interest for potential marginal populations; however, Dimmitt indicated (in consultations with staff cited in CEC SA/DEIS, 2010) that the area containing suitable breeding habitat was observed on the north and east side of the Palen dunes, which intercept washes coming off the Palen Mountains. It is possible that the western boundary of the Couch's spadefoot toad range extends farther west than depicted in the Figure 3.23-5. However, based on consultation with and expert opinion of biologists from AECOM (as cited in CEC SA/DEIS, 2010) and Dr. Dimmit, the BLM has determined that no suitable habitat (temporary pools at the base of dunes, in washes, channels, or playas) occurs in the PSPP area. Without survey results it is difficult to assess the potential for direct and indirect impacts to this species, but it tentatively has been concluded that Couch's spadefoot toads are not likely to occur in the Project Disturbance Area, and therefore the PSPP would not result in significant cumulative impacts to this species.

5.3 Wildlife Movement and Connectivity

Connectivity refers to the degree to which organisms can move among habitat patches and populations. Individuals must be able to move between patches to meet their resource needs, and in the long term populations must be connected to allow for dispersion, gene flow, and re-colonization. This discussion includes a qualitative assessment of cumulative effects to connectivity, and the estimated movement corridors are depicted spatially in Figure 3.23-2 "Desert Tortoise DWMAs & Connectivity Corridors", displayed on a base map of USGS desert tortoise habitat modeling (Nussear et al. 2009, cited in CEC SA/DEIS, 2010). Table I-5 and Figures I-2 and I-3, "Bighorn Sheep WHMAs & Connectivity Corridors" provide a summary of cumulative effects to bighorn sheep movement corridors as defined in the NECO Plan (BLM CDD 2002). Table I-9, *Cumulative Effects: WHMAs and Plant Communities*, and Figure I-2 and I-3 look at the cumulative effects to plant communities and landforms within three Multi-Species WHMAs in the Project vicinity: Big Maria Mountains WHMA, Palen-Ford WHMA, and the Continuity DWMA, which provides connectivity between the Chuckwalla DWMA/ACEC south of I-10 and the Palen-Ford WHMA north of I-10. This analysis utilized the NECO Plant Communities and Landforms datasets to describe the type of habitat affected within each separate WHMA.

In both the Palen-Ford WHMA and the DWMA Continuity WHMA, the PSPP is a major contributor to the cumulative effects of future projects on the loss of Sonoran creosote bush scrub within the WHMAs. Thus, the PSPP could impede wildlife movement in these corridors and

TABLE I-9
CUMULATIVE EFFECTS: WHMAS AND PLANT COMMUNITIES

Palen-Ford WHMA

Plant Community[1] within WHMA	Total Plant Communities[1] in WHMA	Impacts to Habitat from Existing[2] Projects (percent of all community type in WHMA)	Impacts to Habitat from Foreseeable Future[3] Projects (percent of all community type in WHMA)	Contribution of PSPP to Future Cumulative Impacts (percent of total impacts to WHMA from Future projects)
Sonoran Creosote Bush Scrub	39,366 acres	2,087 acres 5.3%	5,488 acres 14%	2,359 acres 43% of all future (6% of total in WHMA)
Desert Dry Wash Woodland[4]	13,104 acres	932 acres 7.1%	202 acres 1.5%	5.4 acres[4] 2.7%
Sand Dunes	17,690 acres	0 acres	44 acres 0.25%	0 acres
Chenopod Scrub	381 acres	62 acres 16.3%	0 acres	0 acres
Playas	13,696 acres	950 acres 6.9%	0 acres	0 acres
Agriculture, Urban	152 acres	n/a	0 acres	0 acres

Big Maria Mountains WHMA

Plant Community[1] within WHMA	Total Plant Communities[1] in WHMA	Impacts to Habitat from Existing[2] Projects (percent of all community type in WHMA)	Impacts to Habitat from Foreseeable Future[3] Projects (percent of all community type in WHMA)	Contribution of PSPP to Future Cumulative Impacts (percent of total impacts to WHMA from future projects)
Sonoran Creosote Bush Scrub	24,436 acres	317 acres 1.3%	3,105 acres 12.7%	0 acres
Desert Dry Wash Woodland[4]	9.308 acres	507 acres 5.4%	1,008 acres 10.8%	0 acres[4]
Agriculture, Urban	50 acres	n/a	0 acres	0 acres

DWMA Continuity WHMA

Plant Community[1] within WHMA	Total Plant Communities[1] in WHMA	Impacts to Habitat from Existing[2] Projects (percent of all community type in WHMA)	Impacts to Habitat from Foreseeable Future[3] Projects (percent of all community type in WHMA)	Contribution of PSPP to Future Cumulative Impacts (percent of total impacts to WHMA from future projects)
Sonoran Creosote Bush Scrub	12,804 acres	856 acres 6.7%	988 acres 7.7%	637 acres 64% of all future (5% of total in WHMA)
Desert Dry Wash Woodland[4]	275 acres	2.9 acres 1.1%	1.4 acres 0.5%	0 acres[4]

NOTES:
1 Based on the BLM NECO Plant Communities dataset (BLM CDD 2002), updated from the California Gap Analysis Project, conducted by the Biogeography Lab at the University of California, Santa Barbara and coordinated through the USGS Biological Resources Division UC Santa Barbara GAP Analysis (1996, as cited in CEC SA/DEIS, 2010).
2 Includes only those existing projects for which GIS-based spatial data was available at the time of the analysis; see Table I-1
3 Includes only BLM Renewables that had submitted a Plan of Development (POD) at the time of the analysis and those additional future projects listed in Table I-1
4 Does not reflect the field-verified, ground-based delineation of desert wash woodland (Galati and Blek 2010a, as cited in CEC SA/DEIS, 2010), which totals 141 acres in PSPP (69.8% of all future impacts in WHMA, or 1.5% of total community in WHMA).

obstruct connectivity for wide ranging wildlife such as burro deer, kit fox, coyotes, and badgers, and on a population level could impede gene flow for desert tortoises. These effects are considerable. Mitigation measures BIO-12 and BIO-21, requiring off-site habitat acquisition, would considerably reduce the PSPP's contribution to habitat loss within the Palen-Ford WHMA and the DWMA Continuity WHMA. Impacts to connectivity could be minimized if the acquisitions were targeted for areas that would enhance wildlife connectivity within the same WHMA and corridor.

