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Via email and eplanning website

December 19, 2024

Attn: Copper Rays Solar Project
Jessica Headen, Project Manager
Bureau of Land Management
Southern Nevada District Office, Pahrump Field Office
4701 N. Torrey Pines Drive
Las Vegas, NV, 89130
BLM_NV_SND_EnergyProjects@blm.gov

Re: Copper Rays Solar Project (DOI-BLM-NV-S030-2022-0009-EIS)

Dear Ms. Headen,

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.

Both our physical and email addresses are provided above in our letterhead for your use when providing future correspondence to us. When given a choice, we prefer to receive emails for future correspondence, as mail delivered via the U.S. Postal Service may take several days to be delivered. Email is an "environmentally friendlier way" of receiving correspondence and documents rather than "snail mail."

The Mojave desert tortoise is among the top 50 species on the list of the world's most endangered tortoises and freshwater turtles. The International Union for Conservation of Nature's (IUCN) Species Survival Commission, Tortoise and Freshwater Turtle Specialist Group, now considers the Mojave desert tortoise to be Critically Endangered (Berry et al. 2021), "… based on population reduction (decreasing density), habitat loss of over 80% over three generations (90 years), including past reductions and predicted future declines, as well as the effects of disease (upper respiratory tract disease/mycoplasmosis). *Gopherus agassizii* (sensu stricto) comprises tortoises in the most well-studied 30% of the larger range; this portion of the original range has seen the most human impacts and is where the largest past population losses have been documented. A recent rigorous rangewide population reassessment of *G. agassizii* (sensu stricto) has demonstrated continued adult population and density declines of about 90% over three generations (two in the past and one ongoing) in four of the five *G. agassizii* recovery units and inadequate recruitment with decreasing percentages of juveniles in all five recovery units."

This status, in part, prompted the Council to join Defenders of Wildlife and Desert Tortoise Preserve Committee (Defenders of Wildlife et al. 2020) to petition the California Fish and Game Commission in March 2020 to elevate the listing of the Mojave desert tortoise from Threatened to Endangered in California. In its status review, California Department of Fish and Wildlife (CDFW) (2024) stated: "At its public meeting on October 14, 2020, the Commission considered the petition, and based in part on the Department's [CDFW] petition evaluation and recommendation, found sufficient information exists to indicate the petitioned action may be warranted and accepted the petition for consideration. The Commission's decision initiated this status review to inform the Commission's decision on whether the change in status is warranted."

Importantly, in their April 2024 meeting, the California Fish and Game Commission (Commission) voted unanimously to accept the petition and CDFW's 12-month finding (CDFW 2024) that uplisting the tortoise from threatened to endangered under the California Endangered Species Act (CESA) is warranted based on the scientific data provided on the species' status, declining trend, numerous threats, and lack of effective recovery implementation and land management. If the Commission decides at its December 2024 meeting to uplist the species, the determination would mean that the Mojave desert tortoise population in California is deemed by the Commission to be closer to extinction than when it was listed as threatened in 1989. The only status more dire than "endangered" is "extinct," and the CDFW has formally determined based on its status review (CDFW 2024) that the desert tortoise is closer to extinction than it was in 1989.

We appreciate that the Bureau of Land Management (BLM) contacted the Council directly on September 20, 2024 with a link to the eplanning website, which enabled Ed LaRue to attend the virtual public meeting on October 24, 2024. Unless otherwise noted, the page numbers referenced herein refer to the Draft Environmental Impact Statement (DEIS) and Draft Resource Management Plan Amendment (RMP Amendment) DOI-BLM-NV-S030-2022-0009-EIS, Copper Rays Solar Project Mineral and Land Records System (MLRS), Casefile Number: NVNV105907686 Legacy Casefile Number: NVN-8965.

Page 1 indicates the project "…would include up to a 700-megawatt (MW) alternating current (AC) solar photovoltaic (PV) power generating facility and up to 700 MW of battery energy storage system (BESS) on approximately 4,414 acres of BLM-managed public land. The Project (including alternatives) is located in the Pahrump Valley portion of Nye County, immediately adjacent to the county line, southeast of the town of Pahrump, and approximately 40 miles west of Las Vegas."

The BLM's cover letter, dated September 20, 2024, states, "Approval of the right-of-way (ROW) application for the Project by the BLM would also require an amendment to the 1998 *Las Vegas Resource Management Plan*." For several years now, with absolutely no response from the BLM, the Council has been outspoken in dozens of letters to the Southern Nevada District Office of the BLM about our concern that the BLM continues to amend a 1998 RMP to allow for additional development in tortoise habitat even though this RMP is outdated and fails to consider the latest science concerning the demise of desert tortoises throughout the listed range and particularly in the Eastern Mojave Recovery Unit where the project is proposed.

In addition, BLM and DOE's Solar PEIS and BLM's ROD in 2012 predates the publication of significant findings regarding substantial tortoise declines in numbers and densities since 2004 throughout most of the range and especially in the Eastern Mojave Recovery Unit (Allison and McLuckie 2018, and USFWS 2015, 2020, 2022a, and 2022b). The Council views these declines as a significant change affecting the survival and recovery of the tortoise.

In the DEIS, we were unable to find an analysis of the impacts of utility-scale solar projects on the tortoise and tortoise habitat using the best available science with respect to the survival and recovery of the species especially in combination with the ongoing and increasing severity of climate change impacts. For example, the Solar FPEIS (2012a) and ROD (2012b) predate the identification of the Pahrump and Ivanpah Valleys as a highly important area for providing connectivity among desert tortoise populations for maintaining a viable ecological network (Averill-Murray et al. 2021). "Maintaining an ecological network (recovery network) for the Mojave desert tortoise, with a system of core habitats (TCAs [Tortoise Conservation Areas]) connected by linkages (Hilty et al. 2020), is necessary to support demographically viable populations and long-term gene flow within and between TCAs" (Averill-Murray et al. 2021). In addition, "[l]arge, connected landscapes also are necessary to facilitate natural range shifts in response to climate change (Averill-Murray et al. 2021). We remind BLM of the "importance of tortoise habitat outside of TCAs to recovery" of the tortoise because these areas are necessary to provide "gene flow among TCAs and minimizing impacts and edge effects within TCAs" (Averill-Murray et al. 2021).

"Ignoring minor or temporary disturbance on the landscape could result in a cumulatively large impact that is not explicitly acknowledged (Goble, 2009); therefore, understanding and quantifying all surface disturbance on a given landscape is prudent." Furthermore, "habitat linkages among TCAs must be wide enough to sustain multiple home ranges or local clusters of resident tortoises (Beier and others, 2008; Morafka, 1994), while accounting for edge effects, in order to sustain regional tortoise populations." Consequently, effective linkage habitats are not long narrow corridors. Any development within them has an edge effect (i.e., indirect impact) that extends from all sides into the linkage habitat further narrowing or impeding the use of the linkage habitat, depending on the extent of the edge effect.

Averill-Murray et al. (2021) further notes that "To help maintain tortoise inhabitance and permeability across all other non-conservation-designated tortoise habitat, all surface disturbance could be limited to less than 5-percent development per square kilometer because the 5-percent threshold for development is the point at which tortoise occupation drops precipitously (Carter and others, 2020a)." They caution that the upper threshold of 5 percent development per square kilometer may not maintain population sizes needed for demographic or functional connectivity; therefore, development thresholds should be lower than 5 percent.

The lifetime home range for the Mojave desert tortoise is more than 1.5 square miles (3.9 square kilometers) of habitat (Berry 1986) and, as previously mentioned, tortoises may make periodic forays of more than 7 miles (11 kilometers) at a time (Berry 1986). Consequently, for linkage habitats for the tortoise to be effective, they must be areas of sufficient size and mostly devoid of development including edge effects (e.g., indirect impacts from nearby development, human activities, etc.).

Sinervo et al. (2014) used their eco-physiological model of extinction to predict the distributions of 30 desert-endemic reptile and amphibian species under climate change scenarios. The model predicted the Sonoran desert tortoise (*G. morafkai*) was at a very high risk of extinction as a result of their thermal limits being exceeded by 2070. Although this research did not include the Mojave desert tortoise, it illustrates the importance of providing functioning linkage habitats to connect the current range of the tortoise with the northward movement of tortoise habitats in response to climate change.

Parandhaman (2023) analyzed how the compounded effects of land use and climate change would impact habitat suitability and landscape connectivity for current and future conditions for the tortoise. The habitat-based connectivity models indicated "a significant loss of connectivity in the eastern, central, and southern regions of the tortoise's range" (Parandhaman 2023). In response to climate change, tortoise habitat shifts northward (Parandhaman 2023), but dispersal of the tortoise to follow the habitat is dependent on geography (e.g., topographical and anthropomorphic barriers to movement). Parandhaman's modelling indicates the loss of connectivity/restricted gene flow that will occur over time as a result of habitat fragmentation. Her analyses revealed the importance of the valleys in southwestern Nevada in providing tortoise habitat/connectivity as tortoise habitat shifts north in the future (Parandhaman 2023).

Parandhaman's research (2023) revealed the importance of valleys in southern Nevada in providing habitat for the tortoise in response to climate change now and in the future. There are several existing and proposed projects in the Pahrump and Ivanpah Valley area (Figure 3) that when implemented would impede the ability of the tortoise to move north in response to climate change. In the DEIS, BLM lists 24 projects as past, present, and reasonably foreseeable future actions. These projects total more than 39,000 acres of direct impacts with additional indirect and cumulative impacts. Given Parandhaman's research on the impacts of climate change, this improvement to the north-south connectivity of the tortoise in this Valley with access to valleys farther north should be implemented. BLM should use the best available scientific information to determine the current and future needs of the tortoise in the Indian Springs Valley to provide and manage for effective linkage habitat between the Eastern and Northeastern Mojave Recovery Units and valleys to the north.

