



**DESERT TORTOISE COUNCIL**

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**via email**

February 15, 2021

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RE: Initial Study and Notice of Preparation of a Draft Environmental Impact Report for the Bellefield Solar Project, Kern County, California

Dear Ms. Candia and Mr. Monk,

The Desert Tortoise Council (Council) is a non-profit organization comprised of hundreds of professionals and laypersons who share a common concern for wild desert tortoises and a commitment to advancing the public's understanding of desert tortoise species. Established in 1975 to promote conservation of tortoises in the deserts of the southwestern United States and Mexico, the Council routinely provides information and other forms of assistance to individuals, organizations, and regulatory agencies on matters potentially affecting desert tortoises within their geographic ranges.

We appreciate this opportunity to provide comments on the above-referenced project, and continue to be concerned that Kern County did not contact the Council directly about this project, although we have often asked to be an Affected Interest for all projects in the county that may affect desert tortoises; rather, one of our members informed us of the project. Given the location of the proposed project in habitats likely occupied by Mojave desert tortoise (*Gopherus agassizii*) (synonymous with "Agassiz's desert tortoise"), our comments pertain to enhancing protection of this species during activities authorized by the County and City.

## **Project Description**

50LW 8ME LLC (Project Proponent) is proposing to construct and operate the Bellefield Solar Project (Project), a photovoltaic (PV) solar facility and energy storage system. The utility-scale solar power Project would be capable of producing up to 1,500 megawatts (MW) of alternating current (AC) with up to 1,500 MW-hours (MWh) of energy storage capacity. Permanent facilities would include PV panels, numerous service roads, a power collection system, communication cables, overhead and underground transmission lines, electrical switchyards, project substations, energy storage system(s), and operations and maintenance (O&M) facilities. Transmission lines include a 230-kilovolt (kV) overhead and/or underground electrical transmission line(s) originating from one or more on-site substation(s)/switchyard(s) and terminating at the existing Southern California Edison (SCE) Windhub Substation located about 11 miles west of the west boundary of the solar generating facility. Although not described or numbered, the Notice stated the combined linear distance of the gen-tie alternatives are 89.6 miles with a width of 200 feet.

The Proposed Project is located within portions of unincorporated Kern County and the west/southwest sides of the City of California City on 90 scattered parcels comprising approximately 8,371 acres of privately owned land. The power generation part of the facility is located east of the Mojave Airport, west of the Hyundai Proving Grounds, and north and south of State Route 58. Generally, the gen-tie line route would be an east-west route from the Project's on-site substation(s)/ switchyard(s) west across SR-58 and SR-14 to Oak Creek Road and the existing SCE Windhub Substation. The collector lines are generally located within or adjacent to the Kern County and/or California City parcels.

Under the California Environmental Quality Act (CEQA) Kern County Planning and Natural Resources Department is the lead agency with the City of California City is a Responsible Agency (collectively Agencies).

## **Surveys for Special Status Species**

Special status species are those plants and wildlife that, because of their recognized rarity or vulnerability to various causes of habitat degradation/loss or population decline, are recognized by government agencies as being under threat from human activities as well as natural causes; e.g., listed under the Federal Endangered Species Act (FESA), California Endangered Species Act (CESA), policies of the California State resource agencies, organizations with acknowledged expertise, or policies adopted by local governmental agencies to meet local conservation objectives.

The Proposed Project is within the range of the Mojave desert tortoise (federally and state threatened, state candidate for endangered status), Mohave ground squirrel (*Xerospermophilus mohavensis* – state threatened), American badger (*Taxidea taxus* – species of special concern), western burrowing owl (*Athene cunicularia* – species of special concern), and desert kit fox (*Vulpes macrotis arsipus* – protected from any take under Title 14 California Code of Regulations § 460). The Proposed Project is likely within the range of other special status wildlife species and special status native plant populations and natural communities, such as Barstow woolly sunflower (*Eriophyllum mohavense*), which the Proponent is obligated to reveal and assess in pertinent environmental documents.

We request the Agencies implement focused surveys for these special status species in the Project Area (i.e., locations of the solar facility and transmission line route alternatives) using the appropriate methodologies for each taxa as specified by the U.S. Fish and Wildlife Service (USFWS) and California Department of Fish and Wildlife (CDFW) (formerly California Department of Fish and Game – CDFG):

- Desert tortoise (USFWS 2019) and additional requirements by CDFW
- Mohave ground squirrel (CDFW 2003, revised 2010)
- Swainson’s hawk (CDFW 2010)
- American badger (Wearn and Glover-Kapfer 2017 – from CDFW website)
- Desert kit fox (USFWS 2011a protocol for San Joaquin kit fox)
- Burrowing owl (CDFW 2012)
- Special status native plant populations and natural communities (i.e., Spinescale Scrub, Winterfat Scrubland, and Joshua Tree Woodland) (CDFG 2009, CDFW 2018).