No mitigation measures are currently available that can adequately minimize the proposed action's contribution to cumulative impacts to wildlife connectivity. The proposed action's contribution to cumulative effects can only be minimized by leaving the primary wash open—with an adequate buffer--for continued movement and connectivity between the Chuckwalla DWMA and critical habitat area, and the valley north of I-10. Adoption of Reconfigured Alternatives 1 or 2 or the Reduced Acreage Alternative would considerably minimize the proposed action's contribution to cumulative effects on movement and connectivity.

Although the implementation of the recommended mitigation measures and adoption of an alternative to keep the primary wash open would reduce the proposed action's contribution to cumulative impacts to wildlife movement and connectivity, there some residual impacts may remain that contribute to cumulative impacts. These residual cumulative effects from all future projects can only be addressed through a regional and coordinated planning effort aimed at preserving and enhancing large, intact expanses of wildlife habitat and linkages, including maintaining connections between wildlife management areas and other movement corridors. Ongoing collaborative efforts by federal and state agencies to develop a Desert Renewable Energy Conservation Plan and BLM's Solar Energy Development Programmatic EIS offer an appropriate forum for such planning.

5.4 Natural Communities

The geographic scope of the analysis of cumulative effects on plant communities and general wildlife habitat encompasses the NECO planning area and uses the NECO plant communities dataset to map and quantify cumulative effects on foraging habitat (Table I-10, *Cumulative Effects: Natural Communities***,** and Figure 3.18-1 and 3.18-6). The NECO plant communities dataset is based on the 1996 California Gap Analysis Project (Davis et al. 1998, cited in CEC SA/DEIS, 2010), a project of the Biogeography lab at UC Santa Barbara. The accuracy and resolution of the GAP mapping was improved for the NECO plant communities dataset (BLM CDD; Appendix H) using aerial photos and extensive ground-truthing but should not be viewed as a substitute for site-specific habitat mapping. Table I-9 quantifies the cumulative effects to plant communities, stratified by community type. Mojave creosote scrub refers to the creosote bush-dominant desert scrubs that occur within the Mojave Desert region of the California Desert geographic subdivision (Hickman 1993, cited in CEC SA/DEIS, 2010). The transition to Sonoran Desert is mapped at the Bristol Mountains near the Twenty-Nine Palms Marine Corps Base and extends east and south through the NECO planning area.

Considerable cumulative effects to plant communities from proposed future projects are seen in many community types, particularly Sonoran creosote bush scrub (5.9%), desert dry wash

TABLE I-10
CUMULATIVE EFFECTS: NATURAL COMMUNITIES

Plant Community[1]	Total Plant Communities[1] in NECO	Impacts to Habitat from Existing[2] Projects (percent of all community type in NECO)	Impacts to Habitat from Foreseeable Future[3] Projects (percent of all community type in NECO)	Contribution of PSPP to Future Cumulative Impacts (percent of total impacts from future projects)
Mojave Creosote Bush Scrub	805,832 acres	6,233 acres 0.8%	43,320 acres 5.4%	0 acres
Sonoran Creosote Bush Scrub	3,829,999acres	22,815 acres 0.6%	228,363 acres 5.9%	2,959 acres 1.3%
Desert Dry Wash Woodland[4]	682,027	8,457 acres 1.2%	48,167 acres 7.1%	5.4 acres[4] 0.01%
Playa/Dry Lake	88,110 acres	961 acres 1.1%	18,634 acres 21.1%	0 acres
Sand Dunes	62,140 acres	14 acres 0.02%	175 acres 0.3%	0 acres
Chenopod Scrub	2,113 acres	480 acres 22.7%	0 acres	0 acres
Agriculture, Developed	94,187 acres	n/a	1,017 acres 1.1%	0 acres
Pinyon-Juniper Woodland	1,928 acres	0 acres	0 acres	0 acres

NOTES:
1 - Based on the BLM NECO Plant Communities dataset (BLM CDD 2002)conducted by the Biogeography Lab at the University of California, Santa Barbara and coordinated through the USGS Biological Resources Division UC Santa Barbara GAP Analysis (1996, cited in CEC SA/DEIS, 2010), updated during the NECO planning effort (see Appendix H of the NECO (BLM and CDD 2002)
2 - Includes only those existing projects between Desert Center and the Colorado River for which GIS-based spatial data was available at the time of the analysis; see Table I-1
3 - Includes only BLM Renewables that had submitted a Plan of Development (POD) at the time of the analysis and those additional future projects listed in Table I-1
4 - Does not reflect the field-verified, ground-based delineation of desert wash woodland (Galati and Blek 2009a), which totals 141 acres in Project (0.3% of all future impacts)

SOURCE: CEC SA/DEIS, 2010 (Biological Resources Table 17)

woodland (7.1%), and playa (21.1%). These figures do not address the indirect effects to remaining habitat from fragmentation, alteration of the surface drainage patterns (which support many common and rare species), and an increase in the risk of fire and the introduction and spread of noxious weeds. Sahara mustard is a particular problem because it is already infesting many areas on and adjacent to the PSPP and has the potential to spread explosively if not carefully managed. Climate change is expected to exacerbate the effects of drought and noxious weed spread. The cumulative effects of groundwater pumping by all projects are expected to have adverse effects on groundwater-dependent vegetation in some portions of the Chuckwalla Valley.

