April 29, 2010

Eric Solorio
Project Manager
California Energy Commission
1516 Ninth Street
Sacramento, CA 95814

RE: Ridgecrest Solar Power Project (RSPP), Docket No. 09-AFC-9, Analysis of Population and Species Impacts to the Desert Tortoise, prepared by Alice E. Karl, Ph.D.

Dear Mr. Solorio:

As requested, attached please find the Analysis of Population and Species Impacts to the Desert Tortoise Due to the Siting of this Project in its Current Location, prepared by Alice E. Karl, Ph.D. This is an update to the March document, which was docketed in draft on April 7, 2010. This has been docketed in accordance with CEC requirements.

If you have any questions, please feel free to contact me at 510-809-4662 (office) or 949-433-4049 (cell).

Sincerely,

Billy Owens
Director, Project Development

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BEFORE THE ENERGY RESOURCES CONSERVATION AND DEVELOPMENT COMMISSION OF THE STATE OF CALIFORNIA
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APPLICATION FOR CERTIFICATION
For the *RIDGECREST SOLAR POWER PROJECT*

Docket No. 09-AFC-9

PROOF OF SERVICE
(Revised 4/12/2010)

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DECLARATION OF SERVICE

I, Elizabeth Copley, declare that on April 29, 2010, I served and filed copies of the attached Ridgecrest Solar Power Project (Docket No. 09-AFC-9) Analysis of Population and Species Impacts to the Desert Tortoise Due to the Siting of this Project in its Current Location. 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_ridgecrest].

The documents have been sent to both 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:

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

_ by personal delivery;

X by delivering on this date, for mailing with the United States Postal Service with first-class postage thereon fully prepaid, to the name and address of the person served, for mailing that same day in the ordinary course of business; that the envelope was sealed and placed for collection and mailing on that date 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 and emailed Respectively, to the address below (preferred method);

OR

__ depositing in the mail an original and 12 paper copies, as follows:

CALIFORNIA ENERGY COMMISSION
Attn: Docket No. 09-AFC-9
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.

RIDGECREST SOLAR POWER PROJECT

ANALYSIS OF POPULATION AND SPECIES IMPACTS TO THE DESERT TORTOISE, DUE TO THE SITING OF THIS PROJECT IN ITS CURRENT LOCATION

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BACKGROUND

The Ridgecrest Solar Power Project (RSPP or Project) is located in Indian Wells Valley, approximately 8 km (5 mi) from the city of Ridgecrest and approximately 9.6 km (6 mi) from the town of Inyokern, in Kern County, California (Figure 1). The 702 ha (1734.8 acre) RSPP abuts State Highway 395, a major north-south commerce and transportation route in California, and crosses Brown Rd., a locally-used two-lane paved road. A complete Project description can be found in the Project Application for Certification (AECOM 2009a).

Desert tortoise surveys were completed in Spring 2009 and observed 23 adult desert tortoises within the Project footprint. Using the current USFWS (2009) calculations, the estimated adult tortoise abundance was 57, or 8.1 adult tortoises per square kilometer (km^2) [1].

The discussion presented herein provides an objective assessment of the relative value of the tortoises at the RSPP site to species persistence and recovery, based on the available tortoise data. This analysis is specifically to assist the resource agencies and Project proponents in determining whether the Project's effects on tortoises can be mitigated, and what mitigation measures might be appropriate. Further, there is a brief discussion of specific Project design that could decrease both the Project effects on tortoises at this site, as well as potentially assist in desert tortoise recovery.

ANALYSIS

Several factors are important in assessing the inherent value of a group of tortoises to both the local population and to the species, irrespective of mitigation measures that may be employed to minimize a project's impacts. These include the following:

1. Abundance of tortoises relative to other locations within the population
2. Identified importance of the area for recovery and tortoise conservation, by CDFG and USFWS
3. Existing impacts to the site's tortoises and relative longevity of the population in light of these impacts, irrespective of the project

[1] Note: The Application for Certification (AFC; AECOM 2009a) reports a density estimate of adult tortoises, 9.8 adult tortoises/km^2. The density was revised to 8.1, based on subsequent data analysis (Solar Millennium, LLC, 2010a, b).

4. Disruption to genetic connectivity within the population that would occur due to the project
5. Cumulative population fragmentation, including the project, that could result in decreased value of the habitat surrounding the project
6. Heightened anthropogenic or other impacts that could result should the project be built

Each of these factors is discussed in detail below.

Tortoise Abundance

Tortoise abundance at the RSPP is examined in this paper relative to the following questions:

- Could the absolute value of 8.1 tortoises/km^2 be considered a high tortoise density by historic standards, when tortoise densities were higher throughout their range?

- What does a density of 8.1 mean in the context of tortoise populations?

