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Via email

11 November 2020

Sarah Mongano
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California State Lands Commission
100 Howe Avenue, Suite 100-S
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CEQA.comments@slc.ca.gov

RE: "Stagecoach Solar Project Notice of Preparation (NOP) Comments" (CSLC EIR No. 763; W30213; W26868)

Dear Ms. Mongano,

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. Given the location of the proposed project in habitats potentially 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 California State Lands Commission (CSLS) and California Public Utilities Commission (CPUC). Please accept, carefully review, and include in the relevant project file the Council's following scoping comments for the proposed project. Additionally, we ask that the CSLS and CPUC respond in an email that you have received this comment letter so we are sure our concerns have been registered with the appropriate personnel and offices for this project.

Summary of Proposed Project
Aurora Solar LLC, a wholly-owned subsidiary of Avangrid Renewables, has applied to the CSLC for lease of lands owned by the CSLC on which to construct and operate a solar generation project, called the Stagecoach Solar Project (Project). The proposed Project would produce up to 200 megawatts (MW) of solar energy using photovoltaic (PV) technology. The proposed Project area encompasses approximately 3,000 acres, with PV modules and the following associated infrastructure to be constructed on approximately 1,950 acres:

- 5-acre 34.5/220 kilovolt (kV) onsite electric substation and a 5,000-square-footoperations and maintenance (O&M) building.
- Direct current (DC) underground electricity collection system and a 34.5 kVcollection system linking the PV modules to the onsite substation.
- Battery storage facility up to 200 MW and 100 acres in size.
- Solar resource and meteorological measurement stations.
- Newly constructed access roads throughout the interior of the proposed Project limits.
- Perimeter fencing and site security systems.
- Septic tank system and leach field serving the O&M building.
- Permanent groundwater wells, or an onsite water tank using water transported from offsite, providing water for the O&M building and to wash the PV panels.

The proposed Project also includes construction of a 9.1-mile-long 220 kV generation intertie (gen-tie) transmission line to carry the electricity generated by the solar facility to the regional transmission system interconnecting at a proposed 7-acre Southern California Edison Calcite Substation.

Operations and maintenance of the proposed Project would include routine maintenance and on-site repairs as required. The underground cable system and battery storage facility would be inspected, maintained, and repaired as necessary, following construction. Panel washing may be conducted as necessary based on site conditions.

Decommissioning would occur at the end of the CSLC lease and/or contract term to sell energy to the utility buyer, or if no contract extension is available or no other buyer of the energy emerges. The solar plant would be decommissioned and dismantled. After removal of all construction related on-site improvements, remediation and restoration of the area would be performed on the site to its pre-construction condition.

The proposed Project is in the central portion of San Bernardino County, about 12 miles northwest of the unincorporated community of Lucerne Valley and 15 miles south of the City of Barstow. The Project area is located east of Interstate 15, south of Interstate 40, and about 3 miles west of State Route 247.

Objectives of the Proposed Project
- Establish reliable solar PV power-generating facilities in an economically feasible and commercially financeable manner that can be marketed to potential power purchasers.
- Develop land managed by the CSLC to generate revenue applied to the State.
- Assist California in generating power from renewable sources and reducing greenhouse gas emissions.

Comments

Alternatives Analyses

The Council supports alternatives to reduce the need for additional solar energy projects in the Mojave Desert. That alternative is rooftop solar. The City of Los Angeles has implemented a rooftop solar Feed-in Tariff (FiT) program, the largest of its kind in America. The FiT program enables the owners of large buildings to install solar panels on their roofs, and sell the power they generate back to utilities for distribution into the power grid. This approach puts the generation of electricity where the demand is greatest, in populated areas. It may also reduce transmission costs, greenhouse gas emissions from constructing energy projects far from the sources of power demand and materials for construction, the number of affected resources in the desert that must be analyzed under the California Environmental Quality Act (CEQA), and mitigation costs. The Environmental Impact Report (EIR) should include analyses of where the energy generated by this project would be sent and the needs for energy in those targeted areas that may be satisfied by rooftop solar. We contend that rooftop solar should be analyzed as one of the action alternatives.

Another alternative would be to exchange/sell the land at the location of the proposed Project acquire land located in an area with fewer sensitive biological resource (e.g., areas previously used for agriculture could be acquired) and closer to where the demand for electricity is high. This would reduce mitigation costs and gen-tie costs.

The document should consider recently developed solar fields where soils have been bladed versus those facilities where the vegetation has been mowed and allowed to revegetate the area. In the latter case, it may be appropriate to allow tortoises to enter into the facilities and re-establish residency under the solar panels as vegetation recolonizes the area. The environmental documents should document recent successes and failures with this approach at other solar facilities in the desert. This option, which should be analyzed as an action alternative, could be designed as an experiment to add to the limited data on this approach to determine the extent of effects on Agassiz's desert tortoise populations and movements/connectivity.