The PSPP would contribute at least incrementally to the cumulative loss of Sonoran creosote bush scrub and desert dry wash woodland. Sonoran creosote bush scrub is a common and widespread community in the southeastern deserts of California; however, this broad designation does not reflect the importance of large, intact blocks of habitat to wildlife movement, or to foraging and breeding habitat for wildlife, including state and federal listed species. The NECO mapping of plant communities also does not reflect the many uncommon and even rare plant assemblages within creosote scrub that have been documented and are monitored by the CNDDB (CDFG 2003, cited in CEC SA/DEIS, 2010).

Implementation of mitigation measures BIO-12 for acquisition of 4,737 acres of desert tortoise habitat (Sonoran creosote bush scrub) in Chuckwalla Valley, and BIO-21 for acquisition and protection of 643 acres of desert washes and desert dry wash woodland, would considerably reduce the PSPP's contribution to the cumulative loss of these habitats. While acquisition does not address the net loss of habitat in the immediate future (a temporal net loss of habitat), it is expected to prevent future losses of habitat by placing a permanent conservation easement and deed restrictions on private lands that could otherwise be converted for urban, agricultural or energy development.

Mitigation measure BIO-14 for weed management would offset the PSPP's contribution to the indirect cumulative effects of all projects on the spread of invasive non-native plants and their effects on wildlife and fire risk. BIO-23 and BIO-24 for monitoring of groundwater-dependent vegetation (and remedial action in the event of adverse effects) would considerably reduce the PSPP's contribution to this effect. Playas and dry lakebeds appear to be disproportionately affected by the cumulative effects of potential future projects across NECO; 21.1% of this community type would be directly affected. Due to their limited extent and potential status as jurisdictional state waters, and their hydrologic importance and seasonal value to wildlife, this would be a considerable cumulative effect. However, the PSPP does not contribute, even incrementally, to this effect. Consequently, no mitigation measures are recommended to address it.

Table I-11, *Cumulative Effects: Desert Dry Wash Woodland – Palen Watershed*, and Figure 3.18-6 highlights the cumulative effects of existing and future projects to desert dry wash woodland within the immediate watershed encompassing the PSPP. The NECO plant communities dataset was used for this analysis. The PSPP's field-verified, ground-based delineation (Galati and Blek 2010a, cited in CEC SA/DEIS, 2010) documented 141 acres of desert dry wash woodland in the PSPP footprint.

Seemingly minor impacts can be significant if they affect an extremely rare or limited resource, and the cumulative impact may be substantial. Desert dry wash woodland is a sensitive natural community recognized under many laws, ordinances, regulations, standards, and area plans. Because it has a limited distribution (relative to common and widespread communities such as Sonoran creosote bush scrub) and carries an ecological importance that is disproportionate to its limited extent, this would be a significant cumulative effect, particularly in light of the PSPP's contribution to cumulative effects to desert washes in the Palen watershed. The PSPP's contribution to the cumulative loss of desert dry wash woodland would be reduced considerably by the implementation of mitigation measure BIO-22, which specifies acquisition and enhancement of desert wash woodland within or near the Palen watershed a 3:1 mitigation ratio. However, the impacts of channel re-routing on wildlife movement and connectivity, and on fluvial sand transport would not be adequately mitigated through acquisition; these effects could be minimized only by adopting Reconfigured Alternative 1 or 2 or the Reduced Acreage Alternative, each of which would leave the desert dry wash woodland on the primary wash unaffected and the channel unobstructed with an adequately broad buffer zone on both sides of the wash.

TABLE I-11
CUMULATIVE EFFECTS: DESERT DRY WASH WOODLAND – PALEN WATERSHED+

Plant Community[1]	Total Plant Communities[1] in Palen Watershed	Impacts to Habitat from Existing[2] Projects (percent of all community type in Palen Watershed)	Impacts to Habitat from Foreseeable Future[3] Projects (percent of all community type in Palen Watershed)	Contribution of PSPP to Future Cumulative Impacts (percent of total impacts from future projects)
Desert Dry Wash Woodland	148,856 acres	4,566 acres 3.1%	10,950 acres 7.4%	5.4 acres[4] 0.05%

NOTES:
1 Based on the BLM NECO Plant Communities dataset (BLM CDD 2002) conducted by the Biogeography Lab at the University of California, Santa Barbara and coordinated through the USGS Biological Resources Division UC Santa Barbara GAP Analysis (Davis et al. 1998, cited in CEC SA/DEIS, 2010), updated during the NECO planning effort (see Appendix H of the NECO (BLM and CDD 2002)
2 Includes only those existing projects for which GIS-based spatial data was available at the time of the analysis; see Table I-1.
3 Includes only BLM Renewables that had submitted a Plan of Development at the time of the analysis and those additional future projects listed in Table I-1.
4 Based on the California Interagency Watershed Map of 1999 (California Interagency Watershed Mapping Committee 1999, cited in CEC SA/DEIS, 2010). Does not reflect the field-verified, ground-based delineation of desert wash woodland (Galati and Blek 2010a, cited in CEC SA/DEIS, 2010), which totals 141 acres in Project (3.1% of all future impacts within the watershed)
5 Does not reflect site-specific field delineation of desert dry wash woodland, totaling 141 acres affected by PSPP.

