APPENDIX K
Individual Responses to Comments

Individual Responses

In this section, responses are provided for each substantive comment received on the Draft PA/EIS/EIR. All comment letters, coded to delineate comments as described above, are provided in Appendix J.

Letter 1 – Responses to Comments from Chemehuevi Cultural Center

1-1 Mitigation Measure 3.6-2 (Draft PA/EIS/EIR, p. 3.6-31) requires that in the event that a cultural resource is inadvertently discovered during Project implementation, if that resource constitutes a historic property per Section 106 of the National Historic Preservation Act or a historical or unique archaeological resource under CEQA, and if preservation in place is demonstrated to be infeasible, a treatment plan would be prepared and the BLM would consult with appropriate Native American representatives in determining appropriate treatment for resources if the resources are prehistoric or Native American in nature. Consultation with Indian tribes, including the Chemehuevi Indian Tribe, is ongoing.

Letter 2 – Responses to Comments from Ralph Guidero

2-1 The comment is noted. The comment does not address the adequacy or accuracy of the Draft PA/EIS/EIR.

Letter 3 – Responses to Comments from Caltrans Planning

3-1 As indicated in Draft PA/EIS/EIR Section 3.16, Transportation and Travel Demand Management, a Transportation and Public Access Analysis was prepared by Panorama Environmental, Inc., a consultant to the Applicant. A copy of the Transportation and Public Access Analysis was provided to Caltrans Planning in response to this comment.

Letter 4 – Responses to Comments from Native American Heritage Commission

4-1 California Government Code Section 65040.2 describes the responsibilities of the State of California Office of Planning and Research to develop and adopt guidelines for the

preparation of and the content of the mandatory elements required in city and county general plans. Section 65040.1(g) requires that by March 1, 2005, these guidelines shall contain advice, developed in consultation with the Native American Heritage Commission, for consulting with California Native American tribes for the preservation of, or the mitigation of impacts to, places, features, and objects described in Sections 5097.9 and 5097.993 of the Public Resources Code; procedures for identifying through the Native American Heritage Commission the appropriate California Native American tribes; procedures for continuing to protect the confidentiality of information concerning the specific identity, location, character, and use of those places, features, and objects; and procedures to facilitate voluntary landowner participation to preserve and protect the specific identity, location, character, and use of those places, features, and objects.

The goals and policies set forth in the San Bernardino County General Plan that relate to the protection of cultural resources and are relevant to the Project are described in Draft PA/EIS/EIR Section 3.6, *Cultural Resources*, beginning on page 3.6-20. To the extent applicable based on San Bernardino County jurisdiction, the Project would be consistent with these goals and policies. See Appendix I, General Plan Consistency Evaluation.

California Government Code Section 65040.2 contains no requirements specifically applicable to the Project.

4-2 In consideration of the Project's potential effects on the significance of an historical resource(s), an EIR has been prepared pursuant to CEQA Guidelines Section 15064.5(b). Responses to requests for specific mitigation actions are provided in Responses 4-3 through 4-10, below.

4-3 As described on page 3.6-12 of the Draft PA/EIS/EIR, a records search was conducted at the San Bernardino Archaeological Information Center (SBAIC) for the Project area and a 1-mile buffer. Additionally, the BLM has been consulting with Indian tribes in order to identify any potential sacred or traditional cultural resources that may be affected by the Project (see Draft PA/EIS/EIR pages 3.6-12 and 4.3). No traditional cultural resources have been identified within or adjacent to the Project area.

4-4 Field inventory investigations completed for the Project are described starting on page 3.6-12 of the Draft PA/EIS/EIR. It is not anticipated that additional archeological inventory surveys will be required; however, if needed, appropriate coordination would occur and confidential information appropriately protected from public disclosure.

4-5 Federally recognized tribes on the list provided with this letter were consulted as part of the BLM's consideration of the potential impacts of the Project (see Draft PA/EIS/EIR, pp. 3.6-12 and 4-3, and Proposed PA/FEIS/EIR Section 4.2.2.2). The distribution list for the Project has been revised to include all contacts listed in the NAHC's comment letter.

4-6 The Draft PA/EIS/EIR addresses the potential for subsurface archeological resources to be present even where surface expression is absent. See, for example, Mitigation

Measures 3.6-1 through 3.6-3 (Draft PA/EIS/EIR, pp. 3.6-30 and 3.6-31), which require the creation of a Cultural Resources Discovery and Monitoring Plan, require cultural resource monitoring during construction, and impose certain obligations to address inadvertent discovery of Native American and other human remains, respectively.

4-7 The Draft PA/EIS/EIR addresses environmental justice in Section 3.14, Socioeconomics and Environmental Justice (p. 3.14-1 et seq.). Additionally, tribal consultation was described in Draft PA/EIS/EIR Section 4.2.2.2 (p. 4-3) and an updated discussion as of this publication is provided in Proposed PA/FEIS/EIR Section 4.2.2.2. Executive Order B-10-11 contains no requirements specifically applicable to the Project.

4-8 Refer to Response 4-6.

4-9 No sacred or historically significant cultural resources are located within the Project site. Mitigation Measure 3.6-2 (Draft PA/EIS/EIR p. 3.6-31) requires that should a cultural resource be inadvertently discovered during Project implementation, and if that resource constitutes a historic property per Section 106 of the National Historic Preservation Act or a historical or unique archaeological resource under CEQA, preservation in place shall be the preferred manner of mitigation. If preservation in place is demonstrated to be infeasible, a treatment plan would be prepared and the BLM would consult with appropriate Native American representatives in determining appropriate treatment for resources if the resources are prehistoric or Native American in nature.

4-10 Mitigation Measure 3.6-3 (Draft PA/EIS/EIR p. 3.6-31) imposes certain obligations to address inadvertent discovery of Native American and other human remains, including compliance with the Native American Graves Protection and Repatriation Act (NAGPRA). Because the Project is located on federally owned lands, Health and Safety Code Section 7050.5, CEQA Guidelines Section 15064.5(e), and Public Resources Code Section 5097.98 would not be applicable to the Project.

Letter 5 – Responses to Comments from Courtney Larr

5-1 Potential impacts to Rasor Road and the Rasor OHV Recreation Area are considered and analyzed in Draft PA/EIS/EIR Section 3.13, Recreation (p. 3.13-1 et seq.). Also, refer to Common Response 5 in Proposed PA/FEIS/EIR Section 4.5.3.5 regarding clarification of potential impacts to Rasor Road and Rasor OHV Recreation Area.

Letter 6 – Responses to Comments from Dedra Smith

6-1 Potential impacts to Rasor Road and the Rasor OHV Recreation Area are considered and analyzed in Draft PA/EIS/EIR Section 3.13, Recreation (p. 3.13-1 et seq.). Also, refer to Common Response 5 in Proposed PA/FEIS/EIR Section 4.5.3.5 regarding clarification of potential impacts to Rasor Road and Rasor OHV Recreation Area.

Letter 7 – Responses to Comments from Eric and Kelli Reed

7-1 As described in Draft PA/EIS/EIR Section 2.5.3, Alternative D would allow for the continued use of the existing Rasor Road and would not construct a new road. The comment's statement of support for this option is noted.

7-2 Refer to Common Response 5 in Proposed PA/FEIS/EIR Section 4.5.3.5 regarding clarification of potential impacts to Rasor Road and Rasor OHV area.

Letter 8 – Responses to Comments from Jonathan Hall

8-1 Potential impacts to Rasor Road and the Rasor OHV Recreation Area are considered and analyzed in Draft PA/EIS/EIR Section 3.13, Recreation (p. 3.13-1 et seq.). Also, refer to Common Response 5 in Proposed PA/FEIS/EIR Section 4.5.3.5 regarding clarification of potential impacts to Rasor Road and Rasor OHV area.

Letter 9 – Responses to Comments from California Department of Fish and Wildlife

9-1 The comment is noted. In response to this comment, Proposed PA/FEIS/EIR Section 4.1.4 has been revised to further clarify the role of CDFW to include a discussion of its responsibilities under California Fish and Game Code Section 1802 and to acknowledge comments and expertise provided by CDFW throughout the CEQA compliance process for the Soda Mountain Solar Project to date.

9-2 The BLM and County understand that the Applicant may need take authorization for State-listed species from CDFW under CESA Section 2081, as stated on Draft PA/EIS/EIR page 3.4-23. The BLM and County have recommended mitigation measures to ensure that the Project would fully comply with the provisions of the CESA (see, e.g., Mitigation Measure 3.4-1a on Draft PA/EIS/EIR page 3.4-51).

9-3 The County anticipates that Project impacts to desert tortoise can be reduced to less than significant through the implementation of applicable conservation measures and best management practices. As stated in Response 9-2, the Project will fully comply with the provisions of CESA. Draft PA/EIS/EIR Section 3.21.2 (p. 3.21-9 et seq.) provides a statement of Mandatory Findings of Significance. As indicated therein, the Project is not anticipated to result in substantial adverse impacts to threatened or endangered species, with the implementation of all recommended mitigation measures.

9-4 The lead agencies understand CDFW's mandate to protect migratory birds and fully protected species, as specified in the California Fish and Game Code. As identified on Draft PA/EIS/EIR page 3.4-5, the three fully protected species identified in the analysis are golden eagle, brown pelican, and Yuma clapper rail. As reported on Draft PA/EIS/EIR page 3.4-37, the latter two species have been found dead at large-scale solar project sites in the California desert. The contributing causes of these avian fatalities are

not fully known, but BLM is committed to working closely with CDFW to identify and minimize avian risk at solar facilities. The Avian Monitoring Program required by Draft PA/EIS/EIR Mitigation Measure 3.4-1h is proposed to characterize the avian collision risk associated with the Project. It is intended to supplement and be implemented in concert with the Bird and Bat Conservation Strategy (BBCS) described in Mitigation Measure 3.4-1g. Mitigation Measure 3.4-1h would provide avian injury and mortality monitoring and an adaptive management strategy that provides coordination with the CDFW, USFWS, and the BLM. While this measure would help describe the extent of the magnitude of the potential impact to common and special-status avian species, it would not fully reduce the impacts of proposed facilities to fully protected birds because some avian collision risks would remain. A draft BBCS is provided in Appendix L. Regarding golden eagle, the potential impacts of the Project and alternatives on this fully protected species are described in Draft PA/EIS/EIR Sections 3.4.6.1 through 3.4.6.7, and potential cumulative effects are described in Section 3.4.7. The BBCS also includes measures to reduce any potential Project-related direct impacts to golden eagle. The comment from CDFW suggests that the Draft PA/EIS/EIR analysis include "appropriate species-specific avoidance measures," for which no detailed recommendations are provided by CDFW. BLM will continue to work closely with CDFW to minimize bird risks at the Project site.

9-5 The comment is noted, and is consistent with the presentation of CDFW's jurisdiction in the Draft PA/EIS/EIR on page 3.4-48 and description of the Migratory Bird Treaty Act on page 3.4-22.

9-6 The Draft PA/EIS/EIR (page 3.4-5) acknowledges that the Project site is within the range of most of the species described in CDFW's comment. The key exception to this is that while the Project site may be within the greater range of the peregrine falcon, which includes the entire United States, this species is not expected to utilize the Project site.

9-7 The draft BBCS, developed by the Applicant in cooperation with USFWS; draft Desert Tortoise Translocation Plan; draft Burrowing Owl Mitigation and Monitoring Plan; draft Raven Management Plan; and draft Vegetation Resources Management Plan (including cactus salvage) are included in this Proposed PA/FEIS/EIR in Appendix L. No separate golden eagle conservation plan or kit fox mitigation plan is recommended in the Proposed PA/FEIS/EIR. However, Mitigation Measure 3.4-1i has been recommended to protect kit fox and American badger.

9-8 As indicated in Draft PA/EIS/EIR Section ES.1 (p. ES-1) and Section 1.1 (p. 1-1), following final engineering and micro-siting of the Project, areas that would remain undisturbed and not within fenced areas would not be included in the ROW grant.

9-9 Regarding the request to provide additional disclosure and analyses on connectivity for bighorn sheep and desert tortoise, refer to Common Responses 2 and 3, respectively, in Proposed PA/FEIS/EIR Sections 4.5.3.2 and 4.5.3.3.

9-10 As stated in Response 9-2, the lead agencies anticipate that the Applicant may need take authorization from CDFW prior to the relocation of desert tortoise.

9-11 The comment suggests that biological monitoring be provided for the life of the Project for Project-related activities that occur within the ROW but outside the maintained permanent desert tortoise exclusion fence. Following initial construction, no ground-disturbing activities are proposed outside of the fenced Project site. Therefore, the need for such biological monitoring over the life of the Project is not anticipated or recommended in the Draft PA/EIS/EIR.

9-12 An estimate of desert tortoise distribution and abundance was provided in the draft Desert Tortoise Translocation Plan (DTTP) prepared by Panorama Environmental, Inc. in June 2013, as referenced in the Draft PA/EIS/EIR (Panorama Environmental, Inc., 2013b). A revised draft DTTP is included in Appendix L of this Proposed PA/FEIS/EIR. The estimated tortoise abundance on the Project site was made using the USFWS 2010 protocol entitled "2010 Pre-project Field Survey Protocol for Potential Desert Tortoise Habitats."[1] This assessment included all identified live desert tortoise in the Project area as the comment suggests, not just those greater than 160mm carapace length. The limited sign of desert tortoise on the Project site, combined with identification of only one live tortoise during one of several Project area surveys, indicate that there are likely fewer than five desert tortoises inhabiting the Project site.

9-13 The comment indicates that CDFW does not support the use of simultaneous surveys to characterize bighorn sheep and golden eagle, suggesting that it increases the chance that a species can be overlooked. As characterized in the BioResource Consultants, Inc. (BRC), survey report for the March and May 2011 surveys, BRC biologists Brian Latta and Catherine Rhaintre conducted two helicopter surveys for nesting raptors with a primary focus on golden eagles in the Soda Mountains, Cronese Mountains, and Cave Mountain of the eastern Mojave Desert region of San Bernardino County, California. Additionally, the biologists surveyed and recorded any incidental sightings and associated information for desert bighorn sheep encountered during the surveys (BRC, 2011). Thus, surveys were principally intended to document the presence/absence and distribution of golden eagles and their nests. BRC's surveys were coordinated with Regina Abella, the CDFW desert bighorn sheep contact person, to avoid overflying potential bighorn sheep lambing areas. Thus, portions of the south Soda Mountains were not included in BRC's helicopter assessment. Thus, as summarized in the Draft PA/EIS/EIR, CDFW's ground survey for bighorn sheep on April 30 and May 1, 2012, in the south Soda Mountains near Zzyzx was relied upon to characterize bighorn sheep occupancy in this area (Abella, 2012). Abella's survey findings are presented on Draft PA/EIS/EIR page 3.4-17. The golden eagle and bighorn sheep survey methods are considered sufficient to document the potential distribution of both species in the Project area.

[1] Available online at http://www.deserttortoise.org/documents/2010DTPre-projectSurveyProtocol.pdf.

9-14 The comment states that if construction must occur during the breeding bird season, the BLM should require the Applicant to comply with regulations that protect nesting birds. The lead agencies agree with CDFW's assessment and for this reason the Draft PA/EIS/EIR clearly states that Project-related removal or disturbance of active bird nests is prohibited. As stated on Draft PA/EIS/EIR page 3.4-48, "Direct impacts to actively nesting birds would be avoided through the implementation of measures that would provide consistency with Fish and Game Code Sections 3503.5 and 3511, and the MBTA. Under these laws, the removal or disturbance of active nests is prohibited." With implementation of Mitigation Measures 3.4-1a (monitoring by a designated biologist), 3.4-1b (biological monitoring during construction), 3.4-1c (WEAP), 3.4-1g (Bird and Bat Conservation Strategy), and 3.4-4 (preconstruction nesting bird surveys and avoidance measures), the Project would avoid impacts to nesting birds.

9-15 Regarding potential impacts to bighorn sheep population connectivity and movement, refer to Common Response 2 in Proposed PA/FEIS/EIR Section 4.5.3.2.

9-16 Regarding the proposed use of artificial water sources to enhance bighorn sheep movement, refer to Common Response 2 in Proposed PA/FEIS/EIR Section 4.5.3.2.

9-17 Regarding potential changes to the Project design to encourage bighorn sheep movement, refer to Common Response 2 in Proposed PA/FEIS/EIR Section 4.5.3.2.

9-18 Draft PA/EIS/EIR Mitigation Measure 3.4-1f, *Burrowing Owl Protection Measures*, is largely based on the 2012 CDFW *Staff Report on Burrowing Owl Mitigation* in describing burrowing owl protection measures. Additionally, under this measure, the Applicant must prepare and submit a Burrowing Owl Mitigation and Monitoring Plan to BLM, subject to CDFW for review and approval, prior to passive relocation of owls. This strategy is fully consistent with the CDFW 2012 *Staff Report* guidance. A draft Burrowing Owl Mitigation and Monitoring Plan is included in Appendix L of this Proposed PA/FEIS/EIR.

9-19 In the absence of specific hazards to desert kit fox from disease vectors such as distemper in the Project area, the BLM is not recommending the preparation of a mitigation and monitoring plan for desert kit fox for this Project. However, Mitigation Measure 3.4-1i has been recommended to provide protection for kit fox on the Project site.

9-20 No active dunes or sand fields occur on the Project site. Additionally, the Project would avoid large washes and drainages that traverse the Project ROW and act as sand transport corridors to supply the dunes. The creation of flood protection berms (see, e.g., Figures 2-1, 2-5, 2-6, 2-7) and Project siting outside of drainages would allow continued sand replenishment by water and wind.

9-21 CDFW indicates that their recommended replacement ratio for mesquite is 3:1. As detailed in the Draft PA/EIS/EIR (p. 3.3-13), one western honey mesquite (*Prosopis glandulosa* var. *torreyana*) was identified on the Project site (Panorama Environmental,

Inc., 2013a). As identified in the BRTR (Appendix E-1, Appendix A, Table A-1), no smoke tree (*Psorothamnus spinosus*) or cat claw acacia (*Acacia greggii*) plants were detected in the requested ROW area during focused surveys (Panorama Environmental, Inc., 2013a). Mitigation for potential impacts to the one western honey mesquite on the Project site has been incorporated into Mitigation Measure 3.3-3.

9-22 CDFW comments that they have direct authority to regulate activities that would modify state-jurisdictional drainages on the Project site and that CEQA requires that the Project provide adequate avoidance, mitigation, monitoring, and reporting for impacts to such features. As identified in the Draft PA/EIS/EIR (Table 3.3-5, page 3.3-13), approximately 498 acres of state-jurisdictional ephemeral dry washes were characterized in the Project area. The Project footprint has been considerably reduced and reconfigured from its initial configuration to minimize impacts to these features. Most notably, solar arrays were adjusted to avoid the main stems of most large ephemeral washes that traverse the site. Numerous smaller washes, however, wind their way through the Project site, as shown in Figure 3.3-2. Through numerous iterations of the array layout, BLM avoided and minimized impacts to the 1,240 acres of waters of the State that were detected in the study area. Additionally, the Draft PA/EIS/EIR describes that general grading is not proposed within the fenced Project site and that solar arrays would be carried and hand-installed on support structures (page 3.3-23 et seq.). In this manner, much of the ground surface, including areas of dry wash, would remain intact for the duration of the Project. Thus, the direct impact to waters of the State would be minimized, and would be considerably smaller than the 498 acres of jurisdictional area mapped in the Project site.

Mitigation for impacts to waters of the State would be provided through the implementation of Mitigation Measure 3.3-4 (Draft PA/EIS/EIR pp. 3.3-36 and 3.3-37), which describes BMPs that will minimize impacts to jurisdictional features. As this measure explains, the acquisition and protection of off-site wash habitat is the principal means of mitigating for impacts to jurisdictional features. Monitoring requirements would be provided within a management plan that is prepared for acquired lands, subject to CDFW review and approval, that includes site-specific enhancement measures for drainages on the acquired compensation lands (item 3 on Draft PA/EIS/EIR p. 3.3-36). The objective of the management plan shall be to enhance the natural values of the drainages, and may include enhancement actions such as weed control, fencing to exclude livestock, or erosion control.

9-23 Coordination between the lead agencies and CDFW is ongoing and is described in Proposed PA/FEIS/EIR Section 4.1.4.

9-24 Receipt of the map is acknowledged. Refer to Response 9-17.

9-25 The January comment letter from CDFW was received and responses are provided above.

9-26 Regarding potential changes to the Project design to encourage bighorn sheep movement, refer to Common Response 2 in Proposed PA/FEIS/EIR Section 4.5.3.2.

Letter 10 – Responses to Comments from Robin Kelley

10-1 Refer to Common Response 5 in Proposed PA/FEIS/EIR Section 4.5.3.5 regarding clarification of potential impacts to Rasor Road and Rasor OHV area.

Letter 11 – Responses to Comments from Keith Daigneault

11-1 The potential for construction, operation, and decommissioning of the Project to loosen existing surface soils and sediments and increase erosion during storm events is fully analyzed in Section 3.19.6 of the Draft PA/EIS/EIR (p. 3.19-20 et seq.). The analysis of storm drainage and erosion presented in the Draft PA/EIS/EIR incorporates consideration of the fact that pre- and post-development runoff rates, volumes, and peak discharges have not been calculated for the Project site. Due to this, it is acknowledged that the installation of proposed facilities, including roads, could interfere with existing drainage patterns on-site to an extent that results in a substantial alteration to the existing drainage pattern of the site, potentially increasing on-site and off-site peak discharges, runoff volumes, runoff rates, erosion, and sedimentation. Detailed hydrologic analysis will be performed, incorporating existing available topographic information supplemented with site specific LIDAR topography, during the detailed design stage for the Project (discussed on page 3.19-32 of the Draft PA/EIS/EIR). The results of this analysis would be incorporated into final design, and both the analysis and final design would be reviewed and approved by the BLM prior to the Notice to Proceed. Further, as discussed in Section 3.19.6.1 of the Draft PA/EIS/EIR (p. 3.19-20 et seq.), construction and decommissioning of the Project would be subject to the conditions of the LRWQCB General Permit R6T-2003-004, which includes specific BMPs for minimizing or avoiding unnatural or accelerated erosion during storm events caused by land development. Additionally, Mitigation Measure 3.19-2 (p. 3.19-43), if adopted, would require the Applicant to develop and implement a comprehensive drainage, stormwater, and sedimentation control plan. Such a plan would ensure that all proposed grading and impervious surfaces on site shall be reviewed and approved by the BLM and County, with respect to its potential to cause or result in additional erosion and sedimentation, increased stormwater flows, or altered drainage patterns that could lead to unintentional ponding or flooding on site or downstream, and/or additional erosion and sedimentation. This mitigation measure was developed so that that final design of the realigned portion of Rasor Road would not become inaccessible during storm events as a result of ponding, flooding, or erosion.

11-2 As indicated in Draft PA/EIS/EIR Chapter 2, *Proposed Action and Alternatives* (p. 2-9), and in Figure 2-4, the Applicant-proposed relocated portion of Rasor Road would be a two-lane unpaved road with a 26-foot-wide traveled way (13 feet per lane). Similarly, the alternative relocated route for Rasor Road analyzed under Alternative B would be 26 feet wide. As some portions of the existing Rasor Road are 21 feet or less in width, the realigned portion would be wider than the narrowest portions of the existing road, accommodating wider vehicles than the existing road.

11-3 Flooding and flood hazards relating to construction, operation and maintenance, and decommissioning of the Project are fully analyzed in Section 3.19.6 of the Draft PA/EIS/EIR (p. 3.19-20 et seq.). Detailed analysis of flooding and flood hazards relating to the Proposed Action, as well as mitigation measures that would minimize or avoid flooding and flood related hazards during all project phases, are presented in the Draft PA/EIS/EIR under "Flooding and Flood Hazards" (p. 3.19-23 et seq.). For details regarding erosion related to stormflows and Rasor Road, see Response 11-1.

11-4 See Response 11-1.

11-5 The Applicant has not proposed to provide the requested amenities. No impact has been identified that would be mitigated by the addition of a water source for public use.

11-6 As indicated in Chapter 2, the Applicant anticipates the deposition of dust on the solar panels from a variety of sources and proposes to wash the panels as needed, up to two times per year (Draft PA/EIS/EIR p. 2-24).

11-7 As indicated on Draft PA/EIS/EIR page 3.13-7, as proposed by APM 32, if an alternative requiring the realignment of Rasor Road is developed (i.e., Alternative A, B, or C), the relocated segment of Rasor Road would be completed and open to traffic prior to the permanent closure of the existing Rasor Road, and access to the Recreation Area via Rasor Road would not be disrupted. However, portions of Rasor Road would be shared with construction vehicles. Additionally, if Alternative D is developed and no realignment of Rasor Road is required, portions of the existing Rasor Road would be shared with construction vehicles.

Anticipated traffic volumes are described in Draft PA/EIS/EIR Section 3.16, *Transportation and Travel Management*. As shown in Table 3.16-2 on Draft PA/EIS/EIR page 3.16-6, Project construction would generate a maximum of 410 daily round trips (120 truck trips and 290 worker vehicle trips). All or a portion of these daily trips could use Rasor Road, but would not do so throughout the duration of construction (e.g., trips related to construction on the north side of I-15 would not use Rasor Road). As indicated on Draft PA/EIS/EIR page 3.16-13, in the event that water must be trucked in from an off-site source (Alternative F), this would result in up to 30 additional truck round trips per day. Operation and maintenance traffic would be substantially reduced compared to construction, with approximately 40 trips per day and minimal truck traffic, and up to 11 additional truck trips per day under Alternative F (Draft PA/EIS/EIR pp. 3.16-10, 3.16-13). Decommissioning traffic volumes would likely be similar to construction period traffic volumes (Draft PA/EIS/EIR p. 3.16-11).

11-8 See Response 11-2 for a description of the proposed width and maintenance of the realigned portion of Rasor Road (Applicant-proposed or BLM-proposed route). In the event that an action alternative not requiring relocation of Rasor Road (i.e., Alternative D) is approved, no changes would be made to the width or alignment of Rasor Road. As shown in Figure 2-4, the realigned portion of Rasor Road, if constructed, would be banked at

approximately 2 percent such that opposing traffic would tilt toward the outside of the road, reducing or avoiding the risk of collision described in the comment.

Anticipated traffic volumes are described in Response 11-7.

11-9 As described in Draft PA/EIS/EIR Section 3.6, Cultural Resources (pp. 3.6-12 through 3.6-15), a cultural resources study was conducted to identify significant cultural resources within the Project area. As a result of this study, a total of five archaeological sites and 52 isolated artifacts were recorded within the Project area. The Proposed Action would directly impact a total of four of the sites and 36 of the isolates. The BLM has determined that none of these resources are eligible for listing in the National Register of Historic Places, and San Bernardino County has determined that none are eligible for listing in the California Register of Historical Resources or are considered historical or unique archaeological resources under CEQA. Therefore, no measures are required to mitigate Project impacts to these resources.

11-10 Refer to Common Response 5 in Proposed PA/FEIS/EIR Section 4.5.3.5 regarding clarification of potential impacts to Rasor Road and Rasor OHV area, including the location of the BLM informational kiosk.

11-11 As indicated in Draft PA/EIS/EIR Section 2.4.2.4, during construction, the Applicant would post safety and warning signs at the gate located at the Rasor Road access point, and at regular intervals along the perimeter fence, informing the public of construction activities. Additionally, the Draft PA/EIS/EIR recommended Mitigation Measure 3.13-1 (p. 3.13-14) requiring the Applicant to print and provide up-to-date Travel Management Area Maps for the Project area when the status of travel routes changes. Mitigation Measure 3.13-1 has been revised in Proposed PA/FEIS/EIR Section 3.13 as follows to clarify that the maps also shall depict the current status of open OHV areas:

> **3.13-1:** Travel Management Area Maps <u>for the Project area</u> showing open, closed, and limited travel routes <u>and open OHV areas</u> shall be updated and printed by the Applicant for posting by the BLM during each phase of the Project when the status or location of routes <u>and/or open areas</u> changes <u>as a result of Project construction, operation and maintenance, and/or decommissioning</u>. These notices and signs shall clearly describe which routes <u>and open areas</u> will be closed temporarily or permanently.

The Applicant-proposed relocation of the BLM informational kiosk is shown on Proposed PA/FEIS/EIR Figures 2-1 (Proposed Action), 2-5 (Alternative B), and 2-6 (Alternative C). As clarified in Proposed PA/FEIS/EIR Section 2.5.3, the kiosk would not be relocated under Alternative D. As described in Common Response 5 in Proposed PA/FEIS/EIR Section 4.5.3.5, Mitigation Measure 3.13-3 has been recommended which, if adopted, would shift the position of the relocated kiosk to the entrance to the Rasor OHV Recreation area. The relocated kiosk would be approximately 3 miles from I-15 on the proposed realigned Rasor Road, similar to existing conditions.

11-12 Excavated soils would be reused on site, as indicated in Draft PA/EIS/EIR Chapter 2 (see, e.g., page 2-11, "Soil excavated to create the pond would be utilized to construct the perimeter berms.") A berm such as that suggested in the comment would impede storm flows and is therefore not considered a feasible mitigation measure to reduce visual impacts on the OHV area. However, feasible mitigation measures to reduce visual and night sky impacts are described in Proposed PA/FEIS/EIR Section 3.18.8.

11-13 The proposed management of waste and hazardous materials is described in Draft PA/EIS/EIR Section 2.4.2.10, *Waste and Hazardous Materials Management* (p. 2-14), and analyzed in Section 3.8, Hazards and Hazardous Materials (p. 3.8-1 et seq.). Runoff from new impervious surfaces is described in Draft PA/EIS/EIR Section 3.19, Water Resources (see, e.g., page 3.19-22 et seq.). As also described in Draft PA/EIS/EIR Section 3.8, limited pesticide use to control noxious weeds would occur in accordance with an Invasive Weed Management Plan following approval from the BLM (see Appendix E-2 for a draft plan). Pesticide use, if needed, would be limited to non-persistent, immobile pesticides applied only in accordance with manufacturer directions and all regulations and BLM policies for pesticide use (p. 3.8-19).

11-14 The comment is noted. The potential for intentionally destructive acts, including vandalism of the Project facilities, is described in Draft PA/EIS/EIR Section 3.8, Hazards and Hazardous Materials.

11-15 Refer to Common Response 5 in Proposed PA/FEIS/EIR Section 4.5.3.5 regarding clarification of potential impacts to Rasor Road and the Rasor OHV Recreation Area.

11-16 The comment is noted.

Letter 12 – Responses to Comments from Richard Fee

12-1 The comment's statement of opposition to the Project is noted. The comment expresses concern for the specific resources; several responses addressing these concerns have been developed. See Common Response 2 in Proposed PA/FEIS/EIR Section 4.5.3.2 regarding bighorn sheep; Common Response 3 in Proposed PA/FEIS/EIR Section 4.5.3.3 regarding desert tortoise; Common Response 4 in Proposed PA/FEIS/EIR Section 4.5.3.4 regarding tui chub; and Common Response 6 in Proposed PA/FEIS/EIR Section 4.5.3.6 regarding visual resources, including views from Mojave National Preserve. The comment does not directly address the adequacy or accuracy of the analysis.

Letter 13 – Responses to Comments from Stuart Mills

13-1 As described in Draft PA/EIS/EIR Section 3.10, *Mineral Resources*, the Project would not affect access to the Blue Bell Mine or any other known mineral resource areas. The Project would not preclude access to areas north and south of I-15 accessible via Rasor Road, Blue Bell Mine Road, Opah Ditch Mine Road, or Zzyzx Road.

Letter 14 – Responses to Comments from Anthony Kampf

14-1 As described in Draft PA/EIS/EIR Section 3.10, *Mineral Resources*, the Project would not affect access to the Blue Bell Mine or any other known mineral resource areas. The Project would not preclude access to areas north and south of I-15 accessible via Rasor Road, Blue Bell Mine Road, Opah Ditch Mine Road, or Zzyzx Road.

Letter 15 – Responses to Comments from Beale Dabbs

15-1 The comment's statement of opposition to the Project is noted.

15-2 The comment expresses a preference for distributed generation compared to the proposed Project. See Common Response 1 in Proposed PA/FEIS/EIR Section 4.5.3.1 for a discussion of distributed generation alternatives considered.

15-3 The Draft PA/EIS/EIR describes the potential for job creation by the Proposed Action and Alternatives in Section 3.14, Socioeconomics and Environmental Justice (p. 3.14-1 et seq.)

15-4 The comment's statement of opposition to the Project is noted.

Letter 16 – Responses to Comments from National Park Service, Mojave National Preserve

16-1 The Mojave National Preserve has been added to Proposed PA/FEIS/EIR Figures 2-1, 2-5, 2-6, and 2-7, and added to the legend in Figure 1-2. Additionally, the preserve is shown in Figures 3.1-1, 3.13-1, 3.15-1, 3.18-2, 3.18-5, 3.19-3, and 3.19-9.

16-2 The coordination process between the BLM and NPS for this Project is described in further detail in Proposed PA/FEIS/EIR Section 4.1.3. Coordination between the agencies is ongoing.

16-3 The comment letter provides more specific comments regarding the potential impacts of the Proposed Action and action alternatives on hydrology in comments 16-5, 16-6, and 16-8; on threatened and endangered species at comments 16-7, 16-10 through 16-13, and 16-16 through 16-19; and on scenic landscapes and wilderness values at comment 16-15. See Responses 16-5 through 16-8, 16-10 through 16-13, and 16-15 through 16-19, below, for detailed responses to these comments.

16-4 The comment's statement of support for Alternative G is noted.

16-5 Refer to Common Response 2 in Proposed PA/FEIS/EIR Section 4.5.3.2 regarding bighorn sheep; Common Response 3 in Proposed PA/FEIS/EIR Section 4.5.3.3 regarding desert tortoise; Common Response 4 in Proposed PA/FEIS/EIR Section 4.5.3.4 regarding tui chub; and Common Response 1 in Proposed PA/FEIS/EIR Section 4.5.3.1 regarding alternative sites.

16-6 The BLM and San Bernardino County did not author the referenced report (Draft PA/EIS/EIR Appendix H-3); however, in response to this comment, the lead agencies have requested that the Applicant's consultant revise this report to remove reference to NPS' scoping comments (see revised report in Proposed PA/FEIS/EIR Appendix H-3). The model analysis conducted for the Project and presented in Appendix H-3 of the Draft PA/EIS/EIR was reviewed by the BLM and County staff, as well as resource experts on staff with the BLM and County's environmental consultant, and was considered technically defensible and was approved for use in the environmental analysis of the Project. Additionally, the site-specific technical investigations presented in Appendix H of the Draft PA/EIS/EIR represented the best available scientific information for use in assessing potential impacts under CEQA and NEPA at the time of publication of the Draft PA/EIS/EIR. Further, the presented technical reports formed only a part of materials reviewed and incorporated into the environmental analysis. As detailed in Section 3.19 of the Draft PA/EIS/EIR, a wide range of additional technical and regulatory information was assessed and considered as part of the analysis of potential groundwater-related impacts. The analysis presented in Section 3.19 of the Draft PA/EIS/EIR did not rely on characterizations of the NPS' comments described by the authors of the model report presented in Appendix H-3 of the Draft PA/EIS/EIR regarding groundwater and modeling. For example, the Draft PA/EIS/EIR describes that local rock type and faulting may be a significant factor in the existence of Soda Spring relating to groundwater flow (Section 3.19.2.3, p. 3.19-7). Refer to Common Response 4 in Draft Proposed PA/FEIS/EIR Section 4.5.3.4 regarding how issues relating to model assumptions and model uncertainty were addressed in the Draft PA/EIS/EIR. Additionally, a Groundwater Well Test was performed at the Project site to gather further data; a discussion of the results of this test is provided in Common Response 4.

16-7 It is noted that the comment concurs with the number of underpasses (4) and overpasses (2) described by Epps et al. (2013) and cited in the Draft PA/EIS/EIR. Regarding artificial water sources as mitigation to enhance bighorn sheep movement, refer to Common Response 2 in Proposed PA/FEIS/EIR Section 4.5.3.2.

16-8 Regarding potential impacts to sensitive water resources from groundwater drawdown as well as issues relating to the scope of Mitigation Measures 3.19-3 and 3.19-4, refer to Common Response 4 in Proposed PA/FEIS/EIR Section 4.5.3.4. The mission and mandate of the NPS is noted. Figure 3.19-3 on page A-51 of the Draft PA/EIS/EIR shows the location of Soda Spring on NPS-managed land. In response to the comment, the last sentence of the second paragraph on page 3.19-3 of the Draft PA/EIS/EIR has been revised as follows:

> Soda Spring is <u>located on NPS-managed land within the Mojave National Preserve</u> approximately 4 miles east of the Project area (Figure 3.19-3) and is separated from the Project site by the eastern Soda Mountains (Soda Mountain Solar, LLC, 2012).

16-9 The potential impacts of the Proposed Action and alternatives on air resources, specifically as they relate to potential air quality violations, are described in Draft

PA/EIS/EIR Section 3.2, Air Resources (p. 3.2-1 et seq.). The comment does not directly address the adequacy or accuracy of this analysis. Regarding site alternatives, refer to Common Response 1 in Proposed PA/FEIS/EIR Section 4.5.3.1.

16-10 Agreement with the conclusions in the Draft PA/EIS/EIR regarding potential avian impacts is noted. It cannot be known with certainty whether the regional presence of Zzyzx and Soda Springs, which as the comment notes are used by migratory birds, will attract a greater number of birds than noted at the Genesis Solar and Desert Sunlight solar projects. The absolute number of birds that will be affected cannot be known at this time and it remains to be seen whether or not greater numbers of migratory birds are affected by Project facilities compared to other solar facilities. The general lack of peer reviewed information on the underlying causes of avian mortality at utility scale solar energy installations makes the forecasting of potential impacts difficult; however, it is reasonable to conclude that anticipated bird mortality would be within the range of that observed at other similar solar projects. The Draft PA/EIS/EIR analysis references and considers the data available in monitoring reports from the Genesis and Desert Sunlight projects (pp. 3.4-37 and 3.4-49). Furthermore, the analysis in the Proposed PA/FEIS/EIR has been revised to incorporate information provided in the USFWS Forensics Laboratory's April 2014 report, "Avian Mortality at Solar Energy Facilities in Southern California: A Preliminary Analysis" (USFWS, 2014).

In response to this comment, the discussion under "Collision Risks to Special-Status, Resident, and Migratory Birds and Special-Status Bats" in Proposed PA/FEIS/EIR Section 3.4.7 has been revised as follows:

> The Genesis and Desert Sunlight projects, for example, are located between the Colorado River and Salton Sea, and are each within 25 to 50 miles of both water bodies~~, whereas t~~. The Project would be located 90 miles west of the Colorado River; however, local water sources that provide bird stopover are available at Lake Tuendae and Soda Spring in the Mojave National Preserve near the Desert Studies Center.

16-11 The comment's general statement that the disturbance of vegetation and habitat would impact topography, hydrology, native plant communities, special-status plants, and special-status birds, especially the burrowing owl, is documented in the Draft PA/EIS/EIR. See, e.g., page 3.4-35, "the entire site is considered to provide suitable burrowing owl foraging habitat."

As discussed in Response 16-10, the potentially substantial, unknown risks to avian species during all Project phases are addressed in the Draft PA/EIS/EIR and in the Proposed PA/FEIS/EIR, as revised in response to comments. As also discussed in the Draft PA/EIS/EIR, the attractive nature of solar panels to birds likely cannot be offset through the implementation of traditional mitigation measures. It may be revealed through implementation of the adaptive management program recommended in Mitigation Measure 3.4-1h that impacts to birds can only be addressed through some

technological means that has not yet been incorporated into currently available solar panels. It is also possible, and perhaps likely, that no practical or technological solution will be discovered for the avian collision issue using current panel technology. In the absence of a clear present solution, the Avian Monitoring Program includes an adaptive management element that attempts to identify and reduce avian hazards as they arise during the life of the Project. Because the impact to birds is not fully known and cannot be fully mitigated, the CEQA determination in the Draft PA/EIS/EIR is that potential avian impacts are significant and unavoidable (see Impact Wild-3 on Draft PA/EIS/EIR page 3.4-67).

16-12 Regarding potential impacts on bighorn sheep population connectivity and movement, refer to Common Response 2 in Proposed PA/FEIS/EIR Section 4.5.3.2.

16-13 Regarding potential impacts on tui chub habitat from groundwater use, refer to Common Response 4 in Proposed PA/FEIS/EIR Section 4.5.3.4.

16-14 The comment does not provide a basis for how or why consideration of the active dune systems south and east of the Soda Mountains would affect the fugitive dust emissions estimate conducted for the Project. Additionally, the Draft PA/EIS/EIR already discloses that construction-related emissions of PM_{10}, including fugitive dust, would exceed the daily and annual MDAQMD PM_{10} thresholds (see Draft PA/EIS/EIR pages 3.2-16 and 3.2-17); therefore, the likelihood that the Project would exceed these thresholds (i.e., very likely if not certainly) is accurately disclosed.

As described in the description of the Proposed Action (see Draft PA/EIS/EIR page 2-18), the areas of the Project site proposed for the location of the solar arrays and other infrastructure would undergo partial removal of scrub vegetation; the plants would be cut back leaving the root structure and about 6 inches of stem in place, which would continue to limit fugitive dust emissions. Therefore, dust abatement measures are not appropriate for all disturbed areas on the Project site. Actual grading and disturbance of the ground surface would be limited to access road development, site preparation for the staging area, maintenance building, and the substation, as well as at minor drainage washes along the alignment of the wash, and to level isolated undulations. Therefore, the unimproved roads and unpaved parking areas that would be associated with long-term operation and maintenance of the Project represent the majority of the area where the ground surface would remain exposed after construction.

Mitigation Measure 3.2-1 has been revised to include the use of dust palliatives, and watering as needed, on unpaved access roads and other graded areas of the site during long-term operation and maintenance of the Project.

16-15 Refer to Common Response 6 in Proposed PA/FEIS/EIR Section 4.5.3.6 regarding the analysis of impacts on visual resources, including the night sky and views from the Mojave National Preserve.

16-16 The Draft PA/EIS/EIR identifies the presence of desert kit fox on the Project site and proposes measures to avoid and minimize direct impacts to this species. As a highly mobile species, the kit fox populations are somewhat widespread in the Project region and populations are not considered fragmented or genetically isolated. Kit foxes are expected to continue using undeveloped lands within and surrounding the Project site; thus, the Project is not expected to significantly reduce kit fox movement within the Project area. The loss of kit fox habitat on the Project site as a result of perimeter fencing would be an adverse effect of the Project, but does not necessitate compensatory mitigation. As indicated in the Draft PA/EIS/EIR, direct impacts to this species during construction would be reduced through the implementation of Mitigation Measures 3.4-1a (Compliance Monitoring by the Designated Biologist), 3.4-1b (Biological Monitoring during Construction), and 3.4-1c (Worker Environmental Awareness Program). Also, as indicated on Draft PA/EIS/EIR page 3.4-50, the loss of habitat for kit fox and other species such as American badger and burrowing owl would also be addressed through the implementation of measures designed to compensate for the loss of desert tortoise habitat (i.e., Mitigation Measure 3.4-2d). Additionally, the Proposed PA/FEIS/EIR recommends Mitigation Measure 3.4-1i, American Badger and Kit Fox Protection.

16-17 Regarding potential changes to the Project design to encourage bighorn sheep movement, refer to Common Response 2 in Proposed PA/FEIS/EIR Section 4.5.3.2.

16-18 Regarding artificial water sources as mitigation to enhance bighorn sheep movement, refer to Common Response 2 in Proposed PA/FEIS/EIR Section 4.5.3.2.

16-19 Regarding potential changes to the Project design to encourage bighorn sheep movement, refer to Common Response 2 in Proposed PA/FEIS/EIR Section 4.5.3.2.

16-20 A summary of the BLM's coordination with the NPS to date is provided in Proposed PA/FEIS/EIR Section 4.1.3. Coordination between the agencies is ongoing.

Letter 17 – Responses to Comments from Robert Reynolds

17-1 As described in Draft PA/EIS/EIR Section 3.10, *Mineral Resources*, the Project would not affect access to the Blue Bell Mine or any other known mineral resource areas. The Project would not preclude access to areas north and south of I-15 accessible via Rasor Road, Blue Bell Mine Road, Opah Ditch Mine Road, or Zzyzx Road.

Letter 18 – Responses to Comments from Phyllis Schwartz

18-1 The Project would not directly affect any lands within the Mojave National Preserve, as it is located outside of the Preserve. The potential impacts of the Proposed Action and alternatives on the user experience at Mojave National Preserve are analyzed in Draft PA/EIS/EIR Sections 3.13, Recreation (see page 3.13-7 acknowledging noise, dust, and visual disturbance near the Zzyzx Road entrance to the Preserve) and 3.18, Visual Resources (see pages 3.18-26 through 3.18-26 describing impacts on views from Key

Observation Points (KOPs) 13, 14, and 19, which represent views from the Preserve). As noted on page 3.18-26, "The cumulative total of the area from which the Project may be seen from within the Preserve in the foreground/middleground distance zone covers approximately 350 acres. This represents 0.0002 percent of the 1.6-million-acre Preserve," and foreground/middleground views of the Project site from elsewhere in the Preserve would be blocked by the Soda Mountains. The comment does not directly address the adequacy or accuracy of this analysis. Also refer to Common Response 6 in Proposed PA/FEIS/EIR Section 4.5.3.6 regarding visual resource-related impacts on views from Mojave National Preserve.

18-2 See Common Response 1 in Proposed PA/FEIS/EIR Section 4.5.3.1 regarding the analysis of alternative sites. As described in Draft PA/EIS/EIR Section 2.4.2 and shown in Figure 2-1, the Project site is directly adjacent to a 500 kV transmission line, to which the Project substation and switchyard would connect.

18-3 The potential impacts of the Proposed Action and alternatives with respect to habitat and other environmental resources are analyzed, and mitigation measures recommended to reduce or avoid impacts, throughout Chapter 3 of the Draft PA/EIS/EIR. The commenter does not provide specific examples, facts, reasonable assumptions predicated upon facts, or other evidence to support the suggestion that impacts have not been adequately researched.

Letter 19 – Responses to Comments from Richard Schwartz

19-1 The comment's statement of opposition to the Project is noted. The potential impacts of the Proposed Action and alternatives on the user experience at Mojave National Preserve are analyzed in Draft PA/EIS/EIR Sections 3.13, Recreation (see page 3.13-7 acknowledging noise, dust, and visual disturbance near the Zzyzx Road entrance to the Preserve) and 3.18, Visual Resources (see pages 3.18-26 through 3.18-26 describing impacts on views from Key Observation Points (KOPs) 13, 14, and 19, which represent views from the Preserve). As noted on page 3.18-26, "The cumulative total of the area from which the Project may be seen from within the Preserve in the foreground/middleground distance zone covers approximately 350 acres. This represents 0.0002 percent of the 1.6-million-acre Preserve," and foreground/middleground views of the Project site from elsewhere in the Preserve would be blocked by the Soda Mountains. The comment does not directly address the adequacy or accuracy of this analysis. Also refer to Common Response 6 in Proposed PA/FEIS/EIR Section 4.5.3.6 regarding visual resource-related impacts on views from Mojave National Preserve.

19-2 Refer to Common Response 4 in Proposed PA/FEIS/EIR Section 4.5.3.4 regarding groundwater impacts and Common Response 2 in Proposed PA/FEIS/EIR Section 4.5.3.2 regarding bighorn sheep.

Letter 20 – Responses to Comments from Deborah Bollinger

20-1 The comment's statement of opposition to the Project is noted.

20-2 The potential impacts of the Project on scenic views are analyzed, and mitigation measures proposed, in Draft PA/EIS/EIR Section 3.18, Visual Resources (p. 3.18-1 et seq). See also Common Response 6 in Proposed PA/FEIS/EIR Section 4.5.3.6.

20-3 Potential impacts to desert tortoise are fully addressed in Draft PA/EIS/EIR Section 3.4, *Biological Resources – Wildlife*. The Project site is not located within designated critical habitat for this species and site development is not expected to affect the long-term recovery of this species.

