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TECHNICAL MEMORANDUM

To: Soda Mt. Solar, LLC
c/o Apex Energy Solutions
640 Sutter Street
Folsom, California 95630
Submitted via email to: hannah@resolutionenvironmental.com

From: SWCA Environmental Consultants

Date: July 28, 2025

Re: **Desert Bighorn Sheep Literature Review and Technical Report for the Soda Mountain Solar Project / SWCA Project No. 68347**

INTRODUCTION

In response to the California Energy Commission's (CEC) second determination of incomplete application and request for information for the Soda Mountain Solar Project (24-OPT-03; project) Rev 1 Data Request (DR) BIO-3 (included below), SWCA Environmental Consultants (SWCA) has prepared this literature review and technical memorandum to evaluate and summarize existing scientific data and analyses relevant to desert bighorn sheep (*Ovis canadensis nelsoni*) in and adjacent to the project area. This review draws on previously collected GPS collar movement data, peer-reviewed publications, technical reports, and agency analyses, with a particular focus on studies by Dudek (2024), Aiello and Epps (2025), and Epps et al. (2013), to assess habitat use patterns, potential effects of the project, and the appropriateness of buffer recommendations.

Specifically, this analysis is intended to respond to DR BIO-3, which is written as follows:

> *Please provide any compelling biological data demonstrating that a reduction of the 0.25-mile buffer from the 10% slope, would not result in adverse or significant impacts to desert bighorn sheep. The information should include the following, as available:*
>
> - *Site-specific data or studies demonstrating desert bighorn sheep habitat use patterns in the vicinity of the project area, particularly near the eastern fence line;*
> - *Scientific rationale or peer-reviewed evidence supporting any proposed buffer reduction from the 0.25-mile, 0.64 mile, and 1.24-mile buffer; and*
> - *A discussion of how any proposed buffer or lack of buffer maintains consistency with CDFW recommendations and CEQA significance thresholds. If no such data is available, please explain the rationale for proposing a smaller buffer or no buffer despite the absence of biological evidence.*

Background

Studies by Dudek (2024), Aiello and Epps (2025), and Epps et al. (2013) provide important context on primary concerns for desert bighorn sheep in the region of the proposed project. Their research indicates that the primary concerns for desert bighorn sheep are not related to direct take, but to potential indirect impacts from construction, operation, and decommissioning, such as limiting habitat connectivity and inter-mountain movement for local populations. The population of desert bighorn sheep present in the southern Soda Mountains consists of a herd estimated to be between 51 and 100 individuals (California Department of Fish and Wildlife [CDFW] 2012). This location has been identified as a high conservation priority for restoring desert bighorn sheep metapopulation connectivity throughout the southeastern Mojave Desert, with planned wildlife crossings over Interstate 15 (I-15) proposed as mitigation for the Brightline high-speed rail project (Epps et al. 2007, 2013; Creech et al. 2014; CDFW 2023).

The proposed project would be constructed directly east and north-east of the movement corridors used by the local population of desert bighorn sheep in the southern Soda Mountains and is approximately 1.5 miles from the proposed wildlife overpass crossing (Figure 1). Details of the project construction, timeline, and biological analysis can be found in the Soda Mountain Solar Project Environmental Impact Report (EIR) and Soda Mountain Solar Project Biological Resources Technical Report (BRTR) (SWCA 2025, 2025a).

METHODOLOGY

SWCA conducted a review and analysis to address CEC DR BIO-3 with the goal of providing site-specific data, evaluating buffer recommendations, and supporting California Environmental Quality Act (CEQA) analysis. This effort focused on reviewing existing GPS collar movement data and analyses from studies by Dudek (2024), Aiello and Epps (2025), and Epps et al. (2013), emphasizing findings on habitat use patterns within the project footprint and surrounding Soda Mountain ranges.

In addition, SWCA examined recent project permits and mitigation requirements for developments affecting desert bighorn sheep, issued by the CDFW, U.S. Fish and Wildlife Service (USFWS), and Bureau of Land Management (BLM). This review provided insight into agency expectations, buffer distances, and mitigation measures implemented for comparable projects. SWCA also assessed peer-reviewed literature and technical reports related to desert bighorn sheep ecology, movement behavior, disturbance response, tolerance to human activities, and habitat connectivity to evaluate their relevance to potential impacts of the proposed project.

Finally, SWCA integrated the findings from these reviews to determine whether the proposed project design and mitigation measures maintain consistency with CDFW recommendations and CEQA significance thresholds in the absence of a protective buffer. This evaluation considered proposed avoidance, minimization, compensatory mitigation measures, and a new mitigation measure to reduce potential impacts to less-than-significant levels.