In addition, Karban et al. (2024) reported that habitat fragmentation due to utility-scale solar energy development may disrupt genetic linkages of desert tortoise in the Mojave Desert. Even if tortoise habitat remains, temperature changes within habitat patches could alter tortoises environmental sex determination. Increased temperatures associated with solar facilities may result in production of only female hatchlings and no males.

When considering climate change as an impact on vegetation and wildlife, BLM's analysis should periodically be revised because the last 20+ years of climate modeling have shown that climate change models are conservative and have underestimated the impacts of climate change to flora and fauna.

In summary, the Council asserts that BLM should use the best available science on the tortoise (tortoise demographics, genetics, movements, behavior, physiology, nutrition, etc.), the impacts of solar development, the impacts of other current and future anthropomorphic activities, and the impacts of climate change when analyzing the impacts of the Project on the tortoise, tortoise linkage habitat, and the survival and recovery of the species in the future. In reviewing the DEIS, the Council was unable to find that BLM incorporated these factors in its analysis of the impacts of the Project to the tortoise.

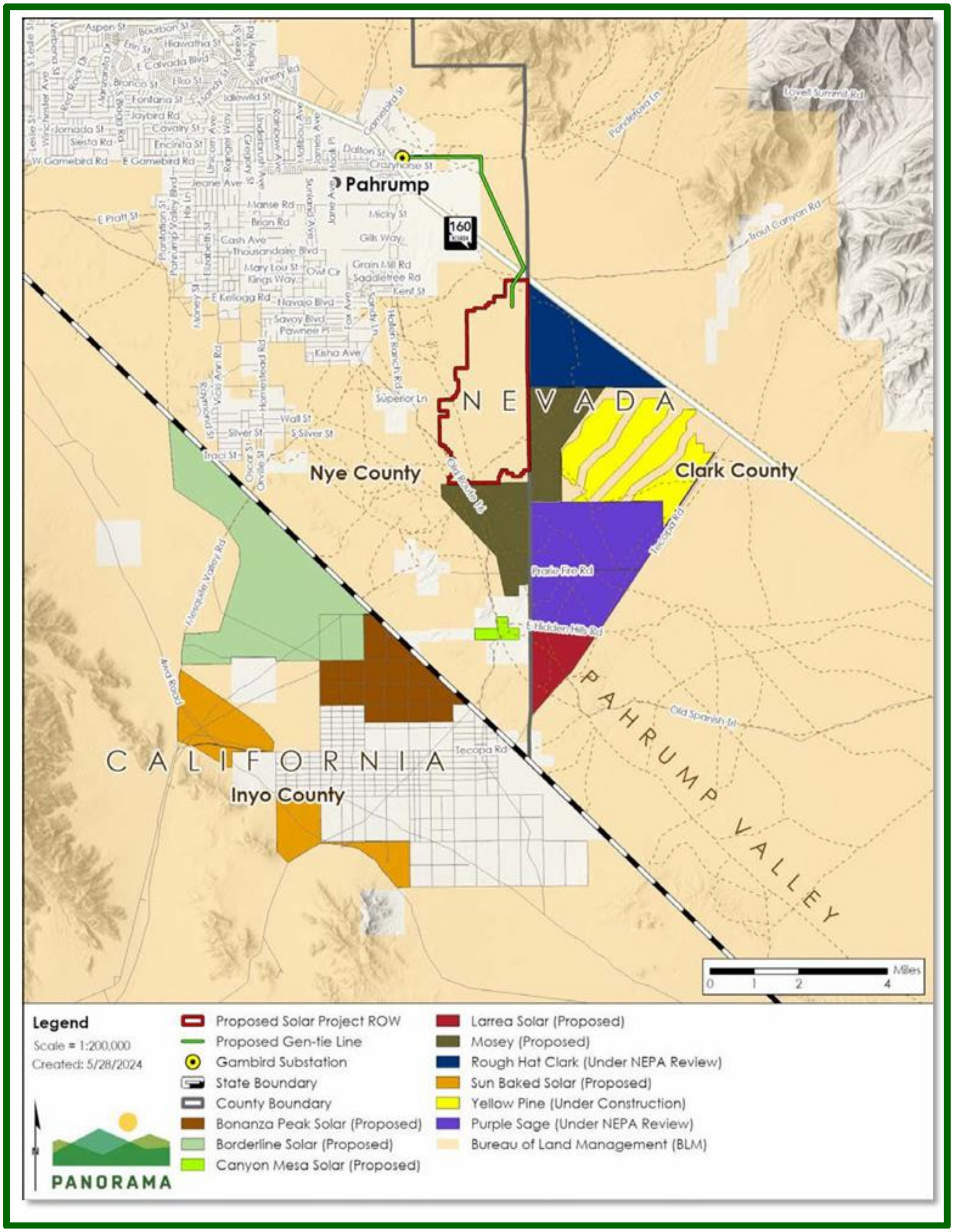


Figure 3 (as cited in the DEIS). Map of solar projects in the Pahrump Valley area.

The BLM (2024) recently adopted the Conservation and Landscape Health Rule that establishes the policy for the BLM to build and maintain the resilience of ecosystems on public lands in three primary ways: (1) protecting the most intact, functioning landscapes; (2) restoring degraded habitat and ecosystems; and (3) using science and data as the foundation for management decisions across all plans and programs. We contend that the RMP did not foresee the volume of solar development within the planning area, nor has the BLM cumulatively assessed the loss of thousands of acres of occupied tortoise habitat and the displacement of thousands of tortoises within the RMP planning area. Until the BLM updates the RMP with, among other things, the latest available science concerning the declining status of the tortoise (see Appendix A), we contend that amending this outdated RMP to promote seemingly unrestricted solar development in southern Nevada is not relying on the latest available science as required by the Conservation and Landscape Health Rule, among other regulations.

During the virtual public meeting on October 24, 2024, in a chat comment question to the BLM, LaRue asked the following question concerning seemingly unrestricted solar development in southern Nevada, and particularly the Pahrump Valley: "It is our understanding, as per FLPMA [Federal Land Policy and Management Act] in particular, that BLM-authorized projects must demonstrate how they will promote recovery of T&E [threatened and endangered] species. How many tortoises would be affected by this project? And given that number, how has BLM satisfied its FLPMA mandates to allow this development while promoting tortoise recovery? What is the anticipated acreage threshold at which BLM determines that enough habitat has been lost to solar [development] and enough tortoises have been translocated in the Pahrump Valley?"

The BLM responded in the chat with the following cut-and-pasted comment: "Sixty live Mojave desert tortoises were encountered during the surveys of the solar Project site, 55 of which met the USFWS criteria to be included in a population estimate. The estimated number of adult Mojave desert tortoises within the survey area for the solar Project site is 121 individuals (approximately 0.03 adult tortoise per acre)… There is no acreage threshold for habitat lost to solar, the BLM analyzes projects on a case-by-case basis, as well as the cumulative effects associated with the Project and other reasonably foreseeable future projects."

We ask that the DEIS be augmented so that the final environmental impact statement (FEIS) documents the number and configuration of acres that have been converted to solar development and the number of tortoises that have been displaced from the Pahrump Valley as the result of BLM's approvals, which have "…no acreage threshold for habitat lost to solar." To respond to this request, we ask that a table like Table 3.1-3 Past, Present, and Reasonably Foreseeable Future Actions within the Cumulative Effects Analysis Area on pages 3.1-9 and 3.1-12 be populated with the numbers of acres and tortoises that have been and would be displaced by these 24 tabulated projects along with their impacts on the ability of the tortoise to move north through the Pahrump Valley in response to climate change.

We contend that for the BLM to effectively analyze its responsibilities under FLPMA to ensure its land management activities promote tortoise recovery rather than exacerbate it, there must be a full accounting of the previous and pending losses of habitat and tortoises to seemingly unrestricted solar development in the Pahrump Valley. We remind BLM that FLPMA directs BLM to manage public lands that consider the long-term needs of future generations for renewable and non-renewable resources, and to take any action necessary to prevent unnecessary or undue degradation of the lands. Our comments demonstrate that BLM is not complying with this mandate with respect to the survival and recovery of the tortoise for current and future generations of Americans, especially in the Eastern Mojave Recovery Unit.

We feel that it is short-sighted of the BLM to fail to identify an "…acreage threshold for habitat lost to solar" in the Pahrump Valley along with avoidance areas to provide effective linkage habitats north through the Ivanpah and Pahrump Valleys so the tortoise may use these habitats to respond to climate change , which need to be determined to ensure that tortoises are not extirpated by direct, indirect, synergistic, and cumulative impacts in the valley.

According to the BLM's quoted statement on October 24, 2024 during the Zoom meeting, an estimated 121 tortoises would be lost from these intact habitats, where 61 live adult tortoises were found (Figure 1). According the supplemental information provided by BLM on their National Environmental Policy Act (NEPA) ePlanning webpage for the Copper Rays Solar Project, the estimated number of adult tortoises throughout the project sites was calculated to be 137, with a 95% confidence interval of 55 to 344 adult tortoises. This estimate does not include the number of hatchling, juvenile, or immature tortoises that occur in the action area (Newfields 2021). The amount of tortoise sign that was found at the Project site covers the entire site (Figure 2), which indicates that tortoises are actively using and have recently used the entire site.

The density and distribution of tortoises and the amount of tortoise sign on this proposed site clearly reflects "intact, functioning landscapes," which is the first of the three primary ways in which the BLM's Conservation and Landscape Health Rule is intended to protect. As given in Table 1-1 at the bottom of page 1-7, we see that the project is proposed "…within a Priority 2 Connectivity Area identified by the USFWS, *which is an area of contiguous, high-quality habitat that provides connectivity for desert tortoise populations* [emphasis added]." The FEIS needs to clearly document why BLM is willing to violate this Health Rule, FLPMA, and other BLM regulations by allowing the proponent to develop this site in a healthy, functioning tortoise population located in important connectivity habitat.