RSPP Tortoise Density Compared to Other Relevant Sites. Historically, a density of 8.1 adult tortoise/km^2 would have been considered a low tortoise density. Table 1 shows the five trend plots studied by BLM in the western Mojave Desert that historically had the highest tortoise densities. Adult tortoise densities from the period 1979-1982 ranged from 36-92 adult tortoises/km^2. The three plots closest to the RSPP (the two Desert Tortoise Natural Area [DTNA] plots and Fremont Valley) had the highest densities. The other recognized high-density plots in California, outside the western Mojave Desert, had 38-83 adult tortoises/km^2. So, historically, 8.1 would have been considered to be very low.

Populations of desert tortoises have declined dramatically since the mid-1980's (Karl 2004a, Tracy et al. 2004, McLuckie et al. 2006, Boarman et al.), so RSPP tortoise density is also examined in the context of current tortoise densities. There are few recent (i.e., within the ten years prior to the 2009 RSPP surveys) available data for localized sites *where tortoises are expected*. Table 2 lists 19 locations in tortoise habitat, and excludes locations that were specifically chosen by project developers based on their anticipated lack of tortoises and other costly resources (e.g., solar project sites). Adult tortoise densities at these 19, western Mojave Desert sites range from 0-28 adult tortoises/km^2 (Table 2). The RSPP tortoise density of 8.1 falls slightly above the median density value (7.7) of these 19 sites and slightly below the mean value (8.5). The relative density of these sites in the context of tortoise density rangewide is unknown because no data are available to complete the analysis.

Table 1. Estimated adult tortoise densities for historically high density plots in California[1].

Historically High Density Plot	#Adults/km2	Year
Western Mojave Desert		
DTNA[2] Interior Plot	92	1982
DTNA Interpretive Center	69	1979
Fremont Valley	45	1981
Kramer Hills	42	1980
Lucerne Valley	36	1980
Elsewhere in California		
Chuckwalla Bench	75	1979
Goffs	83	1983
Upper Ward Valley	38	1980
Ivanpah	42	1979

1. Data Source: BLM (2005), Berry (1990, 1997)
2. Desert Tortoise Natural Area (DTNA)

Two regional sampling programs may further elucidate RSPP tortoise abundance in the context of the tortoise's geographic range in California. Density transects for the Ridgecrest area in the late 1970's estimated 8-19 tortoises/km^2 in the Project vicinity (Berry and Nicholson 1984). This was considered a relatively low tortoise density at the time because during this same sampling program, 7640 km^2 in California were estimated to have over 19 tortoises/km^2 and nine areas were estimated to have over 58 tortoises/km^2. While the validity of those earlier estimates in the strict context of a mathematical representation of tortoise density (i.e., number of tortoises per unit area) has been rejected, the 1970's sampling program was nonetheless valuable in predicting areas of *relatively* high, medium, and low tortoise abundance. The RSPP area was consistently shown to be a relatively low density.

More recent transects conducted for the West Mojave Plan (WMP) in 1999 again consistently found very low sign counts in the RSPP vicinity and remainder of Indian Wells Valley (U.S. Bureau of Land Management [BLM] 2005). On 23 of the 25 transects throughout the valley, zero to three sign were observed; on the remaining two transects (north of the RSPP), four to eight sign were observed[2]. Sign on transects in the immediate vicinity of the RSPP site totaled one to three per transect. During this same sampling program, there were many areas in the WMP planning area that had higher (9-16 sign) to substantially higher (17-50 sign) sign counts, indicating that the RSPP vicinity (i.e., the RSPP site and surrounding Indian Wells Valley) is a low tortoise density

[2] Note: The WMP transects did not attempt to estimate tortoise density. They merely reported sign counts as a measure of relative tortoise abundance. A total sign count was reported for each transect.

Table 2. Available desert tortoise density estimates on localized sites in the western Mojave Desert. Sites were generally small, 1 km^2 or 1 mi^2, unless noted. All sites were expected to be occupied by desert tortoises based on habitat.