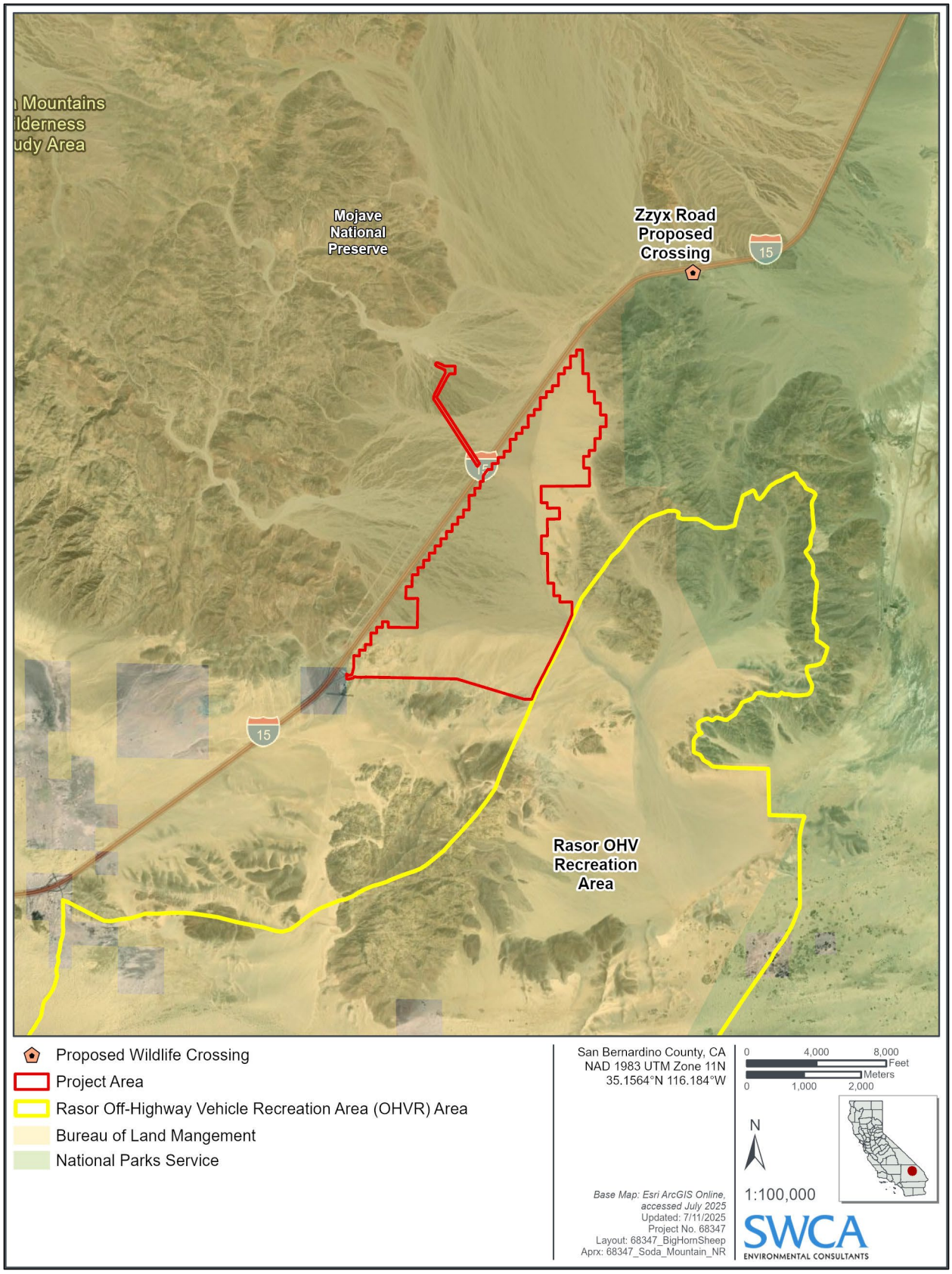

Figure 1. Project area with surrounding land use and proposed wildlife overpass crossing.

RESULTS

Site-Specific Data

SWCA reviewed the following three studies focused on the local desert bighorn sheep population:

- *Desert Bighorn Sheep Study Soda Mountain Solar* (Dudek 2024)
- *Potential impacts of the proposed Soda Mountain Solar development on desert bighorn sheep. A report prepared for the National Park Service* (Aiello and Epps 2025)
- *Potential impacts of proposed solar energy development near the South Soda Mountains on desert bighorn sheep connectivity* (Epps et al. 2013)

These studies relied primarily on data collected from GPS-collared individuals to track habitat use and movement within and between mountain ranges. The subset of GPS collar data for the analysis area—defined here as the project area and the surrounding North and South Soda Mountain ranges (see Figure 1)—was provided by ongoing studies of desert bighorn sheep in the region. These data were collected by the CDFW and Oregon State University Department of Fisheries, Wildlife, and Conservation Sciences. The data from these studies, summarized in Table 1, include GPS collar records collected between 2013 and 2022 for 50 desert bighorn sheep, with an approximately even split between males and females.