20-4 Potential impacts on tui chub are considered and analyzed in Draft PA/EIS/EIR Section 3.4, Biological Resources – Wildlife. Also refer to Common Response 4 in Proposed PA/FEIS/EIR Section 4.5.3.4 for additional discussion of potential impacts to tui chub.

20-5 The potential impacts of the Proposed Action and alternatives on the user experience at Mojave National Preserve are analyzed in Draft PA/EIS/EIR Sections 3.13, Recreation (see page 3.13-7 acknowledging noise, dust, and visual disturbance near the Zzyzx Road entrance to the Preserve) and 3.18, Visual Resources (see pages 3.18-26 through 3.18-26 describing impacts on views from Key Observation Points (KOPs) 13, 14, and 19, which represent views from the Preserve). As noted on page 3.18-26, "The cumulative total of the area from which the Project may be seen from within the Preserve in the foreground/middleground distance zone covers approximately 350 acres. This represents 0.0002 percent of the 1.6-million-acre Preserve," and foreground/middleground views of the Project site from elsewhere in the Preserve would be blocked by the Soda Mountains. The comment does not directly address the adequacy or accuracy of this analysis, nor does it provide specific examples, facts, reasonable assumptions predicated upon facts, or other evidence in support of the comment's suggestion that the Project would have negative impacts on park visitorship and/or economic activity in connection with park tourism. Also refer to Common Response 6 in Proposed PA/FEIS/EIR Section 4.5.3.6 regarding visual resource-related impacts on views from Mojave National Preserve.

20-6 Refer to Common Response 1 in Proposed PA/FEIS/EIR Section 4.5.3.1 for a discussion of alternatives considered.

Letter 21 – Responses to Comments from Laraine Turk

21-1 Refer Common Response 1 in Proposed PA/FEIS/EIR Section 4.5.3.1 for a discussion of distributed generation alternatives considered.

21-2 The potential impacts of the Project on scenic views are analyzed, and mitigation measures proposed, in Draft PA/EIS/EIR Section 3.18, Visual Resources (p. 3.18-1 et seq). The potential impacts of the Proposed Action and alternatives on the user

experience at Mojave National Preserve are analyzed in Draft PA/EIS/EIR Sections 3.13, Recreation (see page 3.13-7 acknowledging noise, dust, and visual disturbance near the Zzyzx Road entrance to the Preserve) and 3.18, Visual Resources (see pages 3.18-26 through 3.18-26 describing impacts on views from Key Observation Points (KOPs) 13, 14, and 19, which represent views from the Preserve). Also see Common Response 6 in Proposed PA/FEIS/EIR Section 4.5.3.6 regarding visual resources, including views from Mojave National Preserve.

21-3 Potential Project impacts to wildlife movement are analyzed in the Draft PA/EIS/EIR, with potential impacts to desert tortoise movement discussed on page 3.4-33 et seq., and potential impacts to bighorn sheep discussed on page 3.4-41 et seq. The Project is not expected to affect the movement of common wildlife species in the Project area; however, as discussed on page 3.4-68, impacts to bighorn sheep movement would remain after implementation of recommended mitigation measures. Also, refer to Common Response 2 in Proposed PA/FEIS/EIR Section 4.5.3.2 regarding bighorn sheep.

21-4 Refer to Response 21-2. The comment does not directly address the adequacy or accuracy of the analysis presented in the Draft PA/EIS/EIR, nor does it provide specific examples, facts, reasonable assumptions predicated upon facts, or other evidence in support of the comment's suggestion that the Project would have negative impacts on park visitorship and/or economic activity in connection with park tourism.

21-5 Regarding potential impacts relating to tui chub habitat from groundwater use, refer to Common Response 4 in Proposed PA/FEIS/EIR Section 4.5.3.4. The comment's statement of opposition to the Project's proposed use of groundwater is noted.

21-6 The comment's statement of opposition to the Project is noted.

Letter 22 – Responses to Comments from Misty Watson

22-1 As described in Draft PA/EIS/EIR Section 3.10, *Mineral Resources*, the Project would not affect access to the Blue Bell Mine or any other known mineral resource areas. The Project would not preclude access to areas north and south of I-15 accessible via Rasor Road, Blue Bell Mine Road, Opah Ditch Mine Road, or Zzyzx Road.

Letter 23 – Responses to Comments from Toni Callaway

23-1 Refer to Common Response 1 in Proposed PA/FEIS/EIR Section 4.5.3.1 for a discussion of alternatives considered in compliance with both NEPA and CEQA requirements. The Proposed Action and alternatives are subject to all applicable environmental regulations, many of which are described throughout Draft PA/EIS/EIR Chapter 3.

23-2 The potential environmental impacts of the Proposed Action and alternatives are analyzed, and mitigation measures recommended to reduce or avoid impacts, throughout Chapter 3 of the Draft PA/EIS/EIR. The comment does not directly address the adequacy

or accuracy of this analysis. The Applicant will be required to comply with all existing applicable environmental regulations, a large number of which are described throughout the Draft PA/EIS/EIR.

23-3 As described in Section 3.19.6, *Direct and Indirect Effects,* under the assessment of potential Project effects to groundwater supply and recharge (p.3.19-23 et seq.), the groundwater pumping simulations and Water Supply Assessment analysis demonstrate that there is adequate groundwater in the Soda Mountain Valley to support construction/decommissioning and operation and maintenance of the solar project without adversely affecting nearby wells or sensitive water resources. Refer to Common Response 4 in Proposed PA/FEIS/EIR Section 4.5.3.4 for a discussion of how issues relating to model assumptions and model uncertainty as well as potential impacts from groundwater use to tui chub habitat and sensitive surface water resources that support bighorn sheep and other desert wildlife were addressed in the Draft PA/EIS/EIR. Also refer to Common Response 4 for a discussion of how the Groundwater Well Test performed for this Project provides additional data related to this analysis.

23-4 As described in Draft PA/EIS/EIR Section 3.10, *Mineral Resources*, the Project would not affect access to the Blue Bell Mine or any other known mineral resource areas. The Project would not preclude access to areas north and south of I-15 accessible via Rasor Road, Blue Bell Mine Road, Opah Ditch Mine Road, or Zzyzx Road.

23-5 The Los Angeles Department of Water and Power has determined that its existing Marketplace-Adelanto 500 kV transmission line, which is located on the north side of I-15 adjacent to the proposed North Array, has adequate capacity for Project electricity (LADWP, 2009a, 2009b).

23-6 Refer to Common Response 4 in Proposed PA/FEIS/EIR Section 4.5.3.4 regarding groundwater impacts.

Letter 24 – Responses to Comments from San Bernardino County Department of Public Works

24-1 The comment refers to the Circulation Element of the San Bernardino County General Plan. The portion of Rasor Road that is proposed to be realigned under the Project or Alternatives B or C is located entirely on BLM-managed lands, and is therefore not subject to San Bernardino County land use and circulation policies.

Letter 25 – Responses to Comments from Desert Tortoise Council

25-1 Copies of all materials referenced in the Draft PA/EIS/EIR that are not appended to the document will not be posted to the Project website, but are available in the administrative record, and the public may obtain it and all other Project-related public records from the BLM by contacting Jeff Childers, Project Manager, California Desert District. Contact information is provided in Draft PA/EIS/EIR Section 4.4 (p. 4-5).

The Spring 2013 Protocol Desert Tortoise Survey Report prepared for the project (Kiva Biological Consulting, 2013a) was provided to the commenter via e-mail on January 21, 2014. This report was referenced in the Draft PA/EIS/EIR (see, e.g., pp. 3.4-4, 3.4-9, and 3.4-76). The Spring 2013 Protocol Desert Tortoise Survey Report was provided to the BLM in June 2013, and as a result is not described in the March 2013 Biological Resources Technical Report prepared by the Applicant's consultant (Panorama Environmental, Inc., 2013a; Draft PA/EIS/EIR Appendix E-1).

The BLM and San Bernardino County are unable to respond to requests made directly to the Applicant or its consultant.

25-2 Applicant-Proposed Measures (APMs) are actions that are proposed by the Applicant as part of the description of the Proposed Action that are not subject to direct modification by the BLM or County; thus, no changes are proposed to APM 71. However, after the impacts of the Proposed Action (including APMs) have been analyzed, the BLM and/or County may apply mitigation to modify the Proposed Action and/or an APM in order to avoid, minimize, or mitigate an environmental impact. As described on Draft PA/EIS/EIR page 3.4-34, Mitigation Measure 3.4-1b is recommended to further address potential impacts to desert tortoise that could occur even with the implementation of APM 71. Mitigation Measure 3.4-1b provides that a biological monitor will be present during construction activities that take place in suitable habitat for desert tortoise, regardless of season (p. 3.4-52). Implementation of this measure would provide environmental monitoring for desert tortoises whenever ground-disturbing activities have the potential to impact this species.

25-3 As described in Response 25-2, APMs are not subject to modification by the BLM and County; thus, no changes are proposed to APM 73. The BLM's desert tortoise compensatory mitigation strategy is fully detailed in Mitigation Measure 3.4-2d, Desert Tortoise Compensatory Mitigation, which describes the endowment funds (p. 3.4-62, item e, *Long-term Maintenance and Management Fund*) and enhancement fees (p. 3.4-62, item c, *Initial Habitat Improvement Fund*) requested by the comment.

25-4 The comment's statement of preference for Alternative G compared to Alternative E is noted.

25-5 The comment's statement of support for Alternative G is noted.

25-6 The Draft PA/EIS/EIR considered a reasonable range of alternatives as described in Chapter 2. In addition, refer to Common Response 1 in Proposed PA/FEIS/EIR Section 4.5.3.1 for further discussion of alternatives considered. As indicated in Draft PA/EIS/EIR Section 2.8.1 (p. 2-39 et seq.), proximity to adequate transmission lines to carry electricity generated by the Project was one of the siting constraints used in determining suitability of alternative sites. The existing Marketplace-Adelanto 500 kV transmission line, which primarily parallels I-15, was determined to have adequate

capacity for Project electricity. Siting a project farther from existing transmission infrastructure would necessitate the construction of a new transmission corridor.

25-7 The comment's statement of support for Alternatives E and G is noted.

25-8 Alternatives C (which removes the East Array, as shown in Figure 2-6) and D (which removes the eastern portion of the East Array, as shown in Figure 2-7) both reduce impacts in the East Arrays consistent with the recommendations in the Kiva survey report.

25-9 The West Mojave Plan (WEMO Plan) description provided in the Draft PA/EIS/EIR was based on the final EIS/EIR for the WEMO Plan (BLM, 2005) and did not reflect the Record of Decision for the WEMO Plan. In response to this comment, the description of the WEMO Plan on Draft PA/EIS/EIR pages 3.3-17 is revised as follows:

> ***WEMO Plan***
>
> The West Mojave Plan (WEMO Plan) includes a 9.3 million-acre planning area in an area located to the north of the Los Angeles metropolitan area. As an amendment to the CDCA Plan that was implemented in 1980, the WEMO Plan is one of the largest ~~habitat conservation plan (HCP)~~ federal land use plan amendments ever put in place in the United States. The Plan was implemented by the BLM; however, following the BLM's publication of the Record of Decision for the WEMO Plan, the habitat conservation plan portion of the WEMO Plan was not adopted by some participating agencies, namely the County of San Bernardino and City of Barstow. ~~Bernardino County, and the City of Barstow and applies to both public and private lands that include 3,263,874 acres of BLM-administered public lands, 3,029,230 acres of private lands and 102,168 acres of lands administered by the State of California. The Project is located on the eastern fringe of the WEMO planning area, thus, consistency with the Plan is required.~~
>
> The WEMO Plan provides a comprehensive strategy to conserve and protect the desert tortoise, Mohave ground squirrel, and nearly 100 other sensitive plants and animals and the natural communities of which they are a part~~. The Plan additionally offers a streamlined process for public agencies and private entities to meet their federal and state endangered species act requirements.~~

Additionally, the description of the WEMO Plan on Draft PA/EIS/EIR page 3.4-21 is revised as follows:

> The West Mojave Plan (WEMO Plan) includes a 9.3 million-acre planning area in an area located to the north of the Los Angeles metropolitan area. As an amendment to the CDCA Plan, the WEMO Plan is one of the ~~largest habitat conservation plan (HCP)~~ and federal land use plan amendments ever put in place in the United States. The Plan was implemented by the BLM; however, following the BLM's publication of the Record of Decision for the WEMO, the habitat

conservation plan portion of the WEMO was not adopted by some participating agencies, namely the County of San Bernardino and City of Barstow.~~San Bernardino County, and the City of Barstow and applies to both public and private lands that include 3,263,874 acres of BLM-administered public lands, 3,029,230 acres of private lands, and 102,168 acres of lands administered by the State of California.~~ The WEMO Plan is consistent with the integrated natural resource management plans that have been adopted for 2,667,445 acres of military lands, and with programs being implemented on the 292,689 acres of lands within Joshua Tree National Park. Other lands within the planning area include lands under the management of the Bureau of Indian Affairs and Department of Defense (BLM, County of San Bernardino, and City of Barstow, 2005). The Project site is located on the eastern fringe of the WEMO planning area.

The WEMO Plan provides a comprehensive strategy to conserve and protect the desert tortoise, Mohave ground squirrel, and nearly 100 other sensitive plants and animals and the natural communities of which they are a part. ~~The plan additionally offers a streamlined process for public agencies and private entities to meet their federal and state endangered species act requirements.~~

25-10 As cited in the Draft PA/EIS/EIR, the comment correctly notes that evidence of historic tortoise sign was detected throughout the Project area, and was not limited to the East Array. The statement that was intended to describe present tortoise use of the site on Draft PA/EIS/EIR page 3.4-9 is revised as follows:

> The distribution of desert tortoise sign in the desert tortoise study area is identified in Figure 3.4-1. Evidence of recent ~~T~~tortoise activity on the Project site seems to be limited to the East Array area, where sign was moderately wide-spread, particularly at the foot of the mountains to the east.

25-11 See Response 25-10, revising the description of "tortoise activity" to "recent tortoise activity." The Project record reflects the presence of desert tortoise sign observed in 2001 near the Opah Ditch Mine, as described in the Biological Resources Technical Report (Panorama Environmental, Inc., 2013a, provided as Appendix E-1 to the Draft PA/EIS/EIR) and the draft Desert Tortoise Translocation Plan (DTTP) (Panorama Environmental, Inc., 2013b). Tortoise distribution and abundance was estimated in the draft DTTP and this species is expected in most portions of the Project site, as reflected in the comment and indicated on Draft PA/EIS/EIR page 3.4-9 and in Figure 3.4-1. A draft DTTP that was revised in September 2014 is included in Appendix L of this Proposed PA/FEIS/EIR.

As indicated in Mitigation Measure 3.4-2d, Desert Tortoise Compensatory Mitigation, "the Project Owner shall provide compensatory mitigation…adjusted to reflect the final Project footprint," which "means all lands disturbed in the construction and operation of the proposed Project, including all Project linears, as well as undeveloped areas inside the Project's boundaries that will no longer provide viable long-term habitat for the desert

tortoise" (p. 3.4-60). Therefore, all land within the Project boundary, including all of the North Array, is considered compensable habitat and would be mitigated as such.

25-12 Table 3.4-2 has been updated in the Proposed PA/FEIS/EIR to reflect the revised status of Townsend's big-eared bat as a California candidate species. The analysis of potential species presence or absence on the site does not warrant revision in response to this update, as roosting habitat for this species does not occur on or adjacent to the Project site.

25-13 The Draft PA/EIS/EIR states on page 3.4-19 that the undeveloped 2,455.57-acre portion of the Project site provides suitable denning and foraging habitat for American badger. The anecdotal observation of badger digs cited by the commenter is noteworthy; however, whereas such digs provide evidence of foraging activity, they are not the same as badger dens, which provide daytime cover for this species and suggest habitation of the site. This species' potential presence was anticipated throughout the Project site. Potential direct and indirect impacts to American badger also were anticipated in the analysis and would be avoided and minimized by implementation of Mitigation Measures 3.4-1a (monitoring by a designated biologist); 3.4-1b (biological monitoring during construction); and 3.4-1c (WEAP). Additionally, the Proposed PA/FEIS/EIR recommends Mitigation Measure 3.4-1i, American badger and kit fox protection. Table 2-5 described APMs. As described in Response 25-2, APMs are proposed by the Applicant and not subject to revision by the lead agencies. Furthermore, as described on Draft PA/EIS/EIR page 2-25, APMs are implemented as design features of the Proposed Action, 'and are not "mitigation measures" as the term is used in the NEPA and CEQA contexts.' However, after the impacts of the Proposed Action (including APMs) have been analyzed, the BLM and/or County may apply mitigation to modify the Proposed Action and/or an APM in order to avoid, minimize, or mitigate an environmental impact.

25-14 The comment is noted but does not question the adequacy or accuracy of the Draft PA/EIR/EIS analysis. The requirements of the Raven Monitoring and Control Plan (APM 72), including any potential funding commitments, will be subject to lead agency review and approval. See Responses 25-2 and 25-13 regarding the status of APMs. A draft Raven Management Plan is provided in Proposed PA/FEIS/EIR Appendix L.

25-15 The 2,557 acres of total Project disturbance (Table 2-1, Draft PA/EIS/EIR p. 2-5) include 2,455.57 acres of known undeveloped habitat that would require compensation. See Table 3.3-2, Natural Communities and Cover Types on the Project Site, which indicates that 8.27 acres are developed/unvegetated, and that the vegetation type(s) for approximately 15 acres of permanent disturbance and 68 acres of temporary disturbance are not known due to preliminary nature of the Project design. The estimated site impacts presented in the Biological Resources Technical Report were based on a preliminary project layout that was later refined to avoid impacts to sensitive species and their habitat, removing several hundred acres from consideration as potential areas of permanent or temporary disturbance. The amount of compensatory lands to be provided for desert tortoise is clearly described in Mitigation Measure 3.4-2d, which indicates that 1 acre of

desert tortoise habitat shall be provided for every acre of habitat within the final Project footprint. The final Project footprint will not be known until final design is completed. Thus, it is estimated that the proposed Project would require 2.455.77 acres of compensatory lands; and this number would be revised to reflect final site impacts in accordance with Mitigation Measure 3.4-2d.

25-16 The Draft Desert Tortoise Translocation Plan (DTTP) indicates that, using the USFWS population estimate metrics, two tortoises are expected on the Project site (Panorama Environmental., Inc., 2013b). The relevant portion of Proposed PA/FEIS/EIR Section 3.4.6.1 has been revised to reflect this information. See Response 25-1 regarding the availability of materials referenced in the Draft PA/EIS/EIR to the public. A draft DTTP revised in September 2014 is provided in Appendix L of this Proposed PA/FEIS/EIR.

25-17 The Kiva Biological Consulting survey findings for desert tortoise (Kiva Biological Consulting, 2013a) and raw data for burrowing owl surveys (Kiva Biological Consulting, 2013b) are cited on Draft PA/EIS/EIR pages 3.4-9 and 3.4-34, respectively. Regarding the estimated density of tortoises on the site, see Response 25-16. Regarding the locations of the translocation sites, see Response 25-18.

25-18 At this time, potential desert tortoise translocation sites are being considered south of the North Arrays and east of the East Arrays, as described in the draft DTTP (Appendix L). If tortoise are detected during preconstruction clearance surveys, they would be located to the nearest suitable translocation area. The comment's suggestion that the Proposed PA/FEIS/EIR needs to assess the appropriateness of the potential translocation sites is noted. As noted in Mitigation Measure 3.4-2b (Draft PA/EIS/EIR p. 3.4-58), the revised DTTP must be approved by the USFWS, CDFW, and BLM prior to implementation. See also Response 25-20. The "north translocation area" described by the commenter is the only area where live tortoise were detected in the Project area, indicating that this area can support relocated individuals, if detected.

25-19 As expressed in Mitigation Measure 3.4-1a (Draft PA/EIS/EIR p. 3.4-51 et seq.), the Designated Biologist shall be the BLM field liaison, whereas the Biological Monitor will implement protective measures to minimize impacts to desert tortoises.

25-20 The comment that the final DTTP should be approved prior to any ground-disturbance activities occur or any tortoises are handled is noted, and has been incorporated into Mitigation Measure 3.4-2b as follows:

> **Mitigation Measure 3.4-2b: Desert Tortoise Translocation Plan.** The Applicant/Owner shall develop and implement a USFWS-approved Desert Tortoise Translocation Plan (DTTP). The DTTP<u>, which shall be approved prior to any ground disturbance or tortoise relocation,</u> shall include measures to minimize the potential for repeated translocations of individual desert tortoises. The goals of the DTTP shall be to: relocate all desert tortoises from the Project site to nearby suitable habitat; minimize impacts on resident desert tortoises outside the Project

> site; minimize stress, disturbance, and injuries to relocated/translocated tortoises; and assess the success of the translocation effort through monitoring. The final DTTP shall be based on the draft Desert Tortoise Translocation Plan prepared by the Applicant/Owner (Panorama Environmental, Inc., 2013d) and shall include all revisions deemed necessary by BLM, USFWS, and CDFW.

Tortoise translocation sites are discussed in Response 25-18, and presently support desert tortoise. The potential for disease transmission between tortoises is addressed in the draft DTTP. Tortoises shall be addressed through a standard program to be reviewed by the USFWS that includes health assessments of resident and translocated tortoises, blood samples, and health evaluations of encountered tortoises.

25-21 The comment is noted. The BLM anticipates that the desert tortoise "take" thresholds in the forthcoming USFWS Biological Opinion will not be exceeded and that no additional contingency measures are necessary.

25-22 As described on Draft PA/EIS/EIR p 3.4-60 et seq., Mitigation Measure 3.4-2d includes the requirement to provide funding for the acquisition, initial improvement, and long-term management of compensation lands, which includes required documentation for site management. Compensatory lands will be held in fee title by CDFW, or if an approved non-profit holds a conservation easement, CDFW shall be named a third party beneficiary. Thus, the conservation lands will not to be subject to future development.

25-23 The suggested change is noted. The BLM anticipates that the desert tortoise "take" thresholds in the forthcoming USFWS Biological Opinion will not be exceeded and that no additional contingency measures are necessary.

25-24 In response to this comment, Mitigation Measure 3.4-5b is revised as follows:

> **Mitigation Measure 3.4-5b: Operation and Maintenance Education Program.** A WEAP shall be implemented during the operation and maintenance phase of the Project to alert workers to the hazards posed by ongoing operations to common and special-status wildlife species. The WEAP shall <u>be repeated annually and</u> include the same program elements discussed in Mitigation Measure 3.4-1c.

25-25 The comment is noted. A copy of the Desert Tortoise Council's scoping letter for the Project is provided in Draft PA/EIS/EIR Appendix B, page B-198. Regarding the analysis of impacts to American badger, please see Response 25-13.

25-26 The comment's statement of support for Alternative G is noted.

Letter 26 – Responses to Comments from David Carpenter

26-1 The Draft PA/EIS/EIR analyzes the Project's and alternatives' potential impacts on scenic values (Section 3.18, Visual Resources; p. 3.18-1 et seq.), biological resources including bighorn sheep and desert tortoise (Section 3.4, Biological Resources – Wildlife; p. 3.4-1), and water resources (Section 3.19, Water Resources; p. 3.19-1). The comment

does not address the adequacy or accuracy of the environmental analysis in the Draft PA/EIS/EIR and does not identify any other significant environmental issue requiring substantive response.

26-2 The potential contributions of the Project and alternatives to cumulative impacts are described and analyzed throughout Chapter 3 of the Draft PA/EIS/EIR. The comment does not address the adequacy or accuracy of the environmental analysis in the Draft PA/EIS/EIR and does not identify any other significant environmental issue requiring substantive response.

26-3 The comment's statement of opposition to the Project is noted.

Letter 27 – Responses to Comments from Michael Gordon

27-1 The comment's statement of opposition to the Project is noted. Refer to Common Response 1 in Proposed PA/FEIS/EIR Section 4.5.3.1 for a discussion of alternatives considered.

27-2 As described in Draft PA/EIS/EIR Section ES.5.1 (p. ES-6) and Appendix B, Scoping Report, the BLM and San Bernardino County considered the input received in scoping comment letters when determining the scope of issues to be addressed in the analysis. Summaries of scoping comments regarding specific resources are provided in the introductory sections throughout Chapter 3 of the Draft PA/EIS/EIR – see, e.g., Section 3.4.1 on page 3.4-1.

27-3 The Draft PA/EIS/EIR addresses the potential impacts identified by the commenter, including potential impacts to spring discharge in the Soda Spring area (Draft PA/EIS/EIR pages 3.19-28 to 3.19-30), potential loss of habitat for Mojave tui chub (Draft PA/EIS/EIR pages 3.4-31, 3.4-70, and 3.19-28 to 3.19-30), loss of desert tortoise habitat (Draft PA/EIS/EIR pages 3.4-30 to 3.4-34), and the potential for the Project to contribute to bighorn sheep habitat fragmentation and loss of wildlife connectivity in the north Soda Mountains (Draft PA/EIS/EIR pages 3.4-41 and 3.4-42). Additionally, refer to Common Response 4 in Proposed PA/FEIS/EIR Section 4.5.3.4 regarding groundwater impacts and tui chub habitat, Common Response 3 in Proposed PA/FEIS/EIR Section 4.5.3.3 regarding desert tortoise, and Common Response 2 in Proposed PA/FEIS/EIR Section 4.5.3.2 regarding bighorn sheep.

27-4 The potential impacts of the Proposed Action and alternatives on the user experience at Mojave National Preserve are analyzed in Draft PA/EIS/EIR Sections 3.13, Recreation (see page 3.13-7 acknowledging noise, dust, and visual disturbance near the Zzyzx Road entrance to the Preserve) and 3.18, Visual Resources (see pages 3.18-26 through 3.18-26 describing impacts on views from Key Observation Points (KOPs) 13, 14, and 19, which represent views from the Preserve). Also see Common Response 6 in Proposed PA/FEIS/EIR Section 4.5.3.6 regarding visual resources, including views from Mojave National Preserve.

The Draft PA/EIS/EIR acknowledges the proximity of the requested ROW area to the Mojave National Preserve. However, the Project would not directly affect lands within the Mojave National Preserve, as it is located outside of the Preserve. The Mojave National Preserve was designated by Congress in the California Desert Protection Act of 1994, and did not include the lands within the requested ROW area, which remain under BLM management per the CDCA Plan.

27-5 Refer to Common Response 6 in Proposed PA/FEIS/EIR Section 4.5.3.6 regarding impacts to views from Mojave National Preserve, including nighttime lighting effects.

27-6 Regarding impacts to Mojave National Preserve, refer to Response 27-4. Zzyzx Road does not traverse the Project site, and travelers accessing the Desert Studies Center via Zzyzx Road from I-15 would not travel through the Project site while on Zzyzx Road. Visual impacts to travelers on I-15 are analyzed in Draft PA/EIS/EIR Section 3.18, Visual Resources (p. 3.18-1 et seq.). The Project site would not be visible from the Desert Studies Center, as the Center is located at least 3 miles from the nearest portion of the Project site and views toward the Project site are blocked by intervening topography.

27-7 Please see Common Response 5 in Proposed PA/FEIS/EIR Section 4.5.3.5 regarding clarification of potential impacts to Rasor Road and Rasor OHV area.

27-8 The potential impacts of the Project with respect to glint and glare, including impacts on drivers on I-15, are addressed on Draft PA/EIS/EIR pages 3.18-24 and 3.18-25, and mitigation measures are proposed to reduce these impacts. See also Common Response 6 in Proposed PA/FEIS/EIR Section 4.5.3.6.

27-9 Refer to Common Response 1 in Proposed PA/FEIS/EIR Section 4.5.3.1 for a discussion of distributed generation and disturbed land alternatives considered. Because the Project is proposed on BLM-managed lands, the Project is considered in the context of the BLM mission statement and FLPMA rather than the National Park Service mission statement. See Proposed PA/FEIS/EIR Section 4.1.3 for a discussion of ongoing consultation with the National Park Service.

27-10 The comment's statement of opposition to the Project is noted.

Letter 28 – Responses to Comments from Cody Dolnick

28-1 The commenter's suggestion is noted. There is no requirement to record public meetings under NEPA or CEQA. Notes taken by the BLM, County, and/or their consultants during the meetings are included in the Administrative Record for this Project. The BLM has not violated any applicable laws, regulations, policies, or guidelines in holding public meetings, the intended and advertised purpose of which is "to aid the public's understanding of the project and to solicit written comments on planning issues and the potential impacts, alternatives, and mitigation measures that should be considered in the Final Environmental Impact Statement/Environmental Impact Report" (BLM, 2013a,

2013b). The comment does not address the adequacy or accuracy of the environmental analysis in the Draft PA/EIS/EIR.

28-2 Regarding site alternatives, see Common Response 1 in Proposed PA/FEIS/EIR Section 4.5.3.1. Because no new alternatives are being considered compared to those analyzed in the Draft PA/EIS/EIR, supplemental environmental review is not being circulated for the Soda Mountain Solar Project.

28-3 The 95-day period provided for public comment is longer than both the NEPA- and FLPMA-required comment periods for draft EISs and plan amendments, and longer than the CEQA-required comment period for draft EIRs. The BLM and San Bernardino County decline to extend the comment period.

28-4 Responses to concerns about the specific issues raised in the comment have been developed. Refer to Common Response 2 in Proposed PA/FEIS/EIR Section 4.5.3.2 regarding bighorn sheep; Common Response 3 in Proposed PA/FEIS/EIR Section 4.5.3.3 regarding desert tortoise; and Common Response 4 in Proposed PA/FEIS/EIR Section 4.5.3.4 regarding groundwater and tui chub impacts.

28-5 The Project is located outside of the Mojave National Preserve on lands managed by the BLM in accordance with the CDCA Plan. The potential impacts of the Proposed Action and alternatives on the user experience at Mojave National Preserve are analyzed in Draft PA/EIS/EIR Sections 3.13, Recreation (see page 3.13-7 acknowledging noise, dust, and visual disturbance near the Zzyzx Road entrance to the Preserve) and 3.18, Visual Resources (see pages 3.18-26 through 3.18-26 describing impacts on views from Key Observation Points (KOPs) 13, 14, and 19, which represent views from the Preserve). As noted on page 3.18-26, "The cumulative total of the area from which the Project may be seen from within the Preserve in the foreground/middleground distance zone covers approximately 350 acres. This represents 0.0002 percent of the 1.6-million-acre Preserve," and foreground/middleground views of the Project site from elsewhere in the Preserve would be blocked by the Soda Mountains. The comment does not directly address the adequacy or accuracy of this analysis. Also, see Common Response 6 in Proposed PA/FEIS/EIR Section 4.5.3.6 regarding visual resources, including views from Mojave National Preserve.

28-6 The comment's statement of opposition to the Project is noted. Please see Common Response 1 in Proposed PA/FEIS/EIR Section 4.5.3.1 for a discussion of distributed generation and disturbed land alternatives considered.

Letter 29 – Responses to Comments from Donald Krouse

29-1 The commenter's suggestion is noted. There is no requirement to record public meetings under NEPA or CEQA. Notes taken by the BLM, County, and/or their consultants during the meetings are included in the Administrative Record for this Project. The BLM has not violated any applicable laws, regulations, policies, or guidelines in holding public

meetings, the intended and advertised purpose of which is "to aid the public's understanding of the project and to solicit written comments on planning issues and the potential impacts, alternatives, and mitigation measures that should be considered in the Final Environmental Impact Statement/Environmental Impact Report" (BLM, 2013a, 2013b). The comment does not address the adequacy or accuracy of the environmental analysis in the Draft PA/EIS/EIR.

29-2 Regarding site alternatives, refer to Common Response 1 in Proposed PA/FEIS/EIR Section 4.5.3.1.

29-3 The 95-day period provided for public comment is longer than both the NEPA- and FLPMA-required comment periods for draft EISs and plan amendments, and longer than the CEQA-required comment period for draft EIRs. No specific examples, facts, reasonable assumptions predicated upon facts, or other evidence are provided in support of the comment's request for an extension of the comment period. The BLM and San Bernardino County decline to extend the comment period.

Letter 30 – Responses to Comments from Carol Wiley

30-1 The comment's statement of opposition to the Project is noted. The comment correctly notes that the Soda Mountains Wilderness Study Area (WSA) and Mojave National Preserve are located near the Project site. As noted in Draft PA/EIS/EIR Section 3.13, Recreation, both are located within 0.5 mile of the Project site (pp. 3.13-3 and 3.13-4). The Desert Studies Center at Zzyzx is located over 3 miles from the Project site.

30-2 The potential impacts of the Project on views from I-15 are analyzed, and mitigation measures proposed, in Draft PA/EIS/EIR Section 3.18, Visual Resources (p. 3.18-1 et seq). The potential impacts of the Proposed Action and alternatives on the user experience at Mojave National Preserve are analyzed in Draft PA/EIS/EIR Sections 3.13, Recreation (see page 3.13-7 acknowledging noise, dust, and visual disturbance near the Zzyzx Road entrance to the Preserve) and 3.18, Visual Resources (see pages 3.18-26 through 3.18-26 describing impacts on views from Key Observation Points (KOPs) 13, 14, and 19, which represent views from the Preserve). As noted on page 3.18-26, "The cumulative total of the area from which the Project may be seen from within the Preserve in the foreground/middleground distance zone covers approximately 350 acres. This represents 0.0002 percent of the 1.6-million-acre Preserve," and foreground/middleground views of the Project site from elsewhere in the Preserve would be blocked by the Soda Mountains. Also refer to Common Response 6 in Proposed PA/FEIS/EIR Section 4.5.3.6 regarding visual resource-related impacts on views from Mojave National Preserve.

30-3 Because the commenter does not specify or provide a copy or link to the map referenced in the comment, the BLM and San Bernardino County are unable to provide a specific response to such at this time. Past, present, and reasonably foreseeable future projects with the potential to contribute to cumulative impacts in combination with the Project or alternatives are described in Draft PA/EIS/EIR Section 3.1.5, Cumulative Scenario

(p. 3.1-4 et seq.). These projects are shown on Draft PA/EIS/EIR Figure 3.1-1 in relation to Mojave National Preserve. The potential project-level and cumulative effects on recreational and visual resources at Mojave National Preserve are described in Draft PA/EIS/EIR Sections 3.13, Recreation (p. 3.13-1 et seq.); 3.15, Special Designations (p. 3.15-1 et seq.); and 3.18, Visual Resources (p. 3.18-1 et seq.).

Additionally, as described in Draft PA/EIS/EIR Section 3.2, Air Resources, long-term emissions associated with operation and maintenance of the Project or an alternative would not exceed the federal *de minimis* levels or thresholds adopted by the MDAQMD with implementation of Mitigation Measure 3.2-1; therefore, the emissions would not cause or contribute to an adverse cumulative effect relative to regional air resources (p. 3.2-31). Refer to Common Response 4 in Proposed PA/FEIS/EIR Section 4.5.3.4 regarding potential groundwater impacts. As noted in Section 3.19, the only reasonably foreseeable projects that cross the basins affected by the Project are the XpressWest and Calnev projects; however, neither proposes to use groundwater from the same basins affected by the Project. Therefore, within the relevant area, the amount of groundwater drawdown would be determined solely by the Project, and would be monitored as described under Mitigation Measure 3.19-4 (p. 3.19-41 et seq.).

30-4 Refer to Common Response 1 in Proposed PA/FEIS/EIR Section 4.5.3.1 for a discussion of the range of alternatives considered in compliance with both NEPA and CEQA requirements.

30-5 Potential project impacts to the species identified by the commenter were adequately addressed in the Draft PA/EIS/EIR. The potential for the Project to contribute to bighorn sheep habitat fragmentation and loss of wildlife connectivity in the north Soda Mountains was discussed on Draft PA/EIS/EIR pages 3.4-41 and 3.4-42. In the Project area, the I-15 freeway presently obstructs bighorn sheep movement between the north and south Soda Mountains. As discussed in the Draft PA/EIS/EIR, the Project would not obstruct any migratory corridors currently used by bighorn sheep. Additionally, refer to Common Response 2 in Proposed PA/FEIS/EIR Section 4.5.3.2 regarding bighorn sheep.

30-6 As disclosed in Draft PA/EIS/EIR Section 3.4, Biological Resources – Wildlife, the Project would result in the loss of 2,455.57 acres of low- to moderate-quality occupied and intermittently occupied desert tortoise habitat; critical habitat for desert tortoise does not occur on the Project site (page 3.4-31). Habitat impacts to this species would be fully mitigated through the implementation of APM 73 and Mitigation Measures 3.4-2a (desert tortoise protection), 3.4-2b (Desert Tortoise Translocation Plan), 3.4-2c (desert tortoise compliance verification), and 3.4-2d (desert tortoise compensatory mitigation). Potential loss of habitat for Mojave tui chub is discussed on Draft PA/EIS/EIR pages 3.4-31, 3.4-70, and 3.19-28 to 3.19-30. No direct or indirect Project impacts to golden eagle are expected to occur (pp 3.4-49 and 3.4-50). Additionally, refer to Common Response 4 in Proposed PA/FEIS/EIR Section 4.5.3.4 regarding groundwater impacts and tui chub habitat and Common Response 3 in Proposed PA/FEIS/EIR Section 4.5.3.3 regarding desert tortoise.

30-7 Regarding potential impacts to sensitive water resources from groundwater use, refer to Common Response 4 in Proposed PA/FEIS/EIR Section 4.5.3.4.

30-8 Regarding potential impacts to Mojave National Preserve, see Response 30-2. As discussed in Draft PA/EIS/EIR Section 3.15, Special Designations, WSAs are areas "under consideration" by Congress as potential wilderness, and, until Congress designates them as Wilderness or releases them from study, are managed in a manner that does not impair the suitability of such areas to be designated as Wilderness (p. 3.15-3). The California Desert Protection Act (PL 103-344, §104) specifically did not release Soda Mountains WSA from WSA protection and the requirements of Section 603(c) of FLPMA. The BLM therefore manages this area in keeping with this policy. The Proposed PA/FEIS/EIR recommends Mitigation Measure 3.15-1, which would provide for a wilderness characteristics inventory and making or funding changes within or near the WSA so that the Project's proximity to the Soda Mountains WSA would not preclude it from consideration as designated Wilderness. Additionally, the CDPA Section 103(d) states, "The Congress does not intend for the designation of wilderness areas in §102 of this title to lead to the creation of protective perimeters or buffer zones around any such wilderness area."

30-9 Refer to Common Response 1 in Proposed PA/FEIS/EIR Section 4.5.3.1 for a discussion of distributed generation and site alternatives considered.

30-10 See Response 30-2.

30-11 The Project's potential direct and indirect impacts to bighorn sheep are discussed on Draft PA/EIS/EIR pages 3.4-41 to 3.4-42. Additionally, refer to Common Response 2 in Proposed PA/FEIS/EIR Section 4.5.3.2 regarding bighorn sheep.

30-12 The Project's potential impacts to the Mojave tui chub are addressed on Draft PA/EIS/EIR pages 3.4-31, 3.4-70, and 3.19-28 to 3.19-30. Additionally, refer to Common Response 4 in Proposed PA/FEIS/EIR Section 4.5.3.4 regarding groundwater impacts and tui chub habitat.

30-13 The comment is noted. Refer to Responses 16-1 through 16-20 for responses to comments from the National Park Service, Mojave National Preserve.

30-14 The comment's statement of opposition to the Project is noted. The potential impacts of the Proposed Action and alternatives on the user experience at Mojave National Preserve are analyzed in Draft PA/EIS/EIR Sections 3.13, Recreation (see page 3.13-7 acknowledging noise, dust, and visual disturbance near the Zzyzx Road entrance to the Preserve) and 3.18, Visual Resources (see pages 3.18-26 through 3.18-26 describing impacts on views from Key Observation Points (KOPs) 13, 14, and 19, which represent views from the Preserve). The comment does not address the adequacy or accuracy of this analysis. Please also refer to Common Response 2 in Proposed PA/FEIS/EIR Section 4.5.3.2 regarding bighorn sheep; Common Response 3 in Proposed PA/FEIS/EIR Section 4.5.3.3 regarding desert tortoise; Common Response 4 in Proposed PA/FEIS/EIR Section 4.5.3.4 regarding

groundwater resources; and Common Response 6 in Proposed PA/FEIS/EIR Section 4.5.3.6 regarding visual resources, including views from Mojave National Preserve.

30-15 The comment's statement of opposition to the Project is noted. Refer to Common Response 1 in Proposed PA/FEIS/EIR Section 4.5.3.1 for a discussion of distributed generation and site alternatives considered.

Letter 31 – Responses to Comments from Center for Biological Diversity

31-1 Consistent with 40 CFR 1502.21 and CEQA Guidelines Section 15148, the Draft PA/EIS/EIR incorporates material by reference rather than appending it to the document to maintain a reasonable document length. All materials referenced in the Draft PA/EIS/EIR are available in the administrative record, and the public may obtain it and all other Project-related public records from the BLM by requesting them from Jeff Childers, Project Manager, California Desert District. Contact information is provided in Draft PA/EIS/EIR Section 4.4 (p. 4-5). The 95-day period provided for public comment is longer than both the NEPA- and FLPMA-required comment periods for draft EISs and plan amendments, and longer than the CEQA-required comment period for draft EIRs. No specific examples, facts, reasonable assumptions predicated upon facts, or other evidence are provided in support of the comment's request for an extension of the comment period. The BLM and San Bernardino County decline to extend the comment period.

31-2 A discussion of the scoping comment letter submitted by the Center for Biological Diversity, Defenders of Wildlife, and other organizations is located in Proposed PA/FEIS/EIR Section 4.4, Scoping.

31-3 The comments regarding the adequacy and accuracy of the analysis are addressed below where comments provide sufficient information to provide a detailed response. Regarding the range of alternatives analyzed, refer to Common Response 1 in Proposed PA/FEIS/EIR Section 4.5.3.1.

31-4 Regarding the range of alternatives analyzed in the Draft PA/EIS/EIR and the relationship of the Proposed Action to the Western Solar Plan and decisions made in the Western Solar Plan Record of Decision (ROD), refer to Common Response 1 in Proposed PA/FEIS/EIR Section 4.5.3.1. The Western Solar Plan was a separate planning process that underwent NEPA review, resulting in a ROD in October 2012. Comments on the decisions made in the Western Solar Plan ROD are outside the scope of the EIS/EIR for the Proposed Action.

31-5 The comments regarding the adequacy and accuracy of the analysis are addressed below where comments provide sufficient information to provide a detailed response.

31-6 See Response 25-9.

31-7 See Response 25-9.

31-8 The Draft PA/EIS/EIR clearly identifies the CDCA Plan Amendment as part of the Proposed Action. Section 1.2.1 of the Draft PA/EIS/EIR states "In connection with its decision on the Project, the BLM's action also will include consideration of a concurrent amendment of the CDCA Plan." Section 2.3 specifies that "the BLM could elect to amend the CDCA Plan to identify the development footprint as suitable for solar energy development" and describes the BLM's range of potential plan amendment decisions considered in the EIS/EIR.

Additionally, Section 2.3 of the Draft PA/EIS/EIR explains what, if any, CDCA Plan Amendment would be required for each of the action and no action/no project alternatives analyzed in the EIS/EIR. Specifically, each of the four action alternatives (A through D) as well as the CEQA No Project alternative (F) would require a finding of suitability for solar development. The No Action/No Project Alternative (E) would require no plan amendment, and Alternative G would require a plan amendment to identify the land as not suitable for solar development. The environmental consequences of each of these plan amendment alternatives are addressed in the Draft PA/EIS/EIR. The specific language relating to a plan amendment will be provided in the ROD once a decision is made on the Project and will be substantially similar to the language in Draft PA/EIS/EIR Section 2.3. Therefore, the BLM and County disagree with the comment's suggestion that recirculation of the Draft PA/EIS/EIR is required to provide specific plan amendment language, as doing so would not present significant new information requiring recirculation under NEPA or CEQA.

31-9 The range of possible CDCA Plan amendments described in Draft PA/EIS/EIR Section 2.3 is analyzed throughout the Draft PA/EIS/EIR. The analysis addresses 1) whether a utility-scale solar PV plant is a suitable use for the requested ROW area (in its evaluation of the action alternatives (A through D) in comparison to the no project alternatives E and G); and 2) how much of the requested ROW area is suitable for such development in light of management goals and impacts to resources (in its comparative evaluation of the Proposed Action and three reduced-acreage alternatives, B, C, and D). The comment's third point ("the location of public lands suitable for such uses") was addressed in the Western Solar Plan, which was a programmatic evaluation of lands in the CDCA and elsewhere in the western United States for their suitability for solar development. Such evaluation is outside of the scope of the Draft PA/EIS/EIR and Proposed PA/FEIS/EIR which evaluate the Proposed Action and a range of alternatives that responds to the BLM's purpose and need for the Project (see Common Response 1 in Proposed PA/FEIS/EIR Section 4.5.3.1). No specific examples, facts, reasonable assumptions predicated upon facts, or other evidence are provided in support of the comment's suggestion that the Draft PA/EIS/EIR's evaluation of the proposed CDCA Plan amendment is inadequate.

Furthermore, the BLM notes that the CDCA Plan does contemplate the potential for projects such as the Proposed Action; as described in Draft PA/EIS/EIR Section 3.9, Lands and Realty, "MUC designations govern the type and degree of land uses allowed

within each of the MUCs present within the ROW boundary. All land use actions and resource-management activities on BLM-administered lands within a MUC delineation must meet the guidelines for that class. These guidelines are provided in Table 1, Multiple-Use Class Guidelines, of the CDCA Plan (BLM, 1999). The Class L, M, and I designations allow electric generation plants for solar facilities to be developed in accordance with federal, state, and local regulations after NEPA requirements are met. In Class L designations, the AO is directed to use judgment in allowing for consumptive uses by taking into consideration the sensitive natural and cultural values that might be degraded as a result." (p. 3.9-14). Additionally, the WEMO Plan contemplates the potential for development on public lands, for example, in Section 2.2.2.2, Mitigation Fee, which notes "There would be three levels of compensation. … Within all other areas outside of the HCA, the mitigation fee would be based on a 1:1 compensation ratio. … The mitigation fee would be applicable to development and/or loss of habitat on both private and BLM administered public lands, and would be considered to be the complete compensation for loss of habitat. …On BLM lands, the mitigation fee would apply to all new land disturbing projects subject to federal permits, and would be collected by the BLM at the time of permit issuance" (BLM, 2005, pp. 2-34 and 2-35).

31-10 As noted in Draft PA/EIS/EIR Section 3.9, Lands and Realty, because any exceedance of applicable air quality thresholds would be temporary and emissions would disperse from the Project site rapidly, the Proposed Action would conform to the Clean Air Act Class II objectives referenced in the CDCA Plan MUC guidelines (p. 3.9-19). The BLM disagrees that other plan amendments would be needed in addition to the CDCA Plan amendment described in Draft PA/EIS/EIR Section 2.3, and the comment does not provide specific examples, facts, reasonable assumptions predicated upon facts, or other evidence are provided in support of this suggestion.

31-11 Regarding the relationship of the Proposed Action to the DRECP planning process, refer to Common Response 1 in Proposed PA/FEIS/EIR Section 4.5.3.1. As indicated therein, the DRECP remains in draft form, and thus does not govern the BLM's decision-making efforts for the Project; rather, the Proposed Action and alternatives are analyzed in accordance with existing laws, regulations, and policies, including the FLPMA.

31-12 Comprehensive biological resource inventory surveys were performed in 2009, 2011, 2012, and 2013 for the Project, and are adequate to characterize biological resources on the site using standard plant and wildlife survey protocols that were developed by regulatory agencies. The surveys included all sensitive plant, wildlife, and wetland resources that are subject to state or federal regulation on the Project site. The multiple years of plant and wildlife surveys completed for the Project provide a long-range assessment of biological resources. The commenting party's opinion that the characterization of baseline biological conditions is not adequate is noted; however, the BLM and County disagree and, without data, facts, or other justification supporting the commenter's opinion, the lead agencies are unable to provide a more detailed response.

31-13 The comment is noted. For the reasons described in other responses to this letter, the BLM and San Bernardino County decline to issue a revised Draft PA/EIS/EIR.