Biological Surveys

The proposed Project is located in the range and habitat of the Mojave desert tortoise and near/adjacent to the Ord-Rodman population of the tortoise in the Western Mojave Recovery Unit (USFWS 2011) and Ord-Rodman designated critical habitat unit (USFWS 1994). We fully expect the EIR to include the results of focused surveys for the tortoise, rare plants, and rare animal species, whose ranges include the proposed Project area, including:

Reptiles

Desert tortoise (*Gopherus agassizii*) – Federally Threatened, State Threatened, and considered by California Fish and Game Commission for uplisting to endangered

Birds

Bendire's thrasher (*Toxostoma bendirei*)
LeConte's thrasher (*Toxostoma lecontei*)
Western burrowing owl (*Athene cunicularia*)

Mammals
American badger (*Taxidea taxus*)
Kit fox (*Vulpes macrotis*)
Mohave ground squirrel (*Xerospermophilus mohavensis*[1])

The appropriate methodologies for surveys for specific taxa and biological resources are given in the following documents:

Desert tortoise (USFWS 2019)
Burrowing owl (CDFW 2012)
Rare plants (CDFG 2009)

Direct and Indirect Impacts
The following direct and indirect impacts should be analyzed in the EIR with respect to the Mojave desert tortoise, tortoise habitat/critical habitat, and connectivity between tortoise populations.

Segmentation of Analysis: From the information provided in the NOP, the Calcite Substation is a proposed feature that is not included in this proposed Project. However, the NOP says the proposed gen-tie line would "carry the electricity generated by the solar facility to the regional transmission system interconnecting at a proposed 7-acre Southern California Edison Calcite Substation." We presume the proposed Project would not be feasible without the proposed Calcite Substation.

If this assumption is correct, the analysis of impacts in the EIR for the proposed Project should include all proposed interconnected features for the proposed Project to produce and deliver electricity to the CAISO transmission grid (e.g., Calcite Substation). We request this EIR analyze the impacts of the proposed Calcite Substation to the tortoise and its habitats.

In addition, the NOP does not indicate there is a utility that has committed to purchase the electricity produced by the proposed Project. We urge the CSLC and CPUC to provide assurances that the proposed Project will only be built when there are agreements with utilities to purchase the electricity generated and will accomplish the objectives of this proposed Project; that the Project be denied in the absence of this purchase agreement.

Blocking Existing Off-highway Vehicle (OHV) Routes: In reviewing Figure 1 of the attachment to the NOP, it appears the proposed Project will overlay an existing BLM open route (e.g., Lucerne Valley Cutoff). Installing security fencing around the proposed Project would block this existing route. This fence would likely result in OHV-users creating new access routes around the proposed Project. This would result in new direct and indirect impacts to the desert tortoise, its habitat, and other special status species in the area. These impacts should be analyzed in the EIR and appropriate action taken to prevent the degradation/loss of additional animals and habitat from these "detours" or new routes, and enforcement and restoration measures implemented to immediately correct these impacts, which would likely be ongoing.

[1] Although the site is outside the known range of Mohave ground squirrel, it lies within suitable habitats within only several miles of where the species was discovered in the late 1880's. Given the lack of focused surveys in the immediate area, we strongly encourage CDFW and/or CSLS, CPUC to require protocol trapping surveys [CDFG 2003 (revised 2010)] for the species.

Heat Sink Effect: PV solar projects have been documented as producing a "heat sink" to surrounding vegetation and wildlife habitats. The impacts from this heat sink should be discussed and analyzed in the EIR, especially with respect to the Mojave desert tortoise and its habitat.

Subsidizing Predators: From information provided in Figure 1, it appears the gen-tie line is located along the western boundary of the Ord-Rodman Tortoise Conservation Area and designated critical habitat unit for the tortoise. Construction and maintenance of powerlines may attract common ravens (*Corvus corax*), which are known predators of adult and juvenile desert tortoises. The towers/poles provide nest and perch sites for ravens and increase their numbers in the area of the powerline. In addition, powerlines require access roads for construction and maintenance. These roads provide access for off-highway vehicle (OHV) users, resulting in roadkill, poaching, vandalism, subsidized food source for ravens and coyotes (from roadkill), and an ongoing source of dust deposition on native plants.