The Dudek analysis specifically used the dataset provided by the CDFW to evaluate movement and habitat use in and adjacent to the project footprint. The analysis was based on a total of 261,868 location data points collected from collared individuals. The results indicate that the majority (greater than 99%) of regular habitat use is concentrated in mountainous habitat, characterized as areas with a slope of 15% of more, and located outside of the project footprint. However, a small number of foraging events (0.01% of all data points) were recorded within the project area, primarily in the northeastern portion during the winter months (80% between December and March) (Dudek 2024).

The analysis conducted by Aeillo and Epps (2025) was conducted using a subset of GPS collar data collected on desert bighorn sheep populations occurring near I-15 and Interstate-40 (I-40) (Aeillo et al. 2023). This subset of data captured the movement of eight bighorn sheep from 2018 through 2021 and indicated that two individuals may have crossed the project footprint multiple times within the three-year study period (Aeillo and Epps 2025). These fine-scale movement data were then used as the basis for a movement simulation, in which habitat use predictions and frequency ranks, ranging from rare to frequent, were assigned for the entire analysis area. From this analysis, the project footprint mainly fell within the rare to infrequent use categories for desert bighorn sheep (Aeillo and Epps 2025). Additionally, these data were used to perform a visibility analysis to identify areas occupied by desert bighorn sheep surrounding the project area that would have a clear view of at least 25% of the solar arrays. Based on the simulation results, the project is estimated to be partly visible from 2,217 acres of adjacent habitat out of the 171,188 acres analyzed.

Finally, the Aeillo and Epps report used landscape and genetic connectivity analyses to determine important dispersal corridors for metapopulations of desert bighorn sheep. The results emphasized the importance of restoring the corridor between the South and North Soda Mountains, with the goal of long-term demographic connectivity to other metapopulations in the Mojave Desert. This analysis was key in identifying priority locations for restoring connectivity between mountain ranges. These areas were recognized as important for wildlife movement before the proposed Brightline project, which later incorporated planned wildlife crossings at these locations as part of its mitigation measures (CDFW 2023).

Table 1. Relevant Bighorn Sheep Data and Analyses Conducted in the Project Area

Study Title	Bighorn Sheep (n)	Females (n)	Males (n)	Years	Data Source	Project Footprint Use Results
Dudek 2024	50	36	14	2013–2023	GPS Collars	30 data points from 11 individuals (seven female, four male) occurred in the project footprint, 80% of which occurred during the winter.
Aeillo and Epps 2025	8	Unk	Unk	2018–2021	GPS Collars	Suggested desert bighorn sheep may have crossed the project footprint multiple times during the period, but no clear data points were collected in the project footprint.
Epps et al. 2013	N/A	N/A	N/A		Landscape Analysis	Identified the corridor between the South and North Soda Mountains as the most important restorable corridor in the Mojave Desert for long-term demographic connectivity.

Literature Review

There is a general lack of research on the impacts of solar development on ungulate species. The few published studies that exist focus on other ungulates and do not specifically examine the effects of these development types on desert bighorn sheep. One such study, conducted by Sawyer et al. 2025, examined the effects of utility-scale solar energy on resident and migratory populations of pronghorn (*Antilocapra americana*) during pre- and postconstruction of the facility. This study included 20 radio-collared individuals and indicated changes in movement patterns and high-use areas surrounding the solar facility. The study highlighted a reduction in high-use habitat from 10% to 4% within 1 kilometer of the solar site. However, the authors conceded that because their preconstruction data covered only a six-month period, it may be difficult to draw conclusions about winter habitat use and the migratory paths of the resident and migratory herds.

In the absence of published research on the effects of solar facility development on desert bighorn sheep, several other solar and infrastructure projects serve as examples of developments that have been successfully approved using mitigation measures similar to those proposed for the project (see Table 2). One such example includes the Ivanpah Solar Electric Generating System, located within the range of the Clark Mountains population near the California-Nevada border. Desert bighorn sheep were observed as close as 2.9 miles from the project site. Construction of this project began in 2010 and was completed in 2014. Mitigation requirements to reduce habitat fragmentation included installing and maintaining artificial water sources (BLM 2010). Although no studies have specifically evaluated the effects of this large-scale solar facility on nearby desert bighorn sheep populations, a 2016 status report for the Clark and Kingston Mountain Ranges estimated populations at 83 and 73 individuals, respectively, with the Kingston Mountains showing a slight increase (CDFW 2018).

The Desert Sunlight Solar Farm is an additional solar facility that was built within the range of desert bighorn sheep. Their presence was confirmed within a 10-mile radius of the project, with suitable foraging habitat present within the washes and alluvial fans directly adjacent to the project footprint. Analyses conducted during the planning phase of the project acknowledged the importance of these habitats and the potential impact this project could have on inter-mountain movements of local populations. However, the primary mitigation measure for desert bighorn sheep was a conditional requirement: “If effects to Nelson’s Bighorn Sheep cannot be avoided, the Applicant shall consult with the California Department of Fish and Game to determine the appropriate level of restoration and mitigation for effects to essential habitat and/or travel corridors” (BLM 2011). This measure also outlined potential options for habitat mitigation. The project's Biological Resources Technical Report did not document any desert bighorn sheep observations within the project footprint, and the impact analysis

concluded that mitigation reduced effects to less-than-significant levels. It is unclear whether this mitigation measure was ever formally triggered, as there is no available evidence or documentation suggesting that additional consultation or habitat restoration was required.