31-14 As explained in the Response 31-12, biological resources were fully and adequately characterized on the Project site prior to the site review. The Draft PA/EIS/EIR analyzes and discloses potential impacts to avian species from the PV arrays in Section 3.4, Biological Resources – Wildlife (see, e.g., pages 3.4-36, 3.4-37, 3.4-39, and 3.4-40). The commenting party's opinion that the potential impacts to avian species are not properly identified or analyzed is noted; however, the BLM and County disagree and, without data, facts, or other justification supporting the commenter's opinion, the lead agencies are unable to provide a more detailed response.

31-15 The comment does not provide enough detail about what information is purported to be incomplete to allow the BLM or County to provide a detailed response to this comment. However, the comment letter provides more specific comments suggesting that the Draft PA/EIS/EIR contains incomplete information with respect to several resources; responses are provided to specific allegations of incomplete information where the comment letter provides enough specificity to allow a substantive response.

31-16 Regarding the BLM's statement of purpose and need and the range of alternatives evaluated, refer to Common Response 1 in Proposed PA/FEIS/EIR Section 4.5.3.1.

31-17 The Draft PA/EIS/EIR discusses potential impacts of climate change on the Project and describes mitigation measures that would minimize these effects in Section 3.5, Climate Change (see, e.g., pages 3.5-14 through 3.5-16). Substantial climate change-related environmental changes such as major shifts in vegetation communities are not anticipated in the Project site during the life of the Project, which would be decommissioned after approximately 30 years of operation unless the permits are renewed. The Project site is situated in a location that already poses a challenging impediment to movement for some wildlife species due to the presence of the I-15 freeway corridor. Project impacts to bighorn sheep movement are disclosed in the Draft PA/EIS/EIR and would not be exacerbated by climate change during the life of the Project. Project risks to avian species and potential impacts resulting from introduction of weeds are similarly disclosed in the Draft PA/EIS/EIR and would not be amplified by climate change during the life of the Project. The comment does not identify any specific proposed or adopted climate change adaptation strategy that may affect or be affected by the Project, nor does it provide any other data, facts, or justification for supporting the opinion that the Draft PA/EIS/EIR inadequately addresses global climate change; therefore, the lead agencies are unable to provide a more detailed response.

31-18 The Draft PA/EIS/EIR presents a direct and indirect GHG emissions impact analysis for Alternative B in Section 3.5.6.2 (pp 3.5-15 through 3.5-17); for Alternative C in Section 3.5.6.3 (pp. 3.5-17 through 3.5-19); for Alternative D in Section 3.5.6.4 (pp. 3.5-19 through 3.5-21); for Alternative E in Section 3.5.6.5 (p. 3.5-21); for Alternative F,

including additional truck trips, in Section 3.5.6.6 (pp. 3.5-21 and 3.5-22); and for Alternative G in Section 3.5.6.7 (p. 3.5-22).

As also described in Draft PA/EIS/EIR Section 3.5, California's Renewables Portfolio Standard (RPS) mandates that 33 percent of the electricity sold in California must come from renewable sources by 2020. When renewable energy is available to the grid, the California Independent Systems Operator (CAISO) requests turndown of fossil power production from unspecified dispatchable fossil fuel plants to make way for the use of the renewable energy resources, per the loading order first adopted in California's 2003 Energy Action Plan. Furthermore, until the RPS goal has been met, electricity generated by new renewable sources will continue to be prioritized over new natural gas power plants. Thus, Project-generated electricity would replace the demand for electricity generated by existing dispatchable fossil fuel power plants and/or future plants that may be developed in the absence of the Project, as demand for new sources of electricity grows. In response to this comment, a description of the Energy Action Plan and CAISO loading order has been added to Proposed PA/FEIS/EIR Section 3.5.3.2 to clarify the basis for the assumption that renewable electricity sources would displace fossil fuel-fired sources.

31-19 The commenter's opinion that the Draft PA/EIS/EIR does not provide adequate baseline information related to the status of plants, animals, and natural communities including bighorn sheep, golden eagles, migratory birds, and rare plant, or sufficient baseline information on water resources and hydrology is noted. The analysis of potential Project impacts to biological resources was evaluated in the Draft PA/EIS/EIR based on recent comprehensive surveys of on-site resources. Plant and wildlife survey protocols were performed to CDFW, USFWS, and BLM survey protocols, as applicable, as detailed in Draft PA/EIS/EIR Sections 3.3, Biological Resources – Vegetation (p. 3.3-2) and 3.4, Biological Resources – Wildlife (p. 3.4-2). The analytical methodology for the wetland and hydrological analysis is presented on Draft PA/EIS/EIR Section 3.19, Water Resources (p. 3.19-17). Each technical study and survey report that was prepared in support of the Draft PA/EIS/EIR analysis was reviewed by BLM and County analysts with appropriate qualifications to verify their applicability to the Project and whether they adequately support the water resources analysis for the Project. Thus, the analysis relied upon current baseline studies of on-site biological and hydrological conditions when reaching conclusions regarding potential Project effects on resources.

31-20 The commenter's opinion that the Draft PA/EIS/EIR does not adequately identify on-site resources, evaluate the impacts to such resources, or propose adequate mitigation or assure adequate monitoring for adaptive management to occur is noted. The example that the commenter presents is that the single-year avian point count surveys should have been more extensive. While avian point count surveys typically are performed in advance of solar projects, the duration of such surveys is not defined by federal or state protocols. The methods used for avian point count surveys performed in spring and fall 2009 were approved by the BLM and are considered adequate to assess potential Project impacts on avian species. Additionally, separate surveys were performed for burrowing owl and

golden eagle to characterize these species' use of the Project site. The comment does not provide data, facts, or justification for supporting the opinion that one year of avian point count surveys is inadequate, or that any other surveys or survey methods were inadequate to characterize baseline conditions.

31-21 The commenter's opinion that a minimum 3:1 mitigation ratio should be applied for desert tortoise is noted. The BLM requires a compensatory mitigation ratio of 1:1 to meet its "fully mitigated" standard for desert tortoise (Mitigation Measure 3.4-2d, p. 3.4-60 et seq.) and a similar 1:1 compensation ratio was applied in the Draft PA/EIS/EIR for the loss of active burrowing owl territories (Mitigation Measure 3.4-1f(5), p. 3.4-54). The Draft PA/EIS/EIR does not identify a need to provide compensatory habitat for special-status and migratory birds, bats, American badger, desert kit fox, or rare plants. Regarding bighorn sheep connectivity, refer to Common Response 2 in Proposed PA/FEIS/EIR Section 4.5.3.2.

31-22 The USFWS survey protocol for desert tortoise is intended to determine the potential presence or absence of this species within a given study area. The presence of desert tortoise has been presumed on the Project site from the initial planning stages, as desert tortoise sign is present throughout much of the site and a tortoise was detected during surveys. While a finding of tortoise absence is considered valid for a limited period, the documentation of species presence is considered valid for an unconstrained period of time. Focused desert tortoise survey findings in 2012 and the subsequent application of USFWS-approved statistical methods resulted in an estimated species density of 2 tortoises on the Project site. If the Project is approved, "pre-project surveys" as identified by the comment will be performed in advance of construction to identify and remove tortoises from the Project area (Mitigation Measure 3.4-2a, Draft PA/EIS/EIR p. 3.4-56 et seq.). Such surveys will be performed immediately prior to construction.

31-23 The potential presence of desert tortoise in the Project area was recognized when the site was initially selected. The desert tortoise is present throughout much of the Mojave Desert in the Project region, albeit at very low population densities. The low population density of this species in the Project region contributed to the initial site selection. Subsequent to selection of the requested ROW, the Project alternatives were refined to minimize impacts to relatively higher quality tortoise habitat areas that occur southwest of the North Array and east of the East Arrays. Alternative C, for example, would avoid the area where the single desert tortoise was detected on site. Focused surveys of the requested ROW verified that the area supports low tortoise population densities. The site is also located away from designated critical habitat for this species. The compensatory mitigation model that is generally used for desert tortoise, whether at a 1:1 or 3:1 ratio, assumes that some portion of this species' habitat will be permanently impacted and that a large portion of the habitat will be permanently protected. For example, applying a 1:1 mitigation ratio ensures that 50 percent of a species' potential habitat will be protected (e.g., 1 acre protected for each acre developed).

31-24 The translocation of desert tortoises from active project sites is a standard mitigation practice that the USFWS and CDFW have allowed for decades, as legally permitted under the federal and state Endangered Species Acts. The risks and uncertainties of translocation to the desert tortoise are well recognized in the desert tortoise scientific community, as described on Draft PA/EIS/EIR page 3.4-33. The commenter refers to the unsuccessful Fort Irwin desert tortoise relocation effort in which many of the 158 relocated tortoises either died or went missing. By comparison, the Project would require the relocation of perhaps two desert tortoises based on modeling results (Panorama Environmental, Inc., 2013b). Given the limited number of tortoises that would be relocated and close proximity of relocation sites to the Project site, no monitoring of relocated individuals is considered to be warranted (USFWS, 2011). Additionally, the BLM does not propose to grant conservation status to BLM-administered relocation areas.

31-25 The compensatory mitigation strategy for desert tortoise is described in Response 31-21.

31-26 As stated in Mitigation Measure 3.4-2b, the final Desert Tortoise Translocation Plan (DTTP) will be approved by the BLM in cooperation with the USFWS and CDFW prior to any ground disturbance or tortoise relocation. Note that the draft DTTP was cited in the Draft PA/EIS/EIR (Panorama Environmental, Inc., 2013b) and was thus included in the administrative record for the Project, available as described in Response 31-1. The environmental review process often results in the requirement to prepare action plans after NEPA and/or CEQA review. A revised draft DTTP is included in Appendix L of this Proposed PA/FEIS/EIR – this draft DTTP is still under development and subject to resource agency review and approval.

31-27 Regarding the Project's potential impacts to bighorn sheep connectivity, refer to Common Response 2 in Proposed PA/FEIS/EIR Section 4.5.3.2.

31-28 Regarding mitigation measures proposed in response to potential impacts to bighorn sheep, refer to Common Response 2 in Proposed PA/FEIS/EIR Section 4.5.3.2.

31-29 Direct and indirect effects on Mojave fringe-toed lizard were discussed in the Draft PA/EIS/EIR (pp. 3.4-34 and 3.4-45). No direct impacts on sand dune or sand sheet habitat would occur; thus, compensatory mitigation is not proposed for Mojave fringe-toed lizard habitat losses. As discussed in Response 9-20, the Project would avoid large washes and drainages that traverse the requested ROW area and act as sand transport corridors to supply the dunes. The creation of flood protection berms (see, e.g., Figures 2-1, 2-5, 2-6, and 2-7) and Project siting outside of drainages would allow continued sand replenishment by water and wind sources.

31-30 The avian collision issues related to Project hazards to common and special-status avian species identified by the commenter are discussed in Draft PA/EIS/EIR Section 3.4 (p. 3.4-36 et seq.). The comment's suggestion that avian point count surveys, which are typically performed from the agency-approved locations on a Project site, should be

expanded to include areas where waterbirds may be encountered such as Afton Campground and Zzyzx Spring, is noted. Note that the avian point count survey protocol was approved by the BLM and did not include sites that are relatively remote to the Project site. The potential for direct mortality of individual birds discussed in the Draft PA/EIS/EIR (p. 3.4-36 et seq.) includes collisions with facilities and considers those birds that are most likely to be identified on the site. Solar facilities have not been shown to be a hazard to the federal and state-listed endangered southwestern willow flycatcher, which is a passerine and habitat specialist associated with dense riparian communities associated with wetlands. Riparian habitat does not occur on the Project site, and solar panels would not mimic suitable habitat for this species. In the absence of evidence to suggest that southwestern willow flycatcher may occur on-site, no Project-related impacts to this species are anticipated.

31-31 The potential impacts to Yuma clapper rail identified by the comment are discussed and addressed in Draft PA/EIS/EIR Section 3.4 (p. 3.4-37 et seq.).

31-32 See Response 31-30 regarding the southwestern willow flycatcher.

31-33 The potential Project impacts to golden eagle cited by the commenter are identified in Draft PA/EIS/EIR Section 3.4 (p. 3.4-36) and considered on a cumulative basis as well (p. 3.4-50). The analysis found that no direct or indirect effects are anticipated to golden eagle during construction, operation and maintenance, or decommissioning. Cumulative effects to golden eagle related to loss of foraging habitat would be negligible because the Project and cumulative projects constitute a small fraction of available foraging habitat. Because no take of golden eagles is anticipated, the Project would not need a permit under the Bald and Golden Eagle Protection Act.

31-34 No Swainson's hawk injuries, fatalities, or other impacts have been documented from existing solar facilities, and as the comment notes, Swainson's hawk is not expected to use or be attracted to the site. Thus, the comment is noted; however, no specific threats were identified to Swainson's hawk when reviewing the Project.

31-35 The Draft PA/EIS/EIR considered that construction of the Project could result in loss of burrowing owl nesting and foraging habitat (see p. 3.4-34). Electrocution of burrowing owls is unlikely because transmission lines would adhere to Avian Power Line Interaction Committee guidelines, as required by APM 49. These issues were identified and adequately analyzed in the Draft PA/EIS/EIR. As described in Response 31-21, a 1:1 compensation ratio is recommended in the Draft PA/EIS/EIR to compensate for the loss of active burrowing owl territories (Mitigation Measure 3.4-1f(5), p. 3.4-54), and as detailed in APM 45 (p. 2-29), the Applicant would be required to install artificial owl burrows in areas that would not be disturbed at a ratio of 5:1 for each burrow that would be destroyed during construction. The location of artificial owl burrows has not been determined at this time and would be determined by the BLM in coordination with CDFW. Artificial burrows would likely be created on BLM lands near the Project site and would

not be granted conservation status. The use of artificial burrows by owls will not be incorporated as a criterion for determining the success of relocation efforts.

31-36 No direct or indirect impacts are anticipated to Emory's crucifixion thorn, as Project activities would avoid the identified plant population by nearly 0.25 mile (see Draft PA/EIS/EIR Figure 3.3-3), with a formal 100-foot "buffer area" around the plant population (see Draft PA/EIS/EIR Section 3.3, APM 37, p. 3.3-22). No additional mitigation is needed to avoid impacts to this non-listed species.

31-37 Botanical surveys performed on the Project site in 2013 did not detect small-flowered androstephium, however, and this species was also not detected at five reference sites that were examined concurrent with Project site botanical surveys. Although it is possible that small-flowered androstephium could occur where potentially suitable sandy soils occur at the southern portion of the site at the South Arrays, southeast of I-15, species presence in this area is deemed unlikely based on the previous negative survey results in this area from 2009 (C.S. Ecological Surveys and Assessments, 2013). Thus, sufficient survey effort has been expended to determine the potential presence of the non-listed small-flowered androstephium on the project site. In addition, APM 35 (Draft PA/EIS/EIR Section 3.3, APM 35, p. 3.3-21) provides that a qualified biologist will survey all areas of proposed ground disturbance for rare or special-status plant species and flagging of identified plants for transplantation. Thus, potential impacts to small-flowered androstephium are addressed in the Draft PA/EIS/EIR.

31-38 At this time, CDFW recommends passive relocation of desert kit fox and American badger from active solar project sites to minimize direct impacts to individual animals. The comment does not identify any potential impacts to kit fox or badger that were not disclosed in the Draft PA/EIS/EIR.

31-39 The fact that the area is designated as a non-attainment area for the state and federal PM10 24-hour standards is disclosed in Draft PA/EIS/EIR Section 3.2 (p. 3.2-3). That construction activities would generate PM10 emissions, including fugitive dust, also is acknowledged (see, e.g., Draft PA/EIS/EIR Table 3.2-5, p. 3.2-16). The MDAQMD is responsible for compliance with applicable air quality requirements.

The comment correctly states that the Draft PA/EIS/EIR did not map or describe the extent of cryptobiotic soil crusts on the Project site and that the Project would disturb an unidentified portion of them. Cryptobiotic soil crusts are not recognized as special-status under NEPA or CEQA and are not regulated by CDFW; therefore, analysis of potential impacts to these ecosystem components is not required. Nonetheless, this response provides additional information about them, the environmental functions they perform, and ways to avoid or minimize adverse impacts to them.

Cryptobiotic soil crusts are living crusts made up primarily of photosynthetic cyanobacteria (blue-green algae). They also include lichens, mosses, fungi, and algae. Cyanobacteria grow in bare soil, creating a web of microscopic sheathed filaments

between the soil particles. The filaments can penetrate up to 6 inches deep in some areas and form soil crusts that are approximately 1 inch high (Rodgers, 2014). Cyanobacteria can survive periods of drought by shutting down their metabolisms, a process known as "cryptobiosis." However, with rain, the "filaments become moist and active, moving through the soils, leaving behind a trail of the sticky sheath material. The sheaths stick to surfaces such as soil particles, forming an intricate webbing of fibers" (NPS, 2014; Rodgers, 2014).

As a topsoil resource, cryptobiotic soils play a key role in arid and semi-arid ecosystems in that they are able to fix carbon, facilitate seed germination, reduce desert soil erosion from the forces of wind and water, and enrich soils with nutrients (Rodgers, 2014).

Cryptobiotic soil crusts are fragile. Compressional stresses placed on them by machinery or walking are particularly harmful when the crusts are dry and brittle, and tracks in continuous strips (like those caused by vehicles) create areas that are highly vulnerable to erosion (NPS, 2014). The NPS advises people to stay on established trails, on rock, or in sandy washes, and to keep vehicles on approved roads to avoid as much cryptobiotic soil crust as possible (Rodgers, 2014).

Quantification and mapping of the extent, location, and area coverage of cryptobiotic soils occurring within the Project site has not occurred. Consistent with the Department of Interior's "Biological Soil Crusts: Ecology And Management" report (Belnap et al., 2001), it is assumed that cryptobiotic soils may be present on up to 70 percent of the site that is not already disturbed or in open sandy washes. Within the Proposed Action footprint, 2,455.57 acres are mapped as *Larrea tridentata –Ambrosia dumosa* Shrubland, *Larrea tridentata* Shrubland, or *Ambrosia salsola* Shrubland (Draft PA/EIS/EIR Table 3.3-2, p. 3.3-4). Seventy percent of the vegetated area would be approximately 1,720 acres. Grading for the Proposed Action would be limited to access roads, buildings, foundations, equipment pads, and areas where existing grade cannot accommodate perimeter fencing, roads, or other equipment or structures, and would not occur on the entire Project site (maximum of 1,155 acres); therefore, only a portion of the vegetated areas of the site would be cleared; however, disturbance related to crushing cryptobiotic soil crusts from walking or equipment could occur on any portions of the site where construction activities would occur.

Recovery of disturbed cryptobiotic soil crusts is a slow process, and some affected areas may never fully recover. Because the organisms that make up the crust are cryptobiotic, meaning that their metabolisms shut down in dry conditions, damaged cryptobiotic soils can grow back only when it is wet. Recovery of a thin veneer of cryptobiotic soil crust could take between 5 and 7 years (Rodgers, 2014). Damaged sheath material, and the accompanying loss of soil nutrients, may take 50 years or more of cyanobacterial growth to recover.

The Draft PA/EIS/EIR addresses the potential indirect impacts of disturbance or destruction of protective ground covers (including biological soil crusts), including the fugitive dust

emissions resulting from increased wind erosion due to soil disturbance (pp. 3.2-11, 3.2-16, and 3.2-17); the disturbance of the structure and ecological functioning of biological soil crusts, which may affect seed germination, reduce soil nutrition, and render the soil vulnerable to water and wind erosion (p. 3.2-24); the loss of carbon uptake from desert ecosystems, including biological soil crusts (p. 3.5-12); the increased erosion of exposed soil materials in disturbed areas (pp. 3.7-15 and 3.7-16); and visual impacts related to the color contrast from disturbed ground cover that are likely to persist after Project decommissioning (p. 3.18-25). Discussions of these impacts in Sections 3.5, *Climate Change*, 3.7, *Geology and Soil Resources*, and 3.18, *Visual Resources*, have been clarified in the Proposed PA/FEIS/EIR to indicate that the disturbance of biological soil crusts would contribute to and is considered in the analysis of these impacts.

The comment incorrectly states that the Draft PA/EIS/EIR failed to present any avoidance or minimization measures to address potential impacts to cryptobiotic soil crusts. To the contrary, Mitigation Measure 3.3-2 requires the Applicant to limit the area of disturbance and stockpile spoils and topsoil in in disturbed areas (1), minimizing the impact of roads by requiring that vehicles stay within the planned impact area or in previously disturbed areas (2), and prohibiting cross-country vehicle and equipment use outside designated work areas (3). Implementation of these measures would minimize the disturbance of soil crusts outside of planned impact areas.

The comment correctly states that the Draft PA/EIS/EIR did not map or quantify desert pavement on the Project site. However, the Draft PA/EIS/EIR acknowledges that the Project likely would disturb desert pavement, and recommends implementation of Mitigation Measure 3.7-4, *Protection of Desert Pavement* (p. 3.7-25), which would be effective in avoiding or substantially reducing disturbance to desert pavement on the site.

The Draft PA/EIS/EIR also addresses the indirect impacts of disturbance of desert pavement, including the fugitive dust emissions resulting from increased wind erosion due to soil disturbance (pp. 3.2-11, 3.2-16, and 3.2-17); the increased erosion of exposed soil materials in disturbed areas (pp. 3.7-15 and 3.7-16); and visual impacts related to the color contrast from disturbed ground cover that are likely to persist after Project decommissioning (p. 3.18-25). Discussions of this impact in Section 3.18, *Visual Resources*, have been clarified in the Proposed PA/FEIS/EIR to indicate that the disturbance of desert pavement would contribute to and is considered in the analysis of this impact.

31-40 The fact that revegetation in desert ecosystems is a process that takes many years is acknowledged in the Draft PA/EIS/EIR (pp. 3.3-20 and 3.3-21), and the analysis relies on this acknowledgement in treating all disturbance as permanent for the purposes of impacts on vegetation. The lead agencies note that the Project site is not 11 square miles as suggested in the comment; as explained in Draft PA/EIS/EIR Chapter 2, the requested ROW area is 4,179 acres (approximately 6.5 square miles) and the Proposed Action would disturb a maximum of 2,557 acres (approximately 4 square miles). The development of the Proposed Action or an action alternative would be subject to a

Performance and Reclamation bond. As described in Draft PA/EIS/EIR Section 3.1.6.1, Terms and Conditions found in FLPMA and BLM ROW Regulations, the Applicant would be required to obtain this bond as a condition of compliance with the terms and conditions of the ROW grant consistent with the requirements of 43 CFR Section 2805.12(g).

The Applicant's draft Decommissioning and Site Reclamation Plan was included in the Draft PA/EIS/EIR as Appendix C, and proposed reclamation and revegetation methods are described therein. After decommissioning and removal of facilities and structures, the ground surface would be recontoured as necessary to match the natural gradient of the surrounding land, disturbed areas would be re-seeded as necessary, and salvaged succulents, palo verde, and mesquite would be transplanted in accordance with the BLM-approved Vegetation Resources Management Plan (VRMP) and Mitigation Measure 3.3-3. A draft VRMP is included in Appendix L of this Proposed PA/FEIS/EIR. The BLM's regulations do not indicate that a financial guarantee for reclamation of a solar ROW grant and/or the cost estimate on which it is based must be provided prior to the circulation of a draft EIS, as suggested by the comment. The comment cites 43 CFR 3809.503, which applies to operations authorized by the mining laws on public lands (43 CFR 3809.2(a)); this regulation is not applicable to this Project. Refer to Draft PA/EIS/EIR Section 3.1.6.1 for a discussion of the timing and requirements of the Performance and Reclamation bond.

Additionally, as indicated in Appendix C, at least 5 years prior to planned closure, a Final Closure Plan will be prepared for BLM review and approval that will include timing for any seed collection deemed necessary. Weed management and revegetation monitoring would be conducted in accordance with the approved VRMP, approved Integrated Weed Management Plan (IWMP), and approved Final Closure Plan. As indicated in Mitigation Measure 3.3-5, the Final Closure Plan shall include a cost estimate for implementing the proposed decommissioning and reclamation activities, subject to review and revisions from the BLM AO in consultation with USFWS and CDFW. Because it will be subject to conditions that cannot be known until closer to decommissioning, the Final Closure Plan will not be prepared until closer to the planned decommissioning date. However, the requirements for the Final Closure Plan are clearly indicated in the draft Decommissioning and Site Restoration Plan (Appendix C) and in Mitigation Measure 3.3-5, which has been revised as shown below for clarification of applicable requirements. Because a cost estimate is not required during the environmental review process, and because a Decommissioning and Site Reclamation Plan was provided, the lead agencies decline to recirculate a revised Draft PA/EIS/EIR in response to this comment.

Mitigation Measure 3.3-5 has been revised as follows:

> **Mitigation Measure 3.3-5: ~~Decommissioning and Reclamation~~Final Closure Plan.** At least 12 months prior to Project closure, the Applicant shall prepare a draft ~~Decommissioning and Reclamation~~Final Closure Plan to restore the site's topography and hydrology to a relatively natural condition and to establish native plant communities within the Project site. The ~~Decommissioning and Reclamation~~ Final Closure Plan shall include a cost estimate for implementing the proposed decommissioning and reclamation activities, and shall cover the estimated cost as if

> BLM were to contract with a third party to decommission the Project and reclaim the Project site.~~, and shall be consistent with the guidelines in BLM's 43 CFR 3809.5502 et seq.~~ The plan shall be subject to review and revisions from the BLM AO in consultation with USFWS and CDFW.

Comments on the West Mojave Plan are outside of the scope of the analysis in the Draft PA/EIS/EIR.

31-41 The Draft PA/EIS/EIR acknowledges the potential for wildfire to spread to off-site areas (see, e.g., page 3.20-7) and Proposed PA/FEIS/EIR Section 3.20 has been revised to clarify that such impacts could occur within the Mojave National Preserve, which the Draft PA/EIS/EIR indicates is within 0.5 mile of the Project site. The comment does not specify what about the analysis in the Draft PA/EIS/EIR it finds inadequate. As indicated in Mitigation Measure 3.20-1 (Draft PA/EIS/EIR p. 3.20-10), the Fire Safety Plan is applicable to Project construction, operation and maintenance, and decommissioning activities, not just construction as the comment suggests. Mitigation Measure 3.20-1 specifies what the Fire Safety Plan must do (in its list of 17 minimum requirements), who shall review and approve it (i.e., the BLM and the County's Victorville Fire Protection office), when it must be prepared and reviewed (i.e., "before the Applicant receives a Notice to Proceed"), and when it must be implemented (i.e., "during Project construction, operation and maintenance, and decommissioning activities"). The purpose of the Fire Safety Plan is to prevent fires, prevent the escape of fire onto adjacent lands, and protect the safety of workers and the public. Mitigation Measure 3.20-1, requirement 16 has been revised as follows to clarify that the measure applies to any Project-related fire ignition:

> 16. Fires ignited on site, or off-site as a result of Project-related activities, shall be immediately reported to BLM FIRE and the VFPO.

Protocols for wildland fire response in areas outside of the Project site are already established by the Federal Wildland Fire Management Policy and site-specific fire management plans and are not subject to Project-specific mitigation. In response to this comment and to clarify the management response to fires on federally managed lands, the following text has been added to the discussion of the Federal Wildland Fire Management Policy in Proposed PA/FEIS/EIR Section 3.20.3.1:

> Additionally, the policy outlines implementation actions for agency managers to accomplish the policy's fire management and response objectives, which include:
>
> a) Developing a comprehensive, interagency strategy for fire management to help achieve ecosystem sustainability;
>
> b) Incorporating mitigation, burned-area rehabilitation, and fuels reduction and restoration activities that contribute to ecosystem sustainability into fire management plans and land management plans; and
>
> c) Basing responses to wildland fires on approved Fire Management Plans and land management plans, regardless of ignition source or the location of the ignition. (NWCG, 2001)

For example, if a fire were to spread from the Project site to the nearby Mojave National Preserve, Preserve managers would implement the suppression and rehabilitation actions indicated in the 2004 Mojave National Preserve Fire Management Plan. Interagency agreements already in place would govern interagency cooperation and response to fires on federally managed lands.

The Mojave National Preserve Fire Management Plan notes, "The Bureau of Land Management's Rasor Road Off-Highway Vehicle (OHV) area is adjacent to the northern portion of the western unit border. This is a high use area in which use occurs predominantly in the winter months. OHV users trespass into NPS wilderness increasing the potential for human-caused ignitions in this area, but the sparseness of fuels renders the potential for large fires or extensive spread insignificant" (NPS, 2004, p. 25) Based on the existing fire management policies in place and on the low potential for damage due to human-caused ignitions such as those that may originate on the Project site, the BLM has not recommended Project-specific mitigation for response to off-site fires.

31-42 The comment does not provide enough detail about what analysis of alternatives and mitigation should have been provided in the Draft PA/EIS/EIR to allow the BLM or County to provide a detailed response to this comment. However, the comment letter provides more specific comments regarding the analysis of alternatives and mitigation measures with respect to several resources in other subsections of the letter; responses are provided above where the comment letter provides enough specificity to allow a substantive response.

31-43 The following plans are requirements of mitigation measures recommended in the Draft PA/EIS/EIR: Temporary Disturbance Revegetation Plan (Mitigation Measure 3.3-2); Worker Environmental Awareness Program (APM 44, Mitigation Measures 3.3-3 and 3.4-1c); Comprehensive Drainage, Stormwater, and Sedimentation Control Plan (Mitigation Measure 3.19-2); Vegetation Resources Management Plan (Mitigation Measure 3.3-3); Desert Tortoise Translocation Plan (Mitigation Measure 3.4-2b); Burrowing Owl Mitigation and Monitoring Plan (Mitigation Measure 3.4-1f); lighting plan (Mitigation Measures 3.18-1, 3.4-1e); Soil Erosion Control Plan (Mitigation Measure 3.7-1); Desert Pavement Identification, Avoidance, and Protection Plan (Mitigation Measure 3.7-4); Groundwater Monitoring and Mitigation Plan (Mitigation Measure 3.19-3); Bird and Bat Conservation Strategy (BBCS) (Mitigation Measure 3.4-1g); and Avian Monitoring Program (Mitigation Measure 3.4-1h). These mitigation measures provide performance standards and specific types of actions to be taken, and contain sufficient information to inform a decision on the Project's impacts and mitigation. The contents of certain of these plans are dictated by law; in these cases the Applicant is required to comply with the law, including implementing all statutory and regulatory requirements. In all cases, plans would be required to be submitted to and approved by BLM and any other agency with regulatory oversight, as detailed in the mitigation measure, before Project construction could begin.

Impacts to American badger and kit fox would be addressed through implementation of Mitigation Measures 3.4-1a, 3.4-1b, and 3.4-1c, as described on Draft PA/EIS/EIR page 3.4-38; a separate plan is not required in addition to these measures. See Response 31-38. Similarly, an operational dust control plan is not required; all or portions of APMs 1 through 8 and Mitigation Measure 3.2-1 would address dust control during operation and maintenance. The comment's suggestions that an Avian Protection Plan and Bat Protection Plan should be required are addressed by the BBCS (Mitigation Measure 3.4-1g) and Avian Monitoring Program (Mitigation Measure 3.4-1h). A draft BBCS is included in Appendix L of this Proposed PA/FEIS/EIR. The commenter's suggestion that a special-status plant impact and avoidance mitigation plan should be required is addressed in Mitigation Measure 3.3-3, Special-Status Plant Species and Cacti Impact Avoidance and Minimization. A draft Vegetation Resources Management Plan is included in Appendix L of this Proposed PA/FEIS/EIR.

The long-term management of compensation lands for impacts to desert tortoise habitat is addressed in Mitigation Measure 3.4-2d; as indicated therein, the Project owner may choose to acquire mitigation lands or to deposit funds into the Renewable Energy Action Team (REAT) Account established with the National Fish and Wildlife Foundation (NFWF). Because mitigation lands have not yet been identified, it would be unreasonable to prepare a management plan for such lands at this time. As indicated in Mitigation Measure 3.4-2d, the Project owner must transfer fee title to the compensation lands, a conservation easement over the lands, or both to CDFW, a non-profit organization qualified to hold title to and manage compensation lands or BLM (part (3)(b)), and must deposit a capital long-term maintenance and management fee in an account as determined by BLM and/or CDFW (part (3)(e)). As needed, a plan would be prepared for mitigation lands once they are identified, and would conform to USFWS and CDFW standards. Mitigation lands are often identified concurrent with or within 6 to 12 months of finalizing formal consultation, and the endowment funding in part (3)(e) would cover required funds for any needed plan.

The Draft PA/EIS/EIR did not identify a potentially significant impact to groundwater-dependent vegetation resulting from the Proposed Action or an alternative; therefore, no mitigation is recommended to address such an impact. See Common Response 4 in Proposed PA/FEIS/EIR Section 4.5.3.4 for a discussion of additional analysis of groundwater resources that supports this conclusion.

Regarding a wildland fire plan, see Response 31-41.

To clarify the intended reference to Mitigation Measure 3.19-2 in Mitigation Measure 3.3-3, the last sentence of item 3 as shown on Draft PA/EIS/EIR pages ES-16 and 3.3-35 is revised as follows:

> These measures shall be incorporated in the Comprehensive Drainage, ~~Erosion~~ <u>Stormwater</u>, and Sedimentation Control Plan (Mitigation Measure 3.19-2).

31-44 Regarding potential impacts to springs and seeps from groundwater drawdown within the Soda Mountain subbasin, especially along Zzyzx Road, and as well as impacts relating to tui chub habitat from groundwater use, refer to Common Response 4 in Proposed PA/FEIS/EIR Section 4.5.3.4. The requirement for consultation with the USFWS regarding potential impacts to threatened and endangered species listed under the FESA is discussed in Section 1.6 and in Table 1-1 on page 1-10 of the Draft PA/EIS/EIR. An alternative to groundwater use is assessed throughout the Draft PA/EIS/EIR under Alternative F, under which the County would deny the requested groundwater well permit application and an off-site source of water for potable use, dust control, panel washing, and fire protection would be required.

31-45 A detailed and comprehensive analysis of direct, indirect, and cumulative impacts of the Proposed Action and alternatives on water quality is presented in the Draft PA/EIS/EIR in Section 3.19, *Water Resources*. No potential for water quality degradation in Zzyzx Springs as a result of the Proposed Action or Alternatives has been identified and, as a result, water quality monitoring at this location is not required.

31-46 The comment correctly notes that the California Desert Protection Act Section 706(a) reserves for each wilderness area designated in the Act (e.g., Palen-McCoy Wilderness, Big Maria Mountains Wilderness) a quantity of water sufficient to fulfill the purposes of the Act (16 U.S.C. §410aaa76). Only the minimum amount of water necessary to fulfill the primary purpose of the reservation may be asserted as a reserved right. As indicated in Draft PA/EIS/EIR Section 3.19.6.1, the Proposed Action's groundwater consumption would result in a maximum predicted drawdown of approximately 2.2 feet at the closest bedrock interface to the east of the wells, and this drawdown would not extend beyond the Soda Mountain Valley groundwater subbasin underlying the Project site (see Common Response 4 in Proposed PA/FEIS/EIR Section 4.5.3.4 for a discussion of additional analysis of groundwater resources that supports this analysis). The action alternatives would pump less water from this subbasin. Thus, it is not anticipated that the Proposed Action or an action alternative would impair wilderness values in any designated wilderness that depends on the Soda Mountain Valley groundwater subbasin. As indicated in Draft PA/EIS/EIR Section 3.19.7, no other projects in the cumulative scenario would draw water from this subbasin.

The BLM presently includes as a standard term and condition in its ROW grants a requirement that grant holders agree not to assert any continuing claim or interest in any water right beyond the uses associated with the approved project for which a ROW is granted.[2] Such a condition would be included in the ROW grant for this Project, if approved.

[2] See, e.g., the Right-of-Way Grant for Unit 1 of the McCoy Solar Energy Project, Serial Number CACA-048728, Exhibit B, Stipulation 23. Available online at http://www.blm.gov/style/medialib/blm/ca/pdf/palmsprings/Solar.Par.37645.File.dat/mccoy%20grant-signed%20508.pdf.

31-47 As disclosed on Draft PA/EIS/EIR page 3.2-15, the Applicant has committed to implementing 10 Applicant-proposed measures (APMs 1 through 10) to reduce air pollutant emissions that would be generated by the Project. In addition, Mitigation Measure 3.2-1 is recommended to ensure that Project operation and maintenance would not result in an exceedance of state PM_{10} AAQSs by formalizing the Applicant's intent to water the site and unpaved access roads, and Mitigation Measure 3.2-2 is recommended to limit vehicle idling during the construction phase of the Project (see Draft PA/EIS/EIR page 3.2-32). The BLM and County consider these APMs and mitigation measures to be specific and enforceable and contend that construction and operation impacts have been adequately addressed in the Draft PA/EIS/EIR. No specific examples, facts, reasonable assumptions predicated upon facts, or other evidence are provided in support of the comment's suggestion to the contrary.

As disclosed on Draft PA/EIS/EIR page 3.2-33, the construction emissions identified in Tables 3.2-5 and 3.2-6 incorporate emission controls associated with APMs 1 through 10 (see Section 3.2.5), which represent state of the art emission controls. Mitigation Measure 3.2-2 would limit vehicle idling and Mitigation Measure 3.2-3, described in Proposed PA/FEIS/EIR Section 3.2.8, would limit ground disturbance activities during periods of high winds (see Response 49-19), and therefore would reduce criteria pollutant emissions, but not to less-than-significant levels. There are no additional feasible mitigation measures that could reduce the impact to less than significant; therefore, the short-term construction-related impact would be significant and unavoidable.

With regard to long-term emissions that would be generated during operation and maintenance activities, implementation of Mitigation Measure 3.2-1 would ensure that operation and maintenance of the Project would not result in an exceedance of state PM_{10} AAQSs because it would require the Applicant to apply water twice daily to all unpaved roads and unpaved parking areas actively used during operation and maintenance. As disclosed on Draft PA/EIS/EIR page 3.2-18, without implementation of a long-term operation-based watering program to control fugitive dust, such as that required by Mitigation Measure 3.2-1, maximum daily emissions of PM_{10} would be as high as 155 pounds, and annual emissions of PM_{10} would be as high as 22 tons, which would exceed the MDAQMD daily and annual significance thresholds indicating that the Project could cause an exceedance of a state PM_{10} AAQS.

As presented in Draft PA/EIS/EIR Sections 3.2.6.2 through 3.2.6.4, three action alternatives (Alternatives B through D) have been considered that would eliminate or minimize short-term construction-related emissions during calendar years 2015 and 2016. Regarding the consideration of a distributed generation alternative, refer to Common Response 1 in Proposed PA/FEIS/EIR Section 4.5.3.1.

31-48 The commenter's opinion that the Draft PA/EIS/EIR does not meaningfully analyze cumulative impacts is noted, and only one general example is provided to support this assertion: cumulative impacts to special-status birds. Refer to Responses 31-30 through 31-35 regarding impacts to special-status birds. Draft PA/EIS/EIR Section 3.4.7

adequately discloses and describes the potential for the Project to contribute to cumulative impacts on birds that may reasonably be anticipated to use or be attracted to the Project site (see pp. 3.4-48 through 3.4-50). No specific examples, facts, reasonable assumptions predicated upon facts, or other evidence are provided in support of the comment's suggestion that the Draft PA/EIS/EIR's evaluation of potential cumulative impacts is inadequate.

31-49 The commenter's opinion that the Draft PA/EIS/EIR fails to consider all reasonably foreseeable cumulative impacts is noted, and only two general examples are provided to support this assertion: cumulative impacts to wildlife movement corridors and habitat fragmentation. Draft PA/EIS/EIR Section 3.4.7 adequately discloses and describes the potential for the Project to contribute to cumulative impacts on wildlife movement and habitat in the context of both desert tortoise (see pp. 3.4-47 and 3.4-48) and bighorn sheep (see p. 3.4-50). The comment does not provide data, facts, reasonable assumptions based on facts, or other reasonable basis to support its assertion that the analysis provided in the Draft PA/EIS/EIR is deficient.

31-50 As identified in Draft PA/EIS/EIR Section 3.14 (p. 3.14-27), the Project would not indirectly induce substantial population growth through the extension of infrastructure because although it would produce additional electricity and increase service capacity, it is intended to meet the demand for energy that is already projected based on growth in demand for electricity in LADWP's service area, and therefore would not be growth-inducing. While land use on the Project site would change due to site development, the Project would not affect surrounding patterns of land use, population density, or population growth rates. Accordingly, no mitigation measures were recommended. This less-than-significant, Project-specific impact related to the extension of infrastructure would not be cumulatively considerable when considered in combination with the impacts contributed by other projects in the cumulative scenario because the energy-generating cumulative projects similarly are intended to meet existing demand.

The opinion that cumulative impacts to desert tortoise, bighorn sheep, golden eagles, migratory birds, water resources, and "the resources of the California deserts" have not been fully analyzed is noted. The comment does not provide data, facts, reasonable assumptions based on facts, or other reasonable basis to support its assertion that the analysis provided in the Draft PA/EIS/EIR is deficient.

31-51 Regarding the BLM's statement of purpose and need and the range of alternatives evaluated, including site alternatives and a distributed generation alternative, refer to Common Response 1 in Proposed PA/FEIS/EIR Section 4.5.3.1.

31-52 Refer to Common Response 7 in Proposed PA/FEIS/EIR Section 4.5.3.7 regarding recirculation. The comment's statement of support for Alternative E or G is noted.

Letter 32 – Responses to Comments from Inga (No Last Name Given)

32-1 The comment's statement of opposition to the Project is noted. Regarding the use of rooftop solar energy generation, refer to Common Response 1 in Proposed PA/FEIS/EIR Section 4.5.3.1.

32-2 The potential impacts of the Proposed Action and alternatives are adequately analyzed in the EIS/EIR. The comments relating to Afton Canyon are outside the scope of this analysis.

32-3 Potential impacts on wildlife, including desert tortoise, burrowing owl, and kit fox, are analyzed in Section 3.4, Biological Resources – Wildlife. Potential impacts on recreational resources are analyzed in Section 3.13, Recreation. The comment does not address the adequacy or accuracy of the environmental analysis and does not identify any other significant environmental issue requiring a response.

32-4 The potential impacts of groundwater consumption and drawdown are analyzed, and mitigation measures proposed, in Draft PA/EIS/EIR Section 3.19, Water Resources (p. 3.19-1 et seq). The Applicant's projected water use estimates are intended to address the need for periodic panel washing, as indicated in Draft PA/EIS/EIR Section 2.4.2.8 (see pp. 2-12 and 2-13). No specific examples, facts, reasonable assumptions predicated upon facts, or other evidence are provided in support of the comment's suggestion that the Draft PA/EIS/EIR underestimates water consumption. For additional discussion of potential groundwater impacts, refer to Common Response 4 in Proposed PA/FEIS/EIR Section 4.5.3.4.

32-5 The dates of vegetation surveys on the Project site are listed in Draft PA/EIS/EIR Table 3.3-1 (page 3.3-2). As shown in the table, surveys were performed during multiple years and in various seasons to account for various plant blooming/identification periods and environmental variation. Additional botanical surveys are not necessary, as the existing surveys adequately characterize the distribution of special-status plants on the Project site.

Letter 33 – Responses to Comments from Susan Steuber and Quintin Lake

33-1 The comment's statement of opposition to the Project is noted. The impacts of the Proposed Action and alternatives on views from I-15 and the Mojave National Preserve are analyzed, and mitigation measures proposed, in Draft PA/EIS/EIR Section 3.18, Visual Resources. The comment does not directly address the adequacy or accuracy of this analysis. See also Common Response 6 in Proposed PA/FEIS/EIR Section 4.5.3.6 regarding visual resources.

33-2 Regarding site alternatives evaluated, refer to Common Response 1 in Proposed PA/FEIS/EIR Section 4.5.3.1. As indicated therein, the Draft PA/EIS/EIR considers a reasonable range of alternatives to the Project including two no project alternatives. As described in Draft PA/EIS/EIR Section 2.8.1.1 (p. 2-30), the BLM and Applicant considered potential alternative sites on BLM-administered land.

33-3 The comment's statement of opposition to the Project is noted.

Letter 34 – Responses to Comments from Karl Young

34-1 Refer to Common Response 2 in Proposed PA/FEIS/EIR Section 4.5.3.2 regarding bighorn sheep; Common Response 3 in Proposed PA/FEIS/EIR Section 4.5.3.3 regarding desert tortoise; Common Response 4 in Proposed PA/FEIS/EIR Section 4.5.3.4 regarding groundwater resources and tui chub habitat; and Common Response 6 in Proposed PA/FEIS/EIR Section 4.5.3.6 regarding visual resources, including views from Mojave National Preserve. The comment does not address the adequacy or accuracy of the analysis provided in the Draft PA/EIS/EIR.

34-2 The potential impacts of the Proposed Action and alternatives on the user experience at Mojave National Preserve are analyzed in Draft PA/EIS/EIR Sections 3.13, Recreation (see page 3.13-7 acknowledging noise, dust, and visual disturbance near the Zzyzx Road entrance to the Preserve) and 3.18, Visual Resources (see pages 3.18-26 through 3.18-26 describing impacts on views from Key Observation Points (KOPs) 13, 14, and 19, which represent views from the Preserve). As noted on page 3.18-26, "The cumulative total of the area from which the Project may be seen from within the Preserve in the foreground/middleground distance zone covers approximately 350 acres. This represents 0.0002 percent of the 1.6-million-acre Preserve," and foreground/middleground views of the Project site from elsewhere in the Preserve would be blocked by the Soda Mountains. The comment does not address the adequacy or accuracy of this analysis. Also refer to Common Response 6 in Proposed PA/FEIS/EIR Section 4.5.3.6 regarding visual resource-related impacts on views from Mojave National Preserve.

34-3 The comment is noted. The potential impacts of the Proposed Action and alternatives to wildlife species are analyzed in Draft PA/EIS/EIR Section 3.4, Biological Resources – Wildlife. The comment does not address the adequacy or accuracy of this analysis.

34-4 The existing Ivanpah Solar Electric Generating System and two proposed Iberdrola projects, the Silurian Valley Wind Project and the Silurian Valley Solar Project, are included in the list of cumulative projects in Draft PA/EIS/EIR Section 3.1, Table 3.1-3 (p. 3.1-9). The impacts of these projects are analyzed in combination with the potential impacts of the Proposed Action and alternatives throughout Draft PA/EIS/EIR Chapter 3. The comment does not directly address the adequacy or accuracy of this analysis.

Letter 35 – Responses to Comments from Joe Cernac

35-1 The comment's statement of support for Alternative G (Site Unsuitable for Solar, No BLM ROW, and No County Permit) is noted.

35-2 The comment is noted, and does not address the adequacy or accuracy of the environmental analysis. The BLM notes that in the event that it grants a ROW for the Proposed Action or an action alternative, rent would be collected from the Grant Holder

for the duration of the ROW grant. Information regarding the BLM's cost recovery regulations is available on the internet at: http://www.blm.gov/wo/st/en/prog/energy/cost_recovery_regulations/grant_issuance.html.

35-3 Refer to Common Response 1 in Proposed PA/FEIS/EIR Section 4.5.3.1 for a discussion of distributed generation alternatives considered.

35-4 The potential impacts of the Project on visual resources are analyzed in Draft PA/EIS/EIR Section 3.18, Visual Resources (p. 3.18-1 et seq.). Specifically, impacts related to glint and glare are addressed on Draft PA/EIS/EIR pages 3.18-24 and 3.18-25, and mitigation measures are proposed to reduce these impacts. See also Common Response 6 in Proposed PA/FEIS/EIR Section 4.5.3.6 regarding visual resources.

35-5 The comment is noted.

Letter 36 – Responses to Comments from Brendan Hughes

36-1 The comment letter provides more specific comments regarding biological resources, water resources, visual resources and recreational, and alternatives at comments 36-2 through 36-6. See Responses 36-2 through 36-6, below, for detailed responses to these comments.

36-2 The comment is noted. Desert tortoise surveys performed by Kiva Biological Consulting in 2013 followed the USFWS (2009) desert tortoise survey protocol, and additional baseline desert tortoise surveys are not required.

36-3 Regarding groundwater drawdown and potential impacts to tui chub habitat, refer to Common Response 4 in Proposed PA/FEIS/EIR Section 4.5.3.4.