Additionally, with the recent acceptance of a petition to list Joshua tree (*Yucca brevifolia*) as an endangered species by the California Fish and Game Commission, the Proponent is obligated to map and assess impacts to Joshua trees, if any, and to treat them as an endangered species until which time the Commission decides to list the species, or not, which is expected approximately October 2021. For now, this entails total avoidance; and, if listed as endangered or threatened, acquiring a Section 2081 incidental take permit from CDFW.

The results of these focused surveys should be reported in the Draft Environmental Impact Report (DEIR) and included in the impact analysis for these resource issues/topics.

### **Alternatives**

The DEIR for the Proposed Project should include several viable alternatives that “achieve the fundamental objective of the project” (California Supreme Court 2008). The initial checklist provided eight objectives for the Proposed Project. The primary objective is to “construct and operate a solar energy facility of sufficient size and configuration to produce (up to) 1,500 MW of reliable electricity and energy storage in an economically feasible and commercially financeable manner that can be marketed to different power utility companies” (Kern County Planning & California City 2021).

Other objectives include compliance with California’s efforts (and therefore local government’s efforts) to increase renewable energy production and decrease greenhouse gas emissions. Generally, we support these objectives, especially the objective to “site and design the project in an environmentally responsible manner.” As part of this objective, the Agencies should include placing energy production (Proposed Project) at a location close to the energy demand. If the Proposed Project is to provide electricity to the Los Angeles metropolitan area, the Proposed Project should be located in the Los Angeles metropolitan area. If the electricity generated is to be used in highly populated areas of Kern County (e.g., Bakersfield, Oildale, Delano, etc.), the Proposed Project should be located in/near these locations. If the Proposed Project is to provide electricity to the Mojave-California City area, the Proposed Project should be located in/near Mojave or California City. Please provide this information in the DEIR.

If the electricity generated is for the Mojave/California City area, we request that the alternatives analyzed include locations west and southwest of the Town of Mojave, where at least two solar facilities are located, near 110th Street SW and Champagne Avenue, with existing transmission lines located between them. These locations are outside the range of the Mohave ground squirrel, in areas where tortoises have been extirpated, and located near similar solar facilities with existing transmission line infrastructure.

When selecting the specific site for the Proposed Project, environmental impacts are minimized to the greatest extent when solar projects are placed in previously developed areas, especially when considering the direct, indirect, and cumulative impacts of such projects and the mitigation needed to offset these impacts. The Initial Study says, “the project site contains large areas of undeveloped desert land with native vegetation.” Thus, areas previously used for agriculture (e.g., Antelope Valley in Los Angeles and Kern Counties) or developed areas in/near the Los Angeles Basin (e.g., rooftop solar in areas with square miles of commercial/industrial buildings) should be included as viable alternatives and evaluated to provide alternatives that avoid large areas of undeveloped desert land with native vegetation.

According to the Guidelines for Implementation of the California Environmental Quality Act (Title 14 section 15021), a public agency should not approve a project as proposed if there are feasible alternatives or mitigation measures available that would substantially lessen any significant effects that the project would have on the environment. We request that these locations and other feasible alternative locations be analyzed in the DEIR.

The Initial Study includes drawings for monopole structures for 230 kV transmission line and 34.5 kV transmission line. We presume all connector and gen-tie lines will be constructed so common ravens (*Corvus corax*), a known predator of the tortoise, will not use them for nest or perch sites.

### **Environmental Setting**

The information on the environmental setting should include all areas to be affected directly or indirectly by Proposed Project, not just the footprint of the Proposed Project.

The DEIR should provide current information on the status and trend of the Mojave desert tortoise in the Project Area (e.g., changes in abundance, density, habitat availability, and population/habitat connectivity), the nearest Tortoise Conservation Areas (TCAs) (i.e., Desert Tortoise Research Natural Area and Fremont-Kramer TCA), and in the Western Mojave Recovery Unit. The DEIR should provide status and trend information for the other species of special concern that occur in the Project Area.