Table I-12, *Cumulative Effects: Landforms/Wildlife Habitat*, and Figure 3.18-2 reflect the cumulative impacts to uncommon landforms (such as dunes and playas) and common or widespread landforms (such as alluvial fans and bajadas) within the NECO Planning Area, stratified by landform. There is some overlap with the GAP Analysis/NECO Plant Communities dataset (dunes and playa); differences in extent reflect the different data sources and mapping methodology.

As illustrated below, the cumulative effects of all future (proposed) projects to dunes, playas, and plains (including sandy plains, which make up a large portion of Mojave fringe-toed lizard habitat) would be significantly and adversely affected. Dunes and sandy plains also provide habitat for several rare plants in the region, including Harwood's milk-vetch. The PSPP' contribution to these effects, even when "seemingly minor can be significant if they affect an extremely rare or limited resource, and the cumulative impact may be substantial", according to CEQ guidance. The PSPP's contribution to cumulative effects to sand dunes significant, particularly when considering the anticipated indirect effects from obstructed winds and sand transport, upon which the maintenance and sustainability of the dunes depends.

Mitigation measure BIO-20 requires implementation of impact avoidance and minimization measures and acquisition of dune habitat at a 3:1 ratio for the sand dune habitat loss attributable to the PSPP, and a 1:1 ratio for other sandy habitats that support Mojave fringe-toed lizards (e.g., sandy plains, sand-covered fans, and sand-covered playas). These acquisitions would need to be targeted for dune habitat within the Chuckwalla Valley with potential to contribute to Mojave fringe-toed lizard habitat connectivity. Implementation of BIO-20 would offset the PSPP's contribution to the loss of habitat.

However, acquisition alone would not mitigate significant indirect effects of disrupted sand transport on habitat down-wind of the PSPP. Substantially minimizing the direct and indirect effects of the proposed action on dune maintenance and Mojave fringe-toed lizard could be

TABLE I-12
CUMULATIVE EFFECTS: LANDFORMS/WILDLIFE HABITAT

NECO Landform[1]	Total Landform[1] in NECO	Impacts to Habitat from Existing[2] Projects (percent of all landform type in NECO)	Impacts to Habitat from Foreseeable Future[3] Projects (percent of all landform type in NECO)	Contribution of PSPP to Future Cumulative Impacts (percent of total impacts from future projects)
Alluvial Fans/Bajadas	2,997,468 acres	42,619 acres 1.4%	217,761 acres 7.3%	1,565 acres 0.7%
Sand Dunes	150,136 acres	3,755 acres 2.5% of total	17,027 acres 11.3% of total	268 acres 1.6%
Pediments	139,282 acres	1,715 acres 1.21% of total	1,263 acres 0.9% of total	0 acres
Plains	408,453 acres	75,687 acres 18.5% of total	48,117 acres 11.8% of total	869 acres 1.8%
Badlands	79,141 acres	40 acres 0.05% of total	1,203 acres 1.5% of total	0 acres
Lava Flows	180 acres	0 acres	0 acres	0 acres
Riverwashes	137,265 acres	1,475 acres 0.1% of total	6,896 acres 5.0% of total	0 acres
Dry Playas	62,106 acres	1,348 acres 2.2% of total	9,423 acres 15.2% of total	0 acres
Mesas	6,843 acres	2 acres 0.001%	0 acres	0 acres
Tilted Plateaus	8,979 acres	0.1 acres 0.001%	3,762 acres 42.0% of total	0 acres
Mountains	609,023 acres	1,468 acres 0.2% of total	8682 acres 1.4% of total	0 acres
Hills	947,205 acres	4,774 acres 0.5% of total	25,495 acres 2.7% of total	0 acres

NOTES:
1 Based on the NECO Landforms dataset (BLM CDD 2002)
2 Includes only those existing projects between Desert Center and the Colorado River for which GIS-based spatial data was available at the time of the analysis; see Table I-1
3 Includes only BLM Renewables that had submitted a Plan of Development (POD) at the time of the analysis and those additional future projects listed in Table I-1

SOURCE: CEC SA/DEIS, 2010 (Biological Resources Table 19)

addressed only by removing the obstruction from the active sand transport corridor. Reconfigured Alternative 1 considerably would reduce the proposed action's impacts on desert washes, desert dry wash woodland, and connectivity, but would not reduce its considerable impacts to dune habitat and Mojave fringe-toed lizard habitat.

5.5 Active Dune Habitat in Chuckwalla Valley

This analysis highlights the cumulative effects of the many BLM renewable energy projects on this important habitat within Chuckwalla Valley, a dune system that is distinct from other dunes in the NECO planning area, and an area that may be disproportionately affected by proposed renewable energy projects. Dunes provide habitat for a variety of special-status plants and animals; locally these include Chuckwalla Valley population of Mojave fringe-toed lizard, and Harwood's milk-vetch. Table I-13, *Cumulative Effects: Active Dune Habitat*, and Figure I-4

quantifies the cumulative effects of the BLM renewable energy projects and other existing and future projects on “active” dune formations in the Chuckwalla Valley.

The NECO landforms dataset was used for this analysis of the most active dune formations; only the following values selected: crescentic dunes, longitudinal dunes, and undifferentiated dunes. Table I-13 quantifies the cumulative effects of the BLM renewable energy projects and other existing and future projects on “active” dune formations in the NECO planning area. The extent of other less active aeolian (wind)-deposited and stream-deposited sands are better reflected in the habitat model for Mojave fringe-toed lizard (Figures 3.23-3 and 3.23-4 and Table I-6). The mapping and model for Mojave fringe-toed lizard includes sandy plains and sand-covered alluvial fans; portions of these landforms may be located within the wind-sand transport corridor but occur in the less active outer portions beyond the active dunes.