36-4 See Common Response 4 in Proposed PA/FEIS/EIR Section 4.5.3.4 regarding groundwater drawdown and the potential effects to sensitive water resources and groundwater supply from groundwater use relating to the Proposed Action and alternatives. Additional information regarding groundwater use and supply relevant to the Proposed Action and alternatives is presented in Section 3.19.2.3, *Groundwater,* of the Draft PA/EIS/EIR (p. 3.19-5 et seq.). As discussed in Section 3.19.2.3, no wells currently are known to be within the Project area and the only existing groundwater use in the Soda Mountain subbasin is the groundwater well installed at the Rasor Road service station. The well at the Rasor Road service station is a 760-foot-deep water supply well screened in bedrock that is hydrologically separated from the saturated alluvium in the valley (p. 3.19-9).

36-5 The potential impacts of the Proposed Action and alternatives on the user experience at Mojave National Preserve are analyzed in Draft PA/EIS/EIR Sections 3.13, Recreation (see page 3.13-7 acknowledging noise, dust, and visual disturbance near the Zzyzx Road entrance to the Preserve) and 3.18, Visual Resources (see pages 3.18-26 through 3.18-26 describing impacts on views from Key Observation Points (KOPs) 13, 14, and 19, which represent views from the Preserve). As noted on page 3.18-26, "The cumulative

total of the area from which the Project may be seen from within the Preserve in the foreground/middleground distance zone covers approximately 350 acres. This represents 0.0002 percent of the 1.6-million-acre Preserve," and foreground/middleground views of the Project site from elsewhere in the Preserve would be blocked by the Soda Mountains. Impacts on the Soda Mountains Wilderness Study Area are analyzed in Draft PA/EIS/EIR Section 3.15, Special Designations. See Common Response 5 in Proposed PA/FEIS/EIR Section 4.5.3.5 regarding clarifications of Project impacts to the Rasor OHV Recreation Area. The comment does not directly address the adequacy or accuracy of this analysis.

36-6 Refer to Common Response 1 in Proposed PA/FEIS/EIR Section 4.5.3.1 for a discussion of distributed generation and private land alternatives considered.

36-7 Regarding the relationship of the Proposed Action to the Western Solar Plan and decisions made in the Western Solar Plan Record of Decision (ROD), refer to Common Response 1 in Proposed PA/FEIS/EIR Section 4.5.3.1.

36-8 The comment's statement of support for Alternative G is noted.

Letter 37 – Responses to Comments from Lauren Browning

37-1 The comment does not address the adequacy or accuracy of the environmental analysis presented in the Draft PA/EIS/EIR. Accordingly, the BLM and San Bernardino County are unable to provide a more detailed response.

Letter 38 – Responses to Comments from Kevin Holmes

38-1 The comment correctly notes that the Project has the potential to change the distribution of invasive plant species in the Project area. Applicant-Proposed Measure (APM) 50 and Mitigation Measure 3.3-2(10) are recommended to reduce this potential effect.

38-2 The comment's statement of support for the proposed burrowing owl mitigation strategy is noted. In addition to APMs 45, 46, 47, 48, and 57, Mitigation Measure 3.4-1f is recommended to mitigate potential impacts to burrowing owl.

38-3 The comment's statement of support for the proposed desert tortoise mitigation strategy is noted. In addition to APM 66, Mitigation Measures 3.4-2a, 3.4-2b, 3.4-2c, and 3.4-2d are recommended to mitigate potential impacts to desert tortoise.

38-4 Regarding the use of artificial water sources to enhance bighorn sheep movement, refer to Common Response 2 in Proposed PA/FEIS/EIR Section 4.5.3.2.

38-5 The comment indicates that there are at least two endangered arthropod species with a range and distribution covering the Project area. However, the distributions of the two butterflies identified by the comment, the Callippe silverspot (*Speyeria callippe callippe*) and Lange's' metalmark (*Apodemia mormo langei*), are well characterized and do not include the Project area. The Project analysis included an assessment of all reported

special-status wildlife species in the Project area, including arthropods. The Project site is not within the active described range of any rare arthropods. Therefore, focused surveys for arthropods are not required for the Project and rare arthropods are not expected on the Project site. The distribution of those species discussed by the commenter are described below.

As summarized in the USFWS Endangered Species Branch's online invertebrate species accounts (http://www.fws.gov/sacramento/es_species/Accounts/Invertebrates/es_species-accounts_invertebrates.htm), the Callippe silverspot was known historically to occur in grassland habitat in the seven counties bordering San Francisco Bay in California. Its historic range included the inner coast range on the eastern shore of San Francisco Bay from northwestern Contra Costa County south to the Castro Valley area in Alameda County. Its present distribution has been reduced from this historic distribution, and does not include southern California.

The USFWS finds that the Lange's metalmark was historically restricted to sand dunes along the southern bank of the Sacramento-San Joaquin River, and is currently found only at Antioch Sand Dunes in Contra Costa County. Most of the habitat is now part of the Antioch Dunes National Wildlife Refuge. Thus, neither of these species occurs within perhaps 300 to 400 miles of the Project area.

Letter 39 – Responses to Comments from Christian Guntert

39-1 The comment's statement of opposition to the Project is noted.

39-2 Refer to Common Response 2 in Proposed PA/FEIS/EIR Section 4.5.3.2 regarding bighorn sheep.

Letter 40 – Responses to Comments from Rebecca Lamphear

40-1 The comment's statement of opposition to the Project is noted. The comment letter provides more specific comments regarding the potential impacts of the Proposed Action and action alternatives on bighorn sheep at comment 40-3 and on tui chub at comment 40-4. See Responses 40-3 and 40-4, below, for detailed responses to these comments.

40-2 Because the Project would be located entirely on federal land administered by the BLM, it would not be subject to San Bernardino County land use policies. The potential impacts of the Proposed Action and alternatives on visual resources are analyzed, and mitigation measures recommended to reduce and/or avoid impacts where feasible, in Draft PA/EIS/EIR Section 3.18, Visual Resources (p. 3.18-1 et seq.)

40-3 Regarding the Project's potential impacts on bighorn sheep connectivity, refer to Common Response 2 in Proposed PA/FEIS/EIR Section 4.5.3.2.

40-4 Regarding potential impacts relating to tui chub habitat from groundwater use, refer to Common Response 4 in Proposed PA/FEIS/EIR Section 4.5.3.4.

40-5 Please see Common Response 1 in Proposed PA/FEIS/EIR Section 4.5.3.1 regarding the relationship of the Project to the Western Solar Plan.

Letter 41 – Responses to Comments from Zoe Sumrall

41-1 The impacts of the Proposed Action and alternatives with respect to the BLM's multiple use considerations are analyzed in Draft PA/EIS/EIR Section 3.9, Lands and Realty (p. 3.9-1 et seq.).

41-2 The Applicant has not yet determined the solar panel manufacturer from which it would purchase panels. The impacts of the Proposed Action and alternatives with respect to job creation during the construction, operation and maintenance, and decommissioning phases are analyzed in Draft PA/EIS/EIR Section 3.14, Socioeconomics and Environmental Justice (p. 3.14-1 et seq.).

41-3 The potential impacts of the Project on views from I-15 are analyzed, and mitigation measures proposed, in Draft PA/EIS/EIR Section 3.18, Visual Resources (p. 3.18-1 et seq). See also Common Response 6 in Proposed PA/FEIS/EIR Section 4.5.3.6 regarding visual resources.

41-4 The solar arrays and other facilities would be fenced as described in Draft PA/EIS/EIR Section 2.4.2.4, Site Security and Fencing (p. 2-7 et seq.) and shown in Figures 2-1, 2-5, 2-6, and 2-7. The impacts of the Proposed Action and alternatives with respect to wildlife (including the effects of fencing) are analyzed in Draft PA/EIS/EIR Section 3.4, Biological Resources – Wildlife (p. 3.4-1 et seq.). No impact has been identified on people who "may encounter displaced wildlife," as the wildlife on the Project site is not considered to pose a hazard to people or have the potential to cause any other effect of concern under NEPA or CEQA. The comment does not provide further information as to what type(s) of impact it references, and the BLM and County are thus unable to provide a more detailed response to this comment.

Letter 42 – Responses to Comments from Jared Fuller

42-1 The comment's statement of opposition to the Project is noted.

42-2 Support for a reduced acreage alternative rather than the Proposed Action is noted. As described in Draft PA/EIS/EIR Section 2.4.3.2 (p. 2-18), the final limits of grading and disc-and-roll or other ground treatment will be determined during final design.

42-3 As identified in Response 9-21, the single mesquite plant and affected palo verde trees on the site would be either transplanted or their removal mitigated in accordance with CDFW policy.

Letter 43 – Responses to Comments from Dessa Kaye

43-1 The impacts of the Proposed Action and alternatives with respect to wildlife are analyzed in Draft PA/EIS/EIR Section 3.4, Biological Resources – Wildlife (p. 3.4-1 et seq.). The impacts of the Proposed Action and alternatives with respect to designated wilderness and wilderness study areas are analyzed in Draft PA/EIS/EIR Section 3.15, Special Designations (p. 3.15-1 et seq.). The Project site was chosen in part based on its proximity to an existing high-voltage transmission line with capacity to transmit the Project's electricity during operation.

43-2 Refer to Common Response 1 in Proposed PA/FEIS/EIR Section 4.5.3.1 for a discussion of distributed generation alternatives considered. The risks to the Project, its workers, and the public from intentionally destructive acts are described in Draft PA/EIS/EIR Section 3.8, Hazards and Hazardous Materials (see, e.g., p. 3.8-22).

43-3 As indicated in Draft PA/EIS/EIR Section 2.4.2.8, Water Supply, Storage, and Use (p. 2-10 et seq.), the Applicant anticipates that the Proposed Action would require 192 acre-feet per year (AFY) of non-potable water and 1.6 AFY of potable water during construction, and 33 AFY of potable and non-potable water during operation and maintenance. No specific examples, facts, reasonable assumptions predicated upon facts, or other evidence are provided in support of the comment's suggestion that 1,275 to 1,371 AFY would be required during operation.

43-4 Potential impacts on local plants and wildlife species, including Emory's crucifixion thorn, Utah vine milkweed, bighorn sheep, desert tortoise, Mojave fringe-toed lizard, burrowing owl, desert kit fox, and Mohave tui chub are addressed in Draft PA/EIS/EIR Sections 3.3, Biological Resources – Vegetation, and 3.4, Biological Resources – Wildlife. Additionally, refer to Common Response 2 in Proposed PA/FEIS/EIR Section 4.5.3.2 regarding bighorn sheep, Common Response 3 in Proposed PA/FEIS/EIR Section 4.5.3.3 regarding desert tortoise, and Common Response 4 in Proposed PA/FEIS/EIR Section 4.5.3.4 regarding tui chub.

43-5 The impacts of the Proposed Action and alternatives with respect to designated wilderness and wilderness study areas are analyzed in Draft PA/EIS/EIR Section 3.15, Special Designations (p. 3.15-1 et seq.). The comment does not address the adequacy or accuracy of this analysis.

43-6 The commenter notes that the Project footprint and surrounding area has been described by The Nature Conservancy (TNC) as "core habitat" and by documents produced in support of the Desert Renewable Energy Conservation Plan (DRECP) process as a "high biological sensitivity" area. The comment regarding the Project's location within TNC "core habitat" is addressed in Response 72-1. The DRECP Preliminary Conservation Strategy (PCS) map identified the Project area as an area with "moderate to high biological value." The PCS is not a draft of the DRECP or a proposed conservation strategy. As indicated in the PCS, the PCS map is not intended to have a regulatory effect or to govern how projects are reviewed

under CEQA, NEPA, or regulatory permitting processes during preparation of the DRECP (California Energy Commission, 2011). Therefore, this analysis does not rely on preliminary identifications made in the PCS. For more discussion on the relationship of the DRECP process to the analysis of the Proposed Action and alternatives, refer to Common Response 1 in Proposed PA/FEIS/EIR Section 4.5.3.1.

43-7 The comment's statement of opposition to the Project is noted.

Letter 44 – Responses to Comments from Tom Budlong

44-1 Refer to Common Response 1 in Proposed PA/FEIS/EIR Section 4.5.3.1.

44-2 The commenter states that the "alternatives section" of the Draft PA/EIS/EIR does not evaluate the alternatives presented. The BLM and County understand this comment to refer to Draft PA/EIS/EIR Chapter 2, Sections 2.5, Action Alternatives, and 2.6, No Action/No Project alternatives. As the commenter correctly notes, these sections describe the physical attributes and construction and operation processes associated with each alternative. The potential impacts of these alternatives are evaluated in full on a resource-by-resource basis in Draft PA/EIS/EIR Chapter 3, Environmental Consequences.

44-3 Regarding the relationship of the Proposed Action to the Western Solar Plan and DRECP planning process, refer to Common Response 1 in Proposed PA/FEIS/EIR Section 4.5.3.1.

44-4 Regarding the evaluation of a distributed generation alternative, refer to Common Response 1 in Proposed PA/FEIS/EIR Section 4.5.3.1.

44-5 Refer to Common Response 1 in Proposed PA/FEIS/EIR Section 4.5.3.1 for a discussion of the BLM' statement of purpose and need, and Common Response 7 in Proposed PA/FEIS/EIR Section 4.5.3.7 regarding recirculation.

44-6 Regarding the relationship of the Proposed Action to the DRECP planning process, refer to Common Response 1 in Proposed PA/FEIS/EIR Section 4.5.3.1.

44-7 Regarding the evaluation of site alternatives, refer to Common Response 1 in Proposed PA/FEIS/EIR Section 4.5.3.1.

44-8 Regarding the relationship of the Proposed Action to the DRECP planning process, refer to Common Response 1 in Proposed PA/FEIS/EIR Section 4.5.3.1.

44-9 The comment's statement of opposition to the Project is noted.

44-10 Because it would be located outside the Mojave National Preserve, the Project would have no direct impact on wildlife habitat within the Preserve. Potential indirect impacts on tui chub habitat are discussed in Common Response 4 in Proposed PA/FEIS/EIR Section 4.5.3.4. While the Project would impact wildlife habitat, as described in Draft PA/EIR/EIS Section 3.4, Biological Resources – Wildlife (p. 3.4-1 et seq.), the comment

provides no reasonable basis for its suggestion that the limited loss of common wildlife habitat would reduce the potential resilience of wildlife populations to climate change. Wildlife are expected to continue using lands around the Project site, including lands within the Preserve, in a similar manner following Project construction, except as noted on Draft PA/EIS/EIR pages 3.4-30 and 3.4-37 in response to noise generated near the Project site during construction, and as noted in the Final Proposed PA/FEIS/EIR in Section 3.4 in response to increased traffic on Blue Bell Mine Road.

44-11 Refer to Common Response 4 in Proposed PA/FEIS/EIR Section 4.5.3.4 for a discussion of groundwater impacts.

44-12 The comment is noted.

Letter 45 – Responses to Comments from Marc Greenhouse

45-1 The Project would not directly affect any lands within the Mojave National Preserve, as it is located outside of the Preserve. The potential impacts of the Proposed Action and alternatives on the user experience at Mojave National Preserve are analyzed in Draft PA/EIS/EIR Sections 3.13, Recreation (see page 3.13-7 acknowledging noise, dust, and visual disturbance near the Zzyzx Road entrance to the Preserve) and 3.18, Visual Resources (see pages 3.18-26 through 3.18-26 describing impacts on views from Key Observation Points (KOPs) 13, 14, and 19, which represent views from the Preserve). The comment does not address the adequacy or accuracy of this analysis. Also refer to Common Response 6 in Proposed PA/FEIS/EIR Section 4.5.3.6 regarding visual resource-related impacts on views from Mojave National Preserve.

45-2 The comment's statement of opposition to the Project is noted. The Draft PA/EIS/EIR considers and analyzes the potential impacts to the resources mentioned in the comment. The comment does not directly address the adequacy or accuracy of this analysis.

45-3 Refer to Response 45-1. Please also see Common Response 1 in Proposed PA/FEIS/EIR Section 4.3.5.1 regarding the range of alternatives evaluated.

Letter 46 – Responses to Comments from Bob Burke

46-1 Regarding potential impacts to bighorn sheep population connectivity and movement, please see Common Response 2 in Proposed PA/FEIS/EIR Section 4.5.3.2.

Letter 47 – Responses to Comments from Dave Focardi

47-1 Regarding the evaluation of a distributed generation alternative, please see Common Response 1 in Proposed PA/FEIS/EIR Section 4.5.3.1.

47-2 Regarding the relationship of the Project to the DRECP planning process, please see Common Response 1 in Proposed PA/FEIS/EIR Section 4.5.3.1.

Letter 48 – Responses to Comments from Ed Gala

48-1 The Project would not directly affect any lands within the Mojave National Preserve, as it is located outside of the Preserve. The potential impacts of the Proposed Action and alternatives on the user experience at Mojave National Preserve are analyzed in Draft PA/EIS/EIR Sections 3.13, Recreation (see page 3.13-7 acknowledging noise, dust, and visual disturbance near the Zzyzx Road entrance to the Preserve) and 3.18, Visual Resources (see pages 3.18-26 through 3.18-26 describing impacts on views from Key Observation Points (KOPs) 13, 14, and 19, which represent views from the Preserve). The comment does not address the adequacy or accuracy of this analysis. Also refer to Common Response 6 in Proposed PA/FEIS/EIR Section 4.5.3.6 regarding visual resource-related impacts on views from Mojave National Preserve.

48-2 The Draft PA/EIS/EIR considered and analyzed potential effects on the resources identified in the comment. Refer to Common Response 2 in Proposed PA/FEIS/EIR Section 4.5.3.2 regarding bighorn sheep; Common Response 3 in Proposed PA/FEIS/EIR Section 4.5.3.3 regarding desert tortoise; Common Response 4 in Proposed PA/FEIS/EIR Section 4.5.3.4 regarding tui chub; and Common Response 6 in Proposed PA/FEIS/EIR Section 4.5.3.6 regarding visual resources.

48-3 Regarding the evaluation of alternative sites, refer to Common Response 1 in Proposed PA/FEIS/EIR Section 4.5.3.1.

48-4 The BLM and County have not supplemented the range of alternatives to the Proposed Action evaluated in the EIS/EIR, and decline to extend the comment period beyond the 95 days provided.

48-5 The comment's statement of opposition to the Project is noted.

Letter 49 – Responses to Comments from Basin and Range Watch

49-1 The comment is noted. The Project would not directly affect any lands within the Mojave National Preserve, as it is located outside of the Preserve. The potential impacts of the Proposed Action and alternatives on the user experience at Mojave National Preserve are analyzed in Draft PA/EIS/EIR Sections 3.13, Recreation (see page 3.13-7 acknowledging noise, dust, and visual disturbance near the Zzyzx Road entrance to the Preserve) and 3.18, Visual Resources (see pages 3.18-26 through 3.18-26 describing impacts on views from Key Observation Points (KOPs) 13, 14, and 19, which represent views from the Preserve).

49-2 The comments regarding the adequacy and accuracy of the analysis and the extent to which mitigation would reduce or avoid the impacts of the Proposed Action and alternatives are addressed below where comments provide sufficient information to provide a detailed response. Consistent with the President's National Energy Policy of 2001, Secretarial Order 3285A1, the President's 2013 Climate Action Plan, and BLM policy, right-of-way applications for solar energy development projects are identified as a

high priority Field Office workload and are to be processed in a timely manner. The BLM and San Bernardino decline to extend the comment period beyond the 95 days provided.

49-3 The comments regarding the adequacy and accuracy of the analysis and the extent to which mitigation would reduce or avoid the impacts of the Proposed Action and alternatives is addressed below where comments provide sufficient information to provide a detailed response.

49-4 As required and noted in the BLM NEPA Handbook excerpts quoted by the commenter, during each public meeting held for the Draft PA/EIS/EIR, the BLM recorded a list of attendees, including the addresses of attendees desiring to be added to the mailing list. These lists, as well as notes taken by the BLM and/or its NEPA consultant during the meetings, are included in the Administrative Record for this Project, and all meeting attendees who provided mailing addresses have been added to the Project-specific mailing list. There is no requirement to record public meetings held on a Draft EIS.

The comment does not specify what requirement of the Americans with Disabilities Act it suggests is violated by not recording public comments for the record, and the BLM disagrees with this assertion. The BLM has not violated any applicable laws, regulations, policies, or guidelines in holding public meetings, the intended and advertised purpose of which is "to aid the public's understanding of the project and to solicit written comments on planning issues and the potential impacts, alternatives, and mitigation measures that should be considered in the Final Environmental Impact Statement/Environmental Impact Report" (BLM, 2013a, 2013b). The BLM and San Bernardino decline to extend the comment period.

49-5 Regarding the BLM's statement of purpose and need for the Project, refer to Common Response 1 in Proposed PA/FEIS/EIR Section 4.5.3.1.

49-6 It is acknowledged that the President's Climate Action Plan does not specifically target the Soda Mountain Project site for development, nor does the Draft PA/EIS/EIR make such a claim.

A discussion of the ongoing natural carbon uptake that would be disrupted due to the Project is provided on Draft PA/EIS/EIR pages 3.5-12 and 3.5-13. The maximum carbon uptake expressed as CO_2 that would be eliminated as a result of Project-related ground disturbance would be about 2,284 metric tons of CO_2 per year. To illustrate the net value of the Project in terms of displacing GHG emissions, this amount can be compared to the 283,785 metric tons of CO_2e that would be reduced annually due to the displacement of existing electricity from natural gas-fired combined-cycle power plants, assuming full build-out of the Proposed Action (see Draft PA/EIS/EIR page 3.5-13).

49-7 The effects of the Proposed Action and alternatives on the BLM's ability to manage the site for multiple uses are analyzed in Draft PA/EIS/EIR Section 3.9, Lands and Realty (p. 3.9-1 et seq.). The comment does not address the adequacy or accuracy of that analysis.

49-8 Regarding the BLM's statement of purpose and need for the Project, refer to Common Response 1 in Proposed PA/FEIS/EIR Section 4.5.3.1.

49-9 Refer to Common Response 1 in Proposed PA/FEIS/EIR Section 4.5.3.1 for a discussion of alternatives considered in compliance with both NEPA and CEQA requirements, including three no action/no project alternatives (Alternatives E, F, and G).

49-10 As described in Common Response 1 in Proposed PA/FEIS/EIR Section 4.5.3.1 and in Draft PA/EIS/EIR Section 2.8.1.2, no private parcels or combinations of parcels of sufficient size were available that met the Applicant's minimum project requirements after consideration of environmental resource constraints. This, in addition to the BLM's analysis that a private lands alternative would not meet the BLM's purpose and need, is the reason that a private lands alternative was not carried forward for detailed analysis.

Furthermore, the comment's suggestion that the BLM extend the search for appropriate private parcels beyond the 50-mile radius already evaluated is not supported by a reasonable assumption that such an exercise would yield different results. In any event, a private lands alternative would not meet the BLM's purpose and need to respond to the Applicant's application under Title V for a ROW grant under the authorities and for the purposes described in Draft PA/EIS/EIR Section 1.2.1.

49-11 Regarding the evaluation of a brownfields/degraded lands alternative, refer to Common Response 1 in Proposed PA/FEIS/EIR Section 4.5.3.1. As the Project is proposed within the California Desert Conservation Area (CDCA), the CDCA Plan is the applicable land use plan under which the Proposed Action and alternatives are analyzed; they are not subject to BLM's Arizona land use plans, nor to amendments contemplated for those plans.

The comment's suggestion that an alternative within the Westlands Solar Park should be considered is noted. However, similar to other private lands alternatives, such an alternative would not respond to the BLM's purpose and need for the Project.

49-12 Regarding the evaluation of a distributed generation alternative, refer to Common Response 1 in Proposed PA/FEIS/EIR Section 4.5.3.1.

49-13 Regarding the relationship of the Project to the DRECP planning process, refer to Common Response 1 in Proposed PA/FEIS/EIR Section 4.5.3.1.

49-14 Regarding the evaluation of a conservation and demand-side management alternative, refer to Common Response 1 in Proposed PA/FEIS/EIR Section 4.5.3.1. Support for a No Project alternative is noted.

49-15 The comment's statement of support for an alternative that identifies the site as unsuitable for solar energy development (i.e., Alternative G) is noted.

49-16 The potential impacts of the Proposed Action and alternatives with respect to disproportionately affecting low-income and/or minority communities (i.e., communities of concern for environmental justice impacts), including impacts related to air quality, are analyzed in Draft PA/EIS/EIR Section 3.14, Socioeconomics and Environmental Justice. As indicated therein (Table 3.14-5 on Draft PA/EIS/EIR page 3.14-7), the Baker Census-Designated Place and Census Tract 103, which is the census tract in which the Desert Studies Center is located, are considered communities of concern within the geographic scope of the environmental justice impact analysis for air quality. However, as indicated on Draft PA/EIS/EIR page 3.14-7, the environmental justice review determined that during the construction, operation, and maintenance phases of the Project, impacts related to air resources and certain other resources would be limited to a small area surrounding the Project site and would not affect people that may be members of communities of concern to the environmental justice analysis (i.e., Baker and Desert Studies Center), due to their distance from the Project site.

From an air resources perspective relative to exposing sensitive receptors to air pollutant concentrations, the primary hazardous air pollutant emission associated with the Proposed Action and alternatives would be diesel particulate matter (DPM) emissions from construction equipment and vehicle exhaust (see Draft PA/EIS/EIR Section 3.2.4.3, *Public Health Risk*). However, Draft PA/EIS/EIR Section 3.8, *Hazards and Hazardous Materials*, addresses the prevalence and risk of Coccidioidomycosis (Valley Fever), including the potential for the Project to generate fugitive dust that could expose workers to Coccidioides fungal spores that may be present in desert soils (see pages 3.8-5 and 3.8-21).

The comment's statement of concern regarding the Project's potential air quality-related visual and public health impacts is noted. However, this comment does not question the adequacy or accuracy of the relevant information in the Draft PA/EIS/EIR or present new information relevant to the analysis.

49-17 The comment is noted. The potential impacts of groundwater consumption and drawdown are analyzed, and mitigation measures proposed, in Draft PA/EIS/EIR Section 3.19, Water Resources (p. 3.19-1 et seq). See also Common Response 4 in Proposed PA/FEIS/EIR Section 4.5.3.4. The Applicant's projected water use estimates are intended to address the need for dust control.

49-18 As indicated in Chapter 2, the Applicant anticipates the deposition of dust on the solar panels and proposes to wash the panels as needed, up to two times per year (Draft PA/EIS/EIR p. 2-24). The Applicant's projected water use estimates are intended to address the need for periodic panel washing.

49-19 It would not be practicable to limit construction activities to periods when wind speeds would be less than 10 miles per hour (mph) because wind speeds of 10 mph or greater happen with relative frequency in the Project area. APM 6 would require non-essential earth-moving activities to be discontinued under high wind conditions when wind speeds

exceed 25 mph and those activities result in visible dust plumes, and all grading activities would be suspended when wind speeds are greater than 30 mph.

Per Mojave Desert Air Quality Management District (MDAQMD) Rule 403.2, *Fugitive Dust Control for the Mojave Desert Planning Area*, high winds are defined as follows: "When wind gusts exceed 40 kilometers (25 miles) per hour or, on an hourly average, when wind speeds exceed 24 kilometers (15 miles) per hour. Then average wind speed determination shall be on a 15 minute average at the nearest meteorological station or by wind instrument on site." In addition, per Rule 403.2, (C)(2)(f), the operator of any Construction/Demolition source shall "Reduce non-essential Earth-Moving Activity under High Wind conditions."

To ensure consistency with the definition of high winds in MDAQMD Rule 403.2, APM 6 has been superseded by Mitigation Measure 3.2-3. Mitigation Measure 3.2-3 has been added to Proposed PA/FEIS/EIR Section 3.2 as follows:

> **Mitigation Measure 3.2-3:** The Applicant shall discontinue non-essential earth-moving activities under high wind conditions when wind speeds exceed gusts of 25 miles per hour or when wind speeds exceed 15 miles per hour based on a 15-minute average as indicated by a wind instrument on-site and those activities result in visible dust plumes. All grading activities shall be suspended when wind gusts are greater than 30 miles per hour.

In addition, the Applicant has proposed to implement eight other measures that would minimize fugitive dust emissions due to wind erosion during the construction phase of the Project. To summarize, APMs 1 and 2 include measures to maintain surface moisture on disturbed areas and Best Management Practices to prevent Project-related visible bulk materials transport (trackout) onto paved surfaces; APMs 3 and 4 require haul vehicles loaded with earthen materials to be covered and graded site surfaces to be stabilized upon completion of grading if subsequent delays in development are expected. In addition, APMs 5 and 7 would require visible bulk materials tracked out on publicly maintained paved surfaces to be cleaned within 24 hours and would limit vehicle travel on un-paved roads to 15 mph. Implementation of these measures would be effective in reducing wind-generated fugitive dust emissions during construction.

Regarding the suggestion that construction should be limited during the three hottest months of the year, pursuant to APM 1, use of a water truck would be required to maintain surface moisture on disturbed areas, and pursuant to APM 8, water would be applied to all unpaved roads and unpaved parking areas actively used during construction, except when moisture remains in the soils such that dust is not produced when driving on unpaved roads. The specific frequency of construction-related water applications to limit fugitive dust required by APMs 1 and 8 is not predetermined; rather, it is dependent on surface moisture and effectiveness in the field. Therefore, the BLM and County decline to adopt mitigation limiting construction during the summer months.

Compliance and enforcement monitoring would be key components of any approval of the requested ROW grant to effectively control dust.

The Draft PA/EIS/EIR discloses the potential visual impacts of fugitive dust (see, e.g., pages 3.13-8, 3.18-22, and 3.18-23). The comment does not address the adequacy or accuracy of this analysis.

49-20 As indicated in Chapter 2 of the Draft PA/EIS/EIR, dust palliatives may be applied during operation and maintenance as an alternative to watering (p. 2-13).

See Common Response 4 in Proposed PA/FEIS/EIR Section 4.5.3.4 regarding the Project's potential impacts on groundwater supply and drawdown effects. In light of the information presented therein, the BLM and County decline to adopt mitigation requiring the Applicant to use alternative panel cleaning methods.

49-21 The consideration and analysis of Alternative F in the Draft PA/EIS/EIR provides an opportunity to evaluate the potential impacts of County denial of a groundwater well permit. The BLM's action with respect to Alternative F would be to approve one of the solar plant layout alternatives evaluated (i.e., Alternatives A through D) and amend the CDCA plan accordingly, as indicated on Draft PA/EIS/EIR page 2-36. As described in Draft PA/EIS/EIR page 2-38, "Alternative F is not preliminarily identified [by the County] as the environmentally superior alternative because while it would avoid potential less-than-significant impacts on tui chub and groundwater supplies, it would exacerbate the significant and unavoidable impact related to criteria air pollutant emissions." Draft PA/EIS/EIR Section 3.2, Air Resources, Impact Air-1 (p. 3.2-33) and Impact Air-3 (p. 3.2-34) note that the significant unavoidable impacts related to criteria air pollutant emissions are associated with construction-period maximum daily emissions of NO_x, CO, and PM_{10} and annual emissions of NO_x and PM_{10}. As shown in Draft PA/EIS/EIR Table 3.2-16 (p. 3.2-29), additional truck trips associated with Alternative F would further contribute to exceedances of these criteria pollutants. This significant unavoidable impact is not associated with greenhouse gas emissions. Regarding groundwater drawdown and potential impacts to tui chub habitat, refer to Common Response 4 in Proposed PA/FEIS/EIR Section 4.5.3.4. Regarding the potential to use alternative panel cleaning methods, see Response 49-20.

49-22 The Applicant's projected water use estimates are intended to address the need for periodic panel washing, as indicated in Draft PA/EIS/EIR Section 2.4.2.8 (see pages 2-12 and 2-13). No specific examples, facts, reasonable assumptions predicated upon facts, or other evidence are provided in support of the comment's suggestion that the Draft PA/EIS/EIR underestimates water consumption. Regarding potential impacts relating to tui chub habitat and other sensitive water resources from groundwater use, as well as a discussion of Applicant Proposed Measures and Mitigation Measures for protecting sensitive water resources from drawdown of groundwater levels, refer to Common Response 4 in Proposed PA/FEIS/EIR Section 4.5.3.4.

49-23 The comment regarding the USFWS' responsibility to regulate "take" of a listed species (under the Federal Endangered Species Act or FESA) is noted and does not disclose any potential impacts to Mohave tui chub that were not disclosed in the Draft PA/EIS/EIR. As indicated in Draft PA/EIS/EIR Section 3.4.3.1 (p. 3.4-20), "take" of listed wildlife species is prohibited without a federal permit (16 USC §1539), and the BLM is required by the FESA to ensure that BLM actions are not likely to jeopardize the continued existence of the Mohave tui chub, a federally endangered species. Pursuant to its responsibilities under Section 7 of the FESA, the BLM has prepared a Biological Assessment (BA) that analyzes whether the Project is likely to affect listed species or their critical habitat, and submitted it to the USFWS. The USFWS is in the process of preparing its Biological Opinion (BO), which will opine whether the Project is likely to jeopardize the continued existence of any listed species or result in adverse modification of critical habitat. If the BO concludes that such jeopardy or adverse modification would occur as a result of the Project, the USFWS may develop and include in the BO reasonable and prudent alternatives to the Project that may avoid the likelihood of jeopardy or adverse modification. However, if take will occur even with implementation of a reasonable and prudent alternative, an incidental take statement from USFWS would be required. Further, in keeping with its responsibilities under FESA, the BLM would require through the implementation of Mitigation Measure 3.4-1a (Draft PA/EIS/EIR page 3.4-51) that the designated biologist ensure compliance with all measures set forth in the BO.

Additionally, San Bernardino County as the state lead agency is required under the California Endangered Species Act (CESA) to consult with CDFW to ensure that any action it authorizes is not likely to jeopardize the continued existence of any CESA-listed endangered or threatened species (including the Mohave tui chub) or result in destruction or adverse modification of essential habitat. As indicated in Mitigation Measure 3.4-1a, the Designated Biologist would have the authority to ensure compliance with all measures set forth in the CESA Section 2081 take authorization.

Regarding potential impacts to tui chub, refer to Common Response 4 in Proposed PA/FEIS/EIR Section 4.5.3.4.

49-24 Regarding potential impacts relating to tui chub habitat from groundwater use, refer to Common Response 4 in Proposed PA/FEIS/EIR Section 4.5.3.4.

49-25 See Common Response 6 in Proposed PA/FEIS/EIR Section 4.5.3.6 regarding the adequacy of KOPs analyzed in the Draft PA/EIS/EIR, as selected in cooperation with NPS staff. Figure 3.18-9 is not a simulation, but an example of what downcast security lighting could look like at the facility. Nighttime lighting simulations have not been prepared for this Project, but impacts resulting from nighttime lighting are analyzed on Draft PA/EIS/EIR pages 3.18-22 through 3.18-24. Further, the lighting item of Mitigation Measure 3.18-1, Siting and Design, on pages 3.18-34 through 3.18-35, has been modified in the Proposed PA/FEIS/EIR as part of a Lead Agency-generated change to minimize night-sky impacts.

49-26 See Response 49-1, as well as Common Response 6 in Proposed PA/FEIS/EIR Section 4.5.3.6 regarding visual impacts to Mojave National Preserve and the selection of interim VRM classification for the Project site.

The comment's summary and agreement with the adverse Project-specific and cumulative visual impacts described in Draft PA/EIS/EIR Section 3.18 are acknowledged, with several clarifications: 1) As indicated in Table 2-1 on Draft PA/EIS/EIR page 2-5, the Proposed Action's solar panel arrays would permanently occupy 2,165 acres, not 4,000 acres as suggested by the comment (ancillary facilities, roads, and fences make up the remainder of the 2,222 acres of permanent disturbance). Alternatives B, C, and D would result in reduced solar array coverage, as indicated in Tables 2-6, 2-7, and 2-8 on Draft PA/EIS/EIR pages 2-33 through 2-35. 2) No overhead transmission lines are proposed under the Proposed Action or action alternatives. The existing transmission lines adjacent to the Project site are described as part of the site's existing conditions (Draft PA/EIS/EIR p. 3.18-3) and in terms of their contribution to cumulative visual impacts (Draft PA/EIS/EIR p. 3.18-32).

As noted on Draft PA/EIS/EIR page 3.18-26, "The cumulative total of the area from which the Project may be seen from within the Preserve in the foreground/middleground distance zone covers approximately 350 acres. This represents 0.0002 percent of the 1.6-million-acre Preserve," and foreground/middleground views of the Project site from elsewhere in the Preserve would be blocked by the Soda Mountains. These impacts are not expected to affect visitation to the Preserve. The nearest community to the Project site is Baker, which is expected to experience economic benefits as a result of the Project. The comment does not provide specific examples, facts, reasonable assumptions predicated upon facts, or other evidence in support of the comment's suggestion that the Project would have negative impacts on park visitorship and/or economic activity in connection with park tourism.

49-27 See the Response to Comment 67-1.

49-28 The BLM and County disagree with the commenter's statement that the Project, with implementation of APM 37, would result in cutting off connectivity for pollinators and seed dispersers of Emory's crucifixion thorn. Refer to Draft PA/EIS/EIR Figure 3.3-3, which shows that the identified plants would be approximately 0.25 mile from the nearest Project facilities. Given this distance, no effects to pollinators and seed dispersers, or other direct or indirect impacts to these plants are anticipated.

49-29 The commenter is correct that the Applicant would be allowed to use approved herbicides, though as described in APM 38 (Draft PA/EIS/EIR page 3.3-22), herbicides would be applied in focused treatments in areas where invasive weed infestations have been identified and would not be applied systemically over the entire Project area. As identified in Draft PA/EIS/EIR Section 3.3.6.1 (p. 3.3-25), the draft IWMP (Appendix E-2) describes the use of herbicides, which would be used in accordance with the BLM's 2007 Herbicide FPEIS. The use of glyophosate on BLM-administered lands is addressed programmatically

in the Herbicide FPEIS, which incorporates by reference an ecological risk assessment conducted by the USFS for glyophosate,[3] among other approved herbicides. The comment provides no specific examples, facts, reasonable assumptions predicated upon facts, or other evidence that would contradict the information used in the Herbicide FPEIS. Impacts of herbicide application on native plants and wildlife species would be minimized because only approved herbicides would be applied on targeted locations of invasive plants following the labeled instructions for use. Such targeted application would virtually eliminate pesticide drift such that there would be no adverse effects on untreated habitat within the Project site, outside of the Project site, or within the Mojave National Preserve. The suggestion to develop a "physical removal alternative" to spraying glyphosate is noted; however, given the vast size of the Project site, the physical removal of invasive species cannot by itself ensure the control of noxious weeds. The BLM does not anticipate that the limited use of herbicides on the site would impact native plant or wildlife populations.

49-30 Contrary to the comment's suggestion that the BLM has not considered an alternative that would require the Applicant to import water from off-site, the Draft PA/EIS/EIR analyzes the potential impacts of Alternative F, which does require an off-site water source (see, e.g., Draft PA/EIS/EIR pages 2-36 and 3.4-46). Regarding potential impacts to tui chub habitat from groundwater use, and regarding the comment's suggestion of further study of groundwater resources, refer to Common Response 4 in Proposed PA/FEIS/EIR Section 4.5.3.4.

49-31 The comment suggests that a possible movement corridor for Mojave fringe-toed lizard may be severed between sand dunes located south of the south arrays and the Mojave River sand fields. Note that there are no project-related activities proposed between the sand dunes located south of the Project site and those associated with the Mojave River and Soda Lake, which lie further south. Thus, no movement connectivity would be severed between these areas.

The comment notes that Mojave fringe-toed lizards can be abundant on relatively small acreages and requests an estimate of how many individuals would be impacted by the project. As identified on Draft PA/EIS/EIR p. 3.4-34, focused surveys in 2009 and 2012 detected fringe-toed lizard habitat approximately 1,000 feet south of the South Arrays, and lizards were not identified in the dividing area. Mojave fringe-toed lizards were not identified on or adjacent to the Project site and no direct effects are anticipated to this species.

49-32 The comment is noted; the direct impact to up to 2,450 acres of Mojave creosote bush scrub habitat is disclosed in the Draft PA/EIS/EIR.

[3] Available online at http://www.fs.fed.us/foresthealth/pesticide/pdfs/Glyphosate_SERA_TR-052-22-03b.pdf.

49-33 The Draft PA/EIS/EIR discloses that potential direct impacts to desert tortoise from the Project could include illegal collection or vandalism (p. 3.4-31). Implementation of the Worker Environmental Awareness Program (APM 44, Mitigation Measure 3.4-1c) would educate workers about environmental issues associated with the Project and the sensitivity of on-site biological resources, including desert tortoise, as well as about the consequences of non-compliance with laws protecting these resources.

49-34 Draft PA/EIS/EIR Section 3.4 (p. 3.4-32 et seq.) discloses that the removal of desert tortoise habitat or relocation of tortoises can result in displacement stress that could result in loss of health, increased exposure, increased risk of predation, increased intra-species competition, and possibly death. Thus, this potential impact was considered in the Draft PA/EIS/EIR analysis.

49-35 The BLM and County have reviewed the abstract at the URL provided in the comment and have included it in the administrative record for this project. Although the abstract mentions a possible heat island effect from solar plants, it does not provide a source for this information, nor does it provide further detail to support the claim that solar plants accelerate local extinction of desert tortoise. A 2013 analysis of the potential for a heat island effect in large solar farms found that it is unlikely that a heat island effect could occur as a result of the installation of a large solar PV project. Specifically, "The field data and our simulations show that the annual average of air temperatures at 2.5 m off the ground in the center of simulated solar farm section is 1.9° higher than the ambient and that it declines to the ambient temperature at 5 to 18 m heights. The field data also show a clear decline of air temperatures as a function of distance from the perimeter of the solar farm, with the temperatures approaching the ambient temperature (within 0.3°), at about 300 m away. Analysis of 18 months of detailed data showed that in most days, the solar array was completely cooled at night, and, thus, it is unlikely that a heat island effect could occur." (Fthenakis and Yu, 2013).

The Project site is not located within the Ivanpah Valley or near California City.

49-36 The comment's references to page E.1-80 and E.1-84 refer to the Biological Resources Technical Report (BRTR), provided as Appendix E-1 to the Draft PA/EIS/EIR. The BRTR formed only a part of the materials reviewed and incorporated into the analysis in the Draft PA/EIS/EIR. The BLM and County agree with the suggestion in the comment that bighorn sheep habitat occurs within and near the Project site. For example, Draft PA/EIS/EIR page 3.4-16 indicates that "[b]ighorn sheep also use habitat on alluvial fans and washes emanating from mountains as well as the flat terrain between mountain ranges" and "[s]heep are also frequently observed within 0.50 mile of slopes greater than 20 percent," and Figure 3.4-5 depicts the areas within the proposed ROW area within 0.25 miles of slopes greater than 20 percent, consistent with the USFWS' "Recovery plan for bighorn sheep in the Peninsular Ranges, California" (2000).

The natural history of and Project-specific survey results for bighorn sheep are described on Draft PA/EIS/EIR pages 3.4-16 and 3.4-17. The potential impacts of the Proposed Action

and alternatives on bighorn sheep are described in Draft PA/EIS/EIR Section 3.4.6. Additional discussion of bighorn sheep impacts and mitigation is provided in Common Response 2 in Proposed PA/FEIS/EIR Section 4.5.3.2.

49-37 The discussion of potential impacts to common and special-status birds in the Draft PA/EIS/EIR relied on preliminary avian monitoring data from the Desert Sunlight and Genesis projects and carefully discussed potential avian collision risks associated with solar PV facilities (pp. 3.4-38 et seq. and 3.4-50 et seq.). Many of the avian species identified in the comment were discussed; however, a comprehensive list of all avian fatalities at these facilities was not provided.

The lead agencies cannot provide a similar estimate of avian mortality because the site-specific risk is not known and cannot reasonably be extrapolated from monitoring data at other solar sites. However, the Draft PA/EIS/EIR discusses avian groups that are considered most at risk from the proposed facility, characterizes the potential effect, and proposes an approach to minimize the effect. The lead agencies consider that monitoring and reporting included in the Avian Monitoring Program (Mitigation Measure 3.4-1h) would characterize the magnitude of the potential effect, while the adaptive element of the plan may slightly reduce facility effects on avian species. The measures proposed by the commenter, which relate to the design of solar panels, are not being considered as adaptive measures. Following the implementation of the Mitigation Measure 3.4-1h and related adaptive measures, the lead agencies expect that residual effects related to bird mortality would continue throughout the operation period of the facility. The comment's statement of support for a no action alternative is noted.

49-38 The Draft PA/EIS/EIR discloses that the Project would remove habitat for the desert kit fox (p. 3.4-38), burrowing owl (p. 3.4-35), and American badger (3.4-38); remove foraging habitat for golden eagles and other raptors (p. 3.4-36); and may disrupt nighttime foraging activities of bats (p. 3.4-38).

49-39 The Draft PA/EIS/EIR acknowledges the presence of desert pavement on areas of the Project site and recommends Mitigation Measure 3.7-4, Protection of Desert Pavement, which requires the avoidance and protection of desert pavement during construction. A plan for identification and avoidance or protection must be submitted to the BLM at least 60 days prior to construction. If avoidance is not possible, the desert pavement surface would be protected from construction-related disturbance by temporary mats. This comment does not question the adequacy or accuracy of information in the Draft PA/EIS/EIR, present new information relevant to the analysis, or affect the alternatives considered, and no changes to the Draft PA/EIS/EIR have been made in response to this comment.

49-40 The comment's statement of support for a no action/no project alternative is noted.

Letter 50 – Responses to Comments from Kellie King

50-1 The comment's statement of opposition to the Project is noted. The Project would not directly affect any lands within the Mojave National Preserve, as it is located outside of the Preserve. The potential impacts of the Proposed Action and alternatives on the user experience at Mojave National Preserve are analyzed in Draft PA/EIS/EIR Sections 3.13, Recreation (see page 3.13-7 acknowledging noise, dust, and visual disturbance near the Zzyzx Road entrance to the Preserve) and 3.18, Visual Resources (see pages 3.18-26 through 3.18-26 describing impacts on views from Key Observation Points (KOPs) 13, 14, and 19, which represent views from the Preserve). Impacts on the Soda Mountains Wilderness Study Area are analyzed in Draft PA/EIS/EIR Section 3.15, Special Designations. Also see Common Response 4 in Proposed PA/FEIS/EIR Section 4.5.3.4 regarding groundwater resources and endangered species, and Common Response 6 in Proposed PA/FEIS/EIR Section 4.5.3.6 regarding visual resources, including views from Mojave National Preserve. The comment does not address the adequacy or accuracy of the analysis.

Letter 51 – Responses to Comments from Sidney Silliman

51-1 There is no requirement under NEPA to record public meetings held on a Draft EIS. Notes taken by the BLM, County, and/or their consultants during the meetings are included in the Administrative Record for this Project. The BLM has not violated any applicable laws, regulations, policies, or guidelines in holding public meetings, the intended and advertised purpose of which is "to aid the public's understanding of the project and to solicit written comments on planning issues and the potential impacts, alternatives, and mitigation measures that should be considered in the Final Environmental Impact Statement/Environmental Impact Report" (BLM, 2013a, 2013b).

Visual representations of the no action/no project alternatives are not provided in the Draft PA/EIS/EIR, nor were they presented at the public meetings. Alternative E is a no action/no project alternative that would not differ from existing conditions; no map is provided because nothing would be developed on the Project site. Similarly, Alternative G would result in no development and would identify the proposed Right-of-Way (ROW) area as unsuitable for solar development; the boundaries of the proposed ROW that would be affected under Alternative G are shown in Draft PA/EIS/EIR Figure 2-1. These alternatives are fully analyzed in the Draft PA/EIS/EIR throughout Chapter 3.