Site	#Adults/km^2		Time or Time Span for Estimates[1]	Reference
	Time 1	Time 2		
USGS Plots				
DTNA Interior Plot	92.0	5.0	1979, **1982**, 1988, 1992 **1996,** 2002	BLM (2005), Berry (2003)
DTNA Interpretive Center	69.9	18.1	**1979**, 1985, 1989, **1993,** 2002	BLM (2005), Berry (2003)
Fremont Valley	44.8	12.7	**1981**, 1987, **1991**, 2001, 2007	BLM (2005), Jones (2008)
Fremont Peak	27.0	1.9	**1980,** 1985, 1989, **1993**, 2001, 2007	BLM (2005), Jones (2008)
Kramer Hills	44.0	13.1	1980, **1982**, 1987, 1991, **1995**, 2007	BLM (2005), Jones (2008)
Lucerne Valley	35.9	25.1	**1980**, 1986, 1990, **1994**, 2005	BLM (2005), Jones (2008)
Johnson Valley	26.6	6.2	**1980**, 1986, 1990, **1994**, 2008	BLM (2005)
Stoddard Valley	47.9		1981, **1987**, 1991	BLM (2005)
Fort Irwin Expansion Project				
MT-1	28.0		1999	Karl (1999)
NL-1	10.0		1999	Karl (1999)
Plot 1	14.0		2001	Karl (2002a)
Plot 2	5.0		2001	Karl (2002a)
Plot 3	0+		2001	Karl (2002a)
Plot 4	7.7		2001	Karl (2002a)
Plot 5	7.0		2001	Karl (2002a)
Plot 6	5.0		2001	Karl (2002a)
Plot 8	10.8-12.0		2001, 2002	Karl (2002a, b)
Plot 9	13.2-13.9		2002	Karl (2002b)
MCAGCC Land Acquisition Project:				
Johnson Valley Plot 1	7.8		2009	B. Henen, NREA, pers. comm.
Johnson Valley Plot 2	6.0		2009	B. Henen, NREA, pers. comm.
Johnson Valley Plot 3	12.5		2009	B. Henen, NREA, pers. comm.
Twentynine Palms Plot 4	10.6		2009	B. Henen, NREA, pers. comm.
Cadiz Valley Plot 5	5.0		2009	B. Henen, NREA, pers. comm.
Cadiz Valley Plot 6	0.0		2009	B. Henen, NREA, pers. comm.
Johnson Valley Plot 7	4.0		2009	B. Henen, NREA, pers. comm.

Table 2, continued.

Site	#Adults/km^2		Time or Time Span for Estimates[1]	Reference
	Time 1	Time 2		
Emerson Lake	3.0		2009	B. Henen, NREA, pers. comm.
Acorn	10.6		2009	B. Henen, NREA, pers. comm.
Larger Sites:				
Fort Irwin: Southern Expansion Area Clearance – 32 km^2	7.2		2006-7	A. Walde, pers. comm.
Hyundai Motor America Mojave Test Track – 18.3 km^2	1.5		2004	Karl (2004b)

1. The years listed are all the years that each site was studied. The years in bold type are those presented in the previous columns of tortoise density, with the (a) first bold-font year in the list representing the year with the highest historic density and the second bold-font year representing the most recent available data. Note that while the sites may have been surveyed in years subsequent to the most recent year in bold type, density data for adult tortoises are not available.

area compared to other locations in the tortoise's range. Consistent with the sampling results in Indian Wells Valley, recent sampling near Red Rocks State Park, west of the RSPP, suggested very low tortoise densities there as well, fewer than four adult tortoises/km^2 (Keith et al. 2005).

The WMP transects are significant in the analysis of tortoise abundance because the WMP data are relatively recent. Compared to other areas in the WMP planning area, tortoise abundance in the RSPP vicinity was low to moderately low. In other words, if the RSPP estimated tortoise density is 8.1adults/km^2, then there are other areas that have substantially higher tortoise densities in the WMP planning area.

In summary, regional sampling studies indicate that tortoise densities have remained consistently relatively low in the RSPP area for 30 years, compared to other areas where tortoise abundance has been sampled. Even assuming that tortoise densities at the RSPP were likely to have been somewhat higher several decades ago than they are now, consistent with the rangewide pattern of tortoise declines (Karl 2004a, Tracy et al. 2004, McLuckie et al. 2006, Boarman et al. 2008), the evidence strongly supports historic low densities, not the dramatic declines seen on the high density areas (see Table 2 - "USGS Plots"). WMP transects indicate that recent tortoise densities in the RSPP vicinity remain relatively low compared to several other areas in the WMP planning area, indicating that 8.1 adult tortoises/km^2 is a relatively low density. A specific RSPP site density comparison to the specific tortoise densities in 19 locations in the western Mojave Desert where tortoises were expected based on suitable habitat, and which were previously assessed during the WMP transects to be areas of moderate to medium tortoise abundance, suggests that the RSPP tortoise density of 8.1 is a moderate to medium tortoise density. Based on available data, then, it can be concluded that the RSPP is, and historically has been, in a relatively low tortoise density area, with the Project site itself considered a moderate to medium tortoise density by current comparisons.