For past data on the tortoise adjacent to the Proposed Project, we suggest referring to the Environmental Assessment and Habitat Conservation Plan for the Hyundai Automotive Test Course Facility (Sapphos Environmental 2004). The Proposed Project is located immediately west of the Hyundai Facility. Most of the live desert tortoises and active sign observed during the 2003 surveys of the 4,527-acre Hyundai project site were found in the west half of the property (i.e., adjacent to the Proposed Project). Nineteen adult and 1 juvenile desert tortoises and 43 active burrows were located plus other tortoise sign (Sapphos Environmental 2004).

### **Impact Analysis for Resource Issues/Topics**

The following resource issues/topics should be analyzed in the DEIR with respect to the direct and indirect impacts of the Proposed Project to the Mojave desert tortoise and other special status species.

Vegetation and Soils: In addition to the direct long-term loss of soils and vegetation from construction activities, the DEIR should include an analysis of the indirect impacts to native vegetation and soils. These include the loss/degradation of cryptobiotic soil crusts, loss of native seed banks, generation of dust and its impacts to adjacent vegetation (i.e., ability of vegetation to survive, reproduce, and provide suitable forage habitat and cover for wildlife, including special status species). The proposed surface disturbance and increased use of existing and construction of new access roads causes/contributes to the transportation and spread of non-native invasive plant species (USFWS 1994, Brooks 1998). These non-native species outcompete native herbaceous vegetation needed by tortoises and other special status species for adequate nutrition and water balance (Brooks and Esque 2002, Morafka and Berry 2002). Non-native invasive annual plants provide inadequate nutrition and negative water balance for tortoises (Ofstedal 2002). In addition, they provide a fuel source to carry fires in the Mojave Desert, increasing their size, intensity, and frequency (Brooks 2000) (see “Fire” below).

Special Status Species: Mojave desert tortoise – The DEIR should include an analysis of all direct and indirect impacts to the Mojave desert tortoise and its habitat from all aspects of the Proposed Project including unintended impacts (e.g., creation/use of access roads for Project purposes that are subsequently used by the public, etc.). This includes but is not limited to, habitat loss, fragmentation, and reduction in habitat quality; effects of roads from increased use and new road creation and use; introduction of and contribution to the proliferation and spread of invasive, non-native plant species and resulting impacts on tortoise nutrition and water balance; subsidizing tortoise predators, increased likelihood of wildfire and loss of tortoises/tortoise habitat; direct loss of tortoises from burial, crushed by vehicles/equipment, vandalism, and collecting; release of contaminants that may migrate to occupied tortoise habitat and adversely impact their health and reproduction, etc.

The Proposed Project is located near the western edge of the distribution of the Mojave desert tortoise and not in a Tortoise Conservation Area (TCA). However, it is within the Western Mojave Recovery Unit. The abundance and density of tortoises and the loss, degradation, and fragmentation of tortoise habitat in this recovery unit has decline substantially since the tortoise was listed (Allison and McLuckie 2018). In addition, adult tortoise densities are below the level needed to have a viable population (USFWS 1994) [please see Appendix A - Status of the Mojave Desert Tortoise (*Gopherus agassizii*)]. Consequently, any loss of tortoises/tortoise habitat unless fully mitigated only continues this declining trend in tortoise numbers and densities and the loss, fragmentation, and degradation of tortoise habitats.

Mohave ground squirrel – According to Sapphos (2004), trapping grids and directed surveys for the Mohave ground squirrel yielded two animals at the Hyundai Test Track Facility.

In the Desert Renewable Energy and Conservation Plan (BLM 2016, Appendix D, Figure D-18), there is a map that appears to show part of the Proposed Project overlapping a Mohave Ground Squirrel Important Area, specifically an expansion area for a key population center or core population located immediately to the east. This designation as an Important Area should be analyzed with respect to the future survival of this key population center/core population and include a viability analysis for this population and species. As mentioned above, focused trapping surveys should be performed, or presence assumed, and incidental take permits secured prior to ground disturbance.

Hazardous Materials: Potential hazards associated with energy storage system (i.e., batteries) include increased potential for electrical shock and chemical release associated with the batteries used. Please include the potential for explosion and fire, especially if batteries containing lithium are used, and their impacts on adjacent areas supporting special status species and their habitats.

The Initial Study mentions requiring a Construction Waste Management Plan and, if required, a Spill Prevention, Containment and Countermeasure Plan. Plans should be required for all materials potentially hazardous to the environment and include monitoring by a third party to ensure compliance. These plans should include a response plan to be implemented in the event there is an “escape” of toxic or hazardous materials and commitment to remediate and compensate for the direct, indirect, and temporal loss of the resource issue (e.g., impacts to Mojave desert tortoises/tortoise habitat) to fully offset the impacts and cleanup activities.