As given on page 2-42, the Council completely supports "The No Action Alternative [as] the environmentally preferable alternative (40 CFR § 1502.12; 43 CFR § 46.30)." Big solar projects should occur on impaired habitats proximate to the customers it serves, not on lands that may support hundreds of tortoises. Developing solar projects in Nevada and then exporting the electricity to California suggests to us that there are much better, more proximate sites on degraded, non-tortoise habitats in California where these projects should be situated. We did not see in the DEIS to whom generated electricity would be transported; would it be to Nevada or California?

When the Council provided scoping comments on this project on January 5, 2022[1], the BLM was considering development of the site under the 2012 Final Programmatic Environmental Impact Statement for Solar Energy Development in Six Southwestern States (Solar PEIS; BLM and DOE 2012). Therein, we made the following statements and requested: "Too often, a single impact footprint is identified, all surveys are restricted to that site, and no alternative sites are assessed, as required by NEPA. We are concerned that this project may have already pre-determined the project

[1] https://www.dropbox.com/scl/fi/hkghj1m6obutimon55q9p/Copper-Rays-Solar-Project.1-5-2022.pdf?rlkey=y1wrdsanilv6a78aovp2mz1ej&dl=0

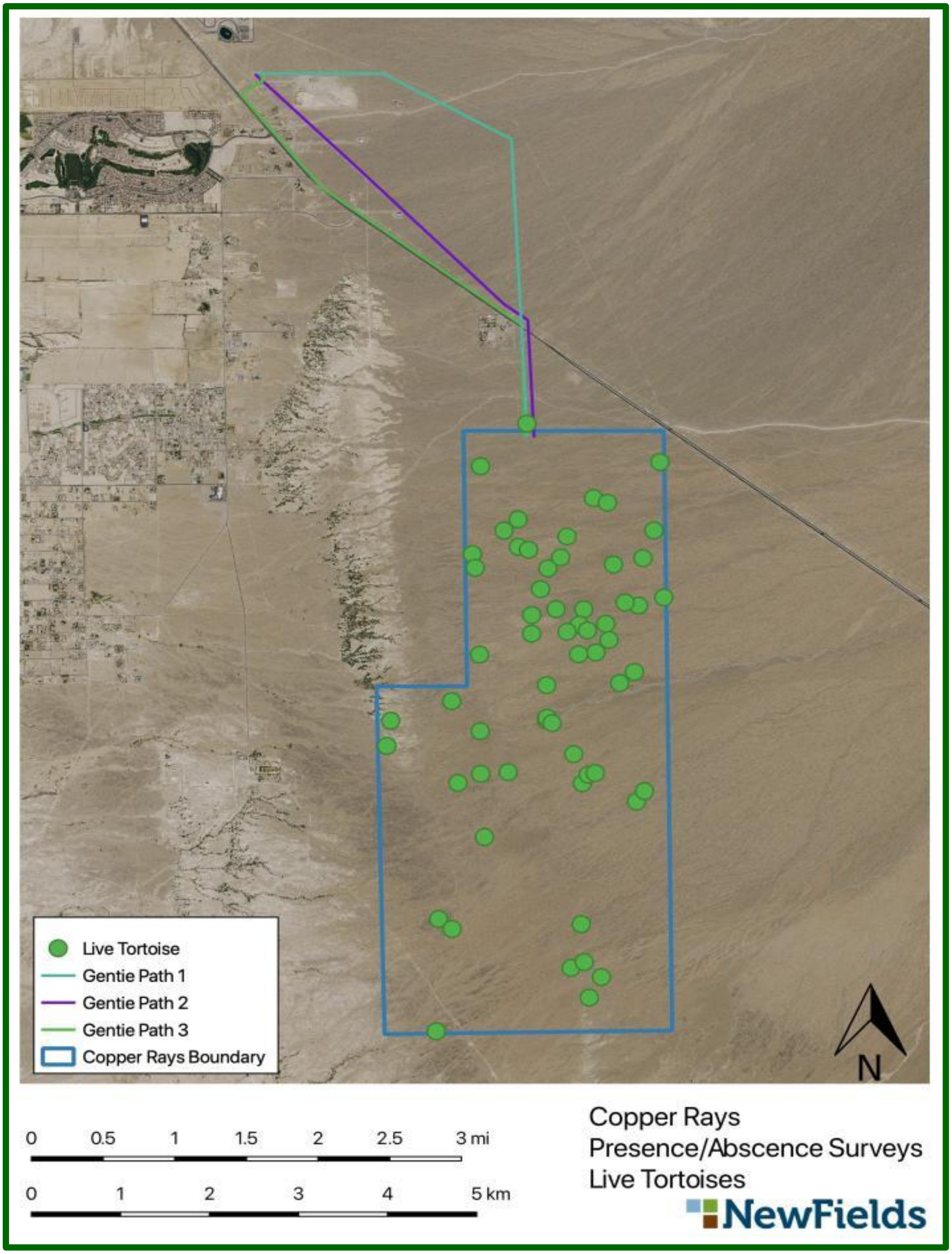


Figure 1 (as cited in the DEIS). Live tortoise survey results.

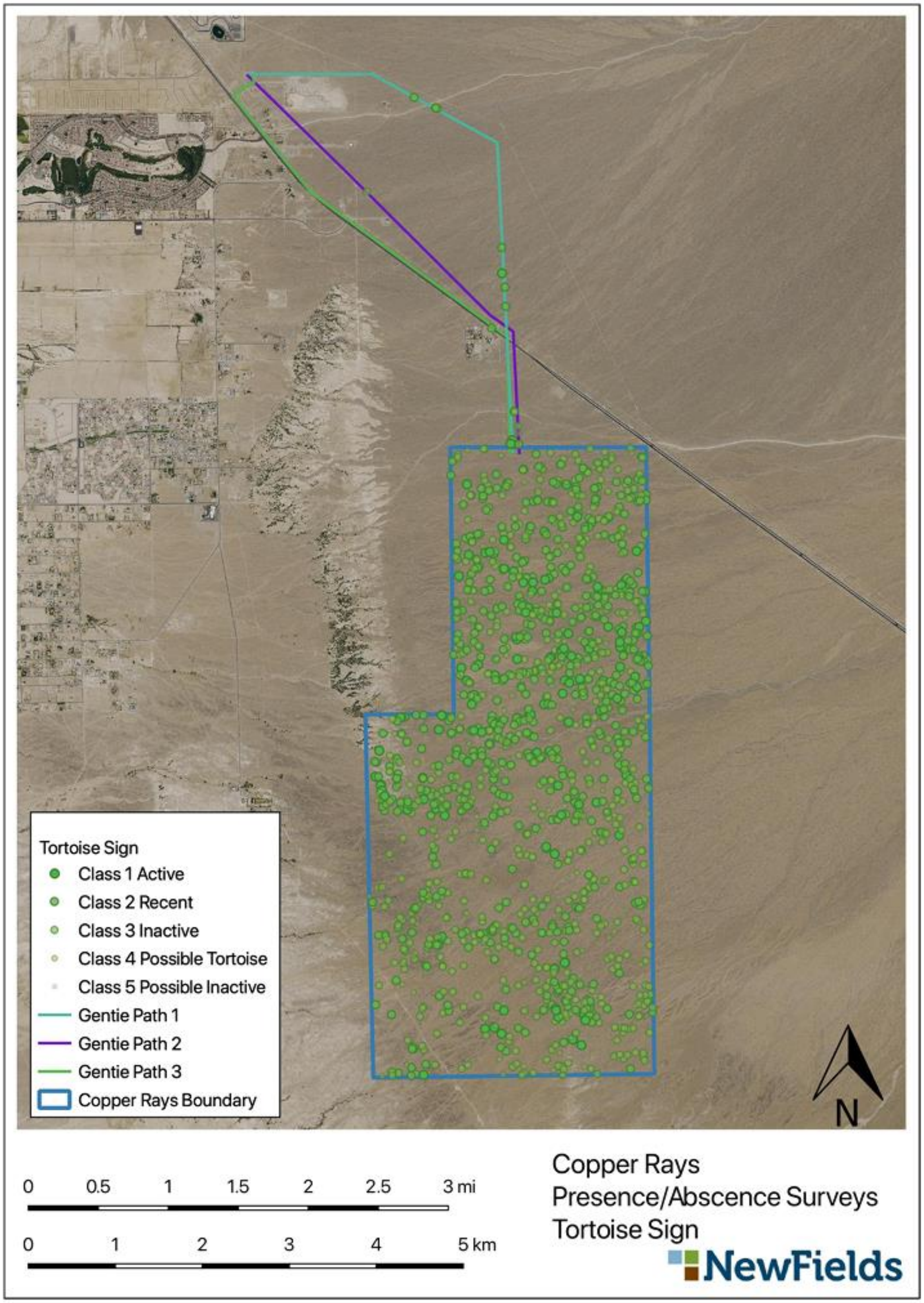


Figure 2. Tortoise Sign Survey Results

footprint. As such, there may be other areas of lower tortoise densities where impacts could be minimized. However, those areas would not be considered if the project footprint is predetermined before survey data are available. As such, we request that more than one site, preferably three, be identified and analyzed in the DEIS and that the alternative with the fewest impacts to tortoises be adopted for development."