Additional development projects with effects to bighorn sheep include the Sunrise Powerlink Project and Ocotillo Wind Farm, both completed in 2012. These projects all occurred within nearby occupied bighorn sheep ranges and implemented mitigation measures to successfully meet regulatory standards (see Table 2). Ocotillo Wind Farm was constructed on BLM lands near habitat occupied by Peninsular bighorn sheep (a federally endangered population of desert bighorn sheep). This project had direct impacts to 157.3 acres of suitable habitat, with several observations of individuals surrounding the project boundary (Helix 2012a). Thus, formal consultation with the USFWS under Section 7 of the Endangered Species Act was required. The USFWS released a biological opinion stating the proposed actions would not likely jeopardize the continued existence on Peninsular bighorn sheep and issued incidental take of five ewes and five lambs. Mitigation measures to reduce impacts also included compensatory mitigation at an off-site habitat restoration site, the development of a Bighorn Sheep Mitigation and Monitoring Plan, timing restrictions of construction activities within the lambing season, and the requirement that a Desert Bighorn Monitor be present during all construction activities, with the authority to stop all project work if an individual sheep was within 1,000 feet of construction (Helix 2012a; BLM 2012a). Monitoring reports provided to the BLM show compliance with these mitigation measures, including the presence of the Desert Bighorn Monitor, during all construction activities, and document evidence of bighorn tracks through the project area (BLM 2012b). Off-site mitigation was also achieved through the restoration of Carizzo Marsh in Anza Borrego State Park (Helix 2012b).

Although formal buffer requirements varied across these projects, all were able to meet regulatory standards through tailored mitigation measures. This precedent demonstrates that projects with potential indirect impacts on bighorn sheep movement and habitat can be successfully permitted and operated with appropriate, site-specific mitigation without imposing standard buffer distances.

Table 2. Mitigation Measures for the Proposed Soda Mountain Project and Comparable Projects with Effects on Bighorn Sheep Populations

Mitigation Measure	Proposed Soda Mountain Solar Project	Ivanpah Solar Electric Generating System	Desert Sunlight Solar Farm	Sunrise Powerlink Project	Ocotillo Wind Farm	Brightline West
Restricted Activity During Lambing Season (Dec 1–June 1)	X			X	X	
Preconstruction Surveys in Desert Bighorn Sheep Habitat	X	X	X		X	X
Noise Restrictions in Desert Bighorn Sheep Habitat	X					
Artificial Water Sources	X	X	X			
Exclusion Fencing	X	X	X			X
Buffers				X	X	
Mitigation Land Acquisition	X	X		X	X	
Biological Monitoring	X	X		X	X	X
Mitigation and Monitoring Plan	X				X	
Highway Wildlife Overpass						X

Mitigation Measure	Proposed Soda Mountain Solar Project	Ivanpah Solar Electric Generating System	Desert Sunlight Solar Farm	Sunrise Powerlink Project	Ocotillo Wind Farm	Brightline West
Bighorn Sheep Habitat Connectivity (Migration Support/Water Source Management)	X					
Bighorn Sheep (-Specific) Monitoring	X					
Bighorn Sheep Adaptive Management Strategy	X					
Bighorn Sheep Demographic and Genetic Management	X					

CDFW Recommendations and CEQA Significance Thresholds

Dudek's 2024 report summarizes CDFW's recommendations since 2013, and includes current recommendations based on these and Dudek's recent analyses. The Dudek report includes revisions to existing mitigation measures and well as new mitigation measures that were not included in the project EIR and BRTR prior to Dudek's analyses. Included in Dudek's report is the following suggested project footprint revision:

> *It is recommended that the project footprint be revised to avoid the 0.25-mile buffer from the 10% slope of the surrounding landscape, specifically in the northern array area.*

The suggested buffer is intended to avoid disrupting key behaviors such as resting, foraging, and predator avoidance, especially during sensitive periods like lambing or drought, agency guidance recommends establishing a protective buffer to reduce disturbance from construction noise, visual impacts, and human activity. All mitigation measure revisions and suggested mitigation measures were subsequently adopted as part of the project, excepting the suggested project footprint revision.

The CEC's Data Request BIO-3 specifically requests a discussion of how any proposed buffer, or the absence of a buffer maintains consistency with CDFW recommendations and CEQA significance thresholds. The following analysis addresses that request by summarizing relevant data on habitat use patterns, existing disturbance, and mitigation measures supporting this approach.