51-2 The Draft PA/EIS/EIR addresses the potential impacts of the Proposed Action and alternatives on special-status plants in Section 3.3, Biological Resources – Vegetation; on special-status wildlife species, wildlife connectivity, and habitat fragmentation in Section 3.4, Biological Resources – Wildlife; on visual resources in Section 3.18, Visual Resources; and on groundwater in Section 3.19, Water Resources. Additionally, refer to Common Response 2 in Proposed PA/FEIS/EIR Section 4.5.3.2 regarding bighorn sheep, Common Response 4 in Proposed PA/FEIS/EIR Section 4.5.3.4 regarding groundwater impacts, and Common Response 6 in Proposed PA/FEIS/EIR Section 4.5.3.6 regarding

visual impacts. This comment provides no basis to question the adequacy or accuracy of the information in the Draft PA/EIS/EIR or the methodology used, and so no further response is provided.

51-3 The Project would not directly affect any lands within the Mojave National Preserve, as it is located outside of the Preserve. The potential impacts of the Proposed Action and alternatives on the user experience at Mojave National Preserve are analyzed in Draft PA/EIS/EIR Sections 3.13, Recreation (see page 3.13-7 acknowledging noise, dust, and visual disturbance near the Zzyzx Road entrance to the Preserve) and 3.18, Visual Resources (see pages 3.18-26 through 3.18-26 describing impacts on views from Key Observation Points (KOPs) 13, 14, and 19, which represent views from the Preserve). Impacts on the Soda Mountains Wilderness Study Area are analyzed in Draft PA/EIS/EIR Section 3.15, Special Designations. Also refer to Common Response 4 in Proposed PA/FEIS/EIR Section 4.5.3.4 regarding groundwater resources and tui chub, and Common Response 6 in Proposed PA/FEIS/EIR Section 4.5.3.6 regarding visual resources, including views from Mojave National Preserve. The comment does not specify what impacts it suggests "are not adequately accounted for" in the Draft PA/EIS/EIR. Accordingly, the BLM and County are unable to provide a more detailed response.

51-4 A detailed and comprehensive analysis of direct, indirect, and cumulative impacts of the Proposed Action and alternatives on water resources is presented in Draft PA/EIS/EIR Section 3.19, *Water Resources*. As described in Section 3.19.6, *Direct and Indirect Effects* (p. 3.19-20 et seq.), the assessment of effects to water resources presented in Section 3.19.6 incorporates consideration of and fully discloses the fact that groundwater level response predictions from the Proposed Action are based on a conceptual model and, as a result, an inherent level of uncertainty remains, as do some risks related to the limitations of groundwater modeling, such as the potential that the Project could affect water levels at Soda Spring. For this reason, Mitigation Measures 3.19-3 and 3.19-4 (pp. 3.19-43 to 3.19-45) supplement the APMs relating to water resources (Section 3.19.5, p. 3.19-18 et seq.) and ensure that adequate testing, monitoring, and reporting are completed on a reasonable schedule to avoid damage to the groundwater and surface water resources, especially at Soda Spring. Also refer to Common Response 4 in Proposed PA/FEIS/EIR Section 4.5.3.4 regarding the credibility, reliability, and technical defensibility of the information considered and incorporated into the analysis of impacts to water resources presented in the Draft PA/EIS/EIR as well as further discussion of potential impacts to tui chub habitat from groundwater use and a description of the Groundwater Well Test performed in support of this analysis.

51-5 Regarding recirculation of the Draft PA/EIS/EIR, refer to Common Response 7 in Proposed PA/FEIS/EIR Section 4.5.3.7. Regarding public meetings, see Response 51-1.

51-6 The comment's statement of support for Alternative G is noted.

51-7 Receipt of the petition is noted. A copy of the petition, downloaded from the URL provided on March 3, 2014, is included with the comment letter in Appendix J.

Letter 52 – Responses to Comments from Terry Young

52-1 The comment's statement of support for the Project is noted.

Letter 53 – Responses to Comments from Chris Lish

53-1 The Draft PA/EIS/EIR acknowledges the proximity of the proposed Project site to Mojave National Preserve. The potential impacts of the Proposed Action and alternatives on the user experience at Mojave National Preserve are analyzed in Draft PA/EIS/EIR Sections 3.13, Recreation (see page 3.13-7 acknowledging noise, dust, and visual disturbance near the Zzyzx Road entrance to the Preserve) and 3.18, Visual Resources (see pages 3.18-26 through 3.18-26 describing impacts on views from Key Observation Points (KOPs) 13, 14, and 19, which represent views from the Preserve). Also refer to Common Response 6 in Proposed PA/FEIS/EIR Section 4.5.3.6 regarding visual resource-related impacts on views from Mojave National Preserve.

53-2 The Draft PA/EIS/EIR considered and analyzed potential effects on the resources identified in the comment. Refer to Common Response 2 in Proposed PA/FEIS/EIR Section 4.5.3.2 regarding bighorn sheep; Common Response 3 in Proposed PA/FEIS/EIR Section 4.5.3.3 regarding desert tortoise; Common Response 4 in Proposed PA/FEIS/EIR Section 4.5.3.4 regarding groundwater resources and tui chub; and Common Response 6 in Proposed PA/FEIS/EIR Section 4.5.3.6 regarding visual resources, including views from Mojave National Preserve.

53-3 Refer to Common Response 1 in Proposed PA/FEIS/EIR Section 4.5.3.1 regarding alternative sites considered.

53-4 The 95-day period provided for public comment is longer than both the NEPA- and FLPMA-required comment periods for draft EISs and plan amendments, and longer than the CEQA-required comment period for draft EIRs. The BLM and San Bernardino County decline to extend the comment period.

Letter 54 – Responses to Comments from Gabriel Villareal

54-1 The comment's statement of support for the Project is noted.

Letter 55 – Responses to Comments from Ann Price

55-1 The comment's statement of support for the Project is noted.

Letter 56 – Responses to Comments from Richard Haney

56-1 The comment's statement of opposition to the Project is noted.

56-2 Refer to Common Response 1 in Proposed PA/FEIS/EIR Section 4.5.3.1 for a discussion of distributed generation alternatives considered.

56-3 The potential impacts of the Proposed Action and alternatives on the user experience at Mojave National Preserve are analyzed in Draft PA/EIS/EIR Sections 3.13, Recreation (see page 3.13-7 acknowledging noise, dust, and visual disturbance near the Zzyzx Road entrance to the Preserve) and 3.18, Visual Resources (see pages 3.18-26 through 3.18-26 describing impacts on views from Key Observation Points (KOPs) 13, 14, and 19, which represent views from the Preserve). Additionally, the synergistic cumulative effects of the Project in combination with other projects along the I-15 corridor are described and analyzed in Draft PA/EIS/EIR Section 3.18.7. The comment does not address the adequacy or accuracy of these analyses. Also refer to Common Response 6 in Proposed PA/FEIS/EIR Section 4.5.3.6 regarding visual resource-related impacts on views from Mojave National Preserve.

56-4 The BLM and San Bernardino County held three public meetings for the Project in January 2014. The 95-day period provided for public comment is longer than both the NEPA- and FLPMA-required comment periods for draft EISs and plan amendments, and longer than the CEQA-required comment period for draft EIRs. The BLM and San Bernardino County decline to extend the comment period.

56-5 Refer to Common Response 1 in Proposed PA/FEIS/EIR Section 4.5.3.1 for a discussion of the Project's relationship to the Western Solar Plan.

56-6 The comment is noted. Please see Common Response 1 in Proposed PA/FEIS/EIR Section 4.5.3.1 for a discussion of the range of alternatives considered.

Letter 57 – Responses to Comments from Doug Peeler

57-1 As described in Draft PA/EIS/EIR Section 3.10, *Mineral Resources*, the Project would not affect access to the Blue Bell Mine or any other known mineral resource areas. The Project would not preclude access to areas north and south of I-15 accessible via Rasor Road, Blue Bell Mine Road, Opah Ditch Mine Road, or Zzyzx Road. The comment's statement regarding the provision of mineral collecting permits is outside the scope of the analysis for this Project.

Letter 58 – Responses to Comments from Bradford Berger

58-1 The Draft PA/EIS/EIR accurately uses the term "sparse" on page 3.3-2 to describe the density of creosote bush-white bursage scrub, creosote bush scrub, and cheesebush scrub vegetation communities on the site. This term is not intended as a reflection of the site's ability to support wildlife, and the Draft PA/EIS/EIR notes on page 3.3-2 that, with the exception of I-15 and limited facilities at Rasor Road, the valley is mostly undeveloped. Potential impacts of the Proposed Action and alternatives to bighorn sheep, desert kit fox, and American badger are analyzed throughout Draft PA/EIS/EIR Section 3.4, *Biological Resources – Wildlife*; the comment does not question, with reasonable basis, the adequacy or accuracy of that analysis. The resource agencies do not require specific mitigation for losses of potential habitat for desert bighorn, American badger, or desert

kit fox; however, compensatory mitigation would be required for Project impacts to desert tortoise habitat.

58-2 Section 3.19.7, *Cumulative Effects* (p. 3.19-40 et seq.), presents detailed and comprehensive analysis of potential cumulative impacts of the Proposed Action and alternatives on water resources. The cumulative analysis incorporates consideration of all reasonably foreseeable projects that cross or overlie the groundwater basins affected by the Project. None of the identified reasonably foreseeable projects included in the assessment of cumulative impacts proposes to use groundwater from the same groundwater basin as the Project. Therefore, the amount of groundwater drawdown from the affected basins would be determined solely by the Project. A detailed and comprehensive analysis of direct and indirect impacts of the Proposed Action and alternatives on water resources, including the potential for a drop in the water level of the local aquifer, is presented and discussed in detail in Section 3.19.6, *Direct and Indirect Effects* (p.3.19-20 et seq.). Please also refer to Common Response 4 in Proposed PA/FEIS/EIR Section 4.5.3.4. The comment's statement of opposition to the potential County approval of a groundwater permit is noted.

58-3 The comment's suggestion of a "damage footprint" within 0.5 mile of the I-15 freeway is not supported by specific examples, facts, reasonable assumptions predicated upon facts, or other evidence. As shown in Draft PA/EIS/EIR Figures 3.3-1, 3.3-2, 3.4-1, and 3.4-3, for example, there are resources both within and outside of a 0.5-mile corridor on either side of the freeway. Therefore, to draw a distinction between lands within 0.5 miles of the freeway and lands outside that area would be arbitrary.

58-4 Title V of the Federal Land Policy and Management Act (FLPMA) of 1976 as Amended and the Right-of-Way (ROW) regulations authorize the BLM to require a ROW holder to provide a bond to secure the obligations imposed by the ROW authorization (43 USC §1764(i) and 43 CFR 2805.12(g)). If a ROW is granted for the Project, the BLM will require a Performance and Reclamation bond to ensure compliance with the terms and conditions of the ROW authorization. See Proposed PA/FEIS/EIR Section 3.1.6.1.

Letter 59 – Responses to Comments from Corinna Pinzari

59-1 The comment is noted. The potential impacts of the Proposed Action and alternatives on biological resources, water resources, wildland fire ecology, visual resources, and land use are analyzed, and mitigation measures recommended to reduce or avoid impacts, throughout Chapter 3 of the Draft PA/EIS/EIR. The comment does not address the adequacy or accuracy of this analysis.

59-2 The Bat Habitat Assessment (Brown-Berry Biological Consulting, 2012) acknowledges the limitations of acoustic surveys for certain bat species. Acoustic bat surveys performed on the Project site were intended to provide a sample of seasonal bat activity levels and were not intended to comprehensively describe bat use (Brown-Berry Biological Consulting, 2012). In addition to the acoustic surveys, focused surveys were performed to identify roosting habitat on the site and at culverts, overpasses, and bridges along I-15 between

Rasor Road and Zzyzx Road (Draft PA/EIS/EIR p. 3.4-3, et seq.). As described on Draft PA/EIS/EIR page 3.4-16, suitable roosting habitat for Townsend's big-eared bat is not present within the Project area, as there is no cave-like roosting habitat. However, as acknowledged on Draft PA/EIS/EIR page 3.4-15, pallid bat roosts may include burrows within creosote bush scrub habitat that is present on the Project site. The potential direct impact to roosting pallid bats that may use burrows on the Project site is disclosed on Draft PA/EIS/EIR page 3.4-38, and Mitigation Measure 3.4-1b recommends measures to reduce the potential for such effects by inspecting potential habitats (such as burrows) and relocation of any non-listed special-status animals if discovered. Furthermore, the Bird and Bat Conservation Strategy (BBCS) prepared per the requirements of Mitigation Measure 3.4-1g and included in this Proposed PA/FEIS/EIR in Appendix L includes provisions for preconstruction surveys for burrows containing suitable bat roosting habitat that could be used as individual bat roosts, and burrow clearance surveys.

Additionally, roost surveys were conducted at the Blue Bell Mine complex located approximately 2 miles north of the Project site to characterize bat use, and as described on Draft PA/EIS/EIR pages 3.4-15 and 3.4-16, pallid bats and Townsend's big-eared bats have previously been observed at Otto Mountain Mine; therefore, their roosting presence in this mine is acknowledged. The Draft PA/EIS/EIR presumes that pallid bat and Townsend's big-eared bat could forage over the Project site because it provides suitable foraging habitat and is within the foraging range of bats observed to roost at Blue Bell Mine and Otto Mountain Mine. As identified in the draft BBCS, no suitable roosting habitat for western mastiff bat occurs within the study area, no western mastiff bats were identified during acoustic or focused roosting surveys, and the potential for foraging use within the study area is low.

Additionally, as discussed in the Draft PA/EIS/EIR (p. 3.4-70, et seq.), because few bat fatalities have been documented at existing solar facilities, the level of Project risk to special-status bats from the Project is considered low. The Draft PA/EIS/EIR relied on available information about bat mortality at solar facilities (such as from monitoring reports at those facilities); further detailed information on bird and bat mortality from these sites is not yet available. The draft BBCS includes provisions for construction and post-construction monitoring and studies of avian and bat use of the site and impacts to avian and bat species, reporting of results, and adaptive management that would make use of data being collected on other solar facilities and on this site. The recommendation that more bat research and monitoring be conducted in the Project area is noted; however, the lead agencies have declined to require further research and monitoring beyond that outlined in the draft BBCS.

59-3 The comment's statement of support for an alternative with reduced acreage compared to the Proposed Action is noted.

59-4 The comment is noted; the lead agencies will consider all comments received when making decisions regarding the Project and alternatives.

Letter 60 – Responses to Comments from Soda Mountain Solar

60-1 The comment is noted. The Proposed Action, described in Draft PA/EIS/EIR Chapter 2, Proposed Action and Alternatives, and shown in Figure 2-1, reflects the changes made to the proposal as a result of the Applicant's coordination with the BLM.

60-2 Regarding the BLM and San Bernardino County's alternatives screening process, refer to Common Response 1 in Proposed PA/FEIS/EIR Section 4.5.3.1.

60-3 The BLM and County acknowledge receipt of the comment letter's Appendix B. The comment does not request changes to the text of the Draft PA/EIS/EIR, nor have the lead agencies identified changes to be made as a result of this comment.

60-4 Regarding roof-top solar energy generation, refer to Common Response 1 in Proposed PA/FEIS/EIR Section 4.5.3.1.

60-5 The requested editorial change has been made.

60-6 Comment noted. The fourth row under "State Agencies" of Table 1-1 on page 1-11 of the Draft PA/EIS/EIR has been updated as follows:

> ~~If required, NPDES Construction Stormwater General Permit~~Application for Waste Discharge Requirements for Projects Involving Discharge of Dredged and/or Fill Material to Waters of the State.
>
> Required for projects with ~~1 acre of more of land disturbance and~~ potential impacts to waters of the ~~U.S. or waters of the~~ State.

60-7 The requested editorial change has been made.

60-8 The requested editorial change has been made.

60-9 The requested change has been made, indicating that the Ivanpah project was completed between publication of the Draft PA/EIS/EIR and the Proposed PA/FEIS/EIR.

60-10 The requested editorial change has been made.

60-11 To clarify the attainment status of the Project area relative to ozone standards, the following sentences have been added to the beginning of the "Ozone (O_3)" discussion in Proposed PA/FEIS/EIR Section 3.2.2.2 as follows:

> As noted above, the Project area currently is designated as a non-attainment area for the state 1-hour and 8-hour ozone standards. The southern portion of the Project site that is within the Western Mojave Desert Ozone Nonattainment Area is classified as a non-attainment area for the federal 8-hour ozone standard (see Figure 3.2-1).

Note that the requested attainment status information relative to PM_{10} and $PM_{2.5}$ has not been added to this discussion, which is only related to ozone. A discussion of PM_{10} and $PM_{2.5}$ is provided on Draft PA/EIS/EIR page 3.2-5.

60-12 The intent of the sentence requested to be revised is to describe the $PM_{2.5}$ attainment status. The PM_{10} attainment status is described at the beginning of the subject paragraph and in Table 3.2-2. Therefore, the requested revision has not been made.

60-13 The applicable federal Clean Air Act conformity *de minimis* levels are used as measures as to whether the Proposed Action or one of the alternatives could result in an exceedance of a federal AAQSs (see the first paragraph on Draft PA/EIS/EIR page 3.2-14). The referenced discussion on Draft PA/EIS/EIR page 3.2-16 is not associated with the General Conformity analysis, as described in the last sentence of the paragraph which states: "For information related to Project emissions subject to the General Conformity Rule, refer to the *General Conformity Determination* discussion below." The requested revision has not been made.

60-14 Draft PA/EIS/EIR Mitigation Measure 3.2-1 stated, "The Applicant shall apply water twice daily to all unpaved roads and unpaved parking areas *actively used* during operation and maintenance, *except when moisture remains in the soils such that dust is not produced when driving on unpaved roads*" (emphasis added). The BLM and County disagree with the comment's characterization of this measure as not roughly proportional to the impact (active use of roads during dry soil conditions would generate fugitive dust, potentially resulting in an exceedance of a state PM_{10} AAQS) and not mitigating a potentially adverse or significant impact (exceedance of a state PM_{10} AAQS would be a significant adverse impact).

As stated on Draft PA/EIS/EIR page 3.2-18, the PM_{10} and $PM_{2.5}$ operational emission estimates were provided by the Applicant (Pan Environmental, Inc., 2013) and are based on a 55 percent reduction for fugitive dust to account for a fugitive dust control program that would include watering the site and unpaved access roads twice daily; however, although it provided estimates based on such a program, the Applicant did not formally commit to implementing an operation-based watering program to control fugitive dust. Without implementation of long-term operation-based watering program that includes twice daily waterings to control fugitive dust, maximum daily emissions of PM_{10} would be as high as 155 pounds, and annual emission of PM_{10} would be as high as 22 tons, which would exceed the MDAQMD daily and annual thresholds potentially causing an exceedance of a state PM_{10} AAQS. Therefore, Mitigation Measure 3.2-1 was recommended to ensure Project operation and maintenance would not result in an exceedance of a state PM_{10} AAQS.

Subsequent to the publication of the Draft PA/EIS/EIR, Mitigation Measure 3.2-1 has been revised to include the use of dust palliatives in conjunction with watering, with the intent to improve upon the efficacy of watering only and, to the extent that dust palliatives reduce the incidence of visible dust plumes, reduce the need for regular watering.

60-15 The requested clarification has been made.

60-16 In response to this comment, Mitigation Measure 3.2-2 has been revised as follows to allow flexibility to help prevent medical emergencies related to worker heat exposure.

> **Mitigation Measure 3.2-2:** During construction, vehicles and equipment shall not idle for more than 5 minutes if not moving or performing construction activities. The use of idling vehicle air conditioner units to reduce the effects of heat shall be prohibited unless required for a medical emergency or to prevent a medical emergency when temperatures on the Project site exceed 100 °F.

60-17 The survey dates in Table 3.3-1 have been corrected.

60-18 The requested editorial change has been made.

60-19 The description of the location of *Ambrosia salsola* alliance shrubland has been revised to indicate that it runs "southwest to northeast through proposed ROW."

60-20 The comment is noted. The footnote in Table 3.3-2 cites the source of acreage discrepancy between Table 3.3-2 and Chapter 2. The difference relates to undefined location of Project facilities that could not be classified by vegetation type.

60-21 See response 60-20.

60-22 The sentence has been removed.

60-23 See response 60-20.

60-24 Text in Proposed PA/FEIS/EIR Section 3.3.6.2 has been revised to reflect that the locations and densities of cactus were identified during the 2009 spring floristic surveys, as follows:

> Botanical surveys of the Project site documented the locations and densities ~~presence~~ of cactus~~non-listed cacti, but their specific distribution was not mapped~~.

Note also that the associated data cited in the comment showing cacti locations was not comprehensive for the entire Project site; thus, the statement that the species and number of individual cacti that would be impacted under Alternative B is unknown remains valid.

60-25 The commenter correctly indicates that tree locations were mapped in the document cited in the comment. Tree locations were generalized when discussed in the BRTR (Appendix E-1). The text in Proposed PA/FEIS/EIR Section 3.3.6.4 is revised as follows:

> Botanical surveys of the Project site ~~quantified~~ documented the locations and densities of non-listed cacti and several protected trees~~but their specific distribution was not mapped. Therefore,~~ However, GIS data showing the location of ~~the species and number of~~ individual cacti that would be impacted under Alternative D were

not available~~are not known~~. Based on the reduced size of Alternative D, the number of impacted individual cacti under Alternative D is estimated at 25 to 35 percent less than under the Proposed Action. Impacts to individual native desert trees, identified in the BRTR (Appendix E-1, Figure 3.2-3), would be the same between Alternative D and the Proposed Action.

The comment regarding the federal and state protection of blue palo verde and western honey mesquite trees is noted. Refer to Response 9-21.

60-26 The requested editorial change has been made.

60-27 The fact that the 2009 botanical surveys partly covered the Calnev pipeline project alignment has been noted in Proposed PA/FEIS/EIR Section 3.3.7.

60-28 See revisions to Mitigation Measure 3.3-4.

60-29 See revisions to Mitigation Measure 3.3-2, item 1.

60-30 Mitigation Measure 3.3-2 specifically refers to the construction period. The requested editorial revision has been made.

60-31 The comment correctly characterizes the intent of Mitigation Measure 3.3-2, item 9(b), which was to provide 60 percent vegetation cover and density relative to pre-disturbance conditions. This item (Proposed PA/FEIS/EIR Section 3.3.8) has been revised as follows:

> "b. relative cover and density of plant species within the temporarily disturbed areas shall equal at least 60 percent relative to pre-disturbance conditions."

60-32 Utah vine milkweed plants were recorded at only a handful of locations south of the North Array, as shown in Draft PA/EIS/EIR Figure 3.3-3. Plants are close enough to the north array that it is reasonable to retain the recommendation that they be protected from herbicide and other soil stabilizer drift. No other protections are recommended for these plants.

60-33 Consistent with the material in the BLM-reviewed Vegetation Resource Management Plan, the commenter's suggestion to reduce the cacti monitoring requirement from 10 years to 3 years has been adopted as follows:

> g. A requirement for 3~~10~~ years of maintenance of the transplanted individuals, including removal of invasive species and irrigation (if necessary); and
>
> h. A requirement for 3~~10~~ years of monitoring to determine the percentage of surviving plants each year and to adjust maintenance activities using an adaptive management approach.

60-34 The BLM and County have considered the requested edit and have declined to change the requirement that equipment maintenance be prohibited within 150 feet of an ephemeral drainage.

60-35 The 2012 C.S. Ecological report has been added to the Section 3.3 reference list, as follows:

> C.S. Ecological Surveys and Assessments, 2012. Focused Fall Special-Status Plant Survey Soda Mountain Solar Project. October – November 2012. Prepared for Panorama Environmental, Inc. and BLM.

60-36 The requested change has not been made. The sentence in question refers to the study area for wildlife resources, which included a larger area than the Project site itself, and included some private lands under County jurisdiction (see, e.g., Table 3.4-1, in which the study area for bighorn sheep and golden eagle includes lands within a 10-mile radius of the ROW).

60-37 The two identified surveys and associated Kiva Biological Consulting reports have been added to Table 3.4-1 in Proposed PA/FEIS/EIR Section 3.4.

60-38 In response to the comment, the following text has been added to Proposed PA/FEIS/EIR Section 3.4.2.2:

> ***Burrowing Owl***
>
> Kiva Biological Consulting (2013c) conducted a Phase II burrowing owl survey of the Project site in spring 2013. Burrowing owl surveys were conducted by walking over the entire Project site and within a buffer of 150 meters (approximately 500 feet) of the requested ROW in accordance with the CBOC survey protocols for Phase II surveys.

60-39 In response to the comment, the following text has been added to Proposed PA/FEIS/EIR Section 3.4.2.2:

> In 2013, USFWS (2010) protocol-level desert tortoise surveys were performed throughout the two regions of the Project site as well as throughout the proposed North and South Translocation Areas from April 8 through May 11, 2013 (Kiva Biological Consulting, 2013a). Walking surveys considered the entire Project site and a 150-meter buffer.

60-40 The survey findings described in the comment are summarized in the BRTR, which is listed in Section 3.4.2.3. These findings are noted throughout Section 3.4.2.3, with reference to the BRTR.

60-41 The suggested edits have been made in Table 3.4-2 relative to golden eagle and bighorn sheep. Black-tailed gnatcatcher has been removed from Table 3.4-2. This species was formerly protected by CDFW.

60-42 The paragraph already reflects April 2013 Kiva Biological Consulting (2013a) finding of one adult desert tortoise near the eastern fringe of East Array 1. No text changes have been made.

60-43 See response 60-20.

60-44 The requested editorial change has been made.

60-45 The BRTR (Appendix E-1, p. 3-25) states that, "There are anecdotal reports of several bighorn sheep sightings in the Soda Mountain valley," thus, the Draft PA/EIS/EIR reference to such sightings identified in the BRTR is accurate. No changes have been made in response to the comment.

60-46 See Common Response 2 in Proposed PA/FEIS/EIR Section 4.5.3.2 for a discussion of bighorn sheep connectivity considerations.

60-47 A summary of the kit fox survey data from 2013 desert tortoise surveys has been added to the PA/FEIR/EIS. This information does not affect the analysis if potential impacts to kit fox.

60-48 The suggested edit has been made.

60-49 The paragraph has been deleted and a reference added to the summary of surveys provided in Table 3.4-1 and the list of resources provided in Section 3.4.2.3.

60-50 The suggested inclusion of APM 18 in Proposed PA/FEIS/EIR Section 3.4 has been incorporated.

60-51 A discussion of the curtailment provision in the Groundwater Monitoring and Mitigation Plan has been added, as has a discussion of groundwater modeling and the Groundwater Well Test performed at the Project site.

60-52 Proposed PA/FEIS/EIR Section 3.4.6.1 has been revised as follows:

> Little desert tortoise sign was detected in the North Array and <u>no sign was detected in the</u> South Array portions of the Project site, though carcasses were noted in the former area.

60-53 The comment is noted.

60-54 The discussion on Draft PA/EIS/EIR pages 3.4-31 and 3.4-32 does not suggest that the Project would be responsible for road kill on I-15, rather, it notes "The Project would cause increased risk to desert tortoise from roads and traffic. Vehicle traffic would increase as a result of construction and improvement of access roads, thereby increasing the risk of injuring or killing desert tortoise." Road kill on Project access roads is reasonably attributable to Project-related traffic.

60-55 The comment begins by claiming that there is no evidence to suggest that desert tortoise would use culverts under the I-15 highway, and then concludes that even if they did use the culverts the Project would not create a barrier to desert tortoise connectivity. This comment is noted.

60-56 The Kiva Biological Consulting survey findings have been added to the Western Burrowing Owl discussion in Proposed PA/FEIS/EIR Section 3.4.6.1, as suggested by the commenter.

60-57 The requested editorial change has been made.

60-58 The potential golden eagle nest location discussed on Draft PA/EIS/EIR p. 3.4-39 was brought to the BLM and County's attention by National Park Service staff at the Mojave National Preserve.

In response to the comment that the Project would include a short segment of overhead transmission lines, text in Proposed PA/FEIS/EIR Section 3.4.6.1, subsection *Golden Eagle*, has been revised as follows:

> Because the ~~collection lines would be installed underground and the Project does not propose any overhead transmission facilities~~ Project would comply with APLIC standards for bird safe facilities (APLIC, 2006; 2012), ~~the Project~~ it would not pose an electrocution or collision hazard to golden eagles.

60-59 The suggested reference to APM 59 has been added to Proposed PA/FEIS/EIR Section 3.4.6.1, subsection *Other Potential Bird Impacts*.

60-60 In response to the clarification provided by the comment, text in Proposed PA/FEIS/EIR Section 3.4.6.1, subsection Desert Bighorn Sheep is revised as follows:

> The bighorn sheep habitat suitability report included in the BRTR prepared for the Project by Panorama Environmental, Inc. (Appendix E-1, pg. 197 et seq.)did not identify bighorn sheep linkage corridors within the Project ROW~~; however, it acknowledged that the model incorrectly underestimated suitable habitat in the south Soda Mountains where sheep are known to occur~~.

60-61 The suggested editorial change has been made.

60-62 The suggested revision has been made in Proposed PA/FEIS/EIR Section 3.4.6.2 as follows:

> Alternative B would have relatively greater direct impacts to Mojave fringe-toed lizard related to the Rasor Road re-alignment, which would traverse occupied lizard habitat, and would have similar indirect impacts to ~~Mohave fringe-toed lizard and~~ special-status bats to those described for the Proposed Action.

60-63 The suggested change has been made.

60-64 The suggested change has been made.

60-65 The referenced discussion addresses the Ivanpah Solar Electric Generating System's impacts with respect to avian mortality in the context of cumulative impacts (see Draft PA/EIS/EIR page 3.4-46, Section 3.4.7, Cumulative Effects). No change has been made in response to this comment.

60-66 Consistent with the comment, the Draft PA/EIS/EIR (p. 3.4-50) identifies that the XpressWest project would be the only one among the cumulative projects that could have lasting impacts to bighorn sheep movement.

60-67 As presented in the Draft PA/EIS/EIR, a single individual identified as the Designated Biologist would be the single point of contact for the BLM, as opposed to multiple biologists. The Designated Biologist can be changed as needed, and allowances will be made during construction for substitutions to accommodate personnel changes and vacations, as necessary. However, the Draft PA/EIS/EIR's reference to a single point of contact is intentional.

The suggested editorial revision to Mitigation Measure 3.4-1a, item 3 has been made.

60-68 The intent of Mitigation Measure 3.4-1b, Item 5 is to clearly state that non-listed wildlife are protected and must be relocated prior to construction. It is understood that wildlife relocation would be consistent with California Fish and Game code and CDFW guidance. No text change has been made.

60-69 In response to this comment, Mitigation Measure 3.4-1b has been revised as follows:

> **Mitigation Measure 3.4-1b: Biological Monitoring~~ during Construction~~.** Biological Monitor(s) shall be employed to assist the Designated Biologist in conducting pre-construction surveys and monitoring ground disturbance, grading, ~~operation and maintenance,~~ construction, decommissioning, and restoration activities. Additionally, biological monitoring is required during any ground disturbance or grading activities that occur during operation and maintenance.

60-70 The proposed text change is noted; however, species protection is required even when animals are difficult to detect.

In response to the comment, Mitigation Measure 3.4-1b, item 6 is revised as follows.

> 6. At the end of each work day, inspect all potential wildlife pitfalls (e.g., trenches, bores, other excavations) for wildlife and remove wildlife as necessary. If the potential pitfalls will not be immediately backfilled following inspection, the Biological Monitor(s) will ensure that the construction crew slopes the ends of the excavation (3:1 slope), ~~to~~ provides wildlife escape ramps, or completely and securely covers the excavation to prevent wildlife entry.

60-71 The requested editorial change has been made.

60-72 The proposed text change is noted though not incorporated. Fence inspection surveys should occur rain or shine, with exceptions for safety in the case of major events. Presumably, portions of the site would be safely accessible during rain events and could be monitored. No text change is necessary in response to survey timing comment.

The requested editorial change to Mitigation Measure 3.4-1b, item 2d ("all damaged temporary fencing") has been made.

60-73 The requested 15 mph speed limit during operations is provided in Mitigation Measure 3.4-5a, item 1. No text change has been made.

60-74 The 650-foot buffer distance is derived from the CDFW Burrowing Owl Staff Report (CDFG, 2012, table on p. 9) and is correct. The metric equivalent (200 meters) has been revised in the text. The relocation of owls in phases is anticipated and can be stated in the required Burrowing Owl Mitigation and Monitoring Plan to be prepared by the Applicant.

60-75 Mitigation Measure 3.4-1g has been revised to indicate that the Bird and Bat Conservation Strategy (BBCS) may include the Raven Monitoring and Control Plan or it may be provided as a separate document. A draft BBCS and draft Raven Monitoring and Control Plan are provided in Proposed PA/FEIS/EIR Appendix L.

60-76 The purpose of the use of "turbines" in the Draft PA/EIS/EIR was to avoid location off-site compensatory mitigation lands near wind turbines, which may pose a mortality risk to birds. The word "turbines" in Mitigation Measure 3.4-1f, item 5 has been revised to "energy facilities." Because burrowing owl habitat acquired as compensatory mitigation would be located off-site in an as-yet undetermined location, the measure requires that it not be located in an area where any energy facility may pose a mortality risk.

60-77 In response to the comment, Mitigation Measure 3.4-1f, item 5 (in part) is revised as follows:

> The off-site area to be preserved can coincide with other off-site mitigation lands ~~for permanent impacts to sensitive vegetation communities~~, with the approval of the BLM and CDFW.

60-78 In response to the comment and Comment 60-75, Mitigation Measure 3.4-1g is revised as follows:

> **Mitigation Measure 3.4-1g: Bird and Bat Conservation Strategy (BBCS).** The Applicant/Owner shall develop a BBCS to address Project impacts to special-status avian and bat species. The Applicant/Owner shall submit the BBCS to the BLM and USFWS for review and approval prior to initiation of Project construction. The BBCS shall include an assessment of potential avian and bat impacts from lighting, noise, collision, electrocution, and ponds (including attraction of ravens), as applicable, and measures to mitigate for their effects to birds; a description of

general avoidance and minimization measures applicable during construction, post-construction, and operation and maintenance, to include nest management and post-construction monitoring; a description of the reporting requirements and reporting schedule and duration; and the adaptive management strategy. A raven management element shall be included in the BBCS or provided separately that includes measures such as storage of garbage in raven-proof containers and installation of anti-nesting devices on structures where raven nests could be built.

60-79 Mitigation Measure 3.4-1h has been revised in response to this and other comments. See Proposed PA/FEIS/EIR Section 3.4.8.

60-80 In response to the comment, the first paragraph of Mitigation Measure 3.4-2a is revised as follows:

Mitigation Measure 3.4-2a: Desert Tortoise Protection. The Applicant/Owner shall undertake appropriate measures to manage the construction site and related facilities in a manner to avoid or minimize impacts to desert tortoise. Methods for clearance surveys, fence specification and installation, tortoise handling, artificial burrow construction, egg handling, and other procedures shall be consistent with those described in the USFWS' 2009 Desert Tortoise Field Manual (USFWS, 2009d) or more current guidance provided by CDFW and USFWS. The Applicant/Owner shall also implement all terms and conditions described in the Biological Opinion to be prepared by USFWS." ~~These measures include, but are not limited to, the following:~~ These measures include, but are not limited to, the following, subject to modification by the terms of incidental take authorizations issued by the USFWS and CDFW:

Also, the first sentence of Mitigation Measure 3.4-2a, item 2d is revised as follows:

Fence Inspections. Following installation of the desert tortoise exclusion fencing for both the permanent site fencing and temporary fencing ~~in the utility corridors~~, the fencing shall be regularly inspected…

60-81 The suggested text revision related to enhancing public lands has been considered but not incorporated into the Proposed PA/FEIS/EIR.

In response to the comment, the second sentence of Mitigation Measure 3.4-2d is revised as follows:

If compensation lands are acquired in fee title or in easement, the requirements for acquisition, initial improvement, and long-term management of compensation lands include all of the following, subject to modification by the terms of incidental take authorizations issued by the USFWS and CDFW:"

60-82 In response to the comment, Mitigation Measure 3.4-2d, item 1a is revised as follows:

a. be within the Western Mojave Recovery Unit, or, with prior USFWS approval, within the Eastern Mojave Recovery Unit, as defined in the 2011 Revised Recovery Plan (USFWS, 2011a), with potential to contribute to

desert tortoise habitat connectivity and build linkages between desert tortoise designated critical habitat, known populations of desert tortoise, and/or other preserve lands;

60-83 The comment is noted.

60-84 In response to the comment, Mitigation Measure 3.4-4 is revised as follows:

Mitigation Measure 3.4-4: Avoid Disturbance to Nesting Birds. Vegetation clearing shall take place outside of the general avian breeding season (February 15 to September 1), when feasible. If vegetation clearing cannot occur outside the avian breeding season, the Designated Biologist/Biological Monitor(s) shall conduct a preconstruction survey for nesting birds no more than seven ~~three~~ (7~~3~~) days prior to vegetation clearing. If no active nests are found, clearing can proceed. If active nests are found, no clearing shall be allowed within 150 feet (for passerines) to 250 feet (for raptors) of the active nests until the Designated Biologist/Biological Monitor(s) determines the nest is no longer active or the nest fails. The Designated Biologist/Biological Monitor(s) shall submit the results of the pre-construction nesting bird surveys to the BLM, USFWS, and CDFW. Following agency coordination, the size of the next buffer may be adjusted based upon the magnitude of proposed activities and observed sensitivity of the bird to disturbance.

60-85 In response to the comment, Mitigation Measure 3.4-5a, item 1 has been deleted with a reference to Mitigation Measure 3.4-1d, as follows:

1. ~~A speed limit of 15 miles per hour will be maintained on all dirt access/maintenance roads, and all vehicles must remain on designated access/maintenance roads.~~ Speed limits identified in Mitigation Measure 3.4-1d shall continue to be applied during Operation and Maintenance.

60-86 The comment is noted and the BLM concurs, as discussed in the Draft PA/EIS/EIR, that the Project would not obstruct any migratory corridors currently used by bighorn sheep. This estimation is balanced by the CDFW's and others' belief that the Project could negatively affect the potential to restore the North-South Soda Mountain movement corridor for bighorn sheep. The importance of the Project area to sheep movement is summarized by Epps, et al. (2013), who call the Project area, "the most important restorable corridor for long-term demographic potential (i.e., population recolonization by ewes) across the entire southeastern Mojave Desert of California, as it would provide the best and only opportunity for movement between bighorn populations in the Mojave National Preserve and the large complex of populations to the north of Interstate 15, and would facilitate gene flow as well resulting in long-term (multi-step) connections with bighorn sheep populations in Death Valley National Park." Refer to Common Response 2 in Proposed PA/FEIS/EIR Section 4.5.3.2 regarding bighorn sheep connectivity.

60-87 The comment suggests that the Draft PA/EIS/EIR determination of significant and unavoidable adverse effect on bighorn sheep is inconsistent with CEQA thresholds of significance and the results of the Project. Specifically, the comment contends that the Project would not interfere with established native resident or migratory wildlife

corridors relative to CEQA significance criterion 'd' on Draft PA/EIS/EIR page 3.4-65. The comment states that because there would be no substantial interference with existing movement of bighorn sheep, the impact should be reflected as less than significant. The North-South Soda bighorn movement corridor has been recognized for decades as being impaired, though not fully impeded by the I-15 freeway corridor that separates the North and South Soda Mountains. While photographic studies since 2012 have not detected bighorn sheep use of underpasses at Opah Ditch or Zzyzx Road, the finding does not signify that these movement corridors are defunct in a sheep movement context. On the contrary, Soda Mountain bighorn sheep populations have received extensive study in recent years and efforts are underway by CDFW to study and improve sheep movement between populations. Relative to CEQA significance threshold 'd', the Draft PA/EIS/EIR interpretation in the of the phrase, "Interfere substantially with the movement of any native resident or migratory fish or wildlife species," was taken to include the loss of recognized active and impaired wildlife movement corridors in the Project area. Because the Project could obstruct the recovery of the impaired bighorn movement corridor that occurs in the Project area, the County conservatively concluded that this impact would be significant. Because no reasonable mitigation measures were identified that would reduce the magnitude of the movement corridor obstruction on bighorn sheep, this potential effect was accurately characterized under CEQA as significant and unavoidable.

60-88 The BLM agrees that, relative to the I-15 highway, which represents baseline conditions in the Project area, the Project's effect on the potential bighorn connectivity restoration efforts would be minor. As discussed in Response 60-87, the Project would impact bighorn sheep connectivity individually and, in combination with the XpressWest Project and I-15 highway, the Project would contribute to a cumulative effect, as described in the Draft PA/EIS/EIR. See Common Response 2 in Proposed PA/FEIS/EIR Section 4.5.3.2.

60-89 In response to the comment, the first paragraph of Section 3.4.10.2 describing Alternative B is revised as follows:

> CEQA significance for Alternative B would be similar, or result in a reduced effect compared to that of the Proposed Action with respect to effects to candidate, sensitive, or special-status species. Similar to Alternative A, this alternative would cause a significant and unavoidable impact and significant and unavoidable contribution to a cumulative impact on bighorn sheep movement, though connectively impacts may be slightly lower than Alternative A because the North Array is not included in Alternative B.

60-90 See Response 60-37.

60-91 Comment noted. The first sentence of the second paragraph on page 3.7-25 of the Draft PA/EIS/EIR has been updated as follows:

> All erosion control facilities shall be monitored immediately following a ~~significant rainfall event~~ qualified storm event.

60-92 Comment noted. The last sentence of the first paragraph on page 3.7-25 of the Draft PA/EIS/EIR has been updated as follows:

> Any desert tortoise fencing that creates ~~spoil piles or excess soil~~ substantial excess soil shall have straw wattles or other measures installed to prevent soil transport.

In response to this comment, the repair time window described in Mitigation Measure 3.7-1 has been revised to 72 hours, but insufficient rationale has been provided for extending the repair time window to 7 days. The second paragraph on page 3.7-25 of the Draft PA/EIS/EIR has been updated as follows:

> Any erosion control facilities that are damaged by rainfall shall be repaired within ~~24~~ 72 hours of any damage and shall be monitored after any precipitation. Clearance reports and inspection logs shall be submitted to the BLM and the County for approval. ~~Any~~ Substantial damage to erosion control facilities shall be reported to the BLM and the County and per the above, no ground disturbing activity shall restart until the facilities are repaired.

60-93 The USGS West of Soda Lake 7.5 minute series topographic quadrangle published in 1983 shows an "Old FAA Beacon" north of the Beacon Station near the southwestern corner of the Project boundary (USGS, 1983). The updated USGS West of Soda Lake 7.5 minute series topographic quadrangle, published in 2012, does not show the Old FAA Beacon (USGS, 2012). In addition, the Old FAA Beacon could not be located during the Phase I Environmental Site Assessment performed in 2013 (Panorama Environmental, Inc., 2013). The Old FAA Beacon may have been removed. The nearest active public or private airport or airstrip found is located over 10 miles from the Old FAA Beacon site shown on the USGS 1983 topographic quadrangle (AirNav, 2014). For consistency with information provided in Draft PA/EIS/EIR Section 3.16.2.4 and in response to this comment, the following sentence has been added after the last paragraph in Section 3.8.2.1:

> There also is an historical private airstrip located adjacent to the Rasor Road service station (near the junction of Rasor Road and I-15, southwest of the Project site) (Panorama Environmental, Inc., 2013).

60-94 In response to this comment, the following clarification has been made in Proposed PA/FEIS/EIR Section 3.8.6.1:

> Construction of the Proposed Action would involve the use of hazardous materials (see list of wastes in Table 2-3, Construction Waste Types, Volumes, and Management Approaches). These could include paints, thinners, solvents, sealants, fuels, oils and lubricants, drilling mud (for drilling cable conduits under I-15 and possibly for water well drilling), and chemicals related to the reverse osmosis water treatment system such as sulfuric acid, sodium hypochlorite, and caustic soda.

60-95 In response to this comment, the following clarifications have been made in Proposed PA/FEIS/EIR Section 3.8.6.1:

> ~~As described in the APMs, t~~ The Applicant would store all hazardous materials in the manner specified by the manufacturer and in accordance with local, state, and federal regulations. All potential contaminants would be stored and used at least 50 feet from any defined or constructed channels or basins at all times. To reduce the risk of spills a Spill Pollution Control and Countermeasure (SPCC) Plan would be developed and implemented prior to Project construction if the Project would include onsite storage capacity of 1,320 gallons or more of petroleum (in aggregate), in accordance with Title 4 of the Code of Federal Regulations, Part 112.

60-96 The following text has been added to Proposed PA/FEIS/EIR Section 3.9.11.2 to clarify that the Project would conform to the applicable State Implementation Plan and that the BLM would be exempt from performing a General Conformity determination.

> …concluded that Project construction could result in or contribute to a short-term exceedance of the federal AAQS for ozone. However, it should be noted that the air quality General Conformity analysis with regard to the federal ozone standard was performed for only the portion of the Project site that would be in the federal ozone non-attainment area. Approximately 56 percent of the Proposed Action's construction activities would take place within the federal ozone non-attainment area (see Figure 3.2-1). As indicated in Table 3.2-9, the NO_x emissions that would be generated by Project-related construction and operation activities within the federal non-attainment areas would not exceed the General Conformity *de minimis* levels. Therefore, the Proposed Action would conform to the State Implementation Plan and the BLM is exempt from performing a conformity determination. The maximum daily and annual operation emissions that would be associated with the Project are provided in Tables 3.2-7 and 3.2-8....

60-97 The comment includes no basis for deleting the Mitigation Measure 3.11-1 restrictions associated with construction and decommissioning activities on Sundays. As described in the CEQA Impact Noise-1 discussion on Draft PA/EIS/EIR page 3.11-16, pursuant to San Bernardino County Code Section 83.01.080, *Noise,* temporary construction activities are exempt from complying with noise standards only if they occur between 7:00 a.m. and 7:00 p.m., except on Sundays and federal holidays. Construction activities that would take place outside of these hours could increase ambient noise levels, which would result in a significant impact associated with exposing persons to noise levels in excess of San Bernardino County noise standards. Therefore, the Mitigation Measure 3.11-1 restriction against certain construction and decommissioning activities on Sundays is required to ensure that the Project would not conflict with applicable portions of San Bernardino County Code, and to reduce CEQA Impact Noise-1 to a less-than-significant level.

60-98 In response to this comment, the following revisions have been made to text in Proposed PA/FEIS/EIR Section 3.12.8:

> **Mitigation Measure 3.12-3:** Based on the results of the field survey (PaleoResource Consultants, 2009) and in accordance with the BLM's paleontological resource management policies, monitoring shall take place in all areas where excavations that disturb areas with PFYC designations of 3, 4, and 5 ~~older alluvium will~~ would occur during any Project phase.

The revisions to Mitigation Measure 3.12-4 are intended to clarify the procedure in the event of a potential fossil discovery and do not result in changes in the residual impacts described in Draft PA/EIS/EIR Section 3.12.9.

60-99 In response to this comment, Mitigation Measure 3.12-4 has been clarified as follows

> **Mitigation Measure 3.12-4:** If any potential fossil~~s~~ is ~~are~~ discovered during construction, operation and/or maintenance activities, or during decommissioning, ~~the fossils shall be left undisturbed, and the BLM Authorized Officer shall be notified immediately~~ all activities within 100 feet in all directions from the discovery shall cease immediately to protect the discovery and its geological context from damage, and the Applicant shall notify the BLM Authorized Officer immediately. As soon as possible, but not later than 10 working days after being notified, the BLM Authorized Officer shall notify and work with a qualified and BLM-permitted professional paleontologist to evaluate the significance of the discovery. The BLM Authorized Officer and BLM-permitted professional paleontologist shall determine appropriate measures to mitigate adverse effects to significant paleontological resources in consultation with the Applicant. Activities may not resume within 100 feet in any direction of the discovery until the BLM Authorized Officer and BLM-permitted professional paleontologist concur that activities may resume.

The revisions to Mitigation Measure 3.12-4 are intended to clarify the procedure in the event of a potential fossil discovery and do not result in changes in the residual impacts described in Draft PA/EIS/EIR Section 3.12.9.

60-100 Refer to Common Response 5 in Proposed PA/FEIS/EIR Section 4.5.3.5 regarding clarification of potential impacts to Rasor OHV area and clarifications of Mitigation Measure 3.13-2.

60-101 The requested editorial change has been made.

60-102 The requested editorial change has been made.