Despite this input and request, the BLM is once again accommodating a solar project with only one alternative location where "…121 adult individuals as well as approximately 158 hatchlings, and approximately 630 juveniles" are estimated to occur (page 3.4-6). We assert that when the site was surveyed in 2021 for tortoises and so many animals were found that at that time the site should have been abandoned if the intent and function of the NEPA was to be upheld. The so-called "alternatives" given in Section ES-4 are all located within the same footprint promoting the illusion of identifying different alternatives by "setting maximum allowable disturbance thresholds to vegetation during construction, utilizing various construction methods across the site, and setting restoration goals" (page ES-12), all of which would result in the displacement of all tortoises from the site "…prior to construction and for the duration of the Project life" (page 3.4-6).

We assert there are not any real alternatives in this DEIS if degraded habitats, rooftop solar, and other true alternatives located in less intact, nonfunctioning habitats offsite are not truly analyzed. For example, we find it counterintuitive that BLM can conclude at the top of page 4 in Appendix I that private lands in the region are not an alternative because they are too expensive for the proponent to develop. This kind of mentality is likely to attract developers who cannot afford to develop appropriate private lands on tortoise-unsuitable habitats, and functions to attract solar development onto intact, functioning tortoise habitats on our limited public lands.

Also, on page 4 in Appendix I, under Other BLM-Administered Land Alternatives, we find it counterintuitive to, on one hand, say that the project is not covered by the 2012 Solar PEIS (BLM and DOE 2012) yet on the other hand use that plan here to say that the slope requirements in the 2012 document would not be met. The same section concludes that brownfield lands are available but too small to accommodate a 700 MW development, which implies that the proponent cannot downsize its operation. In effect, every alternative given in Appendix I is dismissed because they either do not meet the proponent's needs or the BLM cannot otherwise accommodate their needs, which effectively puts the needs of the solar developer ahead of the needs of tortoises and other resources reliant on the proposed parcels, which the BLM is mandated to protect.

Near the top of page 1-2, we read, "A notice to update the 2012 Western Solar Plan [BLM and DOE 2012] was published in the Federal Register on December 8, 2022 (BLM 2022), but that process is not yet complete." Please note that the process is now complete with the publication of the BLM's (2024) Final Programmatic Environmental Impact Statement and Proposed Resource Management Plan Amendments for Utility-Scale Solar Energy Development in August 2024, which should be corrected in the FEIS.

We question the validity of the following statement given on page 2-15, "The bottom of the access holes would be set at 5 inches from the ground to facilitate access into and out of the facility for general wildlife species. Wildlife access would be provided via 10-inch-tall by 12-inch-wide holes in the fence. These wildlife access holes would be designed for use by small to medium-sized mammals (e.g., kit foxes, desert cottontails, black-tailed jackrabbits, greater roadrunners), while excluding site access by desert tortoises." We found no requirement that this height between the ground and the bottom of the access holes would be maintained as part of the fence maintenance requirements or the frequency of this maintenance (e.g., immediately after a rainfall event, etc.). Thunderstorms, other natural events, and human activities are likely to alter the height of this opening by acting as a barrier to accumulate debris and soil, vegetation, and debris from natural and human sources or damage the fence/fence opening. Hatchling tortoises are 40-50 mm (1.6-2.0 inches) long while subadult and young adult tortoises may be 180-200 mm (7-8 inches) long, both of which would easily fit through the 12-inch wide holes described above. We expect that the following sentence at the top of page 2-16 needs to be changed as indicated: "Access holes are expected to be exclusionary to desert tortoise, though the potential for ~~larger adults~~ **both larger and smaller** tortoises to traverse the openings may exist."

We read at the bottom of page 2-15 and top of page 2-16 that, "As these openings would be considered experimental, the BLM may install camera traps to monitor species diversity and volume of use over the initial year of implementation at all or a subset of openings. Data would be retrieved, and camera maintenance conducted once per month by BLM staff over the 12-month period (Monitoring period may be extended up to 2 years dependent upon the quality and quantity of data collected within the initial trial year)." We ask that the FEIS clarify how these data will be used, and commit the proponent to either close these openings (e.g., if it is shown that tortoises are entering in through them) or keep them open, in which case the proponent should commit to monitoring them in perpetuity (certainly more than two years) so that they remain open and functional rather than be closed by sand transport by wind and water.

Because this measure and others in the DEIS are experimental with respect to the tortoise, their implementation should not be considered as mitigation until the results and analysis of the experiment are complete and found to be highly successful, which from a scientific perspective this desired goal would be 90 to 95 percent successful. If not successful, BLM should require additional mitigation from the project proponent to comply with BLM's Mitigation policy (BLM 2021a, 2021b) and Section 7 of the Federal Endangered Species Act (FESA) to minimize the impacts of the taking.

We do not believe that the following sentence given on page 3.4-2 adequately analyzes the population status and trends of tortoises in the East Mojave Recovery Unit in which the project is proposed: "Of the six [sic, there are only five] recovery units, the Eastern Mojave has experienced the greatest loss in abundance of Mojave desert tortoises, with an 11.2-percent annual reduction from 2004 to 2014 (USFWS 2022)." As such, we have provided Appendix A as additional information, which we expect will be used to bolster this discussion in the FEIS.

Except for the eastern parts of Riverside County in California, which are covered by the Desert Renewable Energy Conservation Plan (DRECP), we know of no other recovery unit that has been as heavily impacted by solar development as has occurred on our public lands managed by the BLM in southern Nevada in the East Mojave Recovery Unit. Since the East Mojave Recovery Unit has experienced the greatest loss of tortoises among all recovery units encompassing the listed population, it is essential that the BLM fully analyze how its authorization of this and other solar projects throughout Pahrump Valley, Ivanpah Valley, and other parts of southern Nevada have contributed to avoidable losses of tortoise habitat resulting from BLM's unrestrained authorization of solar projects in this recovery unit. Given the precipitous declines in the region, why isn't the BLM being more proactive in managing this recovery unit for tortoises in order to comply with FLPMA, FESA, and other regulations, rather than authorizing another 4,100 acres of important tortoise habitat for solar development?

Impacts of the Proposed Action to Tortoises/Tortoise Habitat

Many of the impacts described in the DEIS for tortoise, are presented with little or no scientific references to support them. In the DEIS we were unable to find references from the scientific literature that support BLM's determinations of impacts to the tortoise, special status species, vegetation, wildlife, and their habitats. In 40 CFR 1502.24 Methodology and scientific accuracy, the Council on Environmental Quality's regulations for implementing the NEPA say, "[a]gencies shall insure the professional integrity, including scientific integrity, of the discussions and analyses in environmental impact statements. They shall identify any methodologies used and shall make explicit reference by footnote to the scientific and other sources relied upon for conclusions in the statement." Please provide these scientific sources for the analyses and conclusions for impacts, including cumulative impacts, to the tortoise and other fauna and flora in the FEIS.

We question the use of "drive and crush" as a method to maintain perennial vegetation at the locations where the arrays would be located. Slade (2023) reported that this site preparation method was used in the southern California desert at a solar facility by construction vehicles "in an attempt to retain the plants' root systems." However, the environment at this solar facility with panels that track the sun was still "largely devoid of plant life more than 2 years post-construction."

When comparing cutting or pruning plants to crushing them, plants that are pruned are far more likely to survive. Pruning involves controlled removal of specific parts, allowing the plant to regrow from healthy tissue. Crushing essentially destroys the plant's structure and ability to function, making survival highly unlikely. Pruning may stimulate new growth, but not all plants can handle severe pruning. In addition, pruning should be done at the right time of the year depending on the plant species.

BLM's objectives should be to prevent undue degradation to the resources and minimize disturbance to vegetation. Consequently, the Council recommends that to implement BLM's goal of maintaining the vegetation that currently occurs at the Project site, BLM should require that the existing vegetation be cut or pruned and not crushed.

Heat Island Effects, Vegetation and Soils: Utility-scale photovoltaic (PV) facilities have significant impacts on local air and ground temperatures. Utility-scale PV solar projects produce increased heat. PV panels create a solid black barrier between the ground and the atmosphere, which alters heat flux dynamics by restricting movement of warm air up into the atmosphere similar to a greenhouse effect (Barron-Gafford et al. 2016). PV solar panels raise ambient air temperatures by as much as 3-4 °C in the summer, creating a "Photovoltaic Heat Island Effect." A PV "heat island" effect refers to the temperatures in and around PV solar facilities increasing from the ambient temperature due to replacement of native land cover with solar panels that absorb heat. This is similar to the "urban heat island" effect, where native cover is replaced with pavement and concrete buildings.

PV solar panels convert solar radiation into heat, which can alter the air flow, energy flux dynamics, and temperatures near the panels (Fthenakis and Yu, 2013; Barron-Gafford et al, 2016). Soils, vegetation, and wildlife may be affected by such changes and increases in temperature in and around utility-scale solar facilities.

Fthenakis and Yu (2013) found that annual average air temperature in the center of a solar project at heights approximately 2.5 meters (8 feet) above the ground can reach up to 1.9 °C (3.5 °F) above ambient temperature. This thermal energy dissipates and reaches ambient temperature at 5-18 meters (16-60 feet) above the ground. This same study found a prompt dissipation of thermal energy and decrease to ambient temperatures around the PV panels at 300 meters (984 feet) away (horizontal distance) from the perimeter of the solar farm and that access roads between solar fields allow for substantial cooling.

Devitt et al. (2022) reported that large photo voltaic facilities similar to the proposed Copper Rays Solar Project raised the air and soil temperatures not only on the project site but significant heat was moving from the solar facility into the plant community, especially in the first 200–400 m (656 to 1,312 feet) off the project site. This rise in temperature also impacts the availability of soil moisture and the ability of burrowing animals such as the tortoise in nearby areas to reduce their body temperatures at night to conserve energy and moisture. The impacts of elevated soil and air temperatures to areas adjacent to the Project should be analyzed in the FEIS including impacts to the survival, growth, and recruitment of native vegetation if this area is to be managed for wildlife use including use by tortoises.