Comparison of RSPP to USFWS Line Distance Sampling Densities. In an earlier California Energy Commission workshop on the RSPP, Mr. Richard Anderson compared RSPP tortoise density to those from the USFWS' Line Distance Sampling (LDS) program that has been implemented to determine regional and rangewide trends in tortoise densities (Attachment 1). This comparison resulted in the RSPP site appearing higher than any area within the desert tortoise's range in California, Nevada, and Utah. However, the comparison is invalid because the sampling units for the LDS program are thousands of square kilometers (Table 3), up to 9298 km^2, compared to the 7.02 km^2 RSPP site. Notwithstanding that the LDS program surveyed critical habitat units within the recovery units, where tortoise densities are assumed to achieve their highest levels, sampling in those critical habitat units included both non-tortoise habitat and occupied habitat:

> "The expectation was that most of the rugged terrain would be sampled in this way, and the transect locations would be representative, not purposefully in better areas for encountering tortoises" (USFWS 2009b:10).

> "Estimates of density for 2007 … coincide(s) with increasing efforts to sample all areas managed for desert tortoises; the new areas of interest were excluded in the past as potentially low or no suitability to desert tortoises….many areas added to the sampling frame contain lower densities of tortoises than the core areas sampled among all years" (USFWS 2009b: 8).

The goal of the LDS program is to provide density for each broad sampling stratum, so no information is provided in the LDS report (USFWS 2009b) that would permit the reader to determine the percentage of the area within each broad sampling stratum that comprises non-habitat or varying levels of tortoise abundance. However, an examination of the smaller sampling units within the major sampling strata shows a high degree of variation in tortoise density (Table 3; USFWS 2009b: Tables 8 and 9), including densities that are higher than at RSPP.

Finally, caution should be used when making comparisons to exact density estimates provided by the LDS program. According to the most recent LDS report:

> "There is considerable variability from year to year in the same recovery unit. For instance, in the Western Mojave the [revised] estimate is 4.4 tortoises/km^2 in 2004, …6.1 in 2005, and 4.7 tortoises/ km^2 in 2007. This does not reflect realistic changes in population size in such a large area over one-year periods, but is a consequence of the relatively imprecise annual estimates" (USFWS 2009b:39).

There is enough variability in the program's methods and precision of estimates, as well as expressed difficulties with the data, that comparing 8.1 tortoises/km^2 to densities that are different by only a few tortoises/km^2 may be too fine-grained a comparison.

In summary, the LDS program's goal of identifying density trends in broad recovery units does not permit applicability of their results, as presented in their summary report (USFWS 2009b), to very small sites such as the RSPP. LDS numbers are not comparable because of the size of the LDS sampling units compared to small units such as the RSPP, because an undisclosed percentage of the sampled sites are not tortoise habitat, and because of other aspects of the methods. The data show that smaller units can have different individual densities (both higher and lower) that are masked by averaging all densities across a unit that includes both non-habitat and suitable habitat.

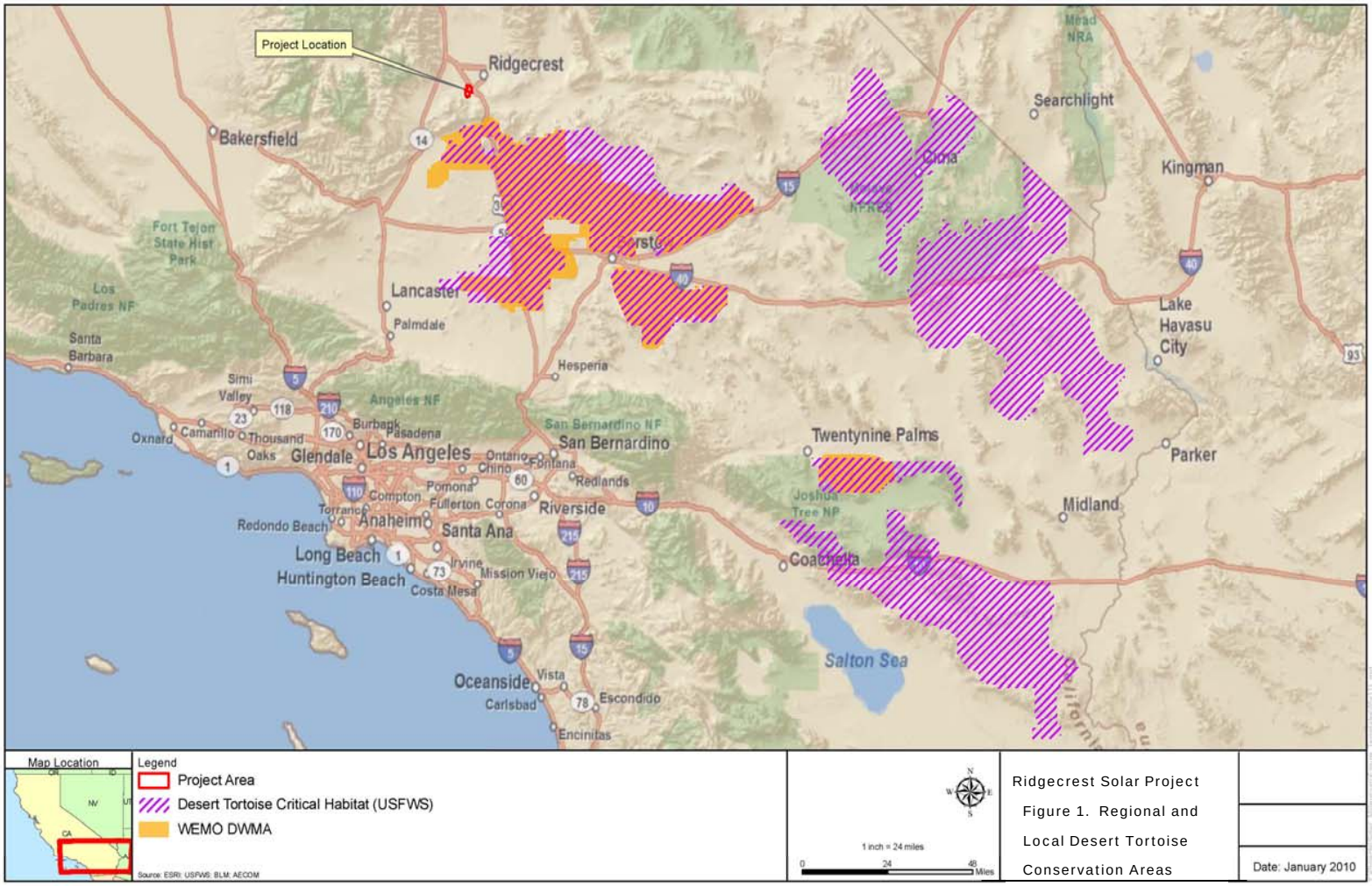
Designated Conservation Areas for the Desert Tortoise