Fire: The Initial Study states that Kern County Fire Department and California City Fire Department would provide fire suppression and emergency medical services to the Proposed Project area. “The project is not expected to expose people or structures to a significant risk of loss, injury, or death involving wildland fires.” Historically wildfires in the Mojave desert were uncommon occurrences because of the sparseness of native vegetation to provide fuel to carry a fire. However, recent invasions by non-native annual grasses that have been exacerbated by roads and surface disturbance in the desert have changed this scenario in the Mojave Desert.

Tortoises are victims of natural and human-caused fires in the Mojave Desert. Mortality and injury to tortoises from wildfires has been documented from open flame, hot ash, and smoke (McLuckie et al. 2007) along with long-term loss of habitat. Recurring fire can result in vegetation type conversion (Brooks and Matchett 2006) such that the habitat no longer provides the life requisites for the tortoise. The analysis on the impacts of fire should include an analysis of impacts to special status species and their habitats near the Proposed Project.

Noise: The DEIR should analyze the impacts of noise during construction and decommissioning activities and for some types of operations and maintenance activities, as they relate to the tortoise and other special status wildlife species. Although there is limited data of the impacts of noise to the tortoise, it indicates that noise of certain amplitudes, energy frequencies, and duration/repetition adversely impacts the ability of tortoises to hear similar to humans and impacts their behavior (Miles 1953, Ruby et al. 1994, Bowles et al. 1999).

**Surface Hydrology:** A hydrologic study will be prepared for the project in accordance with Kern County and California City requirements. This study should include an analysis of how construction activities (e.g., grading, road construction and maintenance, etc.) will affect surface flow to areas downslope during rainfall events. Because the Project Area is relatively flat, a slight change in elevation from construction, decommissioning, or road maintenance activities may impede current surface flow patterns during precipitation events and deprive downslope areas of surface flow. This surface hydrology change may result in the reduction of habitat quality or loss of native vegetation needed by the tortoise and special status species.

### **Cumulative Impacts**

The Council contends that although Proposed Project is not located within a TCA, it is within the Western Mojave Recovery Unit of the desert tortoise, and therefore provides value to tortoise survival and recovery. To recover the tortoise, the margin of safety for the species to withstand catastrophic events, and provide potential opportunities for continued evolution and adaptive change, the USFWS (2011b) considers “tortoise conservation areas to be the minimum baseline [emphasis added] within which to focus recovery efforts.” Much of the land contained within existing TCAs is managed under multiple-use directives and has a declining status and trend. “Activities occurring on lands beyond the boundaries of existing tortoise conservation areas can affect tortoise populations, important linkages between tortoise conservation areas, and the effectiveness of conservation actions occurring within the conservation area boundaries” (USFWS 2011b). Consequently, if the Proposed Project is located within the distribution of the tortoise/in tortoise habitat, the Project Proponent should fully mitigate for the degraded/lost functions and values of the tortoise population/tortoise habitat from the direct, indirect, and cumulative impacts of the Proposed Project.

### **Mitigation**

The DEIR should include the following mitigation plans for the Mojave desert tortoise and, as applicable, other species of special concern:

- Raven/Predator Management Plan
- Site plan for Soils and Hydrology
- Plant and Wildlife Species Conservation Measures Plan (for species of special concern located on the Project Site – including tortoise exclusion fencing)
- Tortoise Translocation Plan (following USFWS and CDFW requirements)
- Habitat Restoration Plan [for temporary long-term impacts (e.g., transmission line construction) and as part of decommissioning]
- Desert Kit Fox Management Plan
- Native Vegetation/Non-native Species Management Plan (including methods to be used (e.g., mechanical, chemical, etc.) and the impacts of those methods on special status species)
- Erosion, Dust Control, and Air Quality Plan (for impacts to vegetation adjacent to Project Site)
- Hazardous Materials Management Plan
- Fire Prevention Plan
- Fire Protection and Habitat Restoration Plan
- Road Effect Zone Management Plan (include tortoise exclusion fencing)
- Waste Management Plan
- Habitat Compensation and Management Plan (including an endowment and permanent conservation easement)
- Decommissioning Plan

For example, the Raven/Predator Management Plan should include actions that will be implemented to reduce/eliminate human subsidies for food, water, and sites for nesting, roosting, and perching to address local impacts (footprint of the Proposed Project). This includes buildings, fences, and other vertical structures associated with the Project Site, surface disturbance that injures/kills invertebrates/vertebrates and provides a subsidized short-term food source, and use of access roads that results in roadkill of wildlife that provides a longer term subsidized food source. In addition, the Raven/Predator Management Plan should include actions that eliminate the pooling of water on the ground or on rooftops.