PV facilities can also alter the energy balance by generating heat (Broadbent et al. 2019). Nighttime temperatures over photovoltaic plants are regularly 3–4 °C warmer than over wildlands, representing a heat island effect (Devitt et al 2022). As the warmer air was displaced down gradient, the temperature front advanced into the creosote—bursage plant community with values 5 to 8 °C warmer at the 1-meter height.

Similarly, Broadbent et al. (2019) found increased temperatures during the day, with an average 1.3 °C increase in air temperature in the solar field at a height of 1.5 meters (5 feet). The nighttime soil temperatures at the solar site were warmer than the reference site. The study demonstrated that shading from solar panels causes warmer soil temperatures at night.

Barron-Gafford et al. (2016) monitored three study sites [natural desert ecosystem, traditional built environment (parking lot with commercial buildings), and PV power plant], measuring air temperature at 2.5 meters (8 feet) off the ground. The average annual air temperature was greater at the PV power plant, increasing 2.5 °C during the day. Contrary to other studies, a delayed cooling of ambient temperatures was detected in the evenings, with average annual midnight temperatures increasing 3.5 °C, compared with the natural desert ecosystem. The authors hypothesized that by removing vegetation, heat-dissipating transpiration from vegetation is decreased, and compared to natural systems, the greater amount of exposed ground surfaces absorbs more solar radiation during the day, which may increase soil temperatures (Barron-Gafford et al, 2016). During the night, stored heat is reradiated, where warming under the panels may be due to the heat trapping of reradiated heat flux (Barron-Gafford et al, 2016).

Devitt (2022) evaluated a large solar facility in the Mojave Desert and the effect it had on adjacent down gradient creosote communities. The study monitored changes in soil and plant water status over a 900-meter transect where a built service road resulted in decoupling of up-gradient washes from down-gradient locations leading to a decline in soil water in storage. Similar to other studies, air temperatures were significantly warmer near the solar facility compared to a reference point. Consistent with Barron-Gafford (2016), night temperatures were found to be higher closest to the solar facility. The results of these studies indicate that PV solar projects increase air temperatures in the vicinity of the solar field, change soil temperatures, and reduce soil moisture.

Notably, these studies were performed on solar sites that were graded and unvegetated. Barron-Gafford postulated that mitigation of the PV heat island effect would be achieved in part through targeted revegetation, which could ease ecosystem degradation associated with development of utility scale solar projects (Barron-Gafford et al, 2016). Regarding nighttime temperatures, the study suggested that if the panels are mounted on a tracking system, the panels could be situated in a perpendicular position relative to the ground at night, allowing longwave radiation and trapped heat to escape to the sky, reducing the heat displacement into adjacent plant communities during the early morning hours.

Beatty et al. (2017) studied revegetation of a solar facility with varying treatments, varying seed mixes (shade tolerant vs. sun tolerant), varying cultural treatments (protection of seeds), and varying amounts of shade (based on orientation of collector panels). The highest total vegetation cover was associated with seeding warm-season native grasses in the absence of any seed protection. Renewable Energies Agency looked at revegetation under modules for various case studies and recommended using a seed mixture appropriate for local site fauna to promote re-establishment of vegetation (Beatty et al. 2017). Although the study did not address whether successful revegetation fostered reestablishment of wildlife use, incidental observations suggested that it had to some extent. However, Beatty et al. (2017) conducted their study in Colorado so the application of their results to vegetation, temperatures, and moisture at a PV solar site in southern Nevada's Mojave Desert may not be applicable.

Tortoises and Other Reptiles/Wildlife: How would these heat island effects impact the tortoise? Slade (2023) found that solar arrays significantly altered the surface-level thermal environment for tortoises and other reptilian species. Besides increased daytime temperatures when compared to undisturbed desert areas, Slade (2023) reported that solar arrays create a shade-warming effect; artificial shade under solar panels have significantly greater temperatures than natural shade. In addition, both fixed, shorter and the taller, sun-tracking panels of solar arrays exhibited warmer nighttime air temperatures than undisturbed sites (Slade 2023). The shade-warming effect from solar panels was most pronounced during the hottest, most thermally challenging months for reptiles.

These altered thermal environments could have unintended physiological and behavioral consequences for ectotherms such as the tortoise, given the tortoise's innate dependence on appropriate environmental temperatures for physiological function and activity. These negative consequences include extended exposure times of clutches of eggs at temperatures above thermal maximum for embryo development resulting in reproductive failure, an upward shift in their resting body temperatures that increase metabolic expenditure and water loss, negatively affecting energy balance (Nagy and Medica 1986, Sowell 2001) and therefore survival, among other physiological and behavioral concerns. Tortoises are already living on the upper edge of their thermal limits and could be pushed closer toward extinction by an additional heating effect created by utility-scale solar arrays (Sinervo 2024).

Desert tortoises are herbivores with low and narrow thermal tolerance ranges relative to other desert reptiles (Berry et al. 2021, Zimmerman et al. 1994). As their environment warms and drought periods increase, their ability to meet their increasing energetic requirements may be thwarted by decreased periods of potential activity time (e.g., reduced time for foraging) and lack of plant food and water availability, pushing them to the brink of their physiological limits (Lovich and Ennen 2011). Under current climate change scenarios without a reduction in carbon dioxide emissions, models predict that Mojave desert tortoises could approach extinction by 2080. When a 0.4 to 0.75 degrees C increase in air temperatures created by a photovoltaic heat island is included, these models indicate an even more rapid decline (Slade 2023).

In addition, Slade (2023) reported that "species richness is lowest in a solar array and increases with distance into natural desert habitat" and "solar arrays decrease vertebrate species richness on their edge habitats." Thus "solar arrays have a deleterious effect on species richness, with extremely few species detected compared to adjacent and control habitats."

Similar changes to the below-ground thermal environment at a solar array could be similarly problematic to the tortoise and other wildlife species. Slade (2023) reported that soil temperatures directly influence the body temperatures of burrowing reptiles, such as the desert tortoise. Any increase in underground temperatures could heighten water loss and resting metabolic rates for dormant reptiles and compromise their fitness and survival. This impact would be more severe for hatchling and juvenile tortoises than adults because of their small body size and larger surface to volume ratio. Thus, recruitment of young tortoises into the population would be adversely affected.

Desert tortoises, like most other turtles, exhibit temperature-dependent sex determination. Soil temperatures directly influence the incubation temperatures of tortoise nests, which affect hatchling survival and sex ratios (Slade 2023). Proper soil temperatures during incubation are critical to the survival of tortoises. With warmer ambient and soil temperatures from solar arrays, eggs laid in nests located in heat island areas of solar arrays would likely result in more hatchling female tortoises and fewer hatchling male tortoises. In addition, long-term exposure to higher temperatures results in deformities and high levels of clutch mortality (Spotila et al. 1994). Climate change would exacerbate this heat island impact on clutch survival and sex determination. Because desert tortoises depend on the suitability and reliability of their thermal environment, this makes them extremely vulnerable to temperature increases imposed by climate change, a photovoltaic heat island, or both (Slade 2023). Parandhaman (2023) reported that temperature, precipitation, and soil conditions are very important factors in determining habitat suitability for the desert tortoise.

Karban et al. (2024) described wildlife responses to utility-scale solar energy disturbance with three response strategies: avoid, tolerate, and exploit. Avoidant species avoid the disturbance, partially or entirely, to forestall negative effects of utility-scale solar energy disturbance. These species are not persistent in solar energy areas and decline if disturbance cannot be avoided.

Avoidant animal species typically have narrow or inflexible ecological niches that make them vulnerable to disturbance, such as specific habitat requirements and specialized diets. Karban classified tortoises as disturbance avoiders, possessing a number of traits (e.g., diet of diverse forb species, susceptibility to road mortality) that make them vulnerable to disturbance (Karban et al. 2024).

Based on these studies, impacts to vegetation, soils, and tortoises at solar facilities related to the PV heat island effect include increased air temperatures in the vicinity of the solar field during the day and at night as well as higher soil temperatures. Increased temperatures would impact the species composition of vegetation and wildlife at and in the vicinity of the solar facility, where temperatures could be too high and soil moisture too low for certain plant and animal species, including the tortoise to persist. Wildlife species would be displaced as they are forced to vacate the area of increased temperatures. Changes in surface hydrology at and down-gradient from features of utility scale PV solar projects may reduce water availability for vegetation communities, and increases or decreases in soil temperatures could affect persistence of vegetation and habitat suitability for burrowing wildlife forcing some species to avoid solar facilities. BLM should include this information the FEIS.

Tortoise Translocation and Mitigation for Loss of Tortoise Habitat

BLM is proposing to translocate tortoises as a mitigation measure to minimize the loss of tortoises. We found no effective mitigation proposed in the DEIS for the loss of tortoise habitat including the temporal loss.

The Council reminds BLM that translocation is not a proven mitigation measure for the tortoise. Mack and Berry (2023) monitored translocated tortoise for 10 years. They reported that 17.7 percent of the tortoises survived, 65.8 percent died, 15.2 percent were missing, and 1.3 percent were removed from the study because they returned to the original site. Mortality was high during the first three years – more than 50 percent of the tortoises died primarily from predation. Thereafter, mortality declined but remained high. Although the translocation efforts by the Marine Corps at Twentynine Palms considered some of these factors, tortoise mortality from predation was high (Henen 2024). To minimize mortality to small tortoises, these animals have been brought into headstart facilities. The Marine Corps continues to monitor the translocated tortoises.

In addition, Mulder (2017) studied translocated tortoises during the first four years and learned that male translocated tortoises did not produce offspring with resident or translocated female tortoises. This absence of successful mating at the translocation site is concerning, because it means their genes were not added to the population at the translocation site. Thus, the perceived benefits of genetic diversity from translocation are not fully realized.