Studies in the analysis area, including Aiello and Epps (2025), acknowledge that development could have long-term indirect impacts on the southern Soda Mountains desert bighorn sheep population by affecting inter-mountain movement. Aiello and Epps note that with the I-15 barrier to the north, a planned high-speed rail corridor, and an existing off-highway vehicle (OHV) recreation area to the south, opportunities for inter-mountain movement are already constrained. However, GPS collar data from both the Aiello and Epps (2025) and Dudek (2024) analyses demonstrate regular bighorn sheep use within the OHV-designated area, with no clear indication of restricted movement between mountain ranges. Figures from these studies show consistent use patterns within the recreational area, suggesting that despite OHV activity, the population continues to use these corridors. For example, Aiello and Epps (2025) highlights high-use habitat overlapping with the OHV area, while raw GPS collar data in Dudek (2024) confirms frequent movements through these zones.

This evidence indicates that bighorn sheep in the South Soda Mountains have adapted to existing disturbance. Research has documented that desert bighorn sheep can tolerate and habituate to intermittent human activities when valuable resources are present (Lowrey and Longshore 2017; Papouchis et al.

2001; Jansen et al. 2007). The Rasor Road OHV recreation area clearly overlaps with areas of high bighorn use, suggesting some level of tolerance to recreational disturbance. While specific visitation data are limited, OHV trend surveys in San Bernardino County indicate ongoing and growing recreational use (BLM 2023), reinforcing the conclusion that the local herd is already exposed to, and has adapted to, intermittent disturbance without apparent disruption of inter-mountain movements.

Further supporting a reduced or absent buffer approach, the project includes mitigation measures specifically designed to reduce disturbance and enhance habitat connectivity. The closure of Arrowhead Road would prohibit motorized access in high-use northern portions of the analysis area, eliminating an existing source of intermittent disturbance in key habitat. Additionally, the project's fencing design and strategically placed artificial water sources are intended to guide bighorn movement toward the planned I-15 wildlife overpass, which has been identified as critical for restoring long-term connectivity between the South Soda Mountains and adjacent ranges to the north (Aiello and Epps 2025).

Scientific studies have also shown that bighorn sheep and related ungulates can learn and adapt to local conditions, concentrating use in favorable habitats while avoiding less suitable areas (Spitz et al. 2018; Jesmer et al. 2018). Within the analysis area, movement data indicate that bighorn sheep already prefer high-resource zones in the northwest South Soda Mountains while avoiding the I-15 barrier. The project footprint itself primarily consists of rarely used winter foraging habitat with extremely low recorded use in GPS data (<0.01% of location points).

Taken together, these data support the conclusion that the recommended buffer of 500 meters is not necessary to maintain consistency with CDFW recommendations or CEQA thresholds. The combination of existing demonstrated tolerance to disturbance, adaptive movement patterns, extremely limited use of the project area, and planned mitigation to reduce disturbance and enhance connectivity indicates that the project can effectively avoid significant impacts to bighorn sheep movement even without implementing a dedicated buffer zone.

EFFECTIVENESS OF PROPOSED MITIGATION UNDER CEQA

The mitigation measures identified in Table 3 are designed to avoid and minimize impacts to desert bighorn sheep and are expected to be effective in reducing potential impacts to less-than-significant levels. The determinations of significance of project impacts to desert bighorn sheep are based on applicable policies, regulations, goals, and guidelines defined by CEQA. Specifically, the project would be considered to have a significant effect on biological resources if the effects exceed the significance criteria described below:

1. Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service.

2. Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service.

3. Have a substantial adverse effect on state or federally protected wetlands (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?

4. Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites.

5. Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance.

6. Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan.

Several measures address potential degradation or loss of desert bighorn sheep habitat. Compensatory mitigation (MM BIO-27) ensures that the limited area of winter foraging habitat affected by the project will be offset at a 1:1 ratio, while the artificial water sources (MM BIO-26) and vegetation BMPs (MM BIO-28) support the continued availability of critical resources within the broader habitat. These measures preserve the ecological function of surrounding lands and prevent a net loss in habitat value.

To reduce the potential for take or disruption of sensitive behaviors, the project includes monitoring by a Designated Biologist (MM BIO-5, MM BIO-7, MM BIO-9), reduced speed limits (MM BIO-10), and worker education (MM BIO-2), all of which are intended to minimize harm to individual animals. Noise limitations near rugged terrain during the lambing season (MM BIO-24) further protect vulnerable life stages. SWCA also recommends expanding MM BIO-24 to prohibit construction during the lambing period (January 1 – June 30), unless preconstruction surveys confirm the absence of nursery groups in the area.

The project design and mitigation also support long-term connectivity and dispersal. Fencing has been designed to direct movement toward the planned I-15 wildlife crossing, and the closure of Arrowhead Road will eliminate motorized access in high-use areas, reducing ongoing disturbance where bighorn sheep activity is most frequent. Movement modeling and GPS collar data indicate that sheep are currently able to move through the landscape despite recreational pressures, and these measures are expected to further enhance functional connectivity.