The RSPP and surrounding area have not been identified by the U.S. Fish and Wildlife Service (USFWS 1994a and b) and the BLM (2005) as an important area for desert tortoise recovery and population persistence (Figure 1). Desert Wildlife Management Areas (DWMAs) and designated critical habitat are both about 11 km (7 miles) south of the RSPP. These designations appear to be consistent with tortoise density information from the RSPP studies, in the context of the remainder of the species range in the Mojave and Sonoran (California) Deserts (see above). The data on tortoise distribution and abundance provide the hard data from which population impacts can be analyzed.

Table 3. Broad sampling strata used to estimate tortoise density in the federally listed portion of the species range. All but the last sampling stratum are USFWS LDS sampling strata. Major strata are in bold font, followed by monitoring strata within each major stratum. Size of each stratum is shown.

Sampling Stratum	#Adults/km^2	Sampling Unit Size (km^2)	Date	Source
West Mojave RU[1]	**4.7**	**9298.0**	2007	USFWS (2009b)
5 sampling strata within the RU used for calculating RU values	2.4-8.2	608-3447	2007	USFWS (2009b)
Eastern Mojave RU	**5.8**	**6681.0**	2007	USFWS (2009b)
3 sampling strata within the RU used for calculating RU values	4.2-6.6	1862-2567		
Northeastern RU	**1.7**	**4917.0**	2007	USFWS (2009b)
4 sampling strata within the RU used for calculating RU values	1.2-3.3	968.0		
Eastern Colorado RU	**5.0**	**4263.0**	2007	USFWS (2009b)
3 sampling strata within the RU used for calculating RU values	4.5-7.1	755-3509		
Northern Colorado	**4.6**	**4038.0**	2007	USFWS (2009b)
Upper Virgin River	**14.9**	**114.0**	2007	McLuckie et al (2008) in USFWS (2009)
Fort Irwin: Southern Expansion Area	**6.8**	**32**	2001-2	(Karl 2002)
32, one km2 sampling units	>0-25.1	1		

1. RU = Recovery Unit


Project Location
Ridgecrest
Bakersfield
Searchlight
Kingman
Lancaster
Palmdale
Hesperia
Lake Havasu City
Santa Barbara
Simi Valley
Oxnard
Camarillo
Thousand Oaks
Glendale
Los Angeles
Burbank
Pasadena
San Bernardino
Ontario
Chino
Fontana
Redlands
Pomona
Compton
Fullerton
Corona
Riverside
Torrance
Redondo Beach
Anaheim
Santa Ana
Long Beach
Irvine
Mission Viejo
Huntington Beach
Costa Mesa
Twentynine Palms
Parker
Midland
Joshua Tree NP
Coachella
Salton Sea
Oceanside
Vista
Carlsbad
Escondido
Encinitas
Map Location
Legend
Project Area
Desert Tortoise Critical Habitat (USFWS)
WEMO DWMA
Source: ESRI; USFWS; BLM; AECOM
1 inch = 24 miles
0
24
48
Miles
Ridgecrest Solar Project
Figure 1. Regional and Local Desert Tortoise Conservation Areas
Date: January 2010