60-103 In response to this comment, "3.6, *Cultural Resources*;" has been added to the list of resource sections reviewed for the environmental justice discussion. As indicated on Draft PA/EIS/EIR page 3.14-17, the evaluation of biological resources with respect to environmental justice is limited to plants gathered for use in traditional medicines and ceremonies; such plants are not discussed in Section 3.3, Biological Resources – Vegetation, and this section was not reviewed for the environmental justice discussion. Similarly, Section 3.17, Utilities and Public Services was not referenced. Neither has been added to the list of sections reviewed.

60-104 Baker Airport, which has one operating runway, as well as the two additional airstrips in the region (at Desert Studies Center and at Rasor Road) are described on Draft PA/EIS/EIR page 3.16-3. The discussion on Draft PA/EIS/EIR page 3.16-18 under criterion c refers first to the Baker Airport, then to the two airstrips previously described. No revision has been made in response to this comment.

60-105 Refer to Common Response 6 in Proposed PA/FEIS/EIR Section 4.5.3.6 regarding management of visual resources on the Project site.

60-106 Refer to Common Response 6 in Proposed PA/FEIS/EIR Section 4.5.3.6 regarding management of visual resources on the Project site.

60-107 The statement on page 3.18-25 that "the color contrast of the solar panels during certain times of the day when the viewer is positioned in line with the sun would momentarily increase, but not to such an extent as to result in a change in the severity of the contrast rating in Table 3.18-4" is made based on the implementation of Mitigation Measures 3.18-1 and 3.18-3. The sentence in question has been revised to clarify this. PV panel glare varies based on technology, orientation, and other variables. These variables should be more carefully studied with the specific site and PV technology taken into consideration, which is the primary reason that the Glint and Glare Assessment, Mitigation, and Monitoring plan is called for as part of Mitigation Measure 3.18-1. This mitigation measure is consistent with recommendations made in the publication Best Management Practices for Reducing Visual Impacts of Renewable Energy Facilities on BLM-Administered Lands (BLM, 2013c, see page 80 et seq.). Additionally, as indicated on Draft PA/EIS/EIR page 3.18-25, "Potentially affected observers would be travelers on I-15, users of nearby OHV routes, and visitors to adjacent mountains and the Mojave National Preserve," not just travelers on I-15 as suggested by the comment, so the analysis of the effects of glint and glare is not limited to a viewing time of "less than 5 minutes."

60-108 The requested revision has been made.

60-109 See Response 60-107. The analysis does not conclude that there would be a less-than-significant impact with respect to glint and glare. Rather, as described on Draft PA/EIS/EIR page 3.18-42,

> It is possible that glare produced by the Project would be more intense than any other natural or cultural features in an observer's perspective. *This could result in a significant impact.* Implementation of Mitigation Measure 3.18-1, which requires measures to reduce glare and nighttime lighting effects, would reduce this potential impact to less than significant. (emphasis added)

Items 1 and 4 of Mitigation Measure 3.18-1 are recommended based on the visual impact BMPs provided in Best Management Practices for Reducing Visual Impacts of Renewable Energy Facilities on BLM-Administered Lands (BLM, 2013c, see pages 85 through 88). In response to this and other comments in this letter, Mitigation Measure 3.18-1 has been revised. See Proposed PA/FEIS/EIR Section 3.18.8.

60-110 Item 4a of Mitigation Measure 3.18-1 (Draft PA/EIS/EIR page 3.18-34) has been removed to maintain consistency with Item 1.

60-111 Mitigation Measure 3.18-2, item 6 is referring to gravel that may be used during construction. The language has been revised to indicate that the item should be considered only if gravel is used during construction.

60-112 The residual impact to views from the ridgeline in Section 3.18.9 describes a physical effect (views of the Project compared to baseline conditions) that would remain after mitigation measures have been applied (BLM NEPA Handbook H-1790-1 §6.8.4). The fact that the Project would be visible from that location is not dependent on the number of people that would experience those views. As also described in Section 3.18.9, the Project would have residual impacts on the visual experience of visitors traveling through the area who are traveling to Mojave National Preserve for a scenic experience in the desert. However, the analysis does not identify this as a significant unavoidable impact; rather, significant unavoidable impacts are associated with synergistic cumulative effects, as indicated on Draft PA/EIS/EIR page 3.18-38.

Individuals who live in the area and enjoy the undeveloped nature of the desert, including those in Baker, could experience visual impacts as they travel in the vicinity of the Project. The analysis does not indicate that the Project site would be visible from the town of Baker, nor does the relatively small size of the local population affect the fact that a residual effect would occur. Finally, residual effects include a determination of the residual cumulative impact following implementation of mitigation measures. No changes have been made in response to this comment.

60-113 Consistent with all other Draft PA/EIS/EIR CEQA discussions (i.e., subsections entitled "CEQA Significance Thresholds and Determinations"), cumulative impacts related to each CEQA significance criterion are discussed within the analysis for that criterion (see, e.g., the last paragraph on Draft PA/EIS/EIR page 3.13-15 regarding cumulative impacts related to CEQA significance criterion a in CEQA Guidelines Section XV). The paragraph in question introduces Impact Vis-2, immediately following. However, to clarify the applicability of this paragraph, it has been moved below the Impact Vis-2 header.

60-114 See Response 60-107. This impact discussion is not limited to travelers on I-15.

60-115 The following statement has been added to the first paragraph of Proposed PA/FEIS/EIR Section 3.18.4.3:

> <u>These simulations were prepared based on a prior Project footprint that is larger than the footprint of the Proposed Action, in particular for the South Array, and so present a conservative indication of several possible views of the Project; views from certain KOPs would include less of the array area than is shown in the simulations.</u>

60-116 Item 3 regarding patrol roads has been removed from Mitigation Measure 3.18-1.

60-117 Comment noted. The first paragraph describing the Clean Water Act on page 3.19-11 of the Draft PA/EIS/EIR has been updated as follows:

> In 1972, the Clean Water Act (CWA, 33 USC 1251-1376) established the basic structure for regulating discharges of pollutants into the Waters of the United States and gave the USEPA the authority to implement water pollution control programs. The CWA sets water quality standards for contaminants in surface waters. The statute employs a variety of regulatory and non-regulatory tools to reduce direct pollutant discharges into waterways and to manage polluted runoff. ~~While~~ Because no Waters of the United States occur on the Project site, the CWA does not apply to the Project and waters in the Project area are not subject to federal jurisdiction under the Act.~~, in~~ In California, the USEPA has delegated responsibility for implementation of portions of the CWA, including water quality control planning and programs that minimize adverse impacts relating to construction site stormwater runoff, to the SWRCB and the nine Regional Water Quality Control Boards (RWQCBs). Water quality regulations and standards applicable to the Project are discussed further under the discussion of state regulations, below.

60-118 The requested editorial change has been made.

60-119 In response to the comment, the last paragraph on page 3.19-20 of the Draft PA/EIS/EIR has been revised as follows:

> ~~Under General Permit R6T-2003-004, the Applicant would be required to obtain a permit from LRWQCB for dredge and fill (described in Section 3.19.3.2, above) for the project due to the installation of solar panel posts and grading in the Waters of the State (drainages). To obtain authorization for stormwater discharges to groundwater and/or surface water associated with land disturbing activities pursuant to the permit, the LRWQCB would require that a SWPPP or BMP Plan be prepared detailing measures to minimize and avoid impacts to water quality that would be implemented during construction as a part of the dredge and fill permit (Panorama Environmental, Inc., 2013b). The permit also would require monitoring and reporting. To obtain coverage under the General Permit, the Applicant would be required to submit a Notice of Intent (NOI) to comply with the General Permit to the LRWQCB prior to commencement of construction activities. The NOI must include a description of specific temporary and permanent BMPs to be implemented to prevent or minimize the discharge of waste from the Project site during and after construction, and would require the Applicant to install temporary erosion control facilities to prevent transport of sediment and other wastes off the property. General Permit R6T-2003-004 implements the Basin Plan (described in Section 3.19.3.2, above), and dischargers regulated by this General Permit must comply with the water quality standards, guidelines, and prohibitions in the Basin Plan. If the LRWQCB determines that the proposed BMPs would not achieve the~~

~~applicable standards and receiving water objectives, the Applicant could be required to implement additional or alternative BMPs by the LRWQCB. Additionally, all land disturbing activities must be conducted in accordance with the Lahontan Region Project Guidelines for Erosion Control (Attachment G of the General Permit), which includes specific BMPs for protecting surface water quality from unnatural or accelerated erosion caused by land development. Implementation of a SWPPP or BMP Plan, as required under General Permit R6T-2003-004, would minimize or avoid the degradation of water quality or the violation of water quality standards, especially during major storm events.~~

Under Statewide General Waste Discharge Requirements, the Applicant would be required to obtain a permit from the LRWQCB for dredge and fill (described in Section 3.19.3.2, above) for the Project. Because drainages within the Project site are contained within an isolated watershed that is not tributary to any navigable body of water, these ephemeral streams are not subject to CWA jurisdiction and waters of the U.S. do not occur within the Project site (see Section 3.19.3.1). Because the waters present are not subject to CWA jurisdiction, a Section 401 Water Quality Certification would not be required and the Project cannot obtain coverage under the Construction General Permit with associated Stormwater Pollution Prevention Plan (SWPPP) through the stormwater National Pollutant Discharge Elimination System permitting system. Although they lack federal CWA protection, the desert washes located on the Project site are waters of the state. Under the Porter-Cologne Water Quality Control Act (see Section 3.19.3.2), the SWRCB regulates discharges of pollutants into "waters of the state," broadly defined as any surface water or groundwater within the boundaries of the state. This authority is independent of any federal requirements, and is applicable to all waters of the state regardless of whether CWA jurisdiction applies. To ensure that California's isolated waters are protected, the SWRCB has issued general Waste Discharge Requirements (WDRs) regulating discharges to "isolated" waters of the state that are not under federal CWA jurisdiction (Water Quality Order No. 2004-0004-DWQ, Statewide General Waste Discharge Requirements for Dredged or Fill Discharges to Waters Deemed by the USACE to be Outside of Federal Jurisdiction). Because the Project would discharge pollutants (including fill material for construction) into these drainages and desert washes during standard construction activities, the Applicant would be required to obtain authorization from the LRWQCB prior to discharging any fill or other material into the on-site drainages. Specifically, the LRWQCB has indicated that a permit for dredge and fill will be required for the project due to installation of solar support posts and grading in the waters of the state (drainages) (Panorama Environmental Inc., 2013b). To obtain authorization for stormwater discharges to groundwater and/or surface water associated with land disturbing activities pursuant to the permit, the LRWQCB would require that a BMP Plan be prepared detailing measures to minimize and avoid impacts to water quality that would be implemented during construction as a part of the dredge and fill permit (Panorama Environmental, Inc.,

2013b). A BMP Plan (similar to a SWPPP) would be prepared and implemented as a part of the dredge and fill permit and the LRWQCB will require the Applicant to avoid, minimize and mitigate water quality impacts to waters of the state the same as they would under Section 401 of the CWA (see Section 3.3.3.1). If the LRWQCB determines that the proposed BMPs would not achieve the applicable standards and receiving water objectives, the Applicant could be required to implement additional or alternative BMPs by the LRWQCB. The permit also would require monitoring and reporting and would implement the water quality standards, guidelines, and prohibitions in the Basin Plan (described in Section 3.19.3.2). Additionally, any mitigation for impacts to waters of the state would be coordinated with CDFW as part of the application for WDRs. Further, as part of the Project, grading would be minimized and grading of major drainages and large washes would be avoided and Mitigation Measure 3.19-2 would ensure that construction and operation of the Proposed Action would not result in a net impact relating to on-site drainage or patterns and rates of erosion or sedimentation by requiring the applicant to develop and implement a comprehensive drainage, stormwater, and sedimentation control plan (see Storm Drainage and Erosion, below). Under APM 20 (see Section 3.19.5), at-grade crossings would be constructed to maintain existing flow channels and sediment transport, thereby leaving stormwater runoff volume unchanged, reducing the potential for increased erosion and sedimentation of stormwater. Implementation of a the requirements of Statewide General Waste Discharge Requirements, in conjunction with APM 20 and the measures described, designed to avoid or minimize water quality impacts, would minimize or avoid the degradation of water quality or the violation of water quality standards, especially during major storm events.

60-120 In response to the comment, the last paragraph on page 3.19-13 of the Draft PA/EIS/EIR have been revised as follows:

However, Waters of the State are present on the Project site in the form of desert washes (Figure 3.3-2). The state has jurisdiction over activities that occur in Waters of the State subject to Porter-Cologne. The Applicant will be required to obtain a permit for dredge and fill (described below) for the Project due to installation of posts and grading in the Waters of the State (drainages). The LRWQCB will require that a ~~SWPPP or~~ BMP Plan (similar to a SWPPP) be prepared as a part of the dredge and fill permit. Monitoring and reporting will also be required.

~~*General Permit R6T-2003-004*~~ *Statewide General Waste Discharge Requirements*

~~General Permit R6T-2003-004, General Waste Discharge Requirements for Small Construction Projects, including Utility, Public Works, and Minor Streambed/Lakebed Alteration Projects throughout the Lahontan Region, Excluding Lake Tahoe, regulates construction activity and may be used to regulate dredged and fill material discharges in State waters of the Lahontan Region when~~

~~the Clean Water Act is not applicable (as determined by the USACE). Land disturbance includes clearing, grading, or disturbances to the ground, including excavation and stockpiling, within the footprint of the structure to be constructed, and any staging and access areas that disturb native soil conditions. Potential pollutant discharges from projects covered under the permit consist of products of erosion, construction waste materials, dewatering waste, turbid water and waste earthen materials from work within surface waters, and small amounts of petroleum products from construction equipment.~~ Under the Porter-Cologne Water Quality Control Act, the SWRCB regulates discharges of pollutants into "waters of the state," broadly defined as any surface water or groundwater within the boundaries of the state. To ensure that California's isolated waters are protected, and to regulate construction activity, the SWRCB has issued general Waste Discharge Requirements (WDRs) regulating discharges to "isolated" waters of the state that are not under federal CWA jurisdiction (Water Quality Order No. 2004-0004-DWQ, Statewide General Waste Discharge Requirements for Dredged or Fill Discharges to Waters Deemed by the USACE to be Outside of Federal Jurisdiction). Because the Project would discharge pollutants (including fill material for construction) into these drainages and desert washes during standard construction and land disturbing activities, the Applicant would be required to obtain authorization, in the form of a dredge and fill permit, from the LRWQCB prior to discharging any fill or other material into the on-site drainages. Land disturbance includes clearing, grading, or disturbances to the ground, including excavation and stockpiling, within the footprint of the structure to be constructed, and any staging and access areas that disturb native soil conditions. Potential pollutant discharges from projects covered under the permit consist of products of erosion, construction waste materials, dewatering waste, turbid water and waste earthen materials from work within surface waters, and small amounts of petroleum products from construction equipment. To obtain authorization for stormwater discharges to groundwater and/or surface water associated with land disturbing activities pursuant to the permit, the LRWQCB would require that a BMP Plan be prepared detailing measures to minimize and avoid impacts to water quality that would be implemented during construction as a part of the dredge and fill permit (Panorama Environmental, Inc., 2013b). A BMP Plan (similar to a SWPPP) would be prepared and implemented as a part of the dredge and fill permit and the LRWQCB will require the Applicant to avoid, minimize and mitigate water quality impacts to waters of the state the same as they would under Section 401 of the CWA (see Section 3.3.3.1).

Further, in response to the comment, the third paragraph on page 3-19-23 of the Draft PA/EIS/EIR have been revised as follows:

Decommissioning impacts generally would be similar to those indicated for construction, with respect to the potential for release of construction related water quality pollutants. As discussed above for construction, decommissioning would

> involve construction activities and land disturbance and would require coverage under ~~General Permit R6T-2003-004~~a dredge and fill permit, administered by the LRWQCB. Coverage under the ~~General Permit~~ dredge and fill permit will require that a ~~SWPPP or~~ BMP Plan be implemented to minimize or avoid impacts to water quality. Implementation of a ~~SWPPP or~~ BMP Plan would minimize the degradation of water quality or the violation of water quality standards, especially during major storm events. As described in detail under "Storm Drainage and Erosion," below, implementation of Mitigation Measure 3.19-2 would ensure that changes to surface water drainage do not result in a net impact to downstream waterways from erosion or sedimentation during operation and maintenance by requiring the Applicant to develop and implement a comprehensive drainage, stormwater, and sedimentation control plan. Additionally, adherence to LRWQCB policies and stipulations of the brine pond WDRs, including applicable decommissioning procedures required under Tile 27 (described in Section 3.19.3, above), would ensure that water quality impacts associated with removal of that facility would be minimized.

Further, in response to the comment, the second paragraph on page 3-19-46 of the Draft PA/EIS/EIR have been revised as follows:

> Potentially significant impacts relating to water quality standards and waste discharge requirements are comprehensively addressed in the discussion of direct and indirect impacts in Section 3.19.6.1. Implementation of a ~~SWPPP or~~ BMP Plan, as would be required under a dredge and fill permit issued by the LRWQCB, as well as implementation of APM 20 and Mitigation Measure 3.19-2 (Comprehensive Drainage, Stormwater, and Sedimentation Plan) ~~occur with implementation of APM 20 and be required under General Permit R6T-2003-004~~, would minimize the degradation of water quality or the violation of water quality standards, especially during major storm events, during construction and decommissioning. Implementation of Mitigation Measure 3.19-1 and compliance with the requirements of the UPC and Title 27 would minimize the degradation of water quality or the violation of water quality standards during operation, and would reduce this potential impact to less than significant.

60-121 The requested editorial change has been made.

60-122 In response to the comment, the last sentence of the third paragraph on page 3.19-31 of the Draft PA/EIS/EIR has been deleted.

60-123 The assessment of high flows potentially being intercepted by proposed flood control berms is based on technical review and analysis of proposed drainage and stormwater management plans and proposed facilities and structures (ESA, 2013). Analysis of the effects relating to stormwater, drainage, and erosion were conducted by BLM and County staff, as well as resource experts on staff with BLM and the County's environmental consultant (such as hydrologists and California licensed engineers), and was considered technically defensible and was approved for use in the environmental analysis of the

Project. Incorporated into the assessment of storm drainage and erosion presented in the Draft PA/EIS/EIR is consideration of the Applicant-proposed drainage plan (described in detail on page 3.19-32 under Project Stormwater Management Approach) that would preserve existing drainage patterns to the extent possible. The findings of the analysis include discussion that the design and placement of flood control berms would be revised following detailed hydrologic analysis during the detailed design stage for the Project (see page 3.19-35 of the Draft PA/EIS/EIR). However, as proposed, the Project could result in altered hydrology on site or downstream, thereby causing increases in erosion and sedimentation as well as alterations to runoff flow rates and volumes. For this reason, Mitigation Measure 3.19-2 is incorporated to ensure that changes to the Project would not result in a net impact to downstream waterways from the alteration of on-site drainage or patterns and rates of erosion or sedimentation by requiring the development and implementation of a comprehensive drainage, stormwater, and sedimentation control plan.

60-124 See Response 60-123 regarding comments relating to the redirection of stormflows by flood control berms and sediment transport. In response to comments relating to sand recruitment at the dunes south of the Project, the first paragraph on page 3.19-35 of the Draft PA/EIS/EIR have been revised as follows:

> The proposed flood protection berms located to the north and south of the central drainage avoidance area and to the north of the southern drainage avoidance area are within the active braided drainage channel network. These berms, as proposed, would be placed within the 100-year flood hazard area and would alter existing drainage patterns. In addition, the flood protection berm proposed for the south side of the southern drainage avoidance area would also alter existing drainage patterns. This berm is similar to the berm proposed for the North Array in that it would redirect flows from the upgradient mountains and the southern-most solar array field after those flows have passed through the array field. While not as large as the watershed that passes through the North Array, the estimated 100-year design discharge is 884 cfs, representing a substantial redirection of flood flows. These potential effects relating to the redirection of flood flows within the South Arrays could substantially alter ~~sediment transport as the drainage from the South Arrays is conveyed directly to the existing dune fields south of the project site that support critical habitat for the endangered fringe toed lizard. If existing drainage pathways are altered,~~ erosion and sediment transport patterns ~~from the South Array area could be substantially affected~~.

60-125 See response 60-123.

60-126 In response to this comment, the first paragraph and items three (3), five (5) and six (6) of Mitigation Measure 3.19-2 have been revised to incorporate a higher degree of specificity as follows:

> The Applicant shall prepare a Comprehensive Drainage, Stormwater, and Sedimentation Plan (Plan) prior to the initiation of construction (or decommissioning

as relevant). Detailed hydrologic analysis will be performed prior to final design of the Project. Results of these analyses will be submitted to the BLM ~~and County~~ for review. All proposed grading and impervious surfaces on site shall be reviewed and approved by the BLM ~~and County~~, with respect to its potential to cause or result in additional erosion and sedimentation, increased stormwater flows, or altered drainage patterns that could lead to unintentional ponding or flooding on site or downstream, and/or additional erosion and sedimentation. The Plan shall include, but not be limited to, the following measures with the overriding goal to prevent a net impact to on-site or downstream waterways from the alteration of on-site drainage or patterns and rates of erosion or sedimentation:

3. The Applicant shall delineate the active drainage channels, defined as reflecting the standard flow regime for a 10-year storm event, within each drainage avoidance area, and avoid placement of proposed flood protection berms within active drainage channels. The drainage avoidance areas shall protect no less than 90 percent of the area of the active drainage channels from construction impacts.

5. The Applicant shall provide the BLM ~~and County~~ design details for the flood protection berms including subgrade preparation, construction methods, and armoring or scour protection if needed (both along the drainage avoidance areas and on the array side of the berm).

6. The Applicant shall provide the BLM ~~and County~~ design details for Habitat Protection Fencing including how stormwater flows and debris will pass through the fencing.

60-127 The primary purpose and intent of Mitigation Measure 3.19-3 is to monitor, evaluate, and correct as necessary Project-related groundwater extractions in the context of avoiding deleterious effects on sensitive water resources. As discussed on page 3.19-30 of the Draft PA/EIS/EIR, Mitigation Measure 3.19-3 ensures that adequate data is gathered to determine groundwater flow and occurrence in response to the introduction of project-related pumping and to set forth appropriate response thresholds and corrective actions that would be required if the acquired data indicated deleterious effects from the proposed project pumping. In response to the comment, the first sentence of Mitigation Measure 3.19-3 has been revised for clarity as follows:

> This Plan shall provide detailed methodology for monitoring and reporting procedures; locate monitoring, extraction and survey points; and define performance standards, appropriate response thresholds and corrective actions ~~significance criteria; and identify mitigation measures~~ in the event that adverse impacts occur that can be attributed to the Project.

60-128 Refer to the discussion of Mitigation Measure 3.19-4 in Proposed PA/FEIS/EIR Section 3.19.8. Because the requirements of this mitigation measure have been fulfilled, this measure has been removed from the Proposed PA/FEIS/EIR.

60-129 In response to the comment, the first and second sentence of Mitigation Measure 3.19-5 have been revised to incorporate a higher degree of specificity as follows:

> The Applicant shall ensure that during construction, temporary construction-related structures constructed within a 100 year floodplain, such as roads, berms, and other facilities would be constructed so as to avoid substantial interference with 100-year flood flows. Temporary installation of the following types of facilities shall be avoided to the extent feasible: temporary elevated earthen structures such as roads and berms; earthen bridges or other structures within a waterway or flood conveyance that could interfere with flood flows; dams; unnecessary ditches; and other major structures that could concentrate flood flows.

60-130 The requested editorial change has been made.

60-131 The requested editorial change to item c on page 3.21-10 has been made. The requested change to item d has not been made; the CEQA topic is "population and housing" (see CEQA Guidelines Appendix G Section XIII). The reference to Draft PA/EIS/EIR Section 3.14 for discussion of this CEQA topic is correct. Visual resource (aesthetics) impacts are considered to be indirect impacts to human beings and are therefore addressed in the first sentence of item d on page 3.21-10; such impact have not been added to the list of direct impacts on human beings.

60-132 The requested changes have been made.

Letter 61 – Responses to Comments from LIUNA Local Union 783, Lonnie Passmore, and Rodrigo Briones (LIUNA et al.)

61-1 See Responses 61-9, 61-10, 61-11, and 61-12, below, regarding mitigation for air quality impacts, and Response 61- 14, 61-15, 61-16, 61-19, 61-21 and 61-22, below, regarding mitigation for wildlife impacts.

61-2 See Responses 61-17, 61-20, and 61-21, below, regarding golden eagle and burrowing owl.

61-3 Regarding recirculation of a revised Draft PA/EIS/EIR, refer to Common Response 7 in Proposed PA/FEIS/EIR Section 4.5.3.7.

61-4 The BLM and County acknowledge receipt of Exhibit A, comments from SWAPE. Responses are provided where the comment letter from LIUNA et al. incorporates and/or cites information from the exhibit.

61-5 The BLM and County acknowledge receipt of Exhibit B, comments from Mr. Scott Cashen. Responses are provided where the comment letter from LIUNA et al. incorporates and/or cites information from the exhibit.

61-6 The potential effects of construction of the Proposed Action with respect to criteria pollutants are analyzed in Draft PA/EIS/EIR Section 3.2.6.1. The comment does not address the adequacy or accuracy of this analysis.

61-7 The range of alternatives to the project is described in Proposed PA/FEIS/EIR Chapter 2, Proposed Action and Alternatives. See, for example, Proposed PA/FEIS/EIR Section 2.5, which describes three "action" or "build" alternatives; Section 2.6, which describes three no action and/or no project alternatives; Section 2.7, which describes the BLM's preferred alternative under NEPA; and Section 2.8, which describes the environmentally superior alternative under CEQA.

As discussed in Proposed PA/FEIS/EIR Section 2.7, NEPA (40 CFR 1502.14(e)) requires a lead agency to identify its preferred alternative or alternatives, if one or more exists, in the final EIS. A NEPA Lead Agency may select a preferred alternative for a variety of reasons, including the agency's priorities, in addition to the environmental considerations discussed in the EIS. NEPA does not require the lead agency to provide justification for its identification of a preferred alternative in the final EIS. However, the lead agency is required to identify and discuss factors of its decision-making process in the Record of Decision (40 CFR §1505.2(b). Similarly, as discussed in Proposed PA/FEIS/EIR Section 2.8, CEQA Guidelines §15126.6(e)(2) requires a lead agency to identify an environmentally superior alternative or alternatives in the EIR. Because the alternatives analyzed in the Proposed PA/FEIS/EIR reduce some impacts while increasing others, Section 2.8 explains the environmental advantages and disadvantages of each alternative relative to the Proposed Action. No more is required under CEQA.

Regarding the comment's suggestion that "At least one alternative should have been included that avoided the Project area where the most desert tortoise sign was observed and been considered in light of the impacts to wildlife movement through the site and across I-15," as shown in Figure 2-6 and described in Draft PA/EIS/EIR Section 2.5.2, Alternative C would not include development of the East Array. As shown in Figure 3.4-1 and described in Draft PA/EIS/EIR Section 3.4.6.3, "most desert tortoise sign in the requested ROW area was observed in or adjacent to the East Arrays (see Figure 3.4-1). Alternative C would have substantially fewer direct and impacts on individual tortoises and occupied tortoise habitat compared to the Proposed Action" (Draft PA/EIS/EIR p. 3.4-44). Alternative C therefore meets the comment's request for an alternative that avoids "the Project area where the most desert tortoise sign was observed." Regarding wildlife movement, refer to Common Responses 2 (bighorn sheep) and 3 (desert tortoise) in Proposed PA/FEIS/EIR Sections 4.5.3.2 and 4.5.3.3, respectively.

For more detailed discussion regarding the selection of alternatives, refer to Common Response 1 in Proposed PA/FEIS/EIR Section 4.5.3.1.

61-8 Draft PA/EIS/EIR Sections 2.8.1.1, 2.8.1.2, and 2.8.1.3 describe the BLM's and Applicant's process of reviewing more than 20 sites on BLM-administered public land in southern California, 4,853,760 acres of lands within 50 miles of the proposed ROW for

potential private sites, and USEPA- and NREL-tracked brownfield/degraded land sites. Each of these discussions reference Soda Mountain Solar, LLC, 2013b, described in the Chapter 2 references section as the "Application for Transportation and Utility Systems and Facilities on Federal Lands (SF-299) for the Soda Mountain Solar Project," which includes a detailed discussion of site selection for the requested ROW area. Additionally, the discussion in Section 2.8.1.3 references both the USEPA and USEPA and NREL databases, including Google Earth search results. All materials referenced in the Draft PA/EIS/EIR are available in the administrative record, and the public may obtain it and all other Project-related public records from the BLM by requesting them from Jeff Childers, Project Manager, California Desert District. Contact information is provided in Draft PA/EIS/EIR Section 4.4 (p. 4-5). Furthermore, two potential private land alternative sites that ultimately were rejected from further analysis are shown in Draft PA/EIS/EIR Figure 2-8. The BLM and San Bernardino County therefore disagree with the comment's suggestions regarding descriptions and evidence related to the review of off-site alternatives. For more discussion regarding the selection of alternatives, refer to Common Response 1 in Proposed PA/FEIS/EIR Section 4.5.3.1.

61-9 It is acknowledged that requiring the use of only model year 2007 and newer diesel trucks for construction hauling as well as requiring the use of off-road construction equipment that would meet Tier 4 emission standards could achieve reductions beyond those that would occur by requiring off-road construction equipment to meet Tier 3 standards pursuant to Applicant Proposed Measure (APM) 9. However, it may not be practical or feasible for the Applicant to exclusively use such equipment due to equipment availability in the Project area. Therefore, APM 9 has been supplemented by Mitigation Measure 3.2-4 in the Proposed PA/FEIS/EIR to require the Applicant to make a good faith effort to use trucks with model year 2007 or newer where available as well as to use the highest-tiered construction equipment available.

It should be noted that it is not possible to quantify the emission reductions that may occur associated with implementation of Mitigation Measure 3.2-4 given that the availability and actual use of newer trucks and high-tiered construction equipment at the time of construction cannot currently be substantiated. Implementation of Mitigation Measure 3.2-4 would not affect the impact conclusions presented in the Proposed PA/FEIS/EIR, nor result in additional environmental impacts under NEPA or CEQA.

Mitigation Measure 3.2-4 has been added to Proposed PA/FEIS/EIR Section 3.2.8 as follows:

> **Mitigation Measure 3.2-4:** The Applicant shall make a good faith effort to use 2007 and newer diesel haul trucks and use available construction equipment that meets the highest USEPA-certified tiered emission standards. An Exhaust Emissions Control Plan that identifies each off-road unit's certified tier specification, Best Available Control Technology (BACT), as well as the model year of all haul trucks to be used on the Project that are under direct control of the Applicant or its construction contractor shall be submitted to BLM and the County for review and approval at least 30 days prior to commencement of construction

> activities. Construction activities cannot commence until the plan has been approved. For all pieces of equipment that would not meet Tier 4 emission standards, the Exhaust Emissions Control Plan shall include documentation from two local heavy construction equipment rental companies that indicates that the companies do not have access to higher-tiered equipment for the given class of equipment. In the event that 2007 or newer diesel haul trucks are not available for the Project, the Exhaust Emissions Control Plan shall document that a good faith effort to obtain such haul trucks has been made.

The second sentence of Proposed PA/FEIS/EIR Section 3.2.9, *Residual Effects*, has been revised as follows:

> Residual short-term construction impacts on air resources would result from construction of the Proposed Action or an action alternative, because each would cause emissions of NO_x, CO, and PM_{10} that could contribute to exceedances of AAQSs, even with implementation of Mitigation Measures 3.2-2 through 3.2-4.

The second to last sentence of the *Impact Air-1* discussion in Proposed PA/FEIS/EIR Section 3.2.10.1 has been revised as follows (for discussion related to new Mitigation Measure 3.2-3, refer to Response 49-19):

> Mitigation Measure 3.2-2 would limit vehicle idling, Mitigation Measure 3.2-3 would discontinue non-essential earth-moving activities under high wind conditions, and Mitigation Measure 3.2-4 would require the use of newer model year haul trucks and high-tiered construction equipment as feasible, and therefore would reduce criteria pollutant emissions, but not to less-than-significant levels.

The last sentence of the second paragraph in the *Impact Air-3* discussion in Proposed PA/FEIS/EIR Section 3.2.10.1 has been revised as follows:

> There is no additional feasible mitigation beyond APMs 1 through 10 and Mitigation Measures 3.2-2 through 3.2-4 that could reduce the impact to less than significant; therefore, the short-term cumulative impact would be significant and unavoidable.

61-10 The first two suggested mitigation measures lack detail related to compliance and enforcement mechanisms, which make implementation of the measures impracticable in the field. Regarding the third item in the comment's bulleted list, it would not be feasible to conduct meaningful simultaneous sampling of upwind and downwind PM_{10} concentrations at the Project boundaries given the large area of the site and the variability of local wind direction and construction activity locations that would occur on-site. The suggested measures have not been incorporated into the Proposed PA/FEIS/EIR.

With regard to MDAQMD Rule 401, a description of this rule has been added to the MDAQMD rules discussion in Proposed PA/FEIS/EIR Section 3.2.3.3 as follows:

Rule 401 – Visible Emissions

This rule prohibits people from discharging air contaminants from a single source that is as dark or darker in shade as that designed No. 1 on the Ringelmann Chart, or of such opacity that would obscure an observer's view to a degree equal to or greater than does smoke (MDAQMD, 1977).

61-11 The cumulative impacts discussion for air resources does not limit its consideration to a handful of projects as the commenter suggests. As stated in the second sentence of the second paragraph on Draft PA/EIS/EIR page 3.2-31, "those projects within the MDAB that would be constructed, operated, or decommissioned at the same time as the Proposed Action, an action alternative (i.e., Alternatives B, C, or D) or the CEQA No Project alternative (Alternative F) could contribute to existing adverse cumulative effects to air resources." However, as a practical matter, the analysis does focus on emissions that would be associated with projects in the MDAB that are within San Bernardino County and along the I-15 corridor, emissions of which would contribute the most to cumulative impacts when considered in combination with the emissions of the Proposed Action or alternatives. The commenter appears to suggest that the air resources cumulative analysis is flawed because it does not list every single renewable energy development project proposed within the MDAB, including projects in the portions of the MDAB in Los Angeles, Riverside, and Kern counties. Given the vast geography of the MDAB, the BLM and the County do not share this opinion and believe that the Draft PA/EIS/EIR's qualitative analysis for regional cumulative impacts to air resources is appropriate.

Further, in response to other comments, Mitigation Measures 3.2-3 and 3.2-4 have been recommended in the Proposed PA/FEIS/EIR (Section 3.2.8) to further reduce fugitive dust and vehicle exhaust emissions.

61-12 All feasible mitigation measures have been incorporated into the Proposed PA/FEIS/EIR to reduce impacts associated with potential short-term exceedances of ambient air quality standards. For discussion related to the commenter's suggested mitigation measures, refer to Responses 61-9 and 61-10.

61-13 A Phase I Environmental Site Assessment (ESA) was performed as prescribed in ASTM International Standard E 1527, Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process. The Phase I ESA conducted by Panorama Environmental, Inc. in May 2013 included, among other methods, interviews and site reconnaissance. No specific examples, facts, reasonable assumptions predicated upon facts, or other evidence are provided in support of the comment's suggestion that the Phase I ESA did not indicate a reasonable effort to seek out persons with knowledge of potential hazards on the site; individuals interviewed include a property owner at the Rasor Road Service Station, the only staffed commercial enterprise in operation near the site (see Comment Letter 52 from Mr. Terry Young, indicating that he has owned and operated the service station for 30 years) and the Assistant Field Manager of the BLM Barstow Field Office, which manages the vacant, federally owned site. Site reconnaissance was performed after aerial photographs, taken roughly once per decade since 1947, and USGS topographic

maps from 1933 to 2012 were reviewed for historical features that could have used or stored hazardous substances. The BLM database of current and historic mines and mining claims in the vicinity of the Project also was reviewed to inform the chosen locations of site reconnaissance. The site reconnaissance performed by Panorama was appropriate given (a) the lack of recorded evidence of current or historic uses that would have released any hazardous substances or petroleum products; and (b) the site geography. The site is located in a desert generally uninhabited by people or businesses that could have illegally released hazardous substances. Additionally, no specific examples, facts, reasonable assumptions predicated upon facts, or other evidence are provided in support of the comment's suggestion of the "likelihood" of finding such illegal and contaminating uses as drug labs on the Project site.

As noted in the ASTM Standard, Phase I Environmental Site Assessments are not intended to be exhaustive if the time required to gather information outweighs the usefulness of the information. In addition, the level of inquiry can vary based upon the type of property subject to assessment, among other factors.

61-14 Regarding mitigation measures to address the Project's groundwater impacts, refer to Common Response 4 in Proposed PA/FEIS/EIR Section 4.5.3.4. As indicated in Mitigation Measure 3.19-3, the Groundwater Monitoring and Mitigation Plan "shall conform to the guidelines for groundwater monitoring as detailed by San Bernardino County in the "*Guidelines for Preparation of a Groundwater Monitoring Plan*" (Guidelines)." This mitigation measure provides performance standards and specific types of actions to be taken, and contains sufficient information to inform a decision on the Project's potential impacts and mitigation.

If the BLM approves a ROW Grant, all mitigation measures adopted in the Record of Decision (ROD) for the Project would be implemented as outlined in an Environmental and Construction Compliance Monitoring Plan (ECCMP) included in the ROD. Similarly, if the County approves a groundwater well permit, mitigation measures implemented wholly or partially under County authority would be included as conditions of approval for the permit and compliance overseen by the applicable County department.

61-15 Mitigation Measure 3.19-2 does not defer mitigation of the Project's hydrological impacts on flows in the numerous washes on site. Final design has not yet been completed. Allowing the Applicant to finish final planning, engineering, and design before submittal of the Comprehensive Drainage, Stormwater, and Sedimentation Plan (Plan) allows the Plan to be appropriately tailored to address Project-specific potential impacts. Mitigation Measure 3.19-2 specifies that the Applicant will provide, prior to the initiation of construction (or decommissioning), design details for Habitat Protection Fencing including how stormwater flows and debris will pass through the fencing as part of the Plan to avoid or minimize additional erosion and sedimentation, increased stormwater flows, or altered drainage patterns that could lead to unintentional ponding or flooding on site or downstream, and/or additional erosion and sedimentation. In response to the comment,

Mitigation Measure 3.19-2, part six, has been revised to incorporate a higher degree of specificity as follows:

> The Applicant shall provide the BLM ~~and County~~ design details for Habitat Protection Fencing including how stormwater flows and debris will pass through the fencing. The use of flow-obstructing fencing shall be avoided; instead, fencing that allows for the passage of water while minimizing buildup of debris shall be utilized on site, such as an elevated chain link fence with a bottom portion of collapsible tortoise fence to allow it to collapse if too much ponding or debris buildup occurs. To ensure implementation of Applicant Proposed Measures 51, 66, and 70 and Mitigation Measure 3.4-2a, the Applicant shall coordinate with the BLM, CDFW, and USFWS to determine appropriate fencing design with respect to the protection of biological resources and the potential to cause or result in additional erosion and sedimentation, increased stormwater flows, or altered drainage patterns that could lead to unintentional ponding or flooding on site or downstream, and/or additional erosion and sedimentation.

Further, it has been specified in the Proposed PA/FEIS/EIR that the Plan must be consistent with its Project Guidelines for Erosion Control (Board Order No R6T-2003-0-04 Attachment G; Lahontan RWQCB, 2003).

61-16 NEPA does not require identified mitigation plans to be finalized prior to the conclusion of the NEPA process. Rather, NEPA requires sufficient detail about the potential content of such plans such that the effects of the measures can be disclosed and analyzed in the NEPA document. Similarly, while NEPA requires a federal agency to discuss possible mitigation measures, 42 U.S.C. §4332(C)(ii), it does not define specific types of mitigation that must be analyzed or adopted; those decisions are left to the discretion of the Agency. Moreover, so long as there is a plan described and in place prior to the milestones set forth in the mitigation measures discussed in the Final EIS, mitigation is not deferred. Thus, the analysis of the identified mitigation plans in the Draft PA/EIS/EIR and Proposed PA/FEIS/EIR satisfies these obligations.

The CEQA Guidelines indicate that "Formulation of mitigation measures should not be deferred until some future time. However, measures may specify performance standards which would mitigate the significant effect of the project and which may be accomplished in more than one specified way" (14 Cal. Code Regs. §15126.4). Here, the applicable mitigation measures in Proposed PA/FEIS/EIR Section 3.4.8 would require the Applicant to prepare and implement a Desert Tortoise Translocation Plan (DTTP), Bird and Bat Conservation Strategy (BBCS), Avian Monitoring Program, and Raven Management Plan. The measures specify what the plans must do, who shall review and approve them (i.e., BLM and USFWS, as applicable), and when these actions must occur. The measures identify the minimum contents of each plan. Furthermore, a draft DTTP was cited in the Draft PA/EIS/EIR (see, e.g., p. 3.4-33) and was therefore part of the project record and available for public review by request from the BLM. The draft DTTP, draft BBCS (incorporating the draft Avian Monitoring Program), and draft Raven

Management Plan are provided in Proposed PA/FEIS/EIR Appendix L. Several additional draft plans associated with other recommended mitigation measures and/or requirements of other agencies also are provided in Appendix L.

Accordingly, the lead agencies disagree with the comment's contention that the Draft PA/EIS/EIR improperly defers mitigation.

61-17 As identified in the Draft PA/EIS/EIR and the BRTR (Appendix E-1), biological surveys were performed using established wildlife survey protocols that were approved in advance by the BLM, USFWS, and CDFW. At the request of CDFW, golden eagle surveys were not performed in the South Soda Mountains due to the local sensitivity of bighorn sheep in this area. As discussed in the Draft PA/EIS/EIR, the analysis relied upon input from biologists at the Mojave National Preserve to characterize potential golden eagle nesting east of the Project site. As described on Draft PA/EIS/EIR page 3.4-37, coordination identified a possible nest in the Mojave National Preserve approximately 4 miles east of the Project site. Based on the local biologists' familiarity with the South Soda Mountains east of the Project site, this area is considered to be adequately characterized for golden eagle nesting and further surveys are not warranted.

Note that the Draft PA/EIS/EIR relied upon preliminary raw 2013 burrowing owl survey data provided by Kiva Biological Consulting; which were subsequently synthesized into a report (Kiva Biological Consulting, 2013b). Kiva performed a protocol-level Phase II burrowing owl survey of the Project site in spring 2013. Burrowing owl surveys were conducted by walking over the entire Project site and within a buffer of 150 meters (approximately 500 feet) of the requested ROW in accordance with the California Burrowing Owl Consortium survey protocols for Phase II surveys. Reference to the burrowing owl surveys have been incorporated into the Proposed PA/FEIS/EIR as suggested in the comment.

61-18 The Draft PA/EIS/EIR acknowledges the presence of desert pavement on areas of the Project site (see, e.g., pages 3.4-10, 3.7-3, 3.7-15, and 3.19-1). The lead agencies note that desert pavement is not a protected resource. However, the potential effects on other resources of removing desert pavement are analyzed throughout the Draft PA/EIS/EIR. The Draft PA/EIS/EIR describes the environmental effects associated with the removal of desert pavement, namely, increased soil erosion (see page 3.7-15, "Without protective measures, disturbance of desert pavement could cause a noticeable and possibly substantial increase in wind erosion rates during construction"). The effects of such soil erosion are considered in the relevant resource sections of the Draft PA/EIS/EIR, including Sections 3.2, Air Quality, which addresses the impacts of dust created by ground disturbance and wind erosion; 3.3, Biological Resources – Vegetation, which addresses the impacts of dust on native vegetation communities; 3.7, Geology and Soil Resources, which addresses the effects of wind and water erosion on soils; and 3.19, Water Resources, which addresses the effects of water erosion on hydrology and water quality. As one measure to reduce soil erosion and its effects, the Draft PA/EIS/EIR recommends Mitigation Measure 3.7-4, Protection of Desert Pavement, which would require the identification, avoidance, and protection of desert

pavement during construction to reduce disturbance of desert pavement on the Project site. A draft Desert Pavement Protection Plan is included in Appendix L. Numerous other measures are recommended to address potential soil erosion; see, e.g., Mitigation Measures 3.3-2(7), addressing the potential for sediment transport into waters of the State; 3.3-3(3) (3.3-3(4) in the Proposed PA/FEIS/EIR), addressing the potential for erosion and sediment transport to affect special-status plant species and cacti; 3.7-1, which would require an erosion control plan; and 3.19-2, which would require implementation of a Comprehensive Drainage, Stormwater, and Sedimentation Control Plan. Therefore, the Draft PA/EIS/EIR adequately analyzes and provides mitigation measures to reduce the effects of soil erosion, including that potentially caused or worsened by disturbance of desert pavement. As the Draft PA/EIS/EIR acknowledges, "Even with the implementation of these measures, some loss of soil through erosion…would occur" (p. 3.7-26).

61-19 The commenter questions the effectiveness of the proposed 100-foot buffer zone around Emory's crucifixion thorn plants in preventing impacts, suggesting that a minimum-sized 250-foot buffer is necessary. The proposed 100-foot buffer is consistent with current BLM practice for avoiding non-listed plant species. Additionally, the five identified crucifixion thorn plants are greater than 250 feet from any proposed Project activities or site disturbance. No modifications to existing measures are necessary to protect special-status plants.

61-20 The USFWS golden eagle survey guidance (Pagel, 2010) does not include a protocol for the identification of potential golden eagle foraging habitat, or a rating scale for judging the quality of available habitat. The protocol states that golden eagles forage close to and far from their nests in areas less than 3.7 miles (6 km) from the center of their territories and have been observed to move 5.6 miles (9 km) from the center of their territories in favorable habitat. Thus, the golden eagle nest site 8 miles (12.9 km) from the site described in the Draft PA/EIS/EIR (page 3.4-41) may be located on the fringe of the territory or outside of the identified golden eagle territory. The Draft PA/EIS/EIR on page 3.4-49 acknowledges that the Project would remove potential golden eagle foraging habitat. The Draft PA/EIS/EIR statement that the site is not unique for golden eagles is validated by the absence of golden eagle nests near the Project site and the absence of golden eagle sightings during avian surveys. Based on the uniformity of Mojave creosote bush scrub habitat on the site, the Draft PA/EIS/EIR correctly characterized the status of golden eagle foraging habitat on the site. Based on the absence of observed golden eagle use over a multi-year survey period, the site does not represent a known golden eagle prey concentration. The Draft PA/EIS/EIR acknowledges that the Mojave creosote bush scrub vegetation community on the site provides foraging opportunities for this species.

Given the negative findings of helicopter and ground surveys, the comment's suggestion that the analysis be supplemented to include golden eagle nest surveys in the Soda Mountains is not supported.

61-21 Focused burrowing owl surveys performed on the site by Kiva Biological Consulting (2013b) identified 13 owls, of which 11 were on the Project site and 2 were detected

beyond the site boundary. If these owls represented 11 pairs, that would be 2.0 percent of 560 pairs of burrowing owls. However, no owls were detected during site surveys in 2012 (Kiva Biological Consulting, 2013b); indicating that owls breed in multiple locations and sometimes minimally use the project site; and that site development may have minimal impacts on active owl burrows. Impacts to individual owls would be minimizing by using the CFDW-approved and recommended methodology for passively displacing owls from burrows. As discussed in Response 61-16, the contents of the *Burrowing Owl Mitigation and Monitoring Plan* are adequately described in Draft PA/EIS/EIR Mitigation Measure 3.4-1f. Furthermore, a draft of this plan is provided in Proposed PA/FEIS/EIR Appendix L. Thus, future revision and finalization of this plan does not constitute deferral of mitigation under CEQA or NEPA. The lead agencies acknowledge that the passive displacement of burrowing owls in accordance with CDFW guidance presents a risk to owls, and will strive to reduce risks to this species through proper plan implementation.