Dust and Native Vegetation: Construction and maintenance activities and OHV activities result in increased wind erosion of soil and dust deposition, disruption of pollination systems, and the spread of invasive nonnative plant species both at the Project area and nearby areas. Adverse impacts to desert vegetation from dust deposition include increases in leaf temperatures and subsequent photosynthetic rates during early spring that may require an increased amount of water for growth and successful reproduction. If this increased amount of water is not available, these plant species may respond by reduced plant vigor, reduced flower and seed production, or abandoned reproduction for the year (USFWS 2014). Subsequent years of dust may result in no recruitment of plants or plant mortality. These impacts in turn adversely affect the breeding, feeding, sheltering, and connectivity requirements of the desert tortoise. These impacts should be analyzed in the EIR.

Non-native Invasive Plant Species: Non-native plant species, including *Bromus rubens, Bromus madritensis*, *Bromus tectorum*, *Schismus arabicus, Schismus barbatus*, *Salsola tragus*, and numerous mustard species (*Brassica* ssp., *Sisymbrium* ssp., *Descurainia sophia,* etc.) are some of the invasive species in many areas of the Mojave Desert. Vehicles travelling along roadways provide a conduit for the transport and establishment of these non-native species (Brooks and Matchett 2006). Once established, they outcompete native forbs resulting in a substantial reduction in the number/densities of native plants that the tortoise needs for adequate nutritional quality and quantity. This is due in part to their fast seed germination times in areas with disturbed soil surfaces/soil crusts. Further, they are benefitted by increased nitrogen deposition in soils from the exhaust from internal combustion engines (e.g., along roadways) (Allen et al. 2009). Once established, residual dried plants provide an enhanced fuel source to carry fires that degrade/destroy native desert vegetation that is not adapted to fire. As the impacts of climate change increase, one impact may be an increase in the occurrence, numbers, and densities of these non-native invasive plants.

The EIR should provide an analysis of how the proposed Project would contribute to the spread and proliferation of non-native invasive plant species; how this spread/proliferation would affect the Mojave desert tortoise and its habitats/critical habitat (including the frequency and size of human-caused fires and vegetation type conversion); and how the proposed Project may affect the likelihood of causing/contributing to human-caused fires. We strongly urge the Project Proponent to develop and implement a management and monitoring plan using this analysis and other relevant data that would reduce the transport to and spread of nonnative seeds and other plant propagules within the Project area and eliminate/reduce the likelihood of human-caused fires. The plan should integrate vegetation management with fire management and fire response.

Hazardous Materials: According to the NOP, there would be a battery storage facility up to 200 MW and 100 acres in size. The EIR should describe the type(s) of battery that would be used and the impacts to the tortoise/tortoise habitat from an accident or improper maintenance (e.g., lithium batteries cause a fire when not stored properly from high temperature or water). What are the impacts of the fire, ash, and smoke components to nearby vegetation, wildlife, and habitats?

Fires: Please see our comments under Hazardous Materials. In addition, several recent fires in California have been started by transmission lines. Battery storage facilities may be a source of explosions/fires. We request the EIR include a fire prevention plan in addition to a fire management plan specifically targeting methods to deal with fires produced by these batteries that cannot be suppressed with water, as well as sources of fuel (e.g., vehicles, etc.) and other hazardous materials on the Project site and gen-tie line.

Access Roads: We presume that access roads would be constructed and maintained for the gen-tie line. These new roads would have direct and indirect impacts form their construction and use by Project personnel and would be available for the public to use as new OHV routes. The impacts from these uses should be analyzed with respect to the tortoise and tortoise habitats.

To mitigate the direct and indirect impacts of the proposed Project to the Mojave desert tortoise and its habitat/critical habitat, the EIR should include the following mitigation plans for the solar field and the gen-tie line:

- Tortoise Translocation Plan (see USFWS 2020)
- Predator Management Plan (see USFWS 2010 for common ravens)
- Site plan for Soils and Hydrology
- Plant and Wildlife Species Conservation Measures Plan
- Habitat Restoration and Monitoring Plan (for temporary impacts)
- Vegetation/Invasive Plant Species Management Plan
- Access Road Management Plan
- Hazardous Spill Prevention, Control and Countermeasure (SPCC) Plan
- Erosion, Dust Control, and Air Quality Plan
- Hazardous Materials Management Plan
- Fire Prevention and Protection Plan
- Waste Management Plan
- Habitat Restoration and Monitoring Plan (as part of the decommissioning process)

The mitigation plans should use the best available science with a commitment to implement the mitigation commensurate to impacts to the tortoise and its habitats. Mitigation should include:

- a fully-developed desert tortoise translocation plan that protects tortoise translocation area(s) from future development and human use/disturbance in perpetuity;
- erosion, dust control, and air quality plan to avoid the impacts of dust on desert vegetation;
- hazardous materials management plan to avoid contaminating tortoises and their habitats;
- predator management plan;

- non-native invasive plant species management plan;
- fire prevention plan;
- compensation plan for the degradation and loss of tortoise habitat that includes protection of the acquired, improved, and restored habitat in perpetuity for the tortoise from future development and human use; and,
- habitat restoration plan when the lease is terminated and the proposed Project is decommissioned.