The “success” of translocation depends on a myriad of factors including the absence of drought, the ability of the translocation area to support additional tortoises (e.g., availability of native nutritious forage, etc.), social interactions between resident and translocated tortoises, the distance translocated tortoises are moved, effective management of translocation lands to eliminate human-caused threats, the time of year tortoises are moved, their physiological/hydration state, and elevated predation.

At a minimum, a translocation plan for the tortoise should address the following questions, the answers to which should be documented in the FEIS:

- Where is the translocation site and what are the adjacent land ownership and uses (please include a map)?
- How far is the translocation site from the project area (translocation sites located close to the site from which tortoises are removed appear to contribute to higher tortoise survival (Mack and Berry 2023)?
- Who will manage the translocation site?
- How will it be managed because it is a mitigation site and no longer a multiple use site
- Will tortoises be released in years with less than average rainfall?
- What time of year will tortoises be released?
- What are the results of tortoise surveys at the translocation site and of native vegetation surveys including annual vegetation?
- Are non-native invasive annual plants species present and if so, are they abundant?
- What other activities that will be allowed to occur at the translocation site and adjacent areas (e.g., mining, grazing, OHV access, utility access, other activities that result in surface disturbance)?
- How will management of the translocation site, a mitigation site, be implemented and effectively enforced?
- How and when will monitoring occur (monitoring schedule) and what environmental parameters besides tortoises will be monitored?
- How long will tortoises and environmental parameters be monitored – monitoring should occur for multiple years?
- When monitoring indicates a change in management is needed, when will this change occur (adaptive management)?
- Who will fund the translocation plan and for how long?
- Will the translocation plan include management of tortoise predators?
- How will small tortoises be managed and monitored?

The translocation plan should state the success criteria and these criteria should be measurable. It should include monitoring and adaptive management that obligate the Applicant to modify the translocation plan when needed science-based monitoring information is not being collected to determine success, when monitoring information indicates the translocation is not meeting its success criteria, and as new information on the implementation of other translocation plans indicate that the plan is not using and implementing the best available scientific information.

The Council contends the results of these studies and BLM's past inability to secure mitigation lands for the long-term management of translocation sites indicate that translocation of Mojave desert tortoises to date has not been an effective, successful *minimization* method. Translocation should not be touted as a mitigation measure. Thus, avoidance of impacts to tortoises/tortoise habitat should be the preferred solution when projects that may result in the loss of tortoises are proposed.

Rather than approving projects in tortoise habitat, especially lands with tortoise densities above the viability threshold, BLM should approve projects located outside of occupied tortoise habitat, critical habitat, and habitat needed for connectivity/movement in response to climate change. FLPMA identifies wildlife as a use and BLM should be managing it as a use. BLM should revisit the statute and Congress's intent, and ensure that its regulations for implementing FLPMA comply with the statute.

Both the Cumulative Impacts analysis (3.2-6 and 3.15-26) and Affected Environment (page 3.4-2, 3.4-3, and particularly 3.4-6) sections in the DEIS are seriously deficient in their lack of assessing and documenting the status and trends of tortoises in the proposed Stump Springs Augmentation Site. The only information provided on page 3.4-7 – "For example, the Stump Springs Regional Augmentation Site proposed for translocated desert tortoises from the Project site has been used recently for the development of the adjacent Yellow Pine Solar Project (#3), and tortoises experienced a high mortality rate following release" – does not bode well for this project or accomplish the intent of translocating tortoises to the Stump Springs Augmentation Site.

Although methods and individual tortoise monitoring are listed on page 3.4-6, in the absence of an assessment of the augmentation site, we do not know how many tortoises have already been displaced into that translocation area; what the success rates are for translocated tortoises on a project-by-project basis; which human (including new solar development in contiguous areas) and stochastic impacts have affected and continue to affect the augmentation site; what the carrying capacity of the augmentation site is and how close it is to being met; and how this new proposal will affect both translocated and resident tortoises, including those previously translocated.

The FEIS needs to provide this information for the public to accurately assess if this proposed translocation effort and continued use of the augmentation site are prudent. With regards to carrying capacity, we note that the Stump Springs site is only 647 acres (page 3.8-2) and that tortoises are being removed from a 4,200-acre site, which is 6.5 times larger than the translocation site. Again, how are BLM and USFWS determining how many tortoises these 647 acres can support? And more to the point, until the carrying capacity is determined, how can BLM approve the translocation of as many as 200-300 tortoises onto this site, which is only a fraction of the "121 adult individuals as well as approximately 158 hatchlings, and approximately 630 juveniles" estimated by the proponent?

In addition, the Council contends that a translocation site must be managed as a reserve, and when located on BLM land, BLM is obligated to remove it from multiple use management (i.e., no activities that result in surface disturbance, removal of native species, etc.), and allow only uses that are documented to be compatible with tortoise conservation (i.e., survival and recovery). In addition, the Project site after Project implementation will not provide tortoise habitat for feeding, breeding, and shelter at a value comparable to its current value. Because of this long-term loss of tortoise habitat and likely reissuance of the ROW grant, the translocation site should be managed in perpetuity for the tortoise.

In the FEIS, BLM should clearly demonstrate how it is complying with BLM's Mitigation Handbook and Manual (BLM 2021a, 2021b) with respect to mitigating the direct, indirect, and cumulative impacts to the tortoise and tortoise habitat. For example, in section 6.2 of the BLM Mitigation Manual, BLM says "[a]mong the reasons that the BLM might deny a discretionary public land use are the inability to mitigate effectively the reasonably foreseeable impacts from a proposed public land use." This wording suggests that for BLM to approve a discretionary land use, BLM should have sufficient information and assurances that an applicant will mitigate effectively the reasonably foreseeable impacts from a proposed land use. The Council requests that BLM demonstrate in the FEIS that the Applicant provide sufficient information and assurances that it will mitigate effectively the reasonably foreseeable impacts from implementation of the Project. In addition, BLM should demonstrate compliance with its Mitigation Handbook, specifically chapters 2, 3, and 6, and in Chapter 6, F. Compensatory Mitigation in Proposed Action and Reasonable Alternatives.

With regards to the following statement on page 3.4-6, "Tortoises could be affected by fugitive dust generated on site and hazardous materials such as fuels and herbicides," were there any tortoise surveys performed in suitable habitats to the east? How large was the action area for this survey effort? The "action area" is defined in 50 Code of Federal Regulations 402.2 and the USFWS Desert Tortoise Field Manual (USFWS 2009) as "all areas to be affected directly or indirectly by proposed development and not merely the immediate area involved in the action" (50 Code of Federal Regulations §402.02). Thus, the 100% coverage survey area should be larger than the project footprint/project site.

The following question was asked of the BLM on October 24, 2024: "Are those lands [augmentation area] protected through a dedicated conservation easement or other regulatory mechanism that is not subject to BLM's multi-use mandates? Have any other tortoises in Pahrump Valley already been released into the intended translocation area? Has the translocation area been surveyed for tortoises, and how is BLM/USFWS determining the carrying capacity in order to know if can receive more than 100 translocated tortoises? How long will translocated tortoises be monitored? [At the time] I [had] not studied the DEIS; is the translocation plan attached to the DEIS?"

The BLM's verbatim response was, "Tortoises will be translocated to the Stump Springs Translocation Area which is bordered by Tecopa Road and Highway 160 in the Pahrump Valley. Prior to translocation, potential recipient sites within the translocation area are surveyed for initial density, habitat quality, predator occupation, etc. Tortoises will be monitored by the applicant for 2 years post translocation and the USFWS will be monitoring Stump Springs for survivorship according to the Long-Term Monitoring Plan. The translocation plan is not attached to the DEIS."

We question if two years is sufficient time to determine if the translocation would be successful. Given the eventual profits likely to be gained by the proponent and the importance of determining if translocation, which is a minimization measure rather than a compensation measure, is successful, we ask if the USFWS's Desert Tortoise Recovery Office (DTRO) has accepted this two-year time period? We believe that a longer period would be more appropriate especially given the impacts of climate change on temperature, precipitation, soil moisture, availability of native annual forbs, etc. The USFWS approved translocation plans for the tortoise from Fort Irwin and Marine Corps Air Ground Combat Center for times much longer than two years. Why is BLM's translocation of high numbers of tortoises from the Ivanpah and Pahrump Valleys for solar development being treated differently? We also stress the importance of providing all mitigation plans as part of the NEPA review period, and request that the draft translocation plan be attached to the FEIS to allow public review.

The DEIS includes several mitigation plans, but mentions others and says they will be developed. Stating that a mitigation plan will be developed even if this statement includes "using the best available science" is not adequate or appropriate, as the preparers are not always experts on the best available science for that specific issue/action. When mitigation plans are included in the public review process, this provides the public with the opportunity to provide comments based on their diverse knowledge and experience regarding the adequacy and soundness of the proposed mitigation plans. This public review process increases the likelihood that the mitigation plans when reviewed and finalized will be effective when implemented.

In addition, the mitigation plans should be included in the FEIS so the decisionmaker can review them and determine the effectiveness of the proposed mitigation prior to signing the decision document. Absent this information, the decisionmaker has no information on whether the mitigation plans will rise to the level of mitigating the impacts as described in the NEPA document or complying with BLM's Mitigation Policy, Manual, and Handbook.

At the top of page 3.4-7, we read, "Renumeration [sic] fees *would likely* be required by the Biological Opinion for the permanent loss of desert tortoise habitat" (emphasis added). As the federal lead agency, isn't it BLM's responsibility to require compensatory mitigation for unavoidable impacts rather than to rely on USFWS to include that in a biological opinion? We ask that the FEIS delete the words, "would likely be required" to clarify what would be required by BLM.