Cumulative effects to dune habitat not reflected in this quantitative analysis include: obstruction of wind and fluvial sand transport systems (which are essential for the maintenance of the dunes) by new structures and wind fencing, fragmentation and degradation of remaining habitat by roads, development, off-road vehicles, altered drainage patterns, and the spread of noxious weeds and other invasive plants, such as Russian thistle and Sahara mustard. Habitat values for dune-dependent wildlife are also affected by increased predation from avian predators, which benefit from new perching structures.

Table I-13 illustrates the considerable contribution of the PSPP to cumulative impacts to active dune habitat (16.7%) resulting from foreseeable future projects in the NECO planning area. This effect may not be adequately mitigated through habitat acquisition proposed under mitigation measure BIO-20 when considering the PSPP’s indirect impacts: solar fields and wind fencing constructed within the active (dune building) sand transport corridor obstruct the corridor (on which the dunes sustainability depends) and deprive large areas of dune habitat down-wind of the PSPP. Other mitigation measures to address effects of the PSPP on dunes and dune-dependent wildlife and plants include the raven and weed management plans (BIO-13 and BIO-14) and the specification for preparation of a detailed revegetation plan for temporary disturbance contained in BIO-8**.** However, as described above under “Landforms”, the impacts of the proposed action on sand transport and related impacts to Mojave fringe-toed lizard habitat could only be adequately minimized by the Reduced Acreage Alternative.

5.6 Groundwater-dependent Vegetation

Groundwater extraction during construction and operation of this and other foreseeable projects would place the Chuckwalla Valley groundwater basin into an overdraft condition. This impact could be exacerbated by other unidentified renewable energy projects in the I-10 corridor, which has been targeted as a potential area for further renewable energy development. However, the PSPP’s contribution (300 acre feet per year) to this cumulative effect is not considerable. Groundwater pumping could have a significant impact to biological resources if it lowers the water table in areas where deep-rooted phreatophytes occur, such as mesquite bosques and succulent chenopod scrubs or alkali sink scrub. To minimize the PSPP’s contribution to cumulative effects, mitigation measures SOIL&WATER-3 through SOIL&WATER-5 would substantially reduce impacts to groundwater levels. BIO-23 would ensure that the PSPP would

TABLE I-13
CUMULATIVE EFFECTS: ACTIVE DUNE HABITAT

Total Dune Habitat[1] in Chuckwalla Valley	Impacts to Dune Habitat from Existing[2] Projects (percent of all dune habitat in Chuckwalla Valley)	Impacts to Dune Habitat from Foreseeable Future[3] Projects (percent of all dune habitat in Chuckwalla Valley)	Contribution of PSPP to Future Cumulative Impacts (percent of total impacts from future projects)
25,463 acres	1,049 acres 4.1%	1,607 acres 6.3%	268 acres 16.7%
Total Dune habitat[1] in NECO	**Impacts to Dune Habitat from Existing[2] Projects (percent of all dune habitat in NECO)**	**Impacts to Dune Habitat from Foreseeable Future[3] Projects (percent of all dune habitat in NECO)**	**Contribution of PSPP to Future Cumulative Impacts (percent of total impacts from future projects)**
150,136 acres	3,755 acres 2.5%	17,027 acres 11.3% of total	268 acres 1.6%

NOTES:
1 Based on the BLM NECO Landforms dataset (BLM CDD 2002) for the following values: crescentic dunes, longitudinal dunes, and undifferentiated dunes; does not include sandy plains or sand-covered fans.
2 Includes only those existing projects between Desert Center and the Colorado River for which GIS-based spatial data was available at the time of the analysis; see Table I-1.
3 Includes only BLM Renewables that had submitted a Plan of Development (POD) at the time of the analysis and those additional future projects listed in Table I-1.

not adversely affect groundwater-dependent vegetation within 2 to 3 miles of the project well for the life of the PSPP. BIO-24 requires a remedial action plan that would be triggered in the event that adverse effects to groundwater-dependent vegetation are detected.