These science-based mitigation plans should include an implementation schedule that is tied to key actions of the construction, operations and maintenance, and decommissioning phases of the proposed Project so that mitigation occurs concurrently with or in advance of the impacts. The plans should specify success criteria, include a monitoring plan to collect data to determine whether success criteria have been met, and identify actions that would be required if the mitigation measures do not meet the success criteria.

Cumulative Impacts Analysis

Regarding cumulative impacts, the EIR should describe and analyze all proposed Project impacts within the region including future state, federal, and private actions affecting listed species on state, federal, and private lands. In particular, we ask that the relationship between the proposed Project and the Desert Renewable Energy Conservation Plan (DRECP; BLM 2016) and impacts to and from climate change be analyzed.

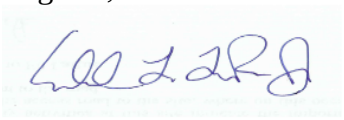
To assist you with analysis of the impacts of the proposed Project to the Mojave desert tortoise and its habitat, we have provided information on the status and trend of the tortoise in an attachment, Appendix A – Status of the Mojave Desert Tortoise.

To mitigate for the cumulative impacts of the common raven to the tortoise from the proposed Project, the Project Proponent should contribute to the Common Raven Management Fund administered by the National Fish and Wildlife Foundation.

The proposed Project is located within 10 miles of a large translocation area where the U.S. Marine Corps recently translocated an unknown number of tortoises from their nearby, expanded training area. We feel that the Project Proponent must contact biologists at the 29 Palms U.S. Marine Corps base, which is clearly an Affected Interest, to ensure that this project does not adversely affect the success of their nearby translocation effort. Dr. Brian Henen is the appropriate person to contact at the base.

We appreciate this opportunity to provide input and trust that our comments will help protect the Mojave desert tortoise and its habitat/critical habitat during any authorized project activities. Herein, we ask that the Desert Tortoise Council be identified as an Affected Interest for this and all other CSLC and CPUC projects that may affect the Mojave desert tortoise, and that any subsequent environmental documentation for this particular project is provided to us at the contact information listed above. We ask that you acknowledge receipt of this letter as soon as possible so we can be sure our concerns have been received by the appropriate parties.

Regards,



Edward L. LaRue, Jr., M.S.
Desert Tortoise Council, Ecosystems Advisory Committee, Chairperson

Attachment: Appendix A Status of the Mojave Desert Tortoise

cc (with attachment): California State Clearinghouse, 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^2 (3.9 adult tortoises per km2). 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 amount 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 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 km2 (USFWS 2015). The Chuckwalla population is near the proposed Project and has a population below the minimum viable density, and an 11-year declining trend (-37.4%)(USFWS 2015). We are concerned that the proposed Project would bring additional indirect and cumulative impacts to this population and its density and trend would further decline.

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 Agassiz's desert tortoise, *Gopherus agassizii* (=Mojave 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/km2 and standard errors = SE), and the percent change in population density between 2004-2014. Populations below the viable level of 3.9 breeding individuals/km^2 (10 breeding individuals per mi^2) (assumes a 1:1 sex ratio) and showing a decline from 2004 to 2014 are in red (USFWS 2015).

Recovery Unit Designated Critical Habitat Unit/Tortoise Conservation Area	Surveyed area (km^2)	% of total habitat area in Recovery Unit & CHU/TCA	2014 density/km^2 (SE)	% 10-year change (2004–2014)
Western Mojave, CA	**6,294**	**24.51**	**2.8 (1.0)**	**–50.7 decline**
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
Colorado Desert, CA	**11,663**	**45.42**	**4.0 (1.4)**	**–36.25 decline**
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
Northeastern Mojave	**4,160**	**16.2**	**4.5 (1.9)**	**+325.62 increase**
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

Eastern Mojave, NV & CA	**3,446**	**13.42**	**1.9 (0.7)**	**–67.26 decline**
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
Upper Virgin River	**115**	**0.45**	**15.3 (6.0)**	**–26.57 decline**
Red Cliffs Desert	115	0.45	15.3 (6.0)	–26.57 decline
Total amount of land	**25,678**	**100.00**		**–32.18 decline**

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 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 were 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 Mojave Recovery Unit the proportion of juveniles in 2014 declined to 91% (a 9 % decline) of their representation in 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 tortoises 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 km2 so far on Fort Irwin and the Marine Corps Air Ground Combat Center), intense or large scale fires (e.g., 576.2 km2 of critical habitat that burned in 2005), development of utility-scale solar facilities (so far 194 km2 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^2)	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%
Total	**68,501**	**336,393**	**212,343**	**-124,050**	**-37%**

(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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