The Habitat Restoration Plan should include the abiotic and biotic (e.g., cryptobiotic crust) components of soils as well as vegetation, seed bank, slope, and terrain.

All mitigation plans should include monitoring and adaptive management actions throughout the life of the Project (i.e., preconstruction, construction, operations and Maintenance, and decommissioning) to collect data on the effectiveness of each plan's implementation and enact changes promptly to accomplish each plan's goals.

The mitigation plans have a direct bearing on the extent of impacts to the Mojave desert tortoise, other species of special concern, and their habitats from implementation of the Proposed Project. Their inclusion in the DEIR is necessary as the purpose of CEQA is to:

- Inform governmental decision makers and the public about the potential, significant environmental effects of proposed activities.
- Identify the ways that environmental damage can be avoided or significantly reduced.
- Prevent significant, avoidable damage to the environment by requiring changes in projects through the use of alternatives or mitigation measures when the governmental agency finds the changes to be feasible.
- Disclose to the public the reasons why a governmental agency approved the project in the manner the agency chose if significant environmental effects are involved (California Natural Resources Agency 2018).

CEQA requires that the formulation of mitigation measures shall not be deferred until some future time (Title 14 Section 15126.4) (California Natural Resources Agency 2018). When included in the DEIR, these plans identify the ways that environmental damage can be avoided/mitigated and the extent to which this mitigation would occur. In addition, these plans should include an analysis of the temporal loss of each resource issue/topic, and how the temporal loss will be mitigated.

We recommend that prior to any ground disturbance, the Authorized Biologist identify the nearest qualified veterinarian capable of treating and rehabilitating any injured tortoises, that any injured tortoises be transported immediately to that office, and that associated veterinary bills and care be paid by the Project Proponent.

We appreciate this opportunity to provide input and trust that our comments will help protect tortoises and other special status species during any authorized project activities. Herein, we ask that the Desert Tortoise Council continue to be identified as an Affected Interest for this and all other projects in the County and City that may affect desert tortoises, and that any subsequent environmental documentation for this particular project is provided to us at the contact information listed above. We also ask that you acknowledge receipt of this letter as soon as possible so we can be sure the appropriate parties have received our concerns.



Regards,



Edward L. LaRue, Jr., M.S.

Desert Tortoise Council, Ecosystems Advisory Committee, Chairperson

cc: California State Clearinghouse, [state.clearinghouse@opr.ca.gov](mailto:state.clearinghouse@opr.ca.gov)

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## **Appendix A**

### **Status of the Mojave Desert Tortoise (*Gopherus agassizii*)**

To assist the Agencies with their analysis of the direct, indirect, and cumulative impacts of the Proposed Project on the Mojave desert tortoise, we provide the following information on its status and trend.

The Desert Tortoise Council (Council) has serious concerns about direct, indirect, and cumulative sources of human mortality for the Mojave desert tortoise given the status and trend of the species range-wide, within each of the five recovery units, within the Tortoise Conservation Areas (TCAs) that comprise each recovery unit.

Densities of Adult Mojave Desert Tortoises: A few years after listing the Mojave desert tortoise under the Federal Endangered Species Act (FESA), the U.S. Fish and Wildlife Service (USFWS) published a Recovery Plan for the Mojave desert tortoise (USFWS 1994a). It contained a detailed population viability analysis. In this analysis, the minimum viable density of a Mojave desert tortoise population is 10 adult tortoises per mile<sup>2</sup> (3.9 adult tortoises per km<sup>2</sup>). This assumed a male-female ratio of 1:1 (USFWS 1994a, page C25) and certain areas of habitat with most of these areas geographically linked by adjacent borders or corridors of suitable tortoise habitat. Populations of Mojave desert tortoises with densities below this density are in danger of extinction (USFWS 1994a, page 32). The revised recovery plan (USFWS 2011) designated five recovery units for the Mojave desert tortoise that are intended to conserve the genetic, behavioral, and morphological diversity necessary for the recovery of the entire listed species (Allison and McLuckie 2018).