However, that tortoises are present at densities of 8.1 adults/km^2 has prompted conclusions that this must be high quality habitat. Most of the site is not high quality habitat, however, even El Paso Wash and the smaller wash along the southern border of the Project site. Rather than being distributed relatively evenly throughout the site, tortoises are concentrated in the better habitats on the site, those that provide greater abundance of cover and forage species. I completed a habitat assessment on 25 February by walking the entire Project site's original footprint (AECOM 2009a) and recording and assessing all habitat variables (shrub species richness, evenness, composition, density, robustness; soil consistence and texture; substrate; hydrology; topography; anthropogenic influences). The eastern portion of the site is the best habitat on the site, with a moderately diverse shrub community (*Larrea tridentata*, *Ambrosia dumosa*, with *Senna armata*, *Eriogonum inflatum*, *Cylindopuntia echinocarpa*, *Ericameria cooperi*, A*camptopappus sphaerocephalus* and occasional *Ambrosia salsola*, *Psorothamnus fremontii*, and *Lycium andersonii*) of about 12-14% cover, gently undulating terrain with numerous runnels, soft coarse-sandy loam, and a 10-15% substrate cover of fine gravel. Proceeding west and south, habitat quality declines rapidly. The topography is relatively flat, with broad, relatively sparsely vegetated rises and long, linear swales. The shrub community has low species richness, generally represented by three species on the rises *L. tridentata* and *A. dumosa* with occasional *E. echinocarpa*; the long troughs, which carry water through the valley, contain *S. armata* and *A. salsola* as well. El Paso Wash is the largest of these troughs and has essentially the same species; they are simply more robust and appear to be slightly more dense, thus providing more cover. The lack of increased species richness and cover was surprising, as El Paso Wash has been represented as a high quality wash in several discussions about the Project site. The smaller wash along the southern border of the Project site is similar to El Paso Wash, simply smaller.

In conclusion, the habitat appears to be generally a medium to moderately low quality on most of the site, with higher quality in the northeast and slightly higher quality in the long swales and washes. Tortoise distribution on RSPP is consistent with this observation.

Even though current densities have declined dramatically on formerly high density study plots (see Table 2), many or most of those areas have the potential to increase again because the habitat that supported the higher densities still exists in most cases. On RSPP, there is no evidence that a habitat that would support higher densities was present in at least the last several decades, so tortoise densities aren't likely to rise to a higher density if the site is left undisturbed, simply based on current habitat quality.

Existing Anthropogenic Impacts

The site is next to Highway 395, a heavily traveled, major commerce and transportation route in California. Heavily traveled roads are known mortality sinks for tortoises and other wildlife (Nicholson 1978, Karl 1989, Boarman 1992 and 2009, LaRue 1993, Marlow and von Seckendorff Hoff 1997, Rosen et al. 2007), so it is highly likely that Highway 395 has resulted in continual tortoise mortalities, simultaneously fragmenting the population.