We remind BLM that it should demonstrate in the FEIS how it is complying with BLM's Mitigation Handbook and Manual (BLM 2021a, 2021b) for the displacement of tortoises, the loss of tortoise habitat, and the degradation and loss of linkage habitat that currently provides connectivity between tortoise populations within the Eastern Mojave Recovery Unit, between tortoise recovery units, and in response to climate change to move north in the Pahrump and Ivanpah valleys.

We question the calculation and standard use of the remuneration fee (please note, not "renumeration" fee as misspelled in the DEIS) that the USFWS has required in past biological opinions and BLM had also required. We remind BLM and USFWS that in preparing a biological assessment and biological opinion, respectively, the agencies are obligated to minimize the *impacts* of incidental take to listed species. In the past, the USFWS and federal agencies have not done this. Rather they have proposed measures to minimize the calculated number of anticipated individuals of the species that would be "taken."

The Council asks that each project located in tortoise habitat in the Pahrump and Ivanpah valleys where incidental take has resulted in direct, indirect, and cumulative impacts to the tortoise be tabulated in the FEIS, thus enabling the BLM to determine a comparable remuneration fee. We request that BLM and USFWS revisit their respective documents under 50 CFR 402.14(i)(1)(ii) of the FESA to ensure that the measures they are requiring are minimizing the *impacts* of the taking and not the taking itself, and under 50 CFR 402.14(i)(3) that the federal agency or any applicant must report the progress of the action and *its impact on the species* to the USFWS.

Techno-ecological synergies (TES)

When BLM is considering locations for solar projects, the Council recommends using a holistic method. Currently, BLM appears to be focused only on increasing renewable energy production by a quantifiable amount with the assumption this will reduce greenhouse gas (GHG) emissions by that amount. It does not appear to be considering the actual reduction in GHG emissions from the construction and operation of each solar project or impacts to other resources in its accounting process.

The Council suggest that BLM use a system that emphasizes calculating GHG emissions by life-cycle analysis and related methods. One such system is TES (Hernandez et al. 2019), a systems-based approach to sustainable development. For example, if solar energy development leads to diminished extent of perennial plant communities, then hazardous GHG emissions, dust emissions and soil-borne pathogens may increase and the benefits from the solar energy development are diminished. TES measures the quantity of resources withdrawn from (for example, water withdrawal and habitat loss) or materials released into (for example, CO_2 emissions and nutrient runoff) the environment.

Cumulative Effects Analysis

In the Executive Summary we were unable to find a summary of the analysis of cumulative impacts to the tortoise/listed species from implementation of the action alternatives. Please add this information to the FEIS.

In the DEIS, BLM lists numerous projects that are existing or proposed in the project area. However, while these projects were listed in the DEIS, we did not find an analysis of how their implementation would affect the cumulative impacts to the tortoise/tortoise habitat in the Pahrump and Ivanpah valleys or the tortoise in the Eastern Mojave Recovery Unit. These reasonably foreseeable and future actions should be combined with past and current actions (e.g., utility corridors, dirt roads, grazing and range improvements, mining, recreation and related activities including off-highway vehicle activities, development, etc.) and climate change and analyzed in the FEIS with respect to their impacts to the tortoise habitat and the future survival and recovery of the tortoise. This analysis should include the best available scientific information. It should analyze the impacts of the effectiveness of the Pahrump and Ivanpah valleys as linkage habitat, impacts to the Eastern Mojave Recovery Unit, and rangewide impacts to the tortoise. It should include the tortoise's demographic status with most populations below the density needed for population viability, substantially reduced tortoise numbers including juvenile tortoises, and the ongoing declining trend of these demographic parameters. Please add this information and analyses to the FEIS.

In the cumulative impacts analysis of the FEIS, please revise it to ensure that the Council on Environmental Quality's (CEQ's) "Considering Cumulative Effects under the National Environmental Policy Act" (1997) is followed, including the eight principles, when analyzing cumulative effects of the proposed action to the affected resource issues. This CEQ document is referred to in BLM's National Environmental Policy Act Handbook (BLM 2008).

CEQ states, "Determining the cumulative environmental consequences of an action requires delineating the cause-and-effect relationships between the multiple actions and the resources, ecosystems, and human communities of concern. The range of actions that must be considered includes not only the project proposal but all connected and similar actions that could contribute to cumulative effects." The analysis "must describe the response of the resource to this environmental change." Cumulative impact analysis should "address the *sustainability of resources* [emphasis added], ecosystems, and human communities."

CEQ's guidance on how to analyze cumulative environmental consequences, which contains eight principles listed below:

1. Cumulative effects are caused by the aggregate of past, present, and reasonable future actions.
The effects of a proposed action on a given resource, ecosystem, and human community, include the present and future effects added to the effects that have taken place in the past. Such cumulative effects must also be added to the effects (past, present, and future) caused by all other actions that affect the same resource.

2. Cumulative effects are the total effect, including both direct and indirect effects, on a given resource, ecosystem, and human community of all actions taken, no matter who (federal, non-federal, or private) has taken the actions.
Individual effects from disparate activities may add up or interact to cause additional effects not apparent when looking at the individual effect at one time. The additional effects contributed by actions unrelated to the proposed action must be included in the analysis of cumulative effects.

3. Cumulative effects need to be analyzed in terms of the specific resource, ecosystem, and human community being affected.
Environmental effects are often evaluated from the perspective of the proposed action. Analyzing cumulative effects requires focusing on the resources, ecosystem, and human community that may be affected and developing an adequate understanding of how the resources are susceptible to effects.

4. It is not practical to analyze the cumulative effects of an action on the universe; the list of environmental effects must focus on those that are truly meaningful.
For cumulative effects analysis to help the decision maker and inform interested parties, it must be limited through scoping to effects that can be evaluated meaningfully. The boundaries for evaluating cumulative effects should be expanded to the point at which the resource is no longer affected significantly or the effects are no longer of interest to the affected parties.

5. Cumulative effects on a given resource, ecosystem, and human community are rarely aligned with political or administrative boundaries.
Resources are typically demarcated according to agency responsibilities, county lines, grazing allotments, or other administrative boundaries. Because natural and sociocultural resources are not usually so aligned, each political entity actually manages only a piece of the affected resource or ecosystem. Cumulative effects analysis on natural systems must use natural ecological boundaries and analysis of human communities must use actual sociocultural boundaries to ensure including all effects.

6. Cumulative effects may result from the accumulation of similar effects or the synergistic interaction of different effects.
Repeated actions may cause effects to build up through simple addition (more and more of the same type of effect), and the same or different actions may produce effects that interact to produce cumulative effects greater than the sum of the effects.

7. Cumulative effects may last for many years beyond the life of the action that caused the effects.
Some actions cause damage lasting far longer than the life of the action itself (e.g., acid mine damage, radioactive waste contamination, species extinctions). Cumulative effects analysis needs to apply the best science and forecasting techniques to assess potential catastrophic consequences in the future.

8. Each affected resource, ecosystem, and human community must be analyzed in terms of its capacity to accommodate additional effects, based on its own time and space parameters.
Analysts tend to think in terms of how the resource, ecosystem, and human community will be modified given the action's development needs. The most effective cumulative effects analysis focuses on what is needed to ensure long-term productivity or sustainability of the resource.

Note that CEQ recognizes that synergistic and interactive impacts as well as cumulative impacts should be analyzed in the NEPA document for the resource issues. This would include the tortoise.

We request that the FEIS (1) include these eight principles in its analysis of cumulative impacts to the Mojave desert tortoise; (2) address the sustainability of the tortoise in/near the Project area, the Pahrump Valley, Eastern Mojave Recovery Unit, and rangewide (e.g., #3, 5, and 8); and (3) analyze, using the best available science, the sustainability of the Pahrump and Ivanpah valleys to adjacent areas, including valleys to the north, for connectivity for the tortoise especially evaluating both the impacts of climate change and reasonably foreseeable future projects/activities in the Pahrump and Ivanpah valleys and adjacent lands regardless of land ownership. Once this analysis has been completed, then BLM is in a position to determine what the cumulative impacts of the Project are and whether all these impacts can be effectively mitigated to ensure that the tortoise in the Eastern Mojave Recovery Unit will remain connected to other recovery units and to tortoise habitat as it moves north in response to climate change. If not, then BLM should not approve the Project.

If BLM determines the cumulative impacts can be effectively mitigated to ensure the current and future connectivity within the Eastern Mojave Recovery Unit, with adjacent recovery units, and to the north so the tortoise is able to move in response to climate change, then BLM should include in the FEIS effective science-based mitigation, monitoring, and adaptive management that protect desert tortoises and their habitats in the Pahrump and Ivanpah valleys and nearby areas during the construction, operations and maintenance, and decommissioning of the Project.

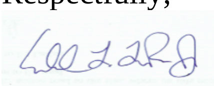
In addition, we request that BLM add this project and its impacts to a BLM database and geospatial tracking system for special status species, including Mojave desert tortoises, that track cumulative impacts (e.g., surface disturbance, paved and unpaved routes, linear projects, non-natives species occurrence, herbicide/pesticide use, wildfires, etc.), management decisions, and effectiveness of mitigation for each project. Without such a tracking system, BLM is unable to analyze cumulative impacts to special status species (e.g., desert tortoises) with any degree of confidence.

We request that the environmental consequences section of the FEIS include a thorough analysis of these indirect and cumulative effects mentioned in this letter (40 Code of Federal Regulations 1502.16) and implement appropriate mitigation to maintain the function of population connectivity for the Mojave desert tortoise and other wildlife species throughout the Pahrump and Ivanpah valleys.