Range-wide, densities of adult Mojave desert tortoises declined more than 32% between 2004 and 2014 (Table 1) (USFWS 2015). At the recovery unit level, between 2004 and 2014, densities of adult desert tortoises declined, on average, in every recovery unit except the Northeastern Mojave (Table 1). Adult densities in the Northeastern Mojave Recovery Unit increased 3.1% per year (SE = 4.3%), while the other four recovery units declined at different annual rates: Colorado Desert (4.5%, SE = 2.8%), Upper Virgin River (3.2%, SE = 2.0%), Eastern Mojave (11.2%, SE = 5.0%), and Western Mojave (7.1%, SE = 3.3%)(Allison and McLuckie 2018). However, the small area and low starting density of the tortoises in the Northeastern Mojave Recovery Unit (lowest density of all Recovery Units) resulted in a small overall increase in the number of adult tortoises by 2014 (Allison and McLuckie 2018). In contrast, the much larger areas of the Eastern Mojave, Western Mojave, and Colorado Desert recovery units, plus the higher estimated initial densities in these areas, explained much of the estimated total loss of adult tortoises since 2004 (Allison and McLuckie 2018).

At the population level, represented by tortoises in the TCAs, densities of 10 of 17 monitored populations of the Mojave desert tortoise declined from 26% to 64% and 11 have a density that is less than 3.9 adult tortoises per km<sup>2</sup> (USFWS 2015). The Fremont-Kramer population is near the Proposed Project and has a population below the minimum viable density, and an 11-year declining trend (-50.6%)(USFWS 2015).

Population Data on Mojave Desert Tortoise: The Mojave desert tortoise was listed as threatened under the FESA in 1990. The listing was warranted because of ongoing population declines throughout the range of the tortoise from multiple human-caused activities. Since the listing, the status of the species has changed. Population numbers (abundance) and densities continue to decline substantially (please see Table 1).

Table 1. Summary of 10-year trend data for 5 Recovery Units and 17 Critical Habitat Units (CHU)/Tortoise Conservation Areas (TCA) for the Mojave desert tortoise, *Gopherus agassizii* (=Agassiz's desert tortoise). The table includes the area of each Recovery Unit and Critical Habitat Unit (CHU)/Tortoise Conservation Area (TCA), percent of total habitat for each Recovery Unit and Critical Habitat Unit/Tortoise Conservation Areas, density (number of breeding adults/km<sup>2</sup> and standard errors = SE), and the percent change in population density between 2004-2014. Populations below the viable level of 3.9 adults/km<sup>2</sup> (10 adults per mi<sup>2</sup>) (assumes a 1:1 sex ratio) and showing a decline from 2004 to 2014 are in red (Allison and McLuckie 2018, USFWS 2015).

Recovery Unit Designated Critical Habitat Unit/Tortoise Conservation Area	Surveyed area (km <sup>2</sup> )	% of total habitat area in Recovery Unit & CHU/TCA	2014 density/km <sup>2</sup> (SE)	% 10-year change (2004–2014)
<b>Western Mojave, CA</b>	<b>6,294</b>	<b>24.51</b>	<b>2.8 (1.0)</b>	<b>-50.7 decline</b>
Fremont-Kramer	2,347	9.14	2.6 (1.0)	-50.6 decline
Ord-Rodman	852	3.32	3.6 (1.4)	-56.5 decline
Superior-Cronese	3,094	12.05	2.4 (0.9)	-61.5 decline
<b>Colorado Desert, CA</b>	<b>11,663</b>	<b>45.42</b>	<b>4.0 (1.4)</b>	<b>-36.25 decline</b>
Chocolate Mtn AGR, CA	713	2.78	7.2 (2.8)	-29.77 decline
Chuckwalla, CA	2,818	10.97	3.3 (1.3)	-37.43 decline
Chemehuevi, CA	3,763	14.65	2.8 (1.1)	-64.70 decline
Fenner, CA	1,782	6.94	4.8 (1.9)	-52.86 decline
Joshua Tree, CA	1,152	4.49	3.7 (1.5)	+178.62 increase
Pinto Mtn, CA	508	1.98	2.4 (1.0)	-60.30 decline
Piute Valley, NV	927	3.61	5.3 (2.1)	+162.36 increase
<b>Northeastern Mojave</b>	<b>4,160</b>	<b>16.2</b>	<b>4.5 (1.9)</b>	<b>+325.62 increase</b>
Beaver Dam Slope, NV, UT, AZ	750	2.92	6.2 (2.4)	+370.33 increase
Coyote Spring, NV	960	3.74	4.0 (1.6)	+ 265.06 increase
Gold Butte, NV & AZ	1,607	6.26	2.7 (1.0)	+ 384.37 increase
Mormon Mesa, NV	844	3.29	6.4 (2.5)	+ 217.80 increase
<b>Eastern Mojave, NV &amp; CA</b>	<b>3,446</b>	<b>13.42</b>	<b>1.9 (0.7)</b>	<b>-67.26 decline</b>
El Dorado Valley, NV	999	3.89	1.5 (0.6)	-61.14 decline
Ivanpah, CA	2,447	9.53	2.3 (0.9)	-56.05 decline
<b>Upper Virgin River</b>	<b>115</b>	<b>0.45</b>	<b>15.3 (6.0)</b>	<b>-26.57 decline</b>
Red Cliffs Desert	115	0.45	15.3 (6.0)	-26.57 decline
<b>Total amount of land</b>	<b>25,678</b>	<b>100.00</b>		<b>-32.18 decline</b>