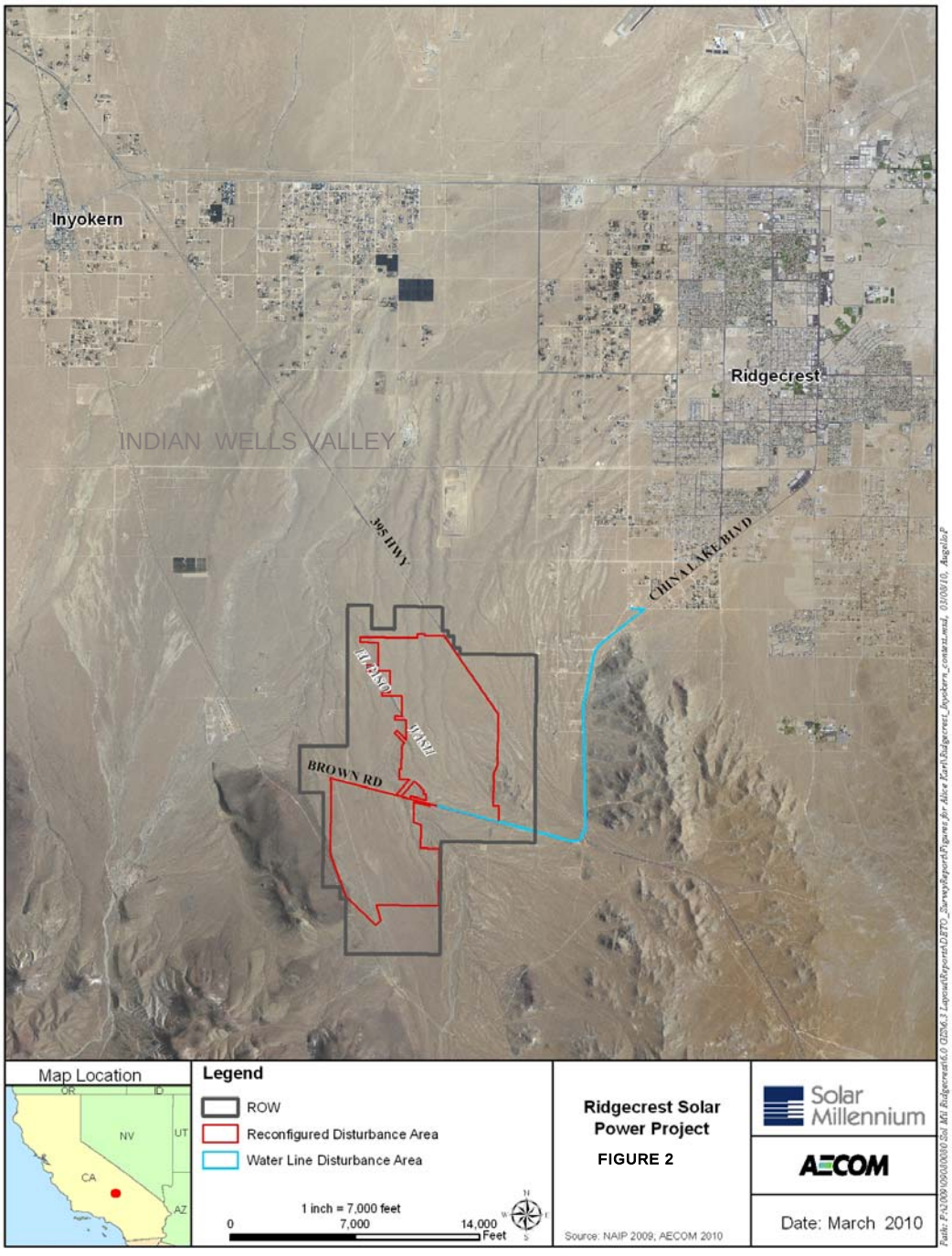
In addition, the towns of Ridgecrest and Inyokern, the "ranchette" community that has expanded away from the towns proper, and local agriculture (Inyokern, mostly) degrade and fragment the area's tortoise habitat. Not only is habitat removed, in a fragmented pattern, but dogs (which prey on desert tortoises), children, and motor-based recreational activity typically expand to areas immediately outside desert towns. The result of these activities is increased loss and degradation of habitat and increased tortoise depredations and collections. Ravens, which are common in the area (pers. obs.), undoubtedly due to the subsidies provided by the town and agriculture (e.g., trash, roadkills, harvesting and tilling practices that provide prey and forage, water) are likely to already exert an influence on recruitment in the local tortoise population, the effects of which could occur at RSPP. For instance, clearance of tortoises for the Hyundai Test Track south of California City, where ravens are common due to the nearby towns (California City and Mojave) and the Mojave landfill, found no tortoises between the reproductive-sized tortoises and the very small (<a few years old) juvenile stage (Karl 2004). There appeared to be total lack of recruitment into this population, possibly due to raven predation. At RSPP, small tortoises were observed, so some recruitment is occurring. But, Ridgecrest-area ravens are probably still impacting recruitment to some extent.

Connectivity

It is reasonable to ask whether this population could be a source population because of its high habitat quality, high density, security from threats to population viability, and/or some other unidentified quality. And, if so, would the Project restrict the flow of genes to other areas of the population? Based on the above analysis and aerial photographs, development of this site would not appear to impair connectivity within the population. First, the relatively low to medium tortoise densities in the RSPP vicinity, a moderate quality habitat that is already impacted by anthropogenic factors, would not suggest that this is an unusually important population segment. While one might further speculate that this population could hold genetic or phenotypic characters that would promote species and population persistence and recovery, there is no evidence to support that speculation. Second, with the updated project footprint refinement (Figure 2), connections to the El Paso Mountains pass to the south could be conserved by minimizing impacts to El Paso Wash, assuming that Project mitigation also ensures that (a) tortoises are not funneled onto the highway along these corridors, and (b) OHV traffic does not increase in these washes. Undoubtedly, the Project would affect tortoise movements, which would subsequently affect connectivity and gene flow, but the RSPP location and surrounding habitats and anthropogenic features do not suggest that the effect would be critical to population functioning.