In response to the comment related to the timing prior burrowing owl surveys prior to construction, Mitigation Measure 3.4-1f is revised as follows:

> **Mitigation Measure 3.4-1f: Burrowing Owl Protection Measures.** No more than ~~30~~ 14 days prior to the start of construction, a pre-construction survey for burrowing owls in conformance with the CDFW *Staff Report on Burrowing Owl Mitigation* (CDFG, 2012) shall be completed within suitable habitat at every work area and within a 150-meter buffer zone of each work area. Work areas will be resurveyed following periods of inactivity of 2 weeks or more. The Applicant/Owner shall submit the results of the pre-construction survey to BLM's Authorized Officer and CDFW. The Applicant/Owner shall also submit evidence of conformance with federal and state regulations regarding the protection of the burrowing owl by demonstrating compliance with the following: […]

Note that a typographical error in Draft PA/EIS/EIR Mitigation Measure 3.4-1f, item 1 has been corrected in the Proposed PA/FEIS/EIR to reflect the appropriate burrowing owl nest buffer during the season: 650 feet is equivalent to 200 meters, not 500 meters.

61-22 See Response 9-19.

61-23 Regarding recirculation of a revised Draft PA/EIS/EIR, refer to Common Response 7 in Proposed PA/FEIS/EIR Section 4.5.3.7.

Letter 62 – Responses to Comments from Lahontan Regional Water Quality Control Board

62-1 Details regarding the design and permitting requirements for the proposed on-site waste management units (brine ponds) in accordance with California Code of Regulations Title 27 Guidelines are discussed in the Draft PA/EIS/EIR in Section 2.4.2.8 (p. 2-11) and in Section 3.19.3.3 (p. 3.19-15).

62-2 Details regarding the drainage and stormwater management approach for the Proposed Action, including maintaining the value and function of onsite drainage channels, are discussed in the Draft PA/EIS/EIR in Section 2.4 (p. 2-2 et seq.) with specific details provided in Section 2.4.2.9, *Drainage and Erosion Control* (p. 2-13 et seq.). Section 3.19.6, *Direct and Indirect Effects* (p. 3.19-20 et seq.), describes impacts relating to surface water hydrology, water quality, and erosion from construction and operation of the Project for all relevant Project activities, including impacts relating to natural drainage channels. To minimize or avoid impacts relating to natural drainage channel function from construction and operation activities, Mitigation Measure 3.19-2 (p. 3.19-43) requires the Applicant to develop and implement a Comprehensive Drainage, Stormwater, and Sediment Control Plan, which includes measures to protect no less than 90 percent of the area of the active drainage channels. Additionally, APM 20, described in Draft PA/EIS/EIR Section 3.19.5 (p. 3.19-19) ensures that, if crossing existing washes is necessary, at-grade crossings would be constructed to maintain existing flow channels and sediment transport.

62-3 See Response 62-2, as well as Responses 60-119 and 65-8.

62-4 Detailed discussion regarding waters of the State and waters of the U.S., including discussion of the protection of such waters under State and federal law and the responsibilities of the LRWQCB, are provided in Draft PA/EIS/EIR Section 3.19.3, *Applicable Laws, Regulations, Plans, and Standards* (p. 3.19-10 et seq.).

62-5 Detailed discussion of the Water Quality Control Plan for the Lahontan Region (Basin Plan) and related water quality protection statutes, regulations, and guidelines relevant to the Proposed Action are provided in Draft PA/EIS/EIR Section 3.19.3.2 (p. 3.19-11 et seq.).

62-6 See Response 62-1. Further, specific discussion and analysis relating to brine pond waste is provided in Section 3.19.6 of the Draft PA/EIS/EIR (page 3.19-21).

62-7 A copy of the Jurisdictional Determination for the Project site was provided to LRWQCB staff via email.

62-8 See Response 62-2.

62-9 See Response 62-5. A detailed and comprehensive analysis of direct, indirect, and cumulative impacts of the Proposed Action and alternatives on water quality that incorporates consideration of the relevant water quality standards is presented in Draft PA/EIS/EIR Section 3.19.6, *Direct and Indirect Effects* (p. 3.19-20 et seq.), and in Section 3.19.7, *Cumulative Effects* (p. 3.19-40).

62-10 Detailed discussion regarding the beneficial uses, as described in the Basin Plan, of water resources relevant the Proposed Action are provided in Draft PA/EIS/EIR Section 3.19.3, *Applicable Laws, Regulations, Plans, and Standards* (p. 3.19-13).

62-11 A detailed and comprehensive analysis of direct, indirect, and cumulative impacts of the Proposed Action and alternatives on water quality and hydrology relevant to stormwater

management, including measures implemented to mitigate erosion and sedimentation, is provided in Draft PA/EIS/EIR Section 3.19.6, *Direct and Indirect Effects,* under *Storm Drainage and Erosion (*p. 3.19-31 et seq.). See also Responses 60-119, 62-2, and 65-8.

62-12 Details relating to vegetation clearing are discussed in Draft PA/EIS/EIR Section 2.4.2.12, *Vegetation Management* (p. 2-17). Details of the Vegetation Resources Management Plan, including vegetation salvage and restoration, are provided under APM 36 in Draft PA/EIS/EIR Section 3.3.5 (pp 3.3-21 and 3.3-22). Vegetation best management practices to be implemented as part of the Proposed Action are detailed as part of Mitigation Measure 3.3-2 in Draft PA/EIS/EIR Section 3.3.8 (p. 3.3-32 et seq.). A draft Vegetation Resources Management Plan is provided in Proposed PA/FEIS/EIR Appendix L.

62-13 See Response 62-12 regarding vegetation management and measures relating to re-vegetation of temporarily impacted areas. Recommendations relating to temporary impact areas are noted. Mitigation Measure 3.19-2 requires the Applicant to develop and implement a Comprehensive Drainage, Stormwater, and Sediment Control Plan, which includes measures to restore temporarily disturbed areas.

62-14 A detailed and comprehensive analysis of direct and indirect impacts of the Proposed Action and alternatives on water quality resulting from construction activities is provided in Draft PA/EIS/EIR Section 3.19.6 (p. 3.19-20 et seq.). Mitigation Measure 3.19-2 requires the Applicant to develop and implement a Comprehensive Drainage, Stormwater, and Sediment Control Plan, which includes measures to avoid water quality impacts related to construction activities. Additionally, Mitigation Measure 3.4-5a outlines requirements for vehicles to utilize designated access roads and staging areas. Draft PA/EIS/EIR Section 3.8.6 (p. 3.8-17 et seq.) provides a detailed and comprehensive analysis of impacts relating to water quality as a result of construction activity use, storage, and disposal of hazardous materials and wastes associated with the Project.

62-15 Best Management Practices (BMPs) and specific measures, such as APMs and Mitigation Measures, to mitigate identified Project impacts are discussed throughout the Draft PA/EIS/EIR and incorporated into the analysis of direct and indirect effects for all resource areas, as appropriate. For example, Section 3.19.6 (p. 3.19-20 et seq.) identifies and incorporates into the analysis BMPs and APMs that describe specific measures to avoid, minimize, or mitigate impacts relating to hydrology and water quality. Where BMPs or APMs incorporated into the Project are insufficient to mitigate impacts, specific mitigation Measures, such as Mitigation Measure 3.19-2, which requires the Applicant to develop and implement a Comprehensive Drainage, Stormwater, and Sediment Control Plan, are required specifically to mitigate for identified impacts.

62-16 See Response 60-120. Permits and approvals that have been identified for the Proposed Action are described in detail in Table 1-1 (page 1-10) of the Draft PA/EIS/EIR. Measures to avoid, minimize, and mitigate for direct and indirect impacts to waters of the State, including compensatory mitigation requirements, are discussed in detail in

Section 3.3. Mitigation Measure 3.3-4 contains specific measure to ensure impacts to waters of the State are avoided, minimized, or mitigated.

62-17 See Response 62-1.

62-18 See Responses 62-4 and 60-120.

62-19 See Response 60-120.

62-20 Project activities that trigger permitting requirements detailed in the comment are identified throughout the Draft PA/EIS/EIR. For example, details regarding the permitting requirements for the proposed brine ponds in accordance with California Code of Regulations Title 27 Guidelines are discussed in Draft PA/EIS/EIR Section 3.19.3.3 (p. 3.19-15), which discusses in detail the permit requirements of the LRWQCB, adherence to WDRs, and minimum standards for the pond liner.

Letter 63 – Responses to Comments from Curt Sauer, et al.

63-1 Refer to Common Response 1 in Proposed PA/FEIS/EIR Section 4.5.3.1 regarding site alternatives considered, and to Common Response 7 in Proposed PA/FEIS/EIR Section 4.5.3.7 regarding recirculation of the Draft PA/EIS/EIR.

63-2 The Project would not directly affect any lands within the Mojave National Preserve, as it is located outside of the Preserve. The potential impacts of the Proposed Action and alternatives on the user experience at Mojave National Preserve are analyzed in Draft PA/EIS/EIR Sections 3.13, Recreation (see page 3.13-7 acknowledging noise, dust, and visual disturbance near the Zzyzx Road entrance to the Preserve) and 3.18, Visual Resources (see pages 3.18-26 through 3.18-26 describing impacts on views from Key Observation Points (KOPs) 13, 14, and 19, which represent views from the Preserve). Impacts on the Soda Mountains Wilderness Study Area are analyzed in Draft PA/EIS/EIR Section 3.15, Special Designations. Please see Common Response 2 in Proposed PA/FEIS/EIR Section 4.5.3.2 regarding bighorn sheep; Common Response 3 in Proposed PA/FEIS/EIR Section 4.5.3.3 regarding desert tortoise; Common Response 4 in Proposed PA/FEIS/EIR Section 4.5.3.4 regarding groundwater drawdown and potential impacts to tui chub; and Common Response 6 in Proposed PA/FEIS/EIR Section 4.5.3.6 regarding visual resource-related impacts on views from Mojave National Preserve.

63-3 Regarding visual resources, refer to Common Response 6 in Proposed PA/FEIS/EIR Section 4.5.3.6. Because the lands on the Project site are federally owned and administered by the BLM, San Bernardino County does not have land use jurisdiction on the Project site, and County land use policies, including the Renewable Energy Ordinance described in the comment, do not apply to the site.

63-4 See Response 63-1. The BLM and San Bernardino decline to extend the comment period beyond the 95 days provided.

Letter 64 – Responses to Comments from Defenders of Wildlife, et al.

64-1 A discussion of the scoping comment letter submitted by Defenders of Wildlife and other organizations is located in Proposed PA/FEIS/EIR Section 4.4, Scoping.

64-2 The comments regarding the adequacy and accuracy of the analysis are addressed below where comments provide sufficient information to provide a detailed response.

64-3 Regarding the range of alternatives analyzed, refer to Common Response 1 in Proposed PA/FEIS/EIR Section 4.5.3.1. The comment's statement of support for Alternative G is noted.

64-4 The comment is noted. However, because this comment does not question the adequacy or accuracy of information in the Draft PA/EIS/EIR, present new information relevant to the analysis, or affect the alternatives considered, the BLM is unable to provide a substantive response. See BLM NEPA Handbook H-1790-1 §6.9.2.1 (BLM, 2008).

64-5 The comment is noted.

64-6 The cited map (Dudek and ICF, 2012) is a preliminary map prepared for discussion purposes, and as indicated on the map itself, "is not intended to govern how projects are reviewed or permitted." Refer to Common Response 1 in Section 4.5.3.1 for a discussion of the relationship of the Project to the DRECP planning process. In the absence of a DRECP ROD, review of existing applications is completed on a project-by-project basis using site-specific analysis, such as that described in Draft PA/EIS/EIR Sections 3.3, Biological Resources – Vegetation, and 3.4, Biological Resources – Wildlife.

64-7 Refer to Common Response 1 in Proposed PA/FEIS/EIR Section 4.5.3.1 for a discussion of site alternatives considered and the relationship of the Proposed Action to the Western Solar Plan and decisions made in the Western Solar Plan Record of Decision (ROD).

64-8 Regarding the range of alternatives analyzed, refer to Common Response 1 in Proposed PA/FEIS/EIR Section 4.5.3.1.

64-9 Refer to Common Response 1 in Proposed PA/FEIS/EIR Section 4.5.3.1 for a discussion of disturbed land alternatives considered.

64-10 The comment's statement of support for Alternative G is noted.

64-11 The comment requests that the BLM confer with the USFWS and integrate their present understanding of desert tortoise movement opportunities into the analysis. The lead agencies have shared focused desert tortoise survey findings with the USFWS and have solicited their input into Draft PA/EIS/EIR analysis of potential Project impacts to desert tortoise. Additionally, the USFWS is preparing a Biological Opinion for the Project to address potential effects to desert tortoise, and any additional measures imposed by the

USFWS in the Biological Opinion to avoid or minimize impacts on desert tortoise will be adopted in the Record of Decision for this Project as conditions of Project approval.

The commenter's preference for alternatives that do not include the East Array is noted.

64-12 The lead agencies recognize that perhaps a dozen or more burrowing owls may intermittently reside on the Project site and that owls may forage on much of the site, as noted by the commenter. To avoid and minimize impacts to burrowing owls, Mitigation Measure 3.4-1f: Burrowing Owl Protection Measures would require that the CDFW mitigation strategy be implemented to avoid direct impacts to owls and provide compensation for impacted owl habitat. According to CFDW guidance, direct harm to owls would not be permitted. Thus, while some displacement of owls may occur due to the Project, the Project is not inconsistent with BLM policies for managing sensitive species.

64-13 Regarding the availability of bighorn sheep habitat within and near the Project site, refer to Common Response 2 in Proposed PA/FEIS/EIR Section 4.5.3.2.

64-14 The BRTR (provided as Draft PA/EIS/EIR Appendix E-1) formed only a part of the materials reviewed and incorporated into the analysis in the Draft PA/EIS/EIR. The BLM and County agree with the suggestion in the comment that bighorn sheep habitat occurs within and near the Project site. For example, Draft PA/EIS/EIR page 3.4-18 indicates that "CDFW identifies the range of the Soda Mountain population of bighorn sheep to include the Soda Mountains both north and south of the Project site, as well as the entire Soda Mountain valley." The potential impacts of the Proposed Action and alternatives on bighorn sheep habitat, including habitat occurring within and near the Project site, are described in Draft PA/EIS/EIR Section 3.4.6. Additional discussion of bighorn sheep impacts and mitigation is provided in Common Response 2 in Proposed PA/FEIS/EIR Section 4.5.3.2.

64-15 Refer to Common Response 2 in Proposed PA/FEIS/EIR Section 4.5.3.2 regarding the adequacy of bighorn sheep surveys.

64-16 Refer to Common Response 2 in Proposed PA/FEIS/EIR Section 4.5.3.2 regarding the adequacy of bighorn sheep surveys.

64-17 Refer to Common Response 2 in Proposed PA/FEIS/EIR Section 4.5.3.2 regarding bighorn sheep connectivity.

64-18 Refer to Common Response 2 in Proposed PA/FEIS/EIR Section 4.5.3.2 regarding bighorn sheep connectivity.

64-19 The use of pre-Project radio telemetry studies to examine long-term bighorn sheep movements is beyond the scope of the analysis needed for the Draft PA/EIS/EIR. Refer to Common Response 2 in Proposed PA/FEIS/EIR Section 4.5.3.2 regarding bighorn sheep survey methods.

64-20 Refer to Common Response 2 in Proposed PA/FEIS/EIR Section 4.5.3.2 regarding mitigation for impacts to bighorn sheep.

64-21 Refer to Common Response 2 in Proposed PA/FEIS/EIR Section 4.5.3.2 regarding impacts to bighorn sheep.

64-22 Refer to Common Response 2 in Proposed PA/FEIS/EIR Section 4.5.3.2 regarding bighorn sheep connectivity.

64-23 Refer to Common Response 2 in Proposed PA/FEIS/EIR Section 4.5.3.2 regarding mitigation for impacts to bighorn sheep.

64-24 Refer to Common Response 2 in Proposed PA/FEIS/EIR Section 4.5.3.2 regarding impacts to bighorn sheep and Common Response 1 in Proposed PA/FEIS/EIR Section 4.5.3.1 regarding the relationship of the Proposed Action to the DRECP process.

64-25 Regarding the use of a groundwater model to assess the Project's impacts, refer to Common Response 4 in Proposed PA/FEIS/EIR Section 4.5.3.4.

64-26 Regarding the methodology and assumptions used as part of the groundwater model to assess the Project's impacts, refer to Common Response 4 in Proposed PA/FEIS/EIR Section 4.5.3.4.

64-27 The Applicant has identified potential alternative water sources in the event that an off-site source(s) must be used, either due to the County's denial of a groundwater permit or due to curtailment requirements in the Groundwater Monitoring and Mitigation plan being triggered. See Proposed PA/FEIS/EIR Section 2.6.2. These specific potential alternative sources have been analyzed throughout the Proposed PA/FEIS/EIR. See, e.g., Section 3.19.6.6. Note that Alternative F (no County groundwater permit) could support any of the solar plant configurations identified in Alternatives A through D, not just the Applicant-proposed layout.

64-28 Regarding the need for climate change effects and reduced groundwater recharge related to climate change to be addressed, refer to Common Response 4 in Proposed PA/FEIS/EIR Section 4.5.3.4.

64-29 The potential impacts of the Proposed Action and alternatives on the user experience at Mojave National Preserve are analyzed in Draft PA/EIS/EIR Sections 3.13, Recreation (see page 3.13-7 acknowledging noise, dust, and visual disturbance near the Zzyzx Road entrance to the Preserve) and 3.18, Visual Resources (see pages 3.18-26 through 3.18-26 describing impacts on views from Key Observation Points (KOPs) 13, 14, and 19, which represent views from the Preserve, and pages 3.18-23 and 3.18-24 describing night lighting impacts). The comment does not address the adequacy or accuracy of this analysis. Please also see Common Response 2 in Proposed PA/FEIS/EIR Section 4.5.3.2 regarding bighorn sheep; Common Response 3 in Proposed PA/FEIS/EIR Section 4.5.3.3 regarding desert tortoise; Common Response 4 in Proposed PA/FEIS/EIR Section 4.5.3.4 regarding

groundwater resources; and Common Response 6 in Proposed PA/FEIS/EIR Section 4.5.3.6 regarding visual resources, including views from Mojave National Preserve.

64-30 See Response 31-46 regarding federal reserved water rights.

64-31 The coordination process between the BLM and NPS for this Project is described in detail in Proposed PA/FEIS/EIR Section 4.1.3. Refer to Common Response 6 in Proposed PA/FEIS/EIR Section 4.5.3.6 regarding visual resources, including views from Mojave National Preserve and proposed mitigation measures. Please also see Common Response 2 in Proposed PA/FEIS/EIR Section 4.5.3.2 regarding bighorn sheep, including proposed water sources.

64-32 The comment's statement of support for Alternative G is noted.

64-33 The comment's statement of opposition to the Project is noted. Refer to Common Response 7 in Proposed PA/FEIS/EIR Section 4.5.3.7 regarding recirculation.

Letter 65 – Responses to Comments from USEPA Region IX

65-1 The comment is noted. Comments regarding the adequacy and accuracy of the analysis are addressed below where comments provide sufficient information to provide a detailed response.

65-2 Regarding potential impacts to sensitive water resources, including tui chub habitat, from groundwater use, as well as the methodology and assumptions used as part of the groundwater model to assess the Project's impacts and further comprehensive groundwater resource investigations, refer to Common Response 4 in Proposed PA/FEIS/EIR Section 4.5.3.4.

65-3 Regarding the need for further groundwater resource investigations, the need for a more extensive groundwater monitoring program, and the identification of measures to be taken and alternate water sources, refer to Common Response 4 in Proposed PA/FEIS/EIR Section 4.5.3.4.

65-4 Regarding the methodology and assumptions used as part of the groundwater model and the reliability of the data incorporated into the model to assess the Project's impacts, refer to Common Response 4 in Proposed PA/FEIS/EIR Section 4.5.3.4.

65-5 Regarding the need for climate change effects and drought to be considered in the groundwater model and the need for further groundwater resource investigations to more accurately estimate recharge rates and groundwater sources for local water features, refer to Common Response 4 in Proposed PA/FEIS/EIR Section 4.5.3.4.

65-6 Regarding the need for further groundwater resource investigations, refer to Common Response 4 in Proposed PA/FEIS/EIR Section 4.5.3.4.

65-7 Regarding the availability of alternative water sources to serve Project demand, refer to Common Response 4 in Proposed PA/FEIS/EIR Section 4.5.3.4.

65-8 A detailed analysis of direct, indirect, and cumulative impacts of the Proposed Action and alternatives on water resources, including site runoff patterns and erosion, is presented in Draft PA/EIS/EIR Section 3.19, *Water Resources*. As described in Section 3.19.6, *Direct and Indirect Effects* (p. 3.19-20 et seq.), the Applicant has developed a drainage plan that would preserve existing drainage patterns to the extent possible. The Proposed Action would not detain runoff on site or substantially interfere with existing drainage patterns on or off the Project site in order to preserve existing drainage patterns and sediment transport through the Project site. As described under *Storm Drainage and Erosion* (page 3.19-31 et seq.), to preserve existing site runoff patterns, a detailed hydrologic analysis will be performed, incorporating existing available topographic information supplemented with site specific LIDAR topography, during the detailed design stage for the Project. Further, implementation of Mitigation Measure 3.19-2, in conjunction with APM 20, as discussed on page 3.19-36 of the Draft PA/EIS/EIR, would ensure that active drainage channels would be identified and avoided and that changes to the Project site from construction and operation of the Proposed Action would not result in a net impact to downstream waterways from the alteration of on-site drainage or patterns and rates of erosion or sedimentation. Regarding potential impacts related to the disturbance of desert pavement, see Response 65-9. Regarding valley fever, see Response 65-10.

65-9 The areas of the Project site covered by desert pavement were not comprehensively mapped for the Draft PA/EIS/EIR; conservatively, based on ages of mapped alluvial fan deposits, desert pavement could be present on 92 percent of the land surface in the northern area of the Project and 60 percent of the land surface in the southern area of the Project (Wilson Geosciences, 2011). Up to 1,155 acres of the Project site would be graded if the Proposed Action were implemented. If grading only occurred in areas where desert pavement may be present on the ground surface, approximately 35 percent of the total desert pavement within the Project boundary could be disturbed by grading, but would be avoided or protected to the extent feasible through implementation of Mitigation Measure 3.7-4.

65-10 The potential impacts of the Project on valley fever infection rates in San Bernardino County are discussed in Section 3.8.6.1 of the Draft PA/EIS/EIR (p. 3.8-21 et seq.). As stated therein, the Project would implement dust control measures required by the Mojave Desert Air Quality Management District (MDAQMD) Rule 403.2, and Applicant Proposed Measures (APMs) 1 through 8 (see Draft PA/EIS/EIR Table 2-5 beginning on page 2-26). In addition, Mitigation Measures 3.7-1, Soil Erosion Control Plan Review and Approval, and 3.7-4, Protection of Desert Pavement, would be implemented during Project construction. To the extent possible, disturbance of desert pavement would be avoided as described in Mitigation Measure 3.7-4 (Draft PA/EIS/EIR p. 3.7-25). As described in the impact analyses in Draft PA/EIS/EIR Sections 3.2, Air Resources, and 3.7, Geology and Soil Resources, these measures would reduce fugitive dust emissions during construction, operation, and decommissioning of the Project, reducing the

potential to expose Project workers to Coccidioides fungal spores that may be present in desert soils.

As indicated in Draft PA/EIS/EIR Section 3.8, Hazards and Hazardous Materials, the implementation of control measures required by MDAQMD Rule 403.2 and Applicant-proposed measures (APMs) 1 through 8 (described on page 2-26) would reduce fugitive dust during all phases of the Project, which would reduce the risk to workers and others on or near the site of contracting valley fever (pp. 3.8-21 and 3.8-22). As indicated in Draft PA/EIS/EIR Section 3.2, Air Quality, APMs 1 through 8 are consistent with dust control strategies recommended in the Mojave Desert Planning Area Federal Particulate Matter Attainment Plan (p. 3.2-34). Additionally, the Proposed PA/FEIS/EIR recommends revised Mitigation Measure 3.2-1, which includes the use of dust palliatives, and watering as needed, on unpaved access roads and other graded areas of the site during long-term operation and maintenance of the Project. To clarify the applicability of this mitigation measure to the issue of valley fever infection, the following revisions have been made to the subsection titled "Public Health" in Proposed PA/FEIS/EIR Section 3.8.6.1:

> **Operation and Maintenance**
>
> Similar to construction, implementation of Mitigation Measure 3.19-2 during operation and maintenance would reduce risk of vector-borne diseases. Implementation of MDAQMD Rule 403.2 control measures, ~~and~~ APMs 1 through 8, and Mitigation Measure 3.2-1 would reduce fugitive dust, which would reduce the risk of valley fever infections. Under the Proposed Action it is not considered likely that there would be public health impacts associated with operation of the Project.

No further mitigation is recommended with respect to valley fever.

Letter 66 – Responses to Comments from Barry and W.K. Grady

66-1 The comment's statement of opposition to the Project is noted. The comment letter includes references to issues related to other projects, such as vegetation clearing, dust and wind erosion, and wildlife, but does not discuss the completeness or adequacy of this Project's Draft PA/EIS/EIR. The aforementioned issues have been considered and analyzed in Chapter 3 of the Draft PA/EIS/EIR. In addition, refer to Common Response 1 in Proposed PA/FEIS/EIR Section 4.5.3.1 for a discussion of the BLM's and County's consideration of a distributed generation alternative.

Letter 67 – Responses to Comments from Michael Garabedian

67-1 Biological soil crusts are naturally common throughout Southern California deserts and are not protected by any federal or state laws, regulations, plans, or standards. The disturbance of the structure and ecological functioning of biological soil crusts was discussed in Draft PA/EIS/EIR Section 3.3 (p. 3.3-24) relative to potential indirect impacts on special-status plants, and is discussed in Proposed PA/FEIS/EIR Section 3.5, Climate Change, relative to

potential impacts on the carbon sequestration potential of the desert ecosystem. The implementation of APM 50, and Mitigation Measure 3.3-2 which describes further recommendations for the final Integrated Weed Management Plan (a draft of which was provided as Draft PA/EIS/EIR Appendix E-2), would ensure that soil disturbance does not facilitate the introduction of invasive species during Project construction. As revised in the Proposed PA/FEIS/EIR, Mitigation Measure 3.3-2 recommends the salvage, preservation, and re-application of biological soil crusts on the site. See also Response 31-39.

Letter 68 – Responses to Comments from Morongo Basin Conservation Association

68-1 The Ivanpah and Stateline solar projects were described and considered in the analysis of cumulative impacts in the Draft PA/EIS/EIR (see Table 3.1-3 on page 3.1-9). The Silver State solar project is among the renewable energy facilities in Nevada described on Draft PA/EIR/EIS page 3.1-4 and is considered in the analysis of cumulative impacts for resources with sufficiently large cumulative geographic scopes to include renewable energy projects proposed or existing outside the CDCA (see, e.g., Draft PA/EIS/EIR Section 3.5.7 on page 3.5-22).

68-2 No specific examples, facts, reasonable assumptions predicated upon facts, or other evidence are provided in support of the comment's suggestion that the recreational baseline for Project impacts considered in the Draft PA/EIS/EIR is not adequate. The synergistic cumulative visual impacts of the Project in combination with the Ivanpah solar project are analyzed in Draft PA/EIS/EIR Section 3.18.7 (p. 3.18-31 et seq.).

68-3 In addition to short-term construction-related effects, the Draft PA/EIS/EIR analyzes the potential long-term economic effects of Project employment and economic output in Section 3.14, Socioeconomics and Environmental Justice (see page 3.14-16), with an estimated annual economic output of $9.7 million during operation and maintenance. Additionally, as indicated on Draft PA/EIS/EIR page 3.14-15, most of the economic benefits of the construction period are expected to be realized within San Bernardino County.

The potential impacts of the Proposed Action and alternatives on the user experience at Mojave National Preserve are analyzed in Draft PA/EIS/EIR Sections 3.13, Recreation (see page 3.13-7 acknowledging noise, dust, and visual disturbance near the Zzyzx Road entrance to the Preserve) and 3.18, Visual Resources (see pages 3.18-26 through 3.18-26 describing impacts on views from Key Observation Points (KOPs) 13, 14, and 19, which represent views from the Preserve). As noted on page 3.18-26, "The cumulative total of the area from which the Project may be seen from within the Preserve in the foreground/middleground distance zone covers approximately 350 acres. This represents 0.0002 percent of the 1.6-million-acre Preserve," and foreground/middleground views of the Project site from elsewhere in the Preserve would be blocked by the Soda Mountains. These impacts are not expected to affect visitation to the Preserve. Also refer to Common

Response 6 in Proposed PA/FEIS/EIR Section 4.5.3.6 regarding visual resource-related impacts on views from Mojave National Preserve.

The nearest community to the Project site is Baker, which is expected to experience economic benefits as a result of the Project. The comment does not provide specific examples, facts, reasonable assumptions predicated upon facts, or other evidence in support of the comment's suggestion that the Project would have negative impacts on Preserve visitorship and/or economic activity in connection with Preserve tourism.

Additionally, nearly all of the recreational activities indicated in the comment (i.e., hiking, backpacking, stargazing, horseback riding, botany, wildlife viewing, visiting historical sites, and OHV travel), are described in Draft PA/EIS/EIR Section 3.13, Recreation (see, e.g., p. 3.13-2). One additional activity noted in the comment, bicycling (i.e., mountain and trail biking), has been added to the description of recreational opportunities in both dispersed recreational areas such as the Project site (see Proposed PA/FEIS/EIR Section 3.13.2.1) and in the Mojave National Preserve (see PA/EIS/EIR Section 3.13.2.2). These revisions in the Environmental Setting description do not affect the impact analysis for recreation.

68-4 As the comment correctly identifies, the Draft PA/EIS/EIR acknowledges the avian mortality risks from the Project that would remain even after the implementation of feasible mitigation measures. Please also see Response 16-10 regarding revisions made to the Proposed PA/FEIS/EIR to acknowledge the proximity of Lake Tuendae and Soda Spring (which provide bird stopover) to the Project site and to incorporate new avian mortality information made available since the publication of the Draft PA/EIS/EIR. Presently, BLM does not intend to post avian mortality to the eBird.org database. As with other solar ROW grants approved by the BLM, if the Project is approved and constructed, annual monitoring reports that include bird mortality data (as required by Mitigation Measure 3.4-1h) will be made available to the public following their review and approval by BLM.

The comment's statements regarding the popularity of sites in the Mojave Desert with recreational birders are noted.

68-5 The potential impacts of groundwater consumption and drawdown are analyzed, and mitigation measures proposed, in Draft PA/EIS/EIR Section 3.19, Water Resources (p. 3.19-1 et seq). The Applicant's projected water use estimates are intended to address the need for periodic panel washing and dust control as indicated in Draft PA/EIS/EIR Section 2.4.2.8 (see pp. 2-12 and 2-13). The comment does not specify or provide adequate information about which projects it references in the Morongo Basin to allow the BLM and County to provide a substantive response to this comment. No specific examples, facts, reasonable assumptions predicated upon facts, or other evidence are provided in support of the comment's suggestion that the Draft PA/EIS/EIR may underestimate water consumption.

68-6 The Applicant's projected water use estimates are intended to address the need for dust control and other uses during construction, and for periodic panel washing, dust control, and other uses during operation and maintenance, based on the soil types on the Project site. See Responses 68-5 and 68-8. The comment is noted and does not question, with reasonable basis, the accuracy or adequacy of information in the Draft PA/EIS/EIR.

68-7 Refer to the draft Groundwater Monitoring and Mitigation Plan (GMMP) in Appendix L, which indicates that the Applicant would track and report the quantity of groundwater withdrawn on a quarterly basis.

68-8 The analysis of soils on the Project site presented in Draft PA/EIS/EIR Section 3.7, Geology and Soils, relies on data collected for preparation of the site-specific Geologic Characterization Report (Wilson Geosciences, 2011). Published soil data was not available from the Natural Resources Conservation Service at the time of Draft PA/EIS/EIR preparation.

The analysis of geologic deposits on the Project site presented in Draft PA/EIS/EIR Section 3.7 relies on available geologic mapping of the site supplemented by aerial imagery mapping and site reconnaissance performed for the Project. The Geologic Map of California, Trona Sheet, 1:250,000 scale, prepared by the California Division of Mines and Geology, is the current geologic map for the site area (1962a, 1962b), as indicated by the U.S. Geological Survey's (USGS) National Geologic Map Database available at http://ngmdb.usgs.gov/maps/mapview/ (USGS, 2014a). The USGS' Geologic Mapping in Progress tool, available at http://ngmdb.usgs.gov/MapProgress/MIP_home.html, shows that additional geologic mapping is in progress for the Project area (Soda Mountains Quadrangle [CA] 1:100,000 scale, FEDMAP Component - Surficial Map), but is not currently available (USGS, 2014b). The aerial imagery mapping and site reconnaissance conducted for the Project resulted detailed maps presented in the Geologic Characterization Report (Wilson Geosciences, 2011). These data were used to describe the geology and soils baseline conditions for the site and to assess Project impacts. No changes to the Draft PA/EIS/EIR have been made in response to this comment.

68-9 In response to this and Comment 49-19, Mitigation Measure 3.2-3 has been recommended in Section 3.2.8:

> **Mitigation Measure 3.2-3:** The Applicant shall discontinue non-essential earth-moving activities under high wind conditions (i.e., when wind speeds exceed gusts of 25 miles per hour or when sustained wind speeds exceed 15 miles per hour based on a 15-minute average as indicated by a wind instrument on-site and those activities result in visible dust plumes). All grading activities shall be suspended when wind gusts are greater than 30 miles per hour.

68-10 Regarding the methodology and assumptions used as part of the groundwater model to assess the Project's impacts and further comprehensive groundwater resource investigations required prior to Project construction, please see Common Response 4 in Proposed PA/FEIS/EIR Section 4.5.3.4.

68-11 See Response 68-3.

68-12 See Response 68-3.

68-13 The comment is noted and does not question, with reasonable basis, the accuracy or adequacy of information in the Draft PA/EIS/EIR. Regarding the public availability of avian mortality data, see Response 68-4.

68-14 The comment is noted and does not question, with reasonable basis, the accuracy or adequacy of information in the Draft PA/EIS/EIR. Regarding the public availability of avian mortality data, see Response 68-4.

68-15 See Response 68-6.

68-16 See Response 68-7.

68-17 See Response 68-8.

68-18 See Response 68-9.

68-19 The comment's statement of support for Alternative G is noted.

Letter 69 – Responses to Comments from The Desert Protective Council, Inc.

69-1 Regarding potential impacts to bighorn sheep movement corridors, refer to Common Response 2 in Proposed PA/FEIS/EIR Section 4.5.3.2. The proximity of the Project site to the Mojave National Preserve is acknowledged.

69-2 The potential impacts of the Proposed Action and alternatives on the user experience at Mojave National Preserve are analyzed in Draft PA/EIS/EIR Sections 3.13, Recreation (see page 3.13-7 acknowledging noise, dust, and visual disturbance near the Zzyzx Road entrance to the Preserve) and 3.18, Visual Resources (see pages 3.18-26 through 3.18-26 describing impacts on views from Key Observation Points (KOPs) 13, 14, and 19, which represent views from the Preserve). Also refer to Common Response 6 in Proposed PA/FEIS/EIR Section 4.5.3.6 regarding visual resources, including views from Mojave National Preserve. The comment does not address the adequacy or accuracy of the analysis.

69-3 The potential for solar photovoltaic panels to attract and injure or kill birds is acknowledged in the extensive discussion of avian collision risk on Draft PA/EIS/EIR pages 3.4-36, 3.4-37, 3.4-40, 3.4-48, and 3.4-49. An Avian Monitoring Program (Mitigation Measure 3.4-1h) would characterize this risk and reduce effects on resident and migratory birds wherever possible through the implementation of adaptive management. However, ongoing monitoring findings from other solar projects indicate that ongoing, unmitigated risks to birds will remain following the implementation of

identified mitigation measures. A draft Avian Monitoring Program is included in the draft Bird and Bat Conservation Strategy provided in Appendix L.

69-4 The comment's statement of support for Alternative G is noted.

69-5 No specific examples, facts, reasonable assumptions predicated upon facts, or other evidence are provided in support of the comment's suggestion that incomplete information was provided in the Draft PA/EIS/EIR. Numerous mitigation measures have been recommended in the Draft PA/EIS/EIR and would be required if the BLM and San Bernardino County approve the Project or an alternative and adopt these measures as part of those approvals. Not all mitigation measures rely on adaptive management. The BLM and San Bernardino County decline to extend the comment period.

69-6 The comment is noted. The Draft PA/EIS/EIR and Proposed PA/Final EIS/EIR have been completed as part of the Project review process under NEPA and CEQA and are intended to assist the lead agencies in making decisions regarding the CDCA Plan Amendment and ROW grant (BLM) and the groundwater well permit (San Bernardino County).

69-7 Congress specifically recognized multiple use and sustained yield management for the CDCA, through FLPMA, providing for present and future use and enjoyment of the public lands. The CDCA Plan identifies allowable uses of the public lands in the CDCA. In particular, it authorizes the location of solar power generating facilities in MUC L, M, and I land classifications, each of which occur within the Project site, upon NEPA review.

The mitigation provided throughout the PA/EIS/EIR ensures that that public lands under consideration will be occupied only with authorized facilities and only to the extent necessary to construct, operate, maintain, and terminate the Project. Compliance with mitigation measures, the Biological Opinion, and NHPA Section 106 requirements will ensure that the Project will not unnecessarily and unduly degrade these public lands.

The CDCA Plan is a comprehensive, long-range plan that was adopted in 1980; it since has been amended many times. The CDCA is a 25-million-acre area that contains over 12 million acres of BLM-administered public lands within the area known as the California Desert. The Plan initially was prepared and continues to provide guidance concerning the use of the California Desert public land holdings while balancing other public needs and protecting resources. More specifically, it establishes goals and specific actions for the management, use, development, and protection of the resources and public lands within the CDCA. It is based on the concepts of multiple use, sustained yield, and maintenance of environmental quality. The Plan anticipated that renewable power generation facilities would be proposed in the California Desert. Accordingly, it made allowances for the review of such applications, including a provision that all proposed applications "associated with power generation or transmission not identified in the [CDCA] Plan will be considered through the Plan Amendment process." The intention of this provision was to ensure that the BLM would take a planning view of all of the

renewable energy applications proposed and that such projects would require an amendment to the CDCA Plan to maintain consistency throughout the plan. Amendments to the CDCA Plan can be site-specific or global, depending on the nature of the amendment. Thus, the Plan Amendment process is an intentional aspect of the Plan designed to allow for both flexibility and consistency in the use and protection of public lands and resources. Accordingly, the proposed CDCA Plan amendment and the overall amendment process would be consistent with the CDCA Plan.

Regarding the range of alternatives considered in the Draft PA/EIS/EIR, please see Common Response 1 in Proposed PA/FEIS/EIR Section 4.5.3.1.

69-8 Please see Common Response 1 in Section 4.5.3.1 for a discussion of the BLM's statement of purpose and need.

69-9 Please see Common Response 1 in Section 4.5.3.1 for a discussion of alternatives considered but rejected, including a private lands alternative, brownfields/degraded lands alternative, and distributed generation alternative.

69-10 As required and noted in the BLM NEPA Handbook excerpt quoted by the commenter, during each public meeting held for the Draft PA/EIS/EIR, the BLM recorded a list of attendees, including the addresses of attendees desiring to be added to the mailing list. These lists, as well as notes taken by the BLM and/or its NEPA consultant during the meetings, are included in the Administrative Record for this Project, and all meeting attendees who provided mailing addresses have been added to the Project-specific mailing list. There is no requirement under NEPA to record public meetings held on a Draft EIS.

The comment does not specify what requirement of the Americans with Disabilities Act it suggests is violated by not recording public comments for the record, and the BLM disagrees with this assertion. The BLM has not violated any applicable laws, regulations, policies, or guidelines in holding public meetings, the intended and advertised purpose of which is "to aid the public's understanding of the project and to solicit written comments on planning issues and the potential impacts, alternatives, and mitigation measures that should be considered in the Final Environmental Impact Statement/Environmental Impact Report" (BLM, 2013a, 2013b). The BLM and San Bernardino County decline to extend the comment period beyond the 95 days provided.

69-11 The comment's statement of support for Alternative G is noted. The impacts of the Proposed Action and alternatives were analyzed in the Draft PA/EIS/EIR, including those indicated in the comment. The comment does not directly address the adequacy or accuracy of that analysis.

69-12 The comments provided by the Morongo Basin Conservation Association are provided in Appendix J (Letter 68 on page J-351) and responses to those comments are provided in

Appendix K under the heading "Letter 68 – Responses to Comments from Morongo Basin Conservation Association."

The comments provided by Basin and Range Watch are provided in Appendix J (Letter 49 on page J-140) and responses to those comments are provided in Appendix K under the heading "Letter 49 – Responses to Comments from Basin and Range Watch."

The comments provided by the National Parks Conservation Association and San Bernardino Valley Audubon Society are provided in Appendix J (Letter 71 on page J-370) and responses to those comments are provided in Appendix K under the heading "Letter 71 – Responses to Comments from the National Parks Conservation Association and San Bernardino Valley Audubon Society."

The comments provided by Michael Garabedian are provided in Appendix J (Letter 67 on page J-349) and responses to those comments are provided in Appendix K under the heading "Letter 67 – Responses to Comments from Michael Garabedian."

Letter 70 – Responses to Comments from Mojave Desert Land Trust

70-1 The comment's statement of opposition to the Project is noted. The comment suggests that the Project would adversely affect MDLT's land holdings; however, it provides no specific examples as a basis for the allegation. Accordingly, the BLM and San Bernardino County are unable to provide a more detailed response. Note that throughout Chapter 3 of the Draft PA/EIS/EIR, the effectiveness of mitigation measures is described for each potential Project impact, and impacts remaining after the implementation of mitigation measures are summarized in the subsections entitled "Residual Effects" (e.g., Sections 3.3.9 and 3.4.9).

70-2 The comment suggests that the Project would adversely affect conservation land acquisitions in the Project vicinity; however, it provides no specific examples as a basis for the allegation. Accordingly, the BLM and San Bernardino County are unable to provide a more detailed response.

70-3 Regarding potential impacts to sensitive water resources and tui chub habitat from groundwater use, refer to Common Response 4 in Proposed PA/FEIS/EIR Section 4.5.3.4. The Applicant's projected water use estimates are indicated in Draft PA/EIS/EIR Section 2.4.2.8 (et seq.). No specific examples, facts, reasonable assumptions predicated upon facts, or other evidence are provided in support of the comment's suggestion that the Draft PA/EIS/EIR underestimates water consumption.

70-4 Refer to Common Response 2 in Proposed PA/FEIS/EIR Section 4.5.3.2 regarding bighorn sheep connectivity.

70-5 There is no requirement to record public meetings under NEPA or CEQA. The comment does not directly address the adequacy or accuracy of the Draft PA/EIS/EIR.

70-6 The comment's statement of opposition to the Project is noted. Please see Common Response 1 in Proposed PA/FEIS/EIR Section 4.5.3.1 regarding site alternatives considered.

Letter 71 – Responses to Comments from National Parks Conservation Association and San Bernardino Valley Audubon Society

71-1 The BLM and San Bernardino County held three public meetings for the Project in January 2014. The 95-day period provided for public comment is longer than both the NEPA- and FLPMA-required comment periods for draft EISs and plan amendments, and longer than the CEQA-required comment period for draft EIRs. The BLM and San Bernardino County decline to extend the comment period. Refer to Common Response 7 in Proposed PA/FEIS/EIR Section 4.5.3.7 regarding the BLM's and County's decision to decline to recirculate a revised Draft PA/EIS/EIR.

71-2 The Defenders of Wildlife, et al. comment letter is included in Appendix J as Letter 64. Refer to Responses 64-1 through 64-33, above.

71-3 The comments regarding the adequacy and accuracy of the analysis are addressed below where comments provide sufficient information to provide a detailed response. Regarding groundwater resources, refer to Common Response 4 in Proposed PA/FEIS/EIR Section 4.5.3.4.

71-4 Refer to Common Response 1 in Section 4.5.3.1 for a discussion of the BLM's statement of purpose and need. Note that the discussion on Draft PA/EIS/EIR page 1-3 reads, "The Project, if approved, also would assist the BLM in addressing several management and policy objectives advanced through the following authorities applicable to the BLM: …" – the BLM does not imply or intend to indicate through this discussion that the policy objectives advanced through Executive Order 13212, Secretarial Order 3285A1, and/or the President's Climate Action Plan are adopted as specific objectives for this Project.

71-5 Refer to Common Response 1 in Proposed PA/FEIS/EIR Section 4.5.3.1 for a discussion of alternatives considered and rejected from further consideration in compliance with both NEPA and CEQA. Regarding the range of NEPA alternatives, see also Response 71-4. Briefly, the range of alternatives for purposes of NEPA responds to the BLM's statement of purpose and need; the BLM does not adopt "broad objectives" for the Project outside of the stated purpose and need. Regarding the suggestion that alternative site locations be considered, refer to Draft PA/EIS/EIR Section 2.8.1, which considered multiple potential off-site locations. The commenting party's apparent disagreement with the BLM's conclusions that the Project could not be implemented feasibly on such sites for technical or other reasons, that the development of such sites for solar use would be inconsistent with the basic policy objectives for the management of the area, and that their implementation would not avoid or substantially lessen any significant effects of the Project is noted.

The commenting party's reliance on *Natural Resources Defense Council, Inc. v. Morton*, 458 F.2d 827 (D.C. Cir. 1972) to suggest that the range of NEPA alternatives should be expanded to include other forms of renewable energy is misplaced. In *Morton*, the court emphasized that NEPA requires consideration of information sufficient to permit a reasoned choice of alternatives so far as environmental aspects are concerned and cautioned that it is not appropriate to "disregard alternatives merely because they do not offer a complete solution to the problem." Id. at 836. Draft PA/EIS/EIR Section 2.8.2 does not reject other types of renewable energy projects from detailed consideration because they could not supply the same amount of energy that the Project would yield. To the contrary, Section 2.8.2 explains that other types of renewable energy projects would not meet the BLM's purpose and need to respond to the Applicant's application. This is quite different than the circumstances of the *Morton* case and perfectly appropriate under NEPA. See Section 6.6.3 of BLM NEPA Handbook H-1790-1 (BLM, 2008), which is clear that a potential action alternative may be eliminated from detailed analysis if it would not respond to the purpose and need.

Regarding the range of CEQA alternatives, off-site alternatives may be excluded from the analysis when such sites are outside the jurisdiction of the lead agency and do not eliminate or reduce significant environmental effects of the project (Pub. Res. Code §21002; CEQA Guidelines §15126.6). Here, the County's jurisdiction is limited to the groundwater well permit. Requiring the proposed wells to be located somewhere other than the Project site would necessitate a pipeline or other transport of the groundwater from the well location to the Project site. The potential additional impacts to air resources, GHG emissions, biological resources, and, if trucks are required for water transport, transportation and traffic would increase rather than eliminate or reduce project impacts.

71-6 See Response 71-5. The discussion in Draft PA/EIS/EIR Chapter 2, including in Section 2.8.1, documents that the BLM has considered an adequate range of alternatives. The commenting party's apparent disagreement with the BLM's screening methodology and resulting conclusions is noted; however, the comment identifies no additional alternative site that satisfies the screening criteria outlined in Section 2.2; in fact, it identifies no additional potential off-site alternatives at all. Without more information, the BLM is unable to provide a more substantive response.

71-7 Refer to Common Response 1 in Proposed PA/FEIS/EIR Section 4.5.3.1 for a discussion of site alternatives considered. Additionally, refer to Response 71-5. The Draft PA/EIS/EIR indicates that "The Applicant initially considered the National Training Center at Fort Irwin" (p. 2-40), not that the BLM or County considered this site as an alternative to the Proposed Action. For the reasons detailed in Common Response 1, the lead agencies did not consider this site further.

71-8 Refer to Common Response 4 in Proposed PA/FEIS/EIR Section 4.5.3.4 regarding: the methodology and assumptions used as part of the groundwater model; the reliability of the data incorporated into the model to adequately assess the Project's groundwater

related impacts; disclosure of the uncertainty and risk related to the groundwater analysis; and, discussion of the significant effects the Project may have on sensitive hydrological resources.