Cumulative impacts for a project would be significant if the incremental effects of the individual project are considerable when combined with the effects of past projects, other current projects, and probable future projects. A Cumulative Projects table is provided in Chapter 3 of the project EIR. Cumulative impacts can result from individually minor but collectively significant projects taking place over a period.

As the County experiences growth in large-scale energy projects and other developments, broad-scale impacts to biological resources are also increasing. As of May 2024, over 23,000 acres of land have been approved for renewable energy projects by the County (San Bernardino County 2024). Currently, the nearest large-scale solar projects are approximately 40-45 miles to the northeast and southwest of the project. Several special-status wildlife species—including desert bighorn sheep—use the study area and the surrounding area. When considered together with other existing or proposed projects in the County, impacts to special-species due to primarily habitat loss, wildlife corridor impairment, and land use conversion may be cumulatively considerable.

The California Department of Transportation, CDFW, and Brightline West have entered into an agreement to design and construct three wildlife overcrossings across I-15 and the future Brightline West high-speed rail system connecting Las Vegas and Southern California (Caltrans 2023). These dedicated overcrossings would provide a sustainable and safe path for wildlife—especially for desert bighorn sheep—over the existing northbound and southbound highway lanes and the future high-speed rail system to be built within the median (Caltrans 2023). CDFW has identified three priority locations for the wildlife overcrossing, all in San Bernardino County (Caltrans 2023). These overcrossings will be built

near Zzyzx Road, near Mountain Pass and near Rasor Road, spanning the entire width of I-15 including the Brightline West rail line (Caltrans 2023). Beyond the three wildlife overcrossings, the Brightline West project will maintain or improve more than 600 culverts and large-scale crossings under I-15 that exist today (Caltrans 2023). The proposed Brightline overcrossings would reduce project impacts associated with temporary and/or permanent disruptions to local wildlife movement, most notably impacts that pertain to desert bighorn sheep. The proposed Brightline overcrossings would reduce cumulative impacts associated with temporary and/or permanent disruptions to local wildlife movement, most notably impacts that pertain to desert bighorn sheep.

This analysis considers relevant desert bighorn sheep mitigation measures based on Appendix 4[1] of the BLM's March 2016 *Soda Mountain Solar Project and Amendment to the California Desert Conservation Area Plan Record of Decision* (ROD), which are included in the current proposed mitigation measures, herein[2], as MM BIO-29 through MM BIO-32 (see Table 3). It is assumed the project would implement these mitigation measures because they were required by BLM in connection with its approval of an earlier version of the project in 2016. This includes the following (measure titles only):

- MM BIO-29 (ROD MM 3.4-3a): Bighorn Sheep Habitat Connectivity
- MM BIO-30 (ROD MM 3.4-3b): Bighorn Sheep Adaptive Management Strategy
- MM BIO-31 (ROD MM 3.4-3c): Bighorn Sheep Monitoring
- MM BIO-32 (ROD MM 3.4-3d): Bighorn Sheep Habitat Compensation
- MM BIO-33 (ROD MM 3.4-3e): Bighorn Sheep Demographic and Genetic Management

Together, these measures support the conclusion that the project will not result in a substantial reduction in biological diversity, will not impair wildlife movement, and will not cause a permanent loss in the extent or function of significant habitat. The implementation of the measures in Table 3 provides a biologically grounded and feasible approach to reducing potential impacts to a level that is less than significant under CEQA.

CONCLUSION AND RECOMMENDATIONS

While research specifically examining the effects of large-scale solar development on desert bighorn sheep remain limited, available site-specific data do not indicate that the project area functions as critical movement habitat that would necessitate a 500-meter buffer. GPS collar data and movement analyses show that the project area receives extremely limited, seasonal use, with less than 0.01% of collar locations recorded within the footprint, primarily as occasional winter foraging events. This low level of use was consistent throughout the project area, including near the eastern fence line. In addition, despite ongoing recreational activities in high-use areas, bighorn sheep continue to move between mountain ranges, suggesting that the local population has developed some tolerance for existing disturbance.

The project EIR (SWCA 2025) incorporates mitigation measures recommended in the Dudek (2024) analysis, focusing on measures designed to maintain connectivity and minimize disturbance. These include compensatory habitat mitigation for the loss of potential winter foraging habitat and closure of Arrowhead Road to eliminate motorized access in sensitive areas, reducing disturbance where bighorn use is most frequent. These measures—combined with the cumulative impacts analysis—support the

[1] Adopted Mitigation Measures

[2] These mitigation measures are not included in the current project EIR.

conclusion that the project will not significantly hinder bighorn sheep movement and will achieve less-than-significant impacts consistent with CEQA and CDFW guidance, even without the implementation of a formal buffer.

SWCA recommends revising *MM BIO-24: Limited Operating Period* to include restrictions on construction activity during the lambing period (January 1–June 30). If work must occur during this time, preconstruction surveys should be conducted to verify the absence of lambing or nursery groups within the planned work area.