5.7 Special-Status Plants

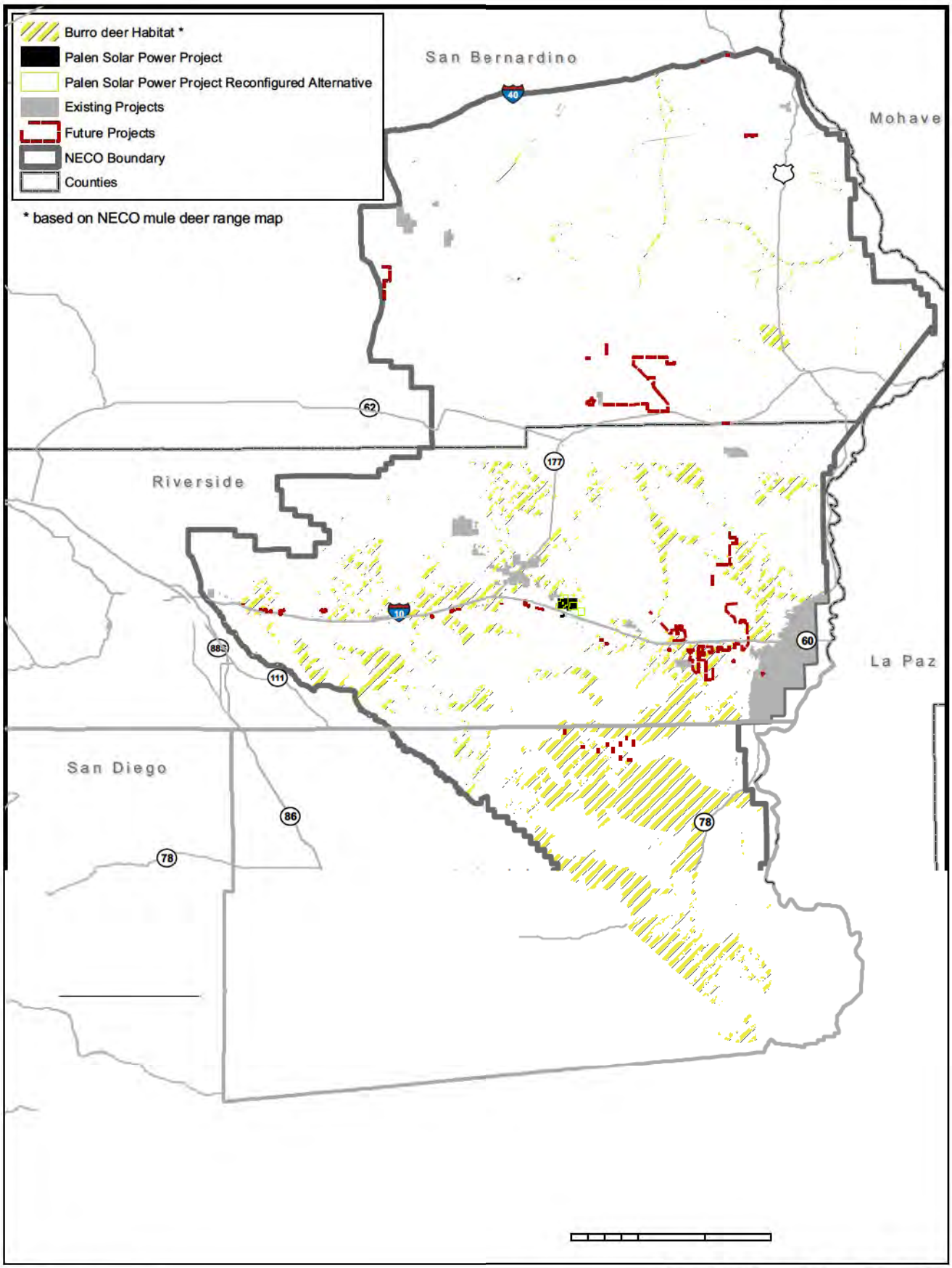
5.7.1 Harwood's Milkvetch

Small populations of Harwood's milkvetch were found just downstream of the northern boundary of the PSPP. Direct effects to plants are not expected, but the PSPP could have indirect effects to the population from altered surface drainage patterns; the occurrence is located below a discharge point on the engineered channel that would divert all washes around the perimeter of the site, and discharge the flows at the northern boundary.

Populations of Harwood's milkvetch, like many other rare plants of the eastern California deserts, were considered relatively stable until recently, as the push for renewable energy development has placed many at risk. Because the occurrence records for this taxon are spotty in portions of its range, this analysis was based instead on threats to potential habitat. However, the mapping of habitat should not be misconstrued as potentially occupied; rare plants have very specific microhabitat requirements that are often poorly understood. Actual distribution within mapped habitat is often confined to small or scattered and infrequent occurrences within an already restricted range. Rare plants can sometimes be locally abundant but highly restricted in their range.

Table I-6 quantifies and Figure 3.18-8 shows the cumulative effects of the BLM renewable energy projects and other existing and future projects on the very sandy substrates associated with this special-status plant. The NECO landforms dataset was used; landforms selected to create the simple model of potential habitat include: sandy dissected fans; sandy plains; fans; dissected fans; undifferentiated plains, and undifferentiated dunes. This was based on a careful review of the landforms dataset overlaid with known occurrences of Harwood's milkvetch from CNDDB occurrences and the PSPP-specific survey data. This model somewhat over-represents actual suitable habitat for Harwood's milkvetch but cannot be refined until the more detailed soil mapping for the region (currently in development by the Natural Resources Conservation Service) is available.

Cumulative impacts to Harwood's milkvetch habitat from all proposed future projects are considerable, and would affect nearly 11% of all potentially suitable habitat. The effects to actual populations or verified occupied habitat are unknown until applicants submit site-specific survey data. The PSPP's contribution to cumulative effects would be reduced through the mitigation measures designed to avoid and minimize indirect effects and accidental effects to plants or their habitat during construction. These are described in the Draft Special-Status Plant Protection Plan (AECOM 2010a, cited in CEC SA/DEIS, 2010) and in mitigation measure BIO-19**.** The PSPP's contribution to the loss of the species' sandy and dune habitat in Chuckwalla Valley would be considerable significant, particularly in light of the indirect effects of interrupted sand-carrying winds, and altered drainage patterns. Mitigation measure BIO-20 requires acquisition of sand dune habitat, and would substantially mitigate the loss of habitat. Mitigation measure BIO-14 (Weed Management Plan) would reduce the PSPP's contribution to the indirect effects of introduction and spread of invasive non-native plants; Sahara mustard has the potential to spread exponentially and is already present in portions of the project site.