Density of Juvenile Mojave Desert Tortoises: Survey results indicate that the proportion of juvenile desert tortoises has been decreasing in all five recovery units since 2007 (Allison and McLuckie 2018). The probability of encountering a juvenile tortoise was consistently lowest in the Western Mojave Recovery Unit. Allison and McLuckie (2018) provided reasons for the decline in juvenile desert tortoises in all recovery units. These included decreased food availability for adult female tortoises resulting in reduced clutch size, decreased food availability resulting in increased mortality of juvenile tortoises, prey switching by coyotes from mammals to tortoises, and increased abundance of common ravens that typically prey on smaller desert tortoises.

Declining adult tortoise densities through 2014 have left the Western Mojave adult numbers at 49% (a 51% decline of their 2004 levels) (Allison and McLuckie 2018, USFWS 2015). Such steep declines in the density of adults are only sustainable if there are suitably large improvements in reproduction and juvenile growth and survival. However, the proportion of juveniles has not increased anywhere in the range of the Mojave desert tortoise since 2007, and in the Western Mojave Recovery Unit the proportion of juveniles in 2014 declined to 91% (a 9 % decline) of their representation since 2004 (Allison and McLuckie 2018).

Abundance of Mojave Desert Tortoises: Allison and McLuckie (2018) noted that because the area available to tortoises (i.e., tortoise habitat and linkage areas between habitats) is decreasing, trends in tortoise density no longer capture the magnitude of decreases in abundance. Hence, they reported on the change in abundance or numbers of the Mojave desert tortoise in each recovery unit (Table 2). They noted that these estimates in abundance are likely higher than actual numbers of tortoises, and the changes in abundance (i.e., decrease in numbers) are likely lower than actual numbers because of their habitat calculation method. They used area estimates that removed only impervious surfaces created by development as cities in the desert expanded. They did not consider degradation and loss of habitat from other sources, such as the recent expansion of military operations (753.4 km<sup>2</sup> so far on Fort Irwin and the Marine Corps Air Ground Combat Center), intense or large scale fires ( e.g., 576.2 km<sup>2</sup> of critical habitat that burned in 2005), development of utility-scale solar facilities (as of 2015, 194 km<sup>2</sup> have been permitted) (USFWS 2016), or other sources of degradation or loss of habitat (e.g., recreation, mining, grazing, infrastructure, etc.). Thus, the declines in abundance of Mojave desert tortoise are likely greater than those reported in Table 2.

Habitat Availability: Data on population density or abundance does not indicate population viability. The area of protected habitat or reserves for the subject species is a crucial part of the viability analysis along with data on density, abundance, and other population parameters. In the Desert Tortoise (Mojave Population) Recovery Plan (USFWS 1994a), the analysis of population viability included population density and size of reserves (i.e., areas managed for the desert tortoise) and population numbers (abundance) and size of reserves. The USFWS Recovery Plan reported that as population densities for the Mojave desert tortoise decline, reserve sizes must increase, and as population numbers (abundance) for the Mojave desert tortoise decline, reserve sizes must increase (USFWS 1994a). In 1994, reserve design (USFWS 1994a) and designation of critical habitat (USFWS 1994b) were based on the population viability analysis from numbers

Table 2. Estimated change in abundance of adult Mojave desert tortoises in each recovery unit between 2004 and 2014 (Allison and McLuckie 2018). Decreases in abundance are in red.