Table 3. Mitigation Measures Related to Desert Bighorn Sheep for the Proposed Soda Mountain Solar Project

Mitigation Measure	Description
MM BIO-1: Best Management Practices (BMP)	BMPs shall be implemented prior to and during construction to control dust pollution, prevent discharge of potentially harmful chemicals, and prevent changes in hydrology.
MM BIO-2: Worker Environmental Awareness Program (WEAP)	Designated Biologist will provide a WEAP to all project personnel on sensitive species identification, BMPs, and protocols to prevent impacts to sensitive species.
MM BIO-5: Biological Monitoring	Monitor will be present during all construction activities to ensure compliance with all avoidance and minimization measures.
MM BIO-7 Designated Biologist	A qualified Designated Biologist will be approved by BLM to effectively implement all project mitigation measures.
MM BIO-8: Fence Design and Site Permeability	Permanent fencing will be installed around the project and will direct wildlife toward the wildlife undercrossing. The project will also extend a line of fencing to connect with the I-15 wildlife overpass structure fencing.
MM BIO-9: Compliance Monitoring by the Designated Biologist	The Designated Biologist (DB) will ensure compliance with all mitigation measures and shall be the primary contact agency for the implementation of these measures. The DB will have the authority and responsibility to halt any project activities that are in violation of the mitigation measures.
MM BIO-10: Speed Limits	Speed limits will not exceed 15 miles per hour (mph) outside of permanent project fencing during construction activities and 25 mph within permanent fencing during operation and maintenance to minimize impacts to wildlife species.
MM BIO-23: Mitigation and Monitoring Plan	Prior to construction, a desert bighorn sheep mitigation and monitoring plan to monitor wildlife crossings, fencing effectiveness, water sources and all other implemented mitigation measures for a minimum of eight years.
MM BIO-24: Limited Operating Period	Noises greater than 85 A-weighted decibels will not be allowed within 500 meters of the 10% slope line during lambing season (December 1–June 30).
MM BIO-25: Work Boot Decontamination	All construction personnel will be trained in the importance of and procedures for decontaminating boots to prevent transmission of disease from domesticated sheep and goats to desert bighorn sheep.
MM BIO-26: Artificial Water Sources	The project will design and install at least five new artificial water sources in cooperation with CEC, CDFW, and BLM.
MM BIO-27: Compensatory Mitigation	Mitigation of bighorn sheep habitat will be acquired at a 1:1 ratio either through the Desert Tortoise Compensatory Mitigation or a separate compensatory mitigation for loss of foraging habitat.
MM BIO-28: Vegetation Best Management Practices	The Applicant shall undertake the measure to manage the construction site and related facilities in a manner to avoid or minimize impacts to vegetation resources.

Mitigation Measure	Description
MM BIO-29 (ROD MM 3.4-3a): Bighorn Sheep Habitat Connectivity	In addition to MM BIO-26, which will provide at least five water sources to improve bighorn sheep habitat connectivity, this measure provides additional detail and requirements for the proposed water sources. Water sources will be designed to exclude ravens to the extent possible, to minimize potential indirect effects on other wildlife species such as desert tortoise and Mojave fringe-toed lizard. To compensate for impacts to bighorn sheep habitat connectivity, the Applicant/Owner shall support current CDFW and NPS efforts to encourage connectivity of bighorn sheep populations between the south Soda Mountains, the north Soda Mountains, and the Avawatz Mountains, which are located further to the north of the project site. More specifically, the Applicant/Owner shall provide funding for CDFW, or similar entity, to install between three and five (total) pre-fabricated bighorn sheep water sources (e.g., guzzlers) in the north Soda Mountains/Avawatz Mountains corridor and provide funding to refill them through the life of the project. The project owner shall consult with BLM and with the CDFW Desert Bighorn Sheep Program Coordinator to identify strategic locations for water sources to promote bighorn sheep migration through the north Soda Mountain range. Water sources will be situated in locations that: 1) facilitate use of existing I-15 crossing sites at culverts and bridges; 2) are situated at key locations within the movement corridor; 3) are accessible using existing roads whenever possible for filling and maintenance; and 4) are situated outside of existing wilderness boundaries and outside of wilderness study areas. The project owner shall monitor and manage the artificial or restored water source for the benefit of bighorn sheep for the life of the project, or shall provide sufficient funding to support such monitoring and management by an approved third party. At the end of the Project, CDFW shall have the option to retain and manage the water sources or have them removed by the Applicant/Owner during the decommissioning process.