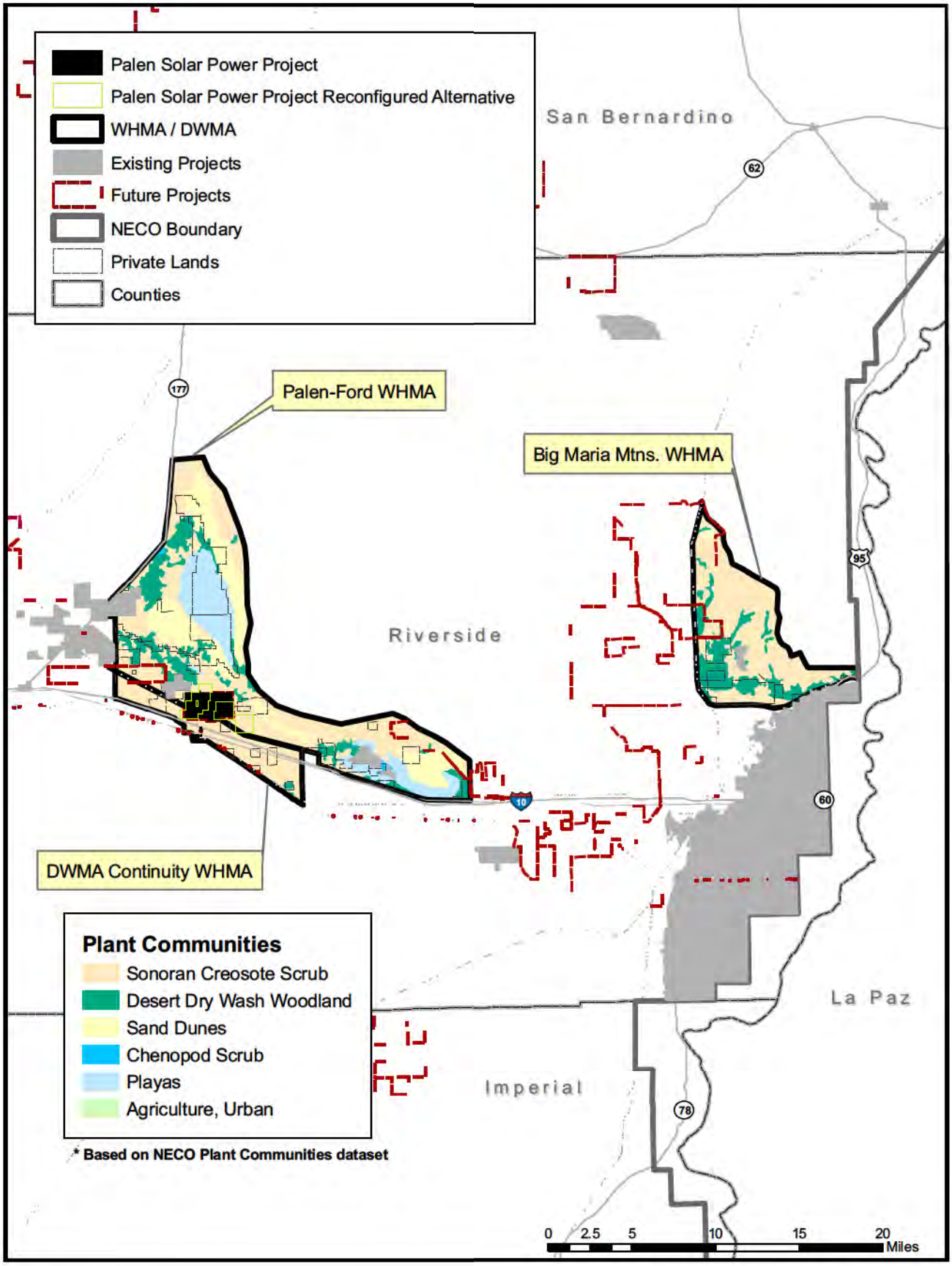


SOURCE: CEC RSA, 2010

Palen Solar Power Project FEIS . 210291.01

Figure I-1

Burro Deer Range

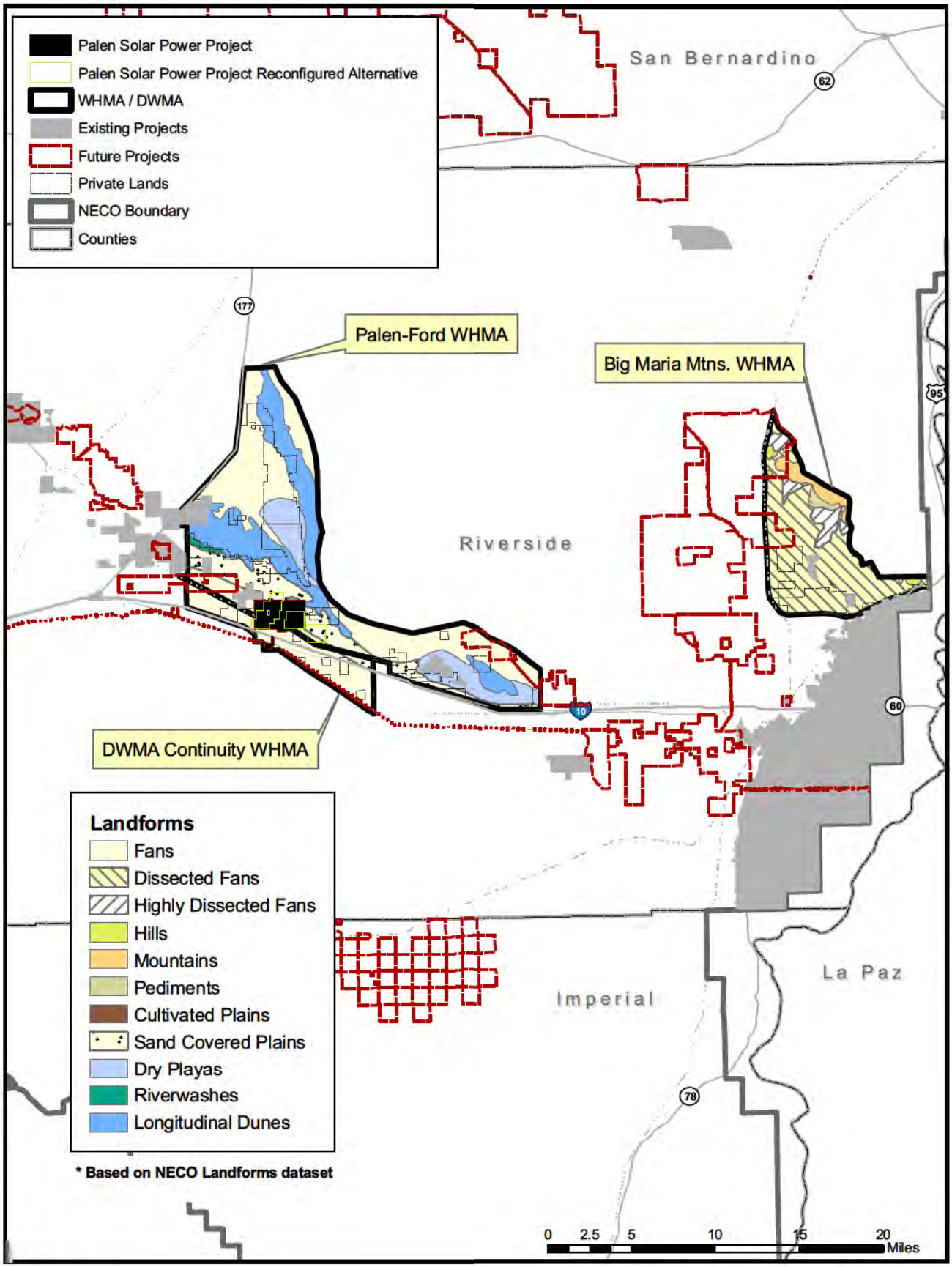


SOURCE: CEC RSA, 2010

Palen Solar Power Project FEIS . 210291.01

Figure I-2