Cumulative Population Fragmentation

The RSPP would further fragment occupied tortoise habitat. Unlike some species of birds and mammals that might abandon an area if habitat fragmentation were to reach a certain threshold, the threshold at which fragmented habitat would become undesirable or unusable by tortoises is unknown. Furthermore, mere habitat fragmentation (i.e., patch


Inyokern
Ridgecrest
INDIAN WELLS VALLEY
395 HWY
CHINA LAKE BLVD
BROWN RD
Map Location
OR
ID
NV
UT
CA
AZ
Legend
ROW
Reconfigured Disturbance Area
Water Line Disturbance Area
1 inch = 7,000 feet
0
7,000
14,000
Feet
N
W
E
S
Source: NAIP 2009, AECOM 2010
Ridgecrest Solar Power Project
FIGURE 2
Solar Millennium
AECOM
Date: March 2010

size and connectivity) is typically difficult to separate from the suite of impacts affecting tortoise use of an area. (For instance, tortoises occupying fragmented habitats around towns are also subject to the other negative influences associated with towns [see above]). It does not appear that development of the RSPP would result in a level of fragmentation that would reduce surrounding habitat to unusable fragments. From aerial photographs, there appears to be ample habitat, even if somewhat degraded by anthropogenic activities, in the surrounding area to support the use of the area by tortoises should the RSPP be built.

Heightened Anthropogenic or Other Impacts That Could Result

No new types of resources for tortoise predators would be added by the RSPP that are not currently in the Project vicinity. Water, food, and nesting resources are all abundant and readily available in the surrounding communities of Ridgecrest and Inyokern.

CONCLUSION

This paper analyzes variables that are important in the analysis of RSPP impacts to this tortoise population. There may be other variables that could be important, but for which the data are currently lacking. At this juncture, an objective assessment of the RSPP's impacts to the species must rely on available data, with a reasonable consideration of the likelihood of unknown factors.

Based on the Project site tortoise abundance in the context of the rest of the species' range through the Mojave and Sonoran (California) Deserts and existing recovery and conservation approaches, as well as its location relative to existing anthropogenic effects, it is difficult to conclude that the siting of this Project in its current location would result in a biologically significant effect on the species persistence or recovery. Furthermore, while the Project would have indisputable effects on tortoises by removing habitat and disrupting movements, behavior and existing social systems, even resulting in some tortoise losses, careful mitigation (well-executed clearances, translocation, and follow-up monitoring) is likely to minimize Project-related tortoise mortality and costs to the population.

More importantly, off-site mitigation has the potential to provide mitigation that will enhance tortoise recovery. Fencing Highway 395 with tortoise exclusion fencing and adequately spaced culverts would eliminate tortoise mortality on Highway 395, decrease the current population fragmentation caused by that highway, and make available many hectares of safe habitat for use by tortoises. Even though tortoise conservationists have consistently agreed that highway fencing, with culverts to permit genetic flow, is an important mitigation measure, it has rarely been achieved. Over 15 years have passed since this measure was identified in the desert tortoise recovery plan (USFWS 1994a). Private mitigation funds are a way to accomplish this. If USFWS and CDFG feel that the tortoise population in the RSPP vicinity is important for tortoise recovery, then it would be important to eliminate the highway mortality and decrease the population

fragmentation. This could be a reasonable trade for the loss of some tortoise habitat in the area and disruption of the tortoise population.

In summary:

- Data show that this is and historically has been a low to moderate or medium density population.
- The revised Project footprint will recede from two of the three best tortoise habitats on the original Project site, thereby permitting continued connectivity to the south.
- Because of the revised Project footprint, it is likely that a large percentage of the tortoises will not require relocation, but will be automatically excluded from the Project.
- If the Project is built, an opportunity exists to eliminate an important mortality sink and population fragmenting feature currently impacting the population. This conservation measure is unlikely to be accomplished in the near future without dedicated funding. History has shown that most heavily traveled roads through tortoise habitat remain unfenced, despite this being a strongly advocated measure for decades.

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Attachment 1.

Presentation by Mr. Richard Anderson at the California Energy Commission Workshop for the Ridgecrest Solar Power Project.

Desert Tortoises Densities (USFWS 2009)

NE Mojave	Density (km²)
2001	2.4
2002	-
2003	3.7
2004	1.2
2005	1.8
2007	1.7
E Mojave	
2001	6.2
2002	4.1
2003	-
2004	5.3
2005	7.2
2007	5.8

E Colorado	Density (km²)
2001	10.1
2002	7.7
2003	4.0
2004	6.4
2005	7.9
2007	5.0
N Colorado	
2001	7.2
2002	-
2003	6.3
2004	6.9
2005	10.8
2007	4.6

Desert Tortoises Densities (USFWS 2009)

W Mojave	Density (km²)
2001	5.6
2002	5.8
2003	3.8
2004	4.4
2005	6.1
2007	4.7

	Density (km²)
Ridgecrest SPP	9.8
Ivanpah SPP	**1.6 (no correction)**
	Raw Data (no correction)
Ridgecrest	**5.1** (km²)
Ivanpah	**1.6** (km²)