We appreciate this opportunity to provide the above comments and trust they will help protect tortoises during any resulting authorized activities. Herein, we reiterate that the Council wants to be identified as an Affected Interest for this and all other projects funded, authorized, or carried out by the BLM that may affect desert tortoises, and that any subsequent environmental documentation for this project is provided to us at the contact information listed above. Additionally, we ask that you notify the Desert Tortoise Council at eac@deserttortoise.org of any proposed projects that BLM may authorize, fund, or carry out in the range of any species of desert tortoise in the southwestern United States (i.e., *Gopherus agassizii*, *G. morafkai*, *G. berlandieri*, *G. flavomarginatus*) so we may comment on them to ensure BLM fully considers actions to conserve these tortoises as part of its directive to conserve biodiversity on public lands managed by BLM.

Please respond in an email that you have received this comment letter so we can be sure our concerns have been registered with the appropriate personnel and office for this Project.

Respectfully,



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Appendix A. Demographic Status and Trend of the Mojave Desert Tortoise (*Gopherus agassizii*)

We provide the following information on the status and trend of the listed population of the desert tortoise to assist the BLM with its analysis of the direct, indirect, and cumulative impacts of the proposed Copper Rays Solar Project on the Mojave desert tortoise.

BLM's implementation of a conservation strategy for the Mojave desert tortoise in its resource management plans through 2020 has resulted in the following changes in the status for the tortoise throughout its range and in Nevada from 2004 to 2014 (Table 1; USFWS 2015) and 2004 to 2020 (Table 2). There are 17 populations of Mojave desert tortoise described below that occur in the Critical Habitat Units (CHUs) and Tortoise Conservation Areas (TCAs); 14 are on lands managed by the BLM.

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, and within the 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 km^2). 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 densities less than 3.9 adult tortoises per km^2 (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 Tables 1 and 2).

Table 1. Summary of 10-year trend data for 5 Recovery Units and 17 CHUs/TCAs for the Mojave desert tortoise, *Gopherus agassizii* (=Agassiz's desert tortoise). The table includes the area of each Recovery Unit and CHU/TCA, percent of total habitat for each Recovery Unit and CHU/TCA, density (number of breeding adults/km^2 and standard errors = SE), and the percent change in population density between 2004-2014. Populations below the viable level of 3.9 adults/km^2 (10 adults per mi^2) (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 CHU/TCA	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 Valley, 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 tortoise densities through 2014 have left the Eastern Mojave adult numbers at 33% (a 67% 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 Eastern Mojave Recovery Unit the proportion of juveniles in 2014 declined from 14 to 11 percent (a 21% decline) of their representation since 2007 (Allison and McLuckie 2018).

The USFWS and Utah Division of Wildlife Resources have continued to collect density data on the Mojave desert tortoise since 2014. The results are provided in Table 2 along with the analysis USFWS (2015) conducted for tortoise density data from 2004 through 2014. These data show that adult tortoise densities in most Recovery Units continued to decline in density since the data collection methodology was initiated in 2004. In addition, in the Northeastern Mojave Recovery Unit that had shown an overall increase in tortoise density between 2004 and 2014, subsequent data indicate a decline in density since 2014 (USFWS 2016, 2018, 2019, 2020, 2022a, 2022b).

Table 2. Summary of data for Agassiz's desert tortoise, *Gopherus agassizii* (=Mojave desert tortoise) from 2004 to 2021 for the 5 Recovery Units and 17 CHUs/TCAs. The table includes the area of each Recovery Unit and CHU/TCA, percent of total habitat for each Recovery Unit and CHU/TCA, density (number of breeding adults/km^2 and standard errors = SE), and percent change in population density between 2004-2014 (USFWS 2015). Populations below the viable level of 3.9 breeding individuals/km^2 (10 breeding individuals per mi^2) (assumes a 1:1 sex ratio) (USFWS 1994a, 2015) or showing a decline from 2004 to 2014 are in **red.**

Recovery Unit: Designated CHU/TCA &	% of total habitat area in Recovery Unit & CHU/TCA	2014 density/ km^2 (SE)	% 10-year change (2004–2014)	2015 density/ km^2	2016 density/ km^2	2017 density/ km^2	2018 density/ km^2	2019 density/ km^2	2020 density/ km^2	2021 density/ km^2
Western Mojave, CA	**24.51**	**2.8 (1.0)**	**–50.7 decline**							
Fremont-Kramer	9.14	2.6 (1.0)	–50.6 decline	4.5	No data	4.1	No data	2.7	1.7	No data
Ord-Rodman	3.32	3.6 (1.4)	–56.5 decline	No data	No data	3.9	2.5/3.4*	2.1/2.5*	No data	1.9/2.5*
Superior-Cronese	12.05	2.4 (0.9)	–61.5 decline	2.6	3.6	1.7	No data	1.9	No data	No data
Colorado Desert, CA	**45.42**	**4.0 (1.4)**	**–36.25 decline**							
Chocolate Mtn AGR, CA	2.78	7.2 (2.8)	–29.77 decline	10.3	8.5	9.4	7.6	7.0	7.1	3.9
Chuckwalla, CA	10.97	3.3 (1.3)	–37.43 decline	No data	No data	4.3	No data	1.8	4.6	2.6
Chemehuevi, CA	14.65	2.8 (1.1)	–64.70 decline	No data	1.7	No data	2.9	No data	4.0	No data
Fenner, CA	6.94	4.8 (1.9)	–52.86 decline	No data	5.5	No data	6.0	2.8	No data	5.3
Joshua Tree, CA	4.49	3.7 (1.5)	+178.62 increase	No data	2.6	3.6	No data	3.1	3.9	No data

Recovery Unit: Designated CHU/TCA	% of total habitat area in Recovery Unit & CHU/TCA	2014 density/km^2 (SE)	% 10-year change (2004–2014)	2015	2016	2017	2018	2019	2020	2021
Pinto Mtn, CA	1.98	2.4 (1.0)	–60.30 decline	No data	2.1	2.3	No data	1.7	2.9	No data
Piute Valley, NV	3.61	5.3 (2.1)	+162.36 increase	No data	4.0	5.9	No data	No data	No data	3.9
Northeastern Mojave AZ, NV, & UT	**16.2**	**4.5 (1.9)**	**+325.62 increase**							
Beaver Dam Slope, NV, UT, & AZ	2.92	6.2 (2.4)	+370.33 increase	No data	5.6	1.3	5.1	2.0	No data	No data
Coyote Spring, NV	3.74	4.0 (1.6)	+ 265.06 increase	No data	4.2	No data	No data	3.2	No data	No data
Gold Butte, NV & AZ	6.26	2.7 (1.0)	+ 384.37 increase	No data	No data	1.9	2.3	No data	No data	2.4
Mormon Mesa, NV	3.29	6.4 (2.5)	+ 217.80 increase	No data	2.1	No data	3.6	No data	5.2	5.2
Eastern Mojave, NV & CA	**13.42**	**1.9 (0.7)**	**–67.26 decline**							
El Dorado Valley, NV	3.89	1.5 (0.6)	–61.14 decline	No data	2.7	5.6	No data	2.3	No data	No data
Ivanpah Valley, CA	9.53	2.3 (0.9)	–56.05 decline	1.9	No data	No data	3.7	2.6	No data	1.8

Recovery Unit: Designated CHU/TCA	**% of total habitat area in Recovery Unit & CHU/TCA**	**2004 density/ km^2**	**2014 density/km^2 (SE)**	**% 10-year change (2004–2014)**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
Upper Virgin River, UT & AZ	**0.45**		**15.3 (6.0)**	**–26.57 decline**							
Red Cliffs Desert**	0.45	29.1 (21.4-39.6)**	15.3 (6.0)	–26.57 decline	15.0	No data	19.1	No data	17.2	No data	
Range-wide Area of CHUs - TCAs/Range-wide Change in Population Status	**100.00**			**–32.18 decline**							

*This density includes the adult tortoises translocated from the expansion of the MCAGCC, that is resident adult tortoises and translocated adult tortoises.

**Methodology for collecting density data initiated in 1999.

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^2 so far on Fort Irwin and the Marine Corps Air Ground Combat Center), intense or large scale fires (e.g., 576.2 km^2 of critical habitat that burned in 2005), development of utility-scale solar facilities (as of 2015, 194 km^2 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 3.

Table 3. 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%**

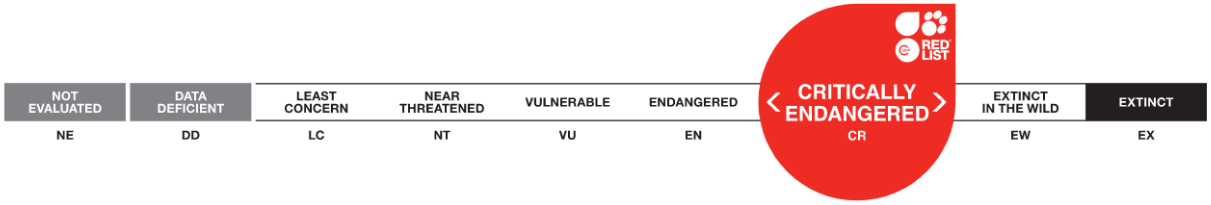
Habitat Availability: Data on population density or abundance does not indicate population viability. The area of protected habitat or reserves for the subject species is a crucial part of the viability analysis along with data on density, abundance, and other population parameters. In the Desert Tortoise (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 (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 resistance Dutcher et al. 2020). 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 and densities continue to decline in most Recovery Units since 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.

<u>IUCN Species Survival Commission</u>: The Mojave desert tortoise is now on 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 Mojave desert tortoise to be Critically Endangered (Berry et al. 2021). As such, it is a “species that possess an extremely high risk of extinction as a result of rapid population declines of 80 to more than 90 percent over the previous 10 years (or three generations), a current population size of fewer than 50 individuals, or other factors.” It is one of three turtle and tortoise species in the United States to be critically endangered. This designation is more grave than endangered.



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