Multi-Species WHMAs - Plant Communities

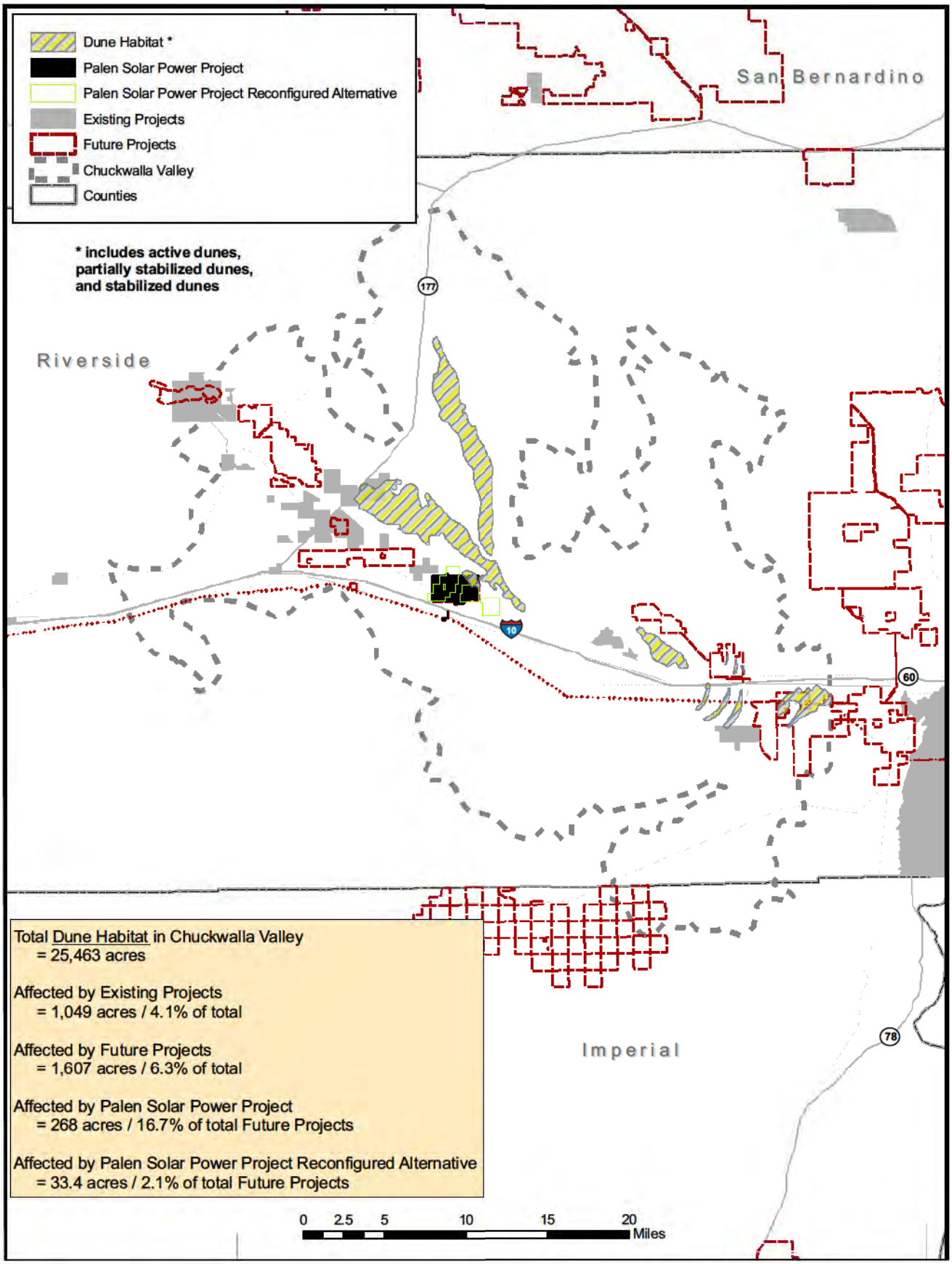


SOURCE: CEC RSA, 2010

Palen Solar Power Project FEIS . 210291.01

Figure I-3

Multi-Species WHMAs - Landforms



SOURCE: CEC RSA, 2010

Palen Solar Power Project FEIS . 210291.01

Figure I-4

Dune Habitat - Chuckwalla