Mitigation Measure	Description
MM BIO-30 (ROD MM 3.4-3b): Bighorn Sheep Adaptive Management Strategy	The Applicant/Owner shall implement a Bighorn Sheep Adaptive Management Strategy in coordination with the BLM, National Park Service (NPS), and CDFW aimed at maintaining existing foraging, movement, and feeding opportunities for bighorn sheep near the project site and at improving regional opportunities to restore bighorn sheep movement. The Bighorn Sheep Adaptive Management Strategy shall be submitted to BLM, NPS, and CDFW for review and approval prior to initiation of ground-disturbing activities on the Project site and shall include, at a minimum, the following provisions: 1. The Applicant/Owner shall fund and/or implement a 10-year study that examines the response of bighorn sheep to the project. This may include the use of radio collars to track the movements of bighorn sheep prior to, during, and post-construction. The study will be conducted in coordination with BLM, CDFW, and NPS. The tracking of bighorn sheep will inform the adaptive management approaches that follow. 2. The Applicant/Owner shall improve the culvert crossing north of Zzyzx Road for bighorn sheep through the use of temporary water sources on both sides of the I-15 freeway. Water sources will be maintained and refilled for a minimum period of 10 years. With CDFW approval, the Applicant/Owner will implement a monitoring study to examine bighorn sheep behavior near the temporary water sources through the use of motion-sensor cameras, radio tracking collars, direct observation of sheep sign (e.g., the presence of tracks or scat), and/or by other means. 3. If the temporary water sources successfully encourage bighorn sheep to use the culvert crossing, as measured by sheep drinking from the water sources and/or crossing through the culvert, identified through the study implemented in item 1, the water sources shall be left in place permanently. Concurrently, the additional water sources described in Mitigation Measures BIO-26 and BIO-29 to encourage use of the north Soda Mountains/Avawatz Mountains corridor also shall be left in place and maintained/filled for the life of the project. 4. Based on the results of item 1, the Applicant/owner will implement measures to minimize the effects of human activities on bighorn sheep. Such actions may include removing fences that currently block underpass movement, establishing new fences to funnel sheep towards underpasses and away from traffic, and/or using shields to reduce the noise and visibility of traffic in key locations. 5. To provide for bighorn sheep demographic and genetic management, the Applicant/Owner shall establish a $250,000 bond prior to the start of construction to be used, at CDFW's discretion, to conduct regional translocation of bighorn sheep. If at any time, efforts are undertaken to construct an overcrossing near the project, with the approval of BLM, NPS, and CDFW, these funds may be allocated to that construction effort. If at any time, prior to expenditure of these funds, bighorn sheep are documented to move through the existing undercrossings between north and south Soda Mountains, or a bighorn sheep population has become established in the North Soda Mountains, these funds may be allocated for bighorn sheep connectivity and genetics management projects elsewhere in the Mojave desert.

Mitigation Measure	Description
MM BIO-31 (ROD MM 3.4-3c): Bighorn Sheep Monitoring	The Applicant will retain a biological consultant approved by the BLM and CDFW to serve as the Bighorn Sheep Monitor of construction activities located within 1,000 feet of bighorn sheep foraging or bedding areas. The Bighorn Sheep Monitor will be present if proposed construction activities are planned within approximately 0.5 mile of 20 percent slopes or within 0.25 mile of 10 percent slope (whichever is less). If bighorn sheep are observed, no construction activities will be conducted within 1,000 feet of the sheep until the Bighorn Sheep Monitor verifies that the sheep have moved to at least 1,000 feet from planned activities. If the Bighorn Sheep Monitor determines that planned activities are unlikely to adversely affect or disrupt normal sheep behavior, planned activities may proceed. If the Bighorn Sheep Monitor is not present on site when sheep are observed, all proposed activities within 0.5 mile of 20 percent slope or 0.25 mile of 10 percent slope will stop, and the Bighorn Sheep Monitor will be contacted immediately for guidance on how to proceed with planned activities. The Bighorn Sheep Monitor will prepare daily monitoring reports that will be submitted to the Designated Biologist and BLM, NPS, and CDFW.
MM BIO-32 (ROD MM 3.4-3d): Bighorn Sheep Habitat Compensation	The Applicant/Owner shall acquire and protect suitable bighorn sheep foraging habitat to compensate for the loss of on-site foraging habitat within 0.25 mile of 10 percent slopes. The amount of compensation habitat shall be determined based on the final, BLM-approved construction plans. The off-site replacement habitat shall be connected to existing occupied bighorn sheep habitat. Compensation can be in the form of fee title acquisition or the acquisition of conservation easement or other habitat protecting measure. Compensation habitats must be approved by BLM and CDFW.
MM BIO-33 (ROD MM 3.4-3e): Bighorn Sheep Demographic and Genetic Management	In lieu of bridge funding, the bond described in Mitigation Measure BIO-31, Bighorn Sheep Adaptive Management Strategy, may be applied at CDFW's discretion toward bighorn sheep demographic and genetic management. If at any time, efforts are undertaken to construct an overcrossing near the Project, with the approval of BLM, NPS, and CDFW, these funds may be allocated to that construction effort. If at any time, prior to expenditure of these funds, bighorn sheep are documented to move through the existing undercrossings between north and south Soda Mountains, or a bighorn sheep population has become established in the North Soda Mountains, these funds may be allocated for bighorn sheep connectivity and genetics management projects elsewhere in the Mojave desert.

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