Recovery Unit	Modeled Habitat (km <sup>2</sup> )	2004 Abundance	2014 Abundance	Change in Abundance	Percent Change in Abundance
Western Mojave	23,139	131,540	64,871	-66,668	-51%
Colorado Desert	18,024	103,675	66,097	-37,578	-36%
Northeastern Mojave	10,664	12,610	46,701	34,091	270%
Eastern Mojave	16,061	75,342	24,664	-50,679	-67%
Upper Virgin River	613	13,226	10,010	-3,216	-24%
<b>Total</b>	<b>68,501</b>	<b>336,393</b>	<b>212,343</b>	<b>-124,050</b>	<b>-37%</b>

(abundance) and densities of populations of the Mojave desert tortoise in the early 1990s. Inherent in this analysis is that the lands be managed with reserve level protection (USFWS 1994a, page 36) or ecosystem protection as described in section 2(b) of the FESA, and that sources of mortality be reduced so recruitment exceeds mortality (that is,  $\lambda > 1$ )(USFWS 1994a, page C46).

Habitat loss would also disrupt the prevailing population structure of this widely distributed species with geographically limited dispersal (isolation by distance; Murphy et al. 2007; Hagerty and Tracy 2010). Allison and McLuckie (2018) anticipate an additional impact of this habitat loss/degradation is decreasing resilience of local tortoise populations by reducing demographic connections to neighboring populations (Fahrig 2007). Military and commercial operations and infrastructure projects that reduce tortoise habitat in the desert are anticipated to continue (Allison and McLuckie 2018) as are other sources of habitat loss/degradation.

Allison and McLuckie (2018) reported that the life history of the Mojave desert tortoise puts it at greater risk from even slightly elevated adult mortality (Congdon et al. 1993; Doak et al. 1994), and recovery from population declines will require more than enhancing adult survivorship (Spencer et al. 2017). The negative population trends in most of the TCAs for the Mojave desert tortoise indicate that this species is on the path to extinction under current conditions (Allison and McLuckie 2018). They state that their results are a call to action to remove ongoing threats to tortoises from TCAs, and possibly to contemplate the role of human activities outside TCAs and their impact on tortoise populations inside them.

Densities, numbers, and habitat for the Mojave desert tortoise declined between 2004 and 2014. As reported in the population viability analysis, to improve the status of the Mojave desert tortoise, reserves (area of protected habitat) must be established and managed. When densities of tortoises decline, the area of protected habitat must increase. When the abundance of tortoises declines, the area of protected habitat must increase. We note that the Desert Tortoise (Mojave Population) Recovery Plan was released in 1994 and its report on population viability and reserve design was reiterated in the 2011 Revised Recovery Plan as needing to be updated with current population data (USFWS 2011, p. 83). With lower population densities and abundance, a revised population viability analysis would show the need for greater areas of habitat to receive

reserve level of management for the Mojave desert tortoise. In addition, we note that none of the recovery actions that are fundamental tenets of conservation biology has been implemented throughout most or all of the range of the Mojave desert tortoise.

Definition of an Endangered Species: In 2011, Murphy et al. stated that the “recognition of *G. morafkai* reduces the range of *G. agassizii* to occupying about 30% of its former range.” Given this reduction in species distribution and numbers and the “...drastic population declines in *G. agassizii* during the past few decades, it might be endangered.”

In 2018, Agassiz’s desert tortoise was added to the list of the world’s most endangered tortoises and freshwater turtles. It is in the top 50 species. The International Union for Conservation of Nature’s (IUCN) Species Survival Commission, Tortoise and Freshwater Turtle Specialist Group, now considers Agassiz’s desert tortoise to be Critically Endangered (Turtle Conservation Coalition 2018).

The IUCN places a taxon in the Critically Endangered category when the best available evidence indicates that it meets one or more of the criteria for Critically Endangered. These criteria are 1) population decline - a substantial (>80 percent) reduction in population size in the last 10 years; 2) geographic decline - a substantial reduction in extent of occurrence, area of occupancy, area/extent, or quality of habitat, and severe fragmentation of occurrences; 3) small population size with continued declines; 4) very small population size; and 5) analysis showing the probability of extinction in the wild is at least 50 percent within 10 years or three generations. In the FESA, Congress defined an “endangered species” as “any species which is in danger of extinction throughout all or a significant portion of its range...” Given the information on the status of the Mojave desert tortoise and the federal definition of an endangered species, the Council believes the status of the Mojave desert tortoise is that of an endangered species.

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