71-9 Regarding the adequacy of groundwater-related mitigation measures, refer to Common Response 4 in Proposed PA/FEIS/EIR Section 4.5.3.4.

71-10 Regarding potential impacts to sensitive water resources, tui chub, and tui chub habitat from groundwater use as well as disclosure of the uncertainty and risk related to the groundwater analysis, refer to Common Response 4 in Proposed PA/FEIS/EIR Section 4.5.3.4.

71-11 Regarding potential impacts to tui chub and tui chub habitat from groundwater use throughout the life of the Project, refer to Common Response 4 in Proposed PA/FEIS/EIR Section 4.5.3.4.

71-12 Refer to Common Response 4 in Proposed PA/FEIS/EIR Section 4.5.3.4 regarding potential impacts to tui chub.

71-13 Refer to Common Response 4 in Proposed PA/FEIS/EIR Section 4.5.3.4 regarding mitigation of potential impacts to tui chub.

71-14 Refer to Common Response 2 in Proposed PA/FEIS/EIR Section 4.5.3.2 regarding potential impacts to bighorn sheep.

71-15 The comment states that there are feasible mitigation measures that the Draft PA/EIS/EIR failed to consider that would lessen the Project's environmental impacts to the desert bighorn sheep. In particular, the comment suggests physically moving bighorn sheep between metapopulation fragments or funding such movement efforts; and building an overpass across the I-15 or helping to fund the construction of such an overpass. CDFW monitors bighorn sheep populations in the Project region and has the authority to relocate bighorn sheep between metapopulations. Thus, the decision of whether or not to relocate sheep and how sheep would be relocated is beyond the authority of the Lead Agencies. However, see recommended Proposed PA/FEIS/EIR Mitigation Measures 3.4-3b and 3.4-3e, which address bighorn sheep habitat connectivity.

71-16 The comment states that the Draft PA/EIS/EIR failed to discuss the indirect effects of groundwater pumping on desert bighorn sheep water sources, noting that groundwater pumping could eliminate the South Soda Mountain desert bighorn sheep herd's water source. Year-round water sources in the South Soda Mountains include multiple pools at Soda Spring (also known as MC Spring and Zzyzx Spring) approximately 4 miles east of the project site. No bighorn sheep water sources occur on the Project site or closer to the site than Soda Spring. Based on an August 2014 modeling study that examined groundwater availability with the Project's proposed pumping, the predicted minimum and maximum difference between current groundwater levels at Soda Spring and those

following 30 years of operation ranges between 0.00022 feet (.003 inch) and 0.061 feet (0.73 inch) (Burns & McDonnell and Panorama Environmental, Inc., 2014). The analysis finds that:

> The project is not likely to affect MC Spring given any range of values of hydraulic conductivity and recharge because (1) there is approximately 4.5 miles between the nearest proposed project well and MC Spring, (2) the duration of construction, during which water use will be high, is only 3 years (maximum), and (3) the proposed volume of water to be used during the 30-year operational period (33 AFY) is small relative to the volume of water in storage and the distance to MC Spring. (Burns & McDonnell and Panorama Environmental, Inc., 2014).

Thus, no direct or indirect effects are anticipated to bighorn sheep water sources.

71-17 The desert tortoise surveys performed as Draft PA/EIS/EIR background studies were done to ascertain the size and distribution of the desert tortoise on and near the Project site. Additionally, survey findings were used in a desert tortoise habitat suitability analysis to consider the value of the site within the context of regional desert tortoise movement opportunities and species conservation. Multi-year desert tortoise surveys that examined the presence of tortoise and tortoise sign on the site found that current and historic desert tortoise use of the Project site was patchy, and that certain portions of the site showed little evidence of tortoise use. These findings were summarized in Table 3.3-2 on page 3-30 of the 2012 *Biological Resources Technical Report* included as Draft PA/EIS/EIR as Appendix E-1 (Panorama Environmental, Inc., 2012). As described in the Draft PA/EIS/EIR, focused desert tortoise surveys continued into spring 2013 (Kiva Biological Consulting, 2013a). Based on these analyses, the Draft PA/EIS/EIR presented the best available data related to the direct and indirect impacts that the Project may have on desert tortoise and their habitat.

The desert tortoise survey methodology that was approved for use by the BLM and USFWS is fully documented in the survey reports that are included in the Draft PA/EIS/EIR project record. The Draft PA/EIS/EIR finding that the Project site supports a low density of desert tortoises is well supported by focused biological surveys. Multi-year surveys detected a single desert tortoise within a 6,770-acre study area that included the Project site. Surveys also confirmed the absence of current or historic tortoise sign, including burrows, within large portions of the study area. Thus, the Project site was not arbitrarily dismissed as good desert tortoise habitat. The Draft PA/EIS/EIR conservatively concluded that nearly the entire site (2,455.57 acres) may be occupied or intermittently occupied habitat by desert tortoise (Draft PA/EIS/EIR p. 3.4-31). Thus, aside from developed areas, the entire site is considered suitable for desert tortoise, regardless of the absence of desert tortoise sign in substantial portions of the site.

The baseline analyses cited in the Draft PA/EIS/EIR were coupled with a complete analysis of potential direct and indirect impacts to desert tortoise (Draft PA/EIS/EIR p. 3.4-30 et seq.). In the spirit of full disclosure of Project impacts, the analysis included potential impacts related to the legal translocation of tortoises. This impact is recognized

by the USFWS and CDFW, who regulate impacts to desert tortoise. As identified in the Draft PA/EIS/EIR (p.3.4-58), potential impacts related to the relocation of detected individuals will be minimized by using agency-approved relocation methods in the draft Desert Tortoise Translocation Plan (DTTP) (Panorama Environmental, Inc., 2013), as required by Mitigation Measure 3.4-2b. The draft DTTP is included in the Proposed PA/FEIS/EIR in Appendix L.

71-18 As noted in Response 60-39, the 2013 desert tortoise survey methodology is provided in the Proposed PA/FEIS/EIR, Section 3.4.2.2. Desert tortoise surveys and reporting methods adhered to the USFWS-developed and publically available 2002 and 2010 survey and report methodologies cited on Draft PA/EIS/EIR page 3.4-3. Additionally, each desert tortoise survey report cited in the Draft PA/EIS/EIR was included in the Project record and available for public review.

71-19 The comment states that the DTTP required by Mitigation Measure 3.4-2b must include more than a perfunctory description of the plan to satisfy NEPA's requirements. Note that the draft DTTP was not only adequately described in the Draft PA/EIR/EIS measure; the draft DTTP was cited in the Draft PA/EIR/EIS and available for public review as part of the Project record. It also is included in the Proposed PA/FEIS/EIR in Appendix L.

Tortoise translocation is a standard mitigation measure for Project located within desert tortoise habitat that is regularly authorized by the USFWS and CDFW consistent with the requirements of the state and federal Endangered Species Acts.

The comment states that the draft DTTP referenced in the Draft PA/EIS/EIR contains several inconsistencies. The document clearly describes post-relocation monitoring of tortoises as follows: Tortoise monitoring would be limited to observations performed immediately following animal relocation (i.e., within several hours of relocation), and does not include the long-term monitoring of recipient or control sites. It is important to note that the draft DTTP remains subject to review and revision by the USFWS and BLM.

The comment states that the draft DTTP does not propose what would happen if more than five desert tortoises were found on the Project site. On the contrary, the document specifically identifies recipient sites in case more than five desert tortoise are located during construction. As discussed in the draft DTTP, the limited sign of desert tortoise on site, combined with identification of only one live tortoise during one of several Project area surveys, indicate that there are likely fewer than five (Panorama Environmental Inc., 2013).

71-20 See Common Response 6 in Proposed PA/FEIS/EIR Section 4.5.3.6. In addition, determinations of the conformance of the Proposed Action and alternatives to VRM Class III are included in Draft PA/EIS/EIR Section 3.18.6; in the third paragraph on page 3.18-22 (Proposed Action), the first and fourth paragraphs on page 3.18-29 (Alternatives B and C, respectively), the third and last paragraphs on page 3.18-30

(Alternatives D and E, respectively), and the second and fourth paragraphs on page 3.18-31 (Alternatives F and G, respectively).

71-21 See Common Response 6 in Proposed PA/FEIS/EIR Section 4.5.3.6 regarding the existing Visual Resources Inventory (VRI) for the Barstow Field Office.

71-22 See Common Response 6 in Proposed PA/FEIS/EIR Section 4.5.3.6 regarding the interim VRM classification for the Project site. The Project site is not located within the Mojave National Preserve.

71-23 See Common Response 6 in Proposed PA/FEIS/EIR Section 4.5.3.6 regarding the adequacy of KOPs analyzed in the Draft PA/EIS/EIR, as selected in cooperation with NPS staff. The BLM and County have considered and included in the administrative record for this Project the Mojave National Preserve Visitor Study cited in the comment (accessed at http://psu.uidaho.edu/files/vsp/reports/151_MOJA_rept.pdf). The results of this report are not inconsistent with information provided in the Draft PA/EIS/EIR. As described in Section 3.18 and Common Response 6, the BLM coordinated with NPS staff to select KOPs in order to analyze the Project's effects on views from the Preserve.

71-24 See Common Response 6 in Proposed PA/FEIS/EIR Section 4.5.3.6 regarding the adequacy of the analysis of views from KOPs.

71-25 The information regarding visitorship to KOPs 13 and 14 was provided to BLM during an interdisciplinary team meeting of BLM and NPS staff conducted in September 2012. The NPS has had several opportunities to provide differing information that may have resulted in a change in the analysis of impacts from these KOPs, including an internal agency review of the Draft PA/EIS/EIR prior to publication and during public review of the Draft PA/EIS/EIR, and has not done so (see, e.g., Letter 16 in Proposed PA/FEIS/EIR Appendix J from the Mojave National Preserve). Nonetheless, the analysis acknowledges impacts on views from these locations; see Common Response 6 in Proposed PA/FEIS/EIR Section 4.5.3.6.

71-26 As described in Section 3.18.6.1, in the third paragraph on Draft PA/EIS/EIR page 3.18-27, "In the vast majority of background/seldom seen viewshed locations within the Preserve, views are expansive such that while a portion of the Project site that might be seen, it would be less than one percent of the total view, and when combined with atmospheric conditions, difficult to notice at such distances." The conclusion that the Project would not be fully in view is the main factor which determined that the visibility of the Project area would be negligible. The following text has been added to the second paragraph under the heading "Background Distance Zone (5 to 15 miles)" (Proposed PA/FEIS/EIR Section 3.18.6.1) which describes the effect of distance on visual contrasts:

> <u>In general, visual contrasts are greater when objects are seen at close range. If other visibility factors are held constant, the greater the distance, the less detail is observable and the more difficult it would be for an observer to distinguish individual features. (BLM, 2013b)</u>

71-27 See Common Response 6 in Proposed PA/FEIS/EIR Section 4.5.3.6 regarding the CEQA analysis and impact determinations for visual resources. There are no designated scenic vistas in the Mojave National Preserve that include the Project site. Additionally, the CEQA analysis in the Draft PA/EIS/EIR, and in Proposed PA/FEIS/EIR as revised in response to comments and Lead Agency-initiated changes, does rely on the low level of viewership in its analysis of the visual sensitivity of a particular view. See Response 71-25. The number of potential viewers is part of the baseline condition against which the Project is analyzed, and not, as suggested in the comment, a mitigation of an impact. The comment's disagreement with the County's methodology for the analysis of impacts on visual resources and disagreement with the conclusions reached regarding the significance of impacts after implementation of mitigation measures provides no justification or supporting data that questions, with reasonable basis, the accuracy or adequacy of the information in the Draft PA/EIS/EIR, or the methodology for, or assumptions used for the analysis.

71-28 See Common Response 6 in Proposed PA/FEIS/EIR Section 4.5.3.6 regarding night sky impacts and regarding the existing VRI completed for the BLM Barstow Field Office in 2010, of which the Scenic Quality Rating is a factor, and regarding glint and glare.

71-29 See Common Response 6 in Proposed PA/FEIS/EIR Section 4.5.3.6 regarding glint and glare.

71-30 The impacts analyzed in Section 3.18.6 (Draft PA/EIS/EIR page 3.18-18 et seq.) include the long-term displacement of vegetation with the introduction of visual contrasts in texture, line, and color introduced by the solar facility. See, e.g., item 1 on Draft PA/EIS/EIR page 3.18-18, Contrast Summaries for KOPs 1 through 14B in Table 3.18-4 beginning on Draft PA/EIS/EIR page 3.18-19, and item 6 on Draft PA/EIS/EIR page 3.28-21. The Draft PA/EIS/EIR acknowledges wildlife viewing as a potential recreational use within the Project vicinity (p. 3.13-6), and impacts to recreational use of the Project site are described in Section 3.13. The displacement of wildlife is not within the scope of the visual resources analysis because the site is not identified or designated for scenic wildlife viewing. Draft PA/EIS/EIR Sections 3.3, Biological Resources – Vegetation, and 3.4, Biological Resources - Wildlife analyze the potential impacts on vegetation and wildlife, respectively. Refer to Common Response 4 in Proposed PA/FEIS/EIR Section 4.5.3.4 regarding potential groundwater impacts.

71-31 The potential impacts of the Proposed Action and alternatives on the user experience at Mojave National Preserve are analyzed in Draft PA/EIS/EIR Sections 3.13, Recreation (see page 3.13-7 acknowledging noise, dust, and visual disturbance near the Zzyzx Road entrance to the Preserve) and 3.18, Visual Resources (see pages 3.18-26 through 3.18-26 describing impacts on views from Key Observation Points (KOPs) 13, 14, and 19, which represent views from the Preserve). As noted on page 3.18-26, "The cumulative total of the area from which the Project may be seen from within the Preserve in the foreground/middleground distance zone covers approximately 350 acres. This represents 0.0002 percent of the 1.6-million-acre Preserve," and foreground/middleground views of

the Project site from elsewhere in the Preserve would be blocked by the Soda Mountains. Furthermore, as indicated on Draft PA/EIS/EIR page 3.18-18, "KOPs 13 and 14 are located within this boundary area on the edge of the Preserve. NPS staff indicated that there may be only one or two people who might hike to the edge of the Preserve boundary each year. In addition, because public access to this general area potentially may impact the presence of bighorn sheep, Preserve staff have indicated a desire to avoid encouraging human access into these mountains." Thus, no measureable impact to Preserve visitorship is anticipated as a result of the Project. The comment does not provide specific examples, facts, reasonable assumptions predicated upon facts, or other evidence in support of the comment's suggestion that the Project would have negative impacts on park visitorship and/or economic activity in connection with park tourism.

71-32 Potential cumulative impacts to burrowing owl, American badger, and desert kit fox are identified on Draft PA/EIS/EIR page 3.4-50. The analysis estimates that each of the four projects identified in the cumulative scenario within 10 miles of the Project would have similar impacts to these species as disclosed for the proposed Project and identified in the cumulative analysis. As discussed on Draft PA/EIS/EIR page 3.4-50, the implementation of specific mitigation measures would reduce Project-level impacts to these species.

Regarding connectivity for bighorn sheep, see Common Response 2 in Proposed PA/FEIS/EIR Section 4.5.3.2.

71-33 For each of the four cumulative projects identified within 10 miles of the Project site, focused biological surveys have not been performed to identify the potential presence of or potential impacts to American badger, desert kit fox, or burrowing owl. In the absence of specific quantitative survey data that describes the population status of these species, the estimate of potential cumulative effects in the Draft PA/EIS/EIR was appropriately nonspecific. The American badger, desert kit fox, and burrowing owl are not listed as threatened or endangered species by the USFWS or CDFW; therefore, potential habitat loss and species displacement are not regulated by the resource agencies. For American badger and desert kit fox, individual animals are protected by CDFW and potential habitat loss is not regulated. In the case of burrowing owl, CDFW recommendations for habitat compensation were incorporated into the Draft PA/EIS/EIR (page 3.4-54, Mitigation Measure 3.4-1f) to minimize construction-related impacts to this species and mitigate the loss of burrowing owl territories consistent with CDFW recommendations. The four cumulative projects will require surveys and avoidance measures for American badger, desert kit fox, and burrowing owl, with habitat compensation potentially required for owls.[4] The implementation of these project-level measures will reduce potential cumulative effects to these species.

71-34 Regarding bighorn sheep, refer to Common Response 2 in Proposed PA/FEIS/EIR Section 4.5.3.2.

[4] See, e.g., the XpressWest Project's Mitigation Measure BIO-2: Conduct Preconstruction Surveys and Install Environmental Fencing (Federal Railroad Administration, 2011, page A-43 et seq.)

71-35 The geographic scope for cumulative impacts to visual resources, as defined in Draft PA/EIS/EIR Section 3.18.7 (p. 3.18-32), consists of "the viewshed of the I-15 corridor *and locations from which a viewer could see the Proposed Action along with views of other projects*" (emphasis added). The cumulative visual impacts from nighttime lighting are acknowledged on Draft PA/EIS/EIR page 3.18-33, and in response to this comment, the following statement regarding the cumulative impacts of nighttime lighting has been added to the last paragraph in Section 3.18.7:

> It is worth noting that all night lighting is cumulative and contributes to the continued encroachment of night lighting on dark spaces.

Further, refer to the discussion of significant unavoidable cumulative night lighting impacts under CEQA on Draft PA/EIS/EIR page 3.18-43 (Impact Vis-6) and the discussion of significant unavoidable cumulative impacts on views from Mojave National Preserve and other locations under CEQA in Proposed PA/FEIS/EIR Section 3.18.10 (Impact Vis-4), as revised compared to the Draft PA/EIS/EIR. See also Common Response 6 in Proposed PA/FEIS/EIR Section 4.5.3.6.

71-36 Because the lands on the Project site are federally owned and administered by the BLM, San Bernardino County does not have land use jurisdiction on the Project site, and County land use policies therefore do not apply to the site. A General Plan Consistency Evaluation was presented in Draft PA/EIS/EIR Appendix I. As indicated therein, "The Land Use Element is intended to guide decision makers and the public in determining the pattern of land use development for the County. The Project would be located entirely on federally-administered public lands. Therefore, this element does not apply to the Project" (p. I-1); and "The San Bernardino County General Plan does not govern the use of federal lands located within the County, and so determinations of consistency with the General Plan will not affect the BLM's decision regarding the ROW application or CDCA Plan Amendment. The provisions of the General Plan are enforceable only with respect to those portions of the Project under County jurisdiction, i.e., the groundwater well permits. The General Plan was written with recognition of the limitations of County land use jurisdiction due to the fact that federal and state agencies own and control most of the land within the County" (p. I-2). Draft PA/EIS/EIR Appendix I provides a consistency evaluation for the policies in the Open Space and Conservation elements of the general plan that are applicable to the County's analysis of the Project and decision regarding the groundwater well permit (see page I-4 et seq.).

Furthermore, as explained in Draft PA/EIS/EIR Section 3.18.2.4, pursuant to FLPMA, the BLM has developed and applied a standard visual assessment methodology to inventory and manage scenic values on lands under its jurisdiction, including the lands within the Project site. The scenic values on BLM-administered lands are managed in accordance with this methodology, and are not subject to County land use policies.

71-37 Regarding the applicability of the San Bernardino County General Plan to the Project and the Draft PA/EIS/EIR's evaluation of consistency with applicable portions of the general

plan, refer to Response 71-36. Because the lands on the Project site are federally owned and administered by the BLM, San Bernardino County does not have land use jurisdiction on the Project site, and County land use policies, including the Renewable Energy Ordinance described in the comment, do not apply to the site. Although the County must analyze the whole of the Project under CEQA, the County's decision on the Project is limited to approval, approval with modifications, or denial of a groundwater well permit; the County's potential decisions for the Project do not include approval of a commercial solar facility. The potential effects of County approval of a groundwater permit are analyzed under Alternatives A, B, C, and D. The potential effects of County denial of a groundwater permit are analyzed under Alternatives E, F, and G; as identified in the analysis of Alternative F, County denial of a groundwater permit would not make the development of a commercial solar facility infeasible.

71-38 Solar energy facilities are permitted in Class L areas provided that the BLM complies with NEPA and follows the CDCA Plan Amendment process. For Class L lands, applicable guidelines from the CDCA Plan, Table 1 are as included in Draft PA/EIS/EIR Table 3.9-3 (p. 3.9-15 et seq). A discussion of CDCA Plan consistency for each Multiple-Use Class designation within the Proposed Action's and alternatives' footprints is provided in Draft PA/EIS/EIR Section 3.9.11. The comment does not question, with reasonable basis, the adequacy or accuracy of this analysis.

Alternative B includes the fewest acres of Class L lands of all action alternatives considered (497 acres, compared to 1,068 acres of Class L lands under the Proposed Action, Proposed PA/FEIS/EIR Sections 3.9.6.1 and 3.9.6.2). Additionally, it is noted that, as shown in Draft PA/EIS/EIR Figure 1-2, much of Utility Corridor 27-225 in the vicinity of the Project is within Class L lands; a Class L designation does not preclude development.

Furthermore, the comment's description of "the 4,179-acre fenced utility-scale project" is in error; as described in Draft PA/EIS/EIR Chapter 2, Proposed Action and Alternatives, the Proposed Action would consist of 2,222 acres within the permanently fenced areas (p. 2-5). Similarly, Alternatives B through D would fence smaller areas within the requested ROW area, as described on Draft PA/EIS/EIR pages 2-33 through 2-35.

71-39 Regarding the potential for the Project to result in overdraft or to adversely affect the health of Soda Spring and associated biological resources, refer to Common Response 4 in Proposed PA/FEIS/EIR Section 4.5.3.4.

71-40 There is no requirement to record public meetings held on a Draft EIS. Notes taken by the BLM, County, and/or their consultants during the meetings are included in the Administrative Record for this Project. The BLM has not violated any applicable laws, regulations, policies, or guidelines in holding public meetings, the intended and advertised purpose of which is "to aid the public's understanding of the project and to solicit written comments on planning issues and the potential impacts, alternatives, and

mitigation measures that should be considered in the Final Environmental Impact Statement/Environmental Impact Report" (BLM, 2013a, 2013b).

71-41 See Response 71-1. The comment's statement of opposition to the Project is noted.

Letter 72 – Responses to Comments from The Nature Conservancy

72-1 Project impacts to terrestrial wildlife movement were characterized in the Draft PA/EIR/EIS for desert tortoise (pages 3.4-33 to 3.4-34) and desert bighorn sheep (page 3.4-41). Potential cumulative impacts on movement and connectivity for bighorn sheep are discussed on Draft PA/EIR/EIS page 3.4-50. For many wildlife species that reside in the Project area, regional use of and movement between adjacent lands would not be affect by the Project.

72-2 The comments regarding the adequacy and accuracy of the analysis are addressed below where comments provide sufficient information to provide a detailed response. Regarding groundwater impacts, refer to Common Response 4 in Proposed PA/FEIS/EIR Section 4.5.3.4.

72-3 Regarding the relationship of the Proposed Action to the Western Solar Plan and decisions made in the Western Solar Plan Record of Decision (ROD), refer to Common Response 1 in Proposed PA/FEIS/EIR Section 4.5.3.1. The relationship of the Proposed Action to the FLPMA is described in Draft PA/EIS/EIR Section 1.3.1. The relationship of the Proposed Action to the Western Solar Plan has no bearing on the BLM's compliance with requirements set forth in the FLPMA.

72-4 The comment requests that focused burrowing owl survey findings be incorporated into the Proposed PA/FEIR/EIS. As identified in Response 61-21, focused burrowing owl surveys performed on the site by Kiva Biological Consulting (2013b) satisfy this request. Note that the 2013 Kiva burrowing owl surveys were complete at the time of Draft PA/EIS/EIR publication, and the raw survey data were cited on Draft PA/EIR/EIS pages 3.4-11 and 3.4-34.

72-5 The commenter asserts that the development of the Proposed Action on-site natural habitats may negatively affect resident birds and migratory birds. As discussed on Draft PA/EIS/EIR page 3.4-36, direct construction-related impacts to resident and migratory birds would be avoided and minimized by implementation of APMs 44, 46, 47, and 48 and Mitigation Measures 3.4-1a (monitoring by a designated biologist); 3.4-1b (biological monitoring during construction); 3.4-1c (WEAP); 3.4-1g (Bird and Bat Conservation Strategy); and 3.4-4 (preconstruction nesting bird surveys and avoidance measures). Habitat losses for golden eagle and burrowing owl are regulated by the USFWS and CDFW, respectively. Following USFWS guidance, the loss of potential golden eagle foraging habitat would be considered significant if losses occurred within 1 mile of an active nest. However, the nearest potentially active nest at least 4 miles from

the Project site. Burrowing owl habitat impacts would be fully mitigated, as described in Response 31-35.

72-6 The commenter states that the site is a tortoise mitigation corridor and should be avoided, and that the proposed 1:1 compensatory mitigation for desert tortoise is inadequate. A discussion of desert tortoise habitat connectivity issues was provided in the wildlife analysis (Draft PA/EIS/EIR p. 3.4-31 et seq.). Refer also to Common Response 3 in Proposed PA/FEIS/EIR Section 4.5.3.3, regarding desert tortoise. As noted in Response 31-21, the BLM requires a compensatory mitigation ratio of 1:1 to meet its "fully mitigated" standard for desert tortoise.

72-7 Regarding potential impacts to bighorn sheep population connectivity and movement, refer to Common Response 2 in Proposed PA/FEIS/EIR Section 4.5.3.2.

72-8 See Response 16-16 regarding mitigation for potential impacts to kit fox.

72-9 Regarding potential impacts to Mojave tui chub habitat, refer to Common Response 4 in Proposed PA/FEIS/EIR Section 4.5.3.4.

72-10 Regarding the methodology and assumptions used as part of the groundwater model to assess the Project's impacts, further comprehensive groundwater resource investigations required prior to Project construction, and the adequacy of mitigation required to address identified impacts, refer to Common Response 4 in Proposed PA/FEIS/EIR Section 4.5.3.4.

72-11 Pursuant to a Memorandum of Understanding (MOU) between San Bernardino County and the BLM, signed by the BLM California Desert District Manager on September 15, 2003 and approved by the County Board of Supervisors on December 2, 2003, all groundwater wells proposed to be drilled on BLM-administered lands within the County are required to comply with the County's Groundwater Ordinance. The terms of this MOU do not remove the BLM's responsibility to manage resources on lands it administers or to analyze impacts to those resources under NEPA. Comments on the terms of this MOU, in effect since 2003, are outside the scope of this EIS/EIR.

72-12 Receipt of the attachment is noted. Refer to Common Response 4 in Proposed PA/FEIS/EIR Section 4.5.3.4 regarding groundwater impacts.

Letter 73 – Responses to Comments from Kirsten Dutcher

73-1 The comment is noted. Regarding site alternatives, refer to Common Response 1 in Proposed PA/FEIS/EIR Section 4.5.3.1.

73-2 The comment does not raise an environmental issue, address the adequacy or accuracy of the Draft PA/EIS/EIR, or comment on the merits of the alternatives discussed. The BLM notes that in the event that it grants a ROW for the Proposed Action or an action alternative,

rent would be collected from the Grant Holder for the duration of the ROW grant. Information regarding the BLM's cost recovery regulations is available on the internet at: http://www.blm.gov/wo/st/en/prog/energy/cost_recovery_regulations/grant_issuance.html.

73-3 A discussion of the existing desert ecosystem that provides ongoing natural carbon uptake at the Project site and how it would be affected by the Project is provided on Draft PA/EIS/EIR pages 3.5-4, 3.5-10, and 3.5-12, and updated in Proposed PA/FEIS/EIR Section 3.5.6; based on available information, and accounting for the loss of carbon uptake in desert ecosystems, the Proposed Action is expected to result in a net reduction of GHG emissions. The comment suggests that the Lead Agencies "See: Lynn Fenstermaker, Carbon Neutral and Holly Campbell, Abby Metzger, Deidra Spencer, Stacey Miller, and Erica Walters, Here Comes the Sun: Solar Thermal in the Mojave Desert – Carbon Reduction or loss of Sequestration." However, the commenter fails to provide a copy of the referenced documents, any explanation of how they conflict with or supplement the analysis in the Draft PA/EIS/EIR, or any other specific basis for suggesting that the analysis in the Draft PA/EIS/EIR is inadequate or inaccurate. The Lead Agencies have been unable independently to locate a copy of an article that meets the suggested parameters for the first reference ("Lynn Fenstermaker, Carbon Neutral") based on online searches and independent review of Dr. Fenstermaker's curriculum vitae available from the Desert Research Institute, a copy of which is included in the administrative record for this Project, and which does not contain the word "neutral."[5] Accordingly, the Lead Agencies have been unable to review and consider the recommended article. The other article referenced in the comment (Campbell, et al., 2009) has been located and reviewed and a copy included in the administrative record for this Project. The Campbell et al., 2009 article provides an analysis of solar thermal technology, whereas the Project would use solar PV technology. Therefore, the information provided in that article that is specific to solar thermal technology is not relevant to this Project, and non-technology-specific information already has been considered, as described in Draft PA/EIS/EIR and Proposed PA/FEIS/EIR Sections 3.5, and is not new information. This comment does not question the adequacy or accuracy of information in the Draft PA/EIS/EIR, present new information relevant to the analysis, or affect the alternatives considered.

73-4 As specifically identified during surveys and stated on Draft PA/EIS/EIR page 3.4-33, et seq., surveys performed by the Applicant's environmental consultant and field observations by agency staff indicate that the trans-highway culverts in the Project area are used by a variety of wildlife, including deer, coyote, roadrunner, black-tailed jackrabbit, gray fox, Gambel's quail, woodrats and other small rodents, and potentially desert tortoise. Thus, the analysis presented in the Draft PA/EIS/EIR relies on empirical observations of actual on-site wildlife use of culverts, and not presumed use by larger wildlife species, to conclude that relatively smaller wildlife species would continue to

[5] Dr. Fenstermaker's curriculum vitae listing publications is available at http://www.dri.edu/images/directory/resume-527.pdf, and was last accessed by the lead agencies on December 23, 2014.

move through culverts following Project implementation. The comment does not question, with reasonable basis, the adequacy or accuracy of this analysis of movement corridors in the Draft PA/EIS/EIR.

Letter 74 – Responses to Comments from Nathan Mellott, et al.

74-1 The commenters' statements of support for the Project are noted.

Letter 75 – Responses to Comments from Jenny Holmes, et al.

75-1 The commenters' statements of support for the Project are noted.

Letter 76 – Responses to Comments from William Thacker

76-1 The comment's statement of support for the Project is noted.

76-2 The anticipated long-term economic impacts of the Proposed Action and alternatives are analyzed in Draft PA/EIS/EIR Section 3.14, Socioeconomics and Environmental Justice (p. 3.14-1 et seq.) The Applicant has not proposed to implement measures other than those described in the Plan of Development (Soda Mountain Solar, LLC, 2013a; Caithness Soda Mountain, LLC, 2011), SF-299 application (Soda Mountain Solar, LLC, 2013b), Groundwater Well Permit Application (Panorama Environmental, Inc., 2012), and Draft PA/EIS/EIR Chapter 2, Proposed Action and Alternatives. The comment's requests for additional benefits, such as lower utility bills or community solar panels, from the Applicant are outside the scope of the analysis for this Project.

Letter 77 – Responses to Comments from Lois Clark

77-1 The comment's statement of support for the Project is noted.

Letter 78 – Responses to Comments from Carl Mendenhall

78-1 The comment's statement of support for the Project is noted.

78-2 An analysis of the type(s) of energy project that may be built in lieu of or in addition to the Project would be speculative and is outside the scope of the analysis for this Project.

78-3 The comment is noted.

Letter 79 – Responses to Comments from Preston Hales

79-1 The anticipated long-term economic impacts of the Proposed Action and alternatives, including job creation impacts, are analyzed in Draft PA/EIS/EIR Section 3.14, Socioeconomics and Environmental Justice (p. 3.14-1 et seq.)

79-2 The comment's statement of support for the Project is noted.

Letter 80 – Responses to Comments from Caryn Davidson

80-1 The comment's statement of opposition to the Project is noted. The Project would not directly affect any lands within the Mojave National Preserve, as it is located outside of the Preserve. The potential impacts of the Proposed Action and alternatives on the user experience at Mojave National Preserve are analyzed in Draft PA/EIS/EIR Sections 3.13, Recreation (see page 3.13-7 acknowledging noise, dust, and visual disturbance near the Zzyzx Road entrance to the Preserve) and 3.18, Visual Resources (see pages 3.18-26 through 3.18-26 describing impacts on views from Key Observation Points (KOPs) 13, 14, and 19, which represent views from the Preserve). Impacts on the Soda Mountains Wilderness Study Area are analyzed in Draft PA/EIS/EIR Section 3.15, Special Designations. Please also see Common Response 2 in Proposed PA/FEIS/EIR Section 4.5.3.2 regarding bighorn sheep; Common Response 3 in Proposed PA/FEIS/EIR Section 4.5.3.3 regarding desert tortoise; Common Response 4 in Proposed PA/FEIS/EIR Section 4.5.3.4 regarding tui chub; and Common Response 6 in Proposed PA/FEIS/EIR Section 4.5.3.6 regarding visual resources, including views from Mojave National Preserve. The comment does not directly address the adequacy or accuracy of the analysis.

Letter 81 – Responses to Comments from Annie Stockley

81-1 The Draft PA/EIS/EIR considered and analyzed potential effects on the resources identified in the comment. Refer to Common Response 2 in Proposed PA/FEIS/EIR Section 4.5.3.2 regarding bighorn sheep; Common Response 3 in Proposed PA/FEIS/EIR Section 4.5.3.3 regarding desert tortoise; Common Response 4 in Proposed PA/FEIS/EIR Section 4.5.3.4 regarding tui chub; and Common Response 6 in Proposed PA/FEIS/EIR Section 4.5.3.6 regarding visual resources, including views from Mojave National Preserve.

81-2 Refer to Common Response 1 in Proposed PA/FEIS/EIR Section 4.5.3.1 regarding a distributed generation alternative.

Letter 82 – Responses to Comments from Linda Harter

82-1 The Draft PA/EIS/EIR considered and analyzed potential effects on the resources identified in the comment. Refer to Common Response 2 in Proposed PA/FEIS/EIR Section 4.5.3.2 regarding bighorn sheep; Common Response 3 in Proposed PA/FEIS/EIR Section 4.5.3.3 regarding desert tortoise; Common Response 4 in Proposed PA/FEIS/EIR Section 4.5.3.4 regarding tui chub; and Common Response 6 in Proposed PA/FEIS/EIR Section 4.5.3.6 regarding visual resources, including views from Mojave National Preserve.

Letter 83 – Responses to Comments from Daniel Elsbrock

83-1 The Draft PA/EIS/EIR considered and analyzed potential effects on the resources identified in the comment. Refer to Common Response 2 in Proposed PA/FEIS/EIR Section 4.5.3.2 regarding bighorn sheep; Common Response 3 in Proposed PA/FEIS/EIR Section 4.5.3.3 regarding desert tortoise; Common Response 4 in Proposed PA/FEIS/EIR Section 4.5.3.4 regarding tui chub; and Common Response 6 in Proposed PA/FEIS/EIR Section 4.5.3.6 regarding visual resources, including views from Mojave National Preserve.

83-2 The range of alternatives considered, including alternatives carried forward for detailed analysis (i.e., Alternatives B through G) and alternatives considered but rejected, is described in Draft PA/EIS/EIR Chapter 2. Additional discussion regarding the range of alternatives is provided in Common Response 1 in Proposed PA/FEIS/EIR Section 4.5.3.1.

Letter 84 – Responses to Comments from Eva Soltes

84-1 The comment's statement of opposition to the Project is noted.

84-2 The comment's statement of opposition to the Project is noted. The potential impacts of the Proposed Action and alternatives on the user experience at Mojave National Preserve are analyzed in Draft PA/EIS/EIR Sections 3.13, Recreation (see page 3.13-7 acknowledging noise, dust, and visual disturbance near the Zzyzx Road entrance to the Preserve) and 3.18, Visual Resources (see pages 3.18-26 through 3.18-26 describing impacts on views from Key Observation Points (KOPs) 13, 14, and 19, which represent views from the Preserve). The comment does not address the adequacy or accuracy of this analysis. Also refer to Common Response 6 in Proposed PA/FEIS/EIR Section 4.5.3.6 regarding visual resource-related impacts on views from Mojave National Preserve.

Letter 85 – Responses to Comments from Terry Wiener

85-1 The comment's statement of opposition to the Project is noted.

85-2 The potential effects of the Proposed Action and alternatives on visual resources are analyzed in Draft PA/EIS/EIR Section 3.18, Visual Resources (p. 3.18-1 et seq.). Also refer to Common Response 6 in Proposed PA/FEIS/EIR Section 4.5.3.6 regarding visual resources, including views from Mojave National Preserve.

85-3 The potential effects of the Proposed Action and alternatives on visual resources are analyzed in Draft PA/EIS/EIR Section 3.18, Visual Resources (p. 3.18-1 et seq.). Also, refer to Common Response 2 in Proposed PA/FEIS/EIR Section 4.5.3.2 regarding bighorn sheep connectivity.

85-4 The potential effects of the Proposed Action and alternatives on visual resources are analyzed in Draft PA/EIS/EIR Section 3.18, Visual Resources (p. 3.18-1 et seq.). Also

refer to Common Response 4 in Proposed PA/FEIS/EIR Section 4.5.3.4 regarding groundwater impacts.

85-5 The Desert Protective Council, Inc. comment letter is included in Appendix J as Letter 69. Please see Responses 69-1 through 69-12, above.

Letter 86 – Responses to Comments from Danielle Segura

86-1 Refer to Common Response 1 in Proposed PA/FEIS/EIR Section 4.5.3.1 regarding the consideration of a brownfields/disturbed lands alternative.

86-2 The Draft PA/EIS/EIR considered and analyzed potential effects on the resources identified in the comment. Refer to Common Response 2 in Proposed PA/FEIS/EIR Section 4.5.3.2 regarding bighorn sheep; Common Response 3 in Proposed PA/FEIS/EIR Section 4.5.3.3 regarding desert tortoise; and Common Response 6 in Proposed PA/FEIS/EIR Section 4.5.3.6 regarding visual resources, including views from Mojave National Preserve.

86-3 The Draft PA/EIS/EIR considered and analyzed potential effects groundwater resources in Section 3.19, Water Resources (p. 3.19-1 et seq.). Refer to Common Response 4 in Proposed PA/FEIS/EIR Section 4.5.3.4 regarding groundwater impacts.

86-4 The potential impacts of the Proposed Action and alternatives on the user experience at Mojave National Preserve are analyzed in Draft PA/EIS/EIR Sections 3.13, Recreation (see page 3.13-7 acknowledging noise, dust, and visual disturbance near the Zzyzx Road entrance to the Preserve) and 3.18, Visual Resources (see pages 3.18-26 through 3.18-26 describing impacts on views from Key Observation Points (KOPs) 13, 14, and 19, which represent views from the Preserve). The comment does not address the adequacy or accuracy of this analysis. Also refer to Common Response 6 in Proposed PA/FEIS/EIR Section 4.5.3.6 regarding visual resource-related impacts on views from Mojave National Preserve.

86-5 The Draft PA/EIS/EIR considered and analyzed potential effects bighorn sheep in Section 3.4, Biological Resources – Wildlife (p. 3.4-1 et seq.). Refer to Common Response 2 in Proposed PA/FEIS/EIR Section 4.5.3.2 regarding bighorn sheep.

86-6 Refer to Common Response 1 in Proposed PA/FEIS/EIR Section 4.5.3.1 regarding the consideration of a brownfields/disturbed lands alternative.

Letter 87 – Responses to Comments from Helen Grey

87-1 The comment's statement of opposition to the Project is noted. The potential impacts of the Proposed Action and alternatives on the user experience at Mojave National Preserve are analyzed in Draft PA/EIS/EIR Sections 3.13, Recreation (see page 3.13-7 acknowledging noise, dust, and visual disturbance near the Zzyzx Road entrance to the

Preserve) and 3.18, Visual Resources (see pages 3.18-26 through 3.18-26 describing impacts on views from Key Observation Points (KOPs) 13, 14, and 19, which represent views from the Preserve). The comment does not address the adequacy or accuracy of this analysis. Please also see Common Response 2 in Proposed PA/FEIS/EIR Section 4.5.3.2 regarding bighorn sheep; Common Response 3 in Proposed PA/FEIS/EIR Section 4.5.3.3 regarding desert tortoise; Common Response 4 in Proposed PA/FEIS/EIR Section 4.5.3.4 regarding groundwater resources; and Common Response 6 in Proposed PA/FEIS/EIR Section 4.5.3.6 regarding visual resources, including views from Mojave National Preserve.

Letter 88 – Responses to Comments from Samantha Johnson

88-1 The comment's statement of opposition to the Project is noted.

Letter 89 – Responses to Comments from Elizabeth Bushong

89-1 The comment's statement of opposition to the Project is noted.

Letter 90 – Responses to Comments from Gregory Glenn

90-1 The comment's statement of opposition to the Project is noted.

Letter 91 – Responses to Comments from Albert Cutillo

91-1 Potential impacts on wildlife, including desert tortoise, were considered and analyzed in Draft PA/EIS/EIR Section 3.4, Biological Resources - Wildlife. Additional information is provided in Common Response 3 in Proposed PA/FEIS/EIR Section 4.5.3.3 regarding desert tortoise impacts.

91-2 A 2013 analysis of the potential for a heat island effect in large solar farms found that it is unlikely that a heat island effect could occur as a result of the installation of a large solar PV project. Specifically, "The field data and our simulations show that the annual average of air temperatures at 2.5 m off the ground in the center of simulated solar farm section is 1.9° higher than the ambient and that it declines to the ambient temperature at 5 to 18 m heights. The field data also show a clear decline of air temperatures as a function of distance from the perimeter of the solar farm, with the temperatures approaching the ambient temperature (within 0.3°), at about 300 m away. Analysis of 18 months of detailed data showed that in most days, the solar array was completely cooled at night, and, thus, it is unlikely that a heat island effect could occur." (Fthenakis and Yu, 2013).

91-3 The BLM manages federal lands under its jurisdiction in accordance with the Federal Land Policy and Management Act of 1976 (FLPMA). The FLPMA establishes public land policy; guidelines for administration; and provides for the management, protection, development, and enhancement of public lands. FLPMA Title V, Section 501, establishes the BLM's authority to grant ROWs for generation, transmission, and distribution of

electrical energy. The BLM is responsible for responding to requests regarding the development of energy resources on BLM-administered lands in a manner that balances diverse resource uses and takes into account the long-term needs for renewable and non-renewable resources for future generations. As indicated on Draft PA/EIS/EIR page 3.9-7, the BLM may allow electrical generation facilities, including solar generation, on the Project site after NEPA requirements are met. The NEPA process provides opportunities for the public to participate in the BLM's decision-making, including by making comments on the Draft PA/EIS/EIR. The comment's opposition to the Project is noted.

91-4 In addition to the analysis of groundwater impacts presented in the Draft PA/EIS/EIR Section 3.19, Water Resources, refer to Common Response 4 in Proposed PA/FEIS/EIR Section 4.5.3.4 regarding groundwater impacts.

Letter 92 – Responses to Comments from Larry Bechtold

92-1 Your interest in the review process is noted. The BLM and San Bernardino County held three public meetings for the Draft PA/EIS/EIR in January 2014. These meetings were noticed via the Project website at: http://www.blm.gov/ca/st/en/fo/barstow/renewableenergy/soda_mountain.html.

Letter 93 – Responses to Comments from James Jackson

93-1 Opposition to the Project is noted. Regarding the evaluation of a brownfields/degraded lands alternative, refer to Common Response 1 in Proposed PA/FEIS/EIR Section 4.5.3.1.

Letter 94 – Responses to Comments from Andrew Slade

94-1 The comment is noted. Specific concerns about brine pond design and biological monitoring during construction are addressed below, where the commenter provides additional context for the general statement of concerns provided below.

94-2 As indicated in Draft PA/EIS/EIR Sections 3.3 and 3.4, the proposed Project site was surveyed for special-status plants, succulents, and jurisdictional waters between 2009 and 2013 (see Table 3.3-1, p. 3.3-2) and for desert tortoise, Mojave fringe-toed lizard, bighorn sheep, golden eagle, and bats, and an avian point count survey completed, between 2009 and 2012 (see Table 3.4-1, p. 3.4-1). Survey methods are summarized on pages 3.3-1, 3.3-2, and 3.4-2 through 3.4-4.

94-3 As noted in Mitigation Measure 3.4-1b (Draft PA/EIS/EIR p. 3.4-51), pre-construction surveys would be conducted to identify and relocate identified special-status species from the work area. Similar surveys and relocation efforts are not typically performed for non-special-status species prior to construction. Many avian species and large common wildlife species that use the Project site would avoid direct impacts by leaving the site (e.g., coyote). The commenter is correct that many slow-moving and subterranean species, such as snakes,

lizards, and small mammals could be subject to loss during construction. Because only a portion of the Project site would be graded, many of the native plants and wildlife on the site would remain on-site during Project operations. As discussed in the Draft PA/EIS/EIR, focused preconstruction avian surveys would be conducted and active nests would be avoided and monitored during the nesting season to avoid impacts to on-site nesting birds that are protected by the federal Migratory Bird Treaty Act (see APMs 46, 47, and 55, Draft PA/EIS/EIR pages 3.4-25 and 3.4-26; Mitigation Measure 3.4-1f: Burrowing Owl Protection Measures, page 3.4-53; and Mitigation Measure 3.4-4: Avoid Disturbance to Nesting Birds, page 3.4-64). Active nests that are identified during surveys shall be avoided by no-work buffers as identified in Mitigation Measure 3.4-4.

94-4 See Draft PA/EIS/EIR Section 3.4, pages 3.4-1 through 3.4-9, for a discussion of desert tortoise survey methods and results and natural history on and around the Project site. Analysis of the Proposed Action's potential impacts in desert tortoise, its habitat, and its movement and habitat connectivity is provided on Draft PA/EIS/EIR pages 3.4-30 through 3.4-34. This comment does not question, with reasonable basis, the adequacy or accuracy of that analysis.

94-5 Flooding is adequately addressed in the Draft PA/EIS/EIR. Existing conditions related to surface water hydrology, drainage, and flooding are addressed in Draft PA/EIS/EIR Section 3.19 on pages 3.19-2 through3.19-5; the methodology for analyzing flooding-related impacts is described on pages 3.19-16 through 3.19-18; analysis of the potential impacts of the Proposed Action on surface water hydrology (including flooding) is provided on pages 3.19-31 through 3.19-28; analysis of the impacts of alternatives on surface water hydrology is provided on pages 3.19-38 through 3.19-40; and cumulative flooding-related effects are described on page 3.19-42.

As indicated on Draft PA/EIS/EIR page 2-11, the brine ponds would be constructed with a plastic liner and leak detection systems, and would be designed and constructed in accordance with California Code of Regulations Title 27 guidelines, which include the requirement to use geosynthetic (e.g., geomembrane) pond liners (Section 20324). Measures to minimize or avoid impacts to wildlife from brine ponds are addressed in APM 59 (Draft PA/EIS/EIR p. 2-30).

Letter 95 – Responses to Comments from Erin Horwith

95-1 Support for the Project is noted. Potential impacts to sensitive vegetation communities and special-status plant species are analyzed, and mitigation measures recommended, in Draft PA/EIS/EIR Section 3.3, Biological Resources – Vegetation. Specifically, see Mitigation Measure 3.3-2, Vegetation Best Management Practices, which includes measures to avoid or minimize impacts to vegetation resources, and Mitigation Measure 3.3-3, Special-Status Plant Species and Cacti Impact Avoidance and Minimization, which includes measures to protect special-status plants from unintended impacts and provide for the salvage of protected cacti.

Letter 96 – Responses to Comments from Ben Chesley

96-1 Support for the Project is noted.

96-2 The potential for the Proposed Action or an action alternative to offset GHG emissions from fossil fuel-fired power plant is addressed in Draft PA/EIS/EIR Section 3.5, Climate Change. The analysis assumes that the solar power would displace energy generated by dispatchable natural-gas fired combined-cycle power plants, rather than coal-fired plants.

96-3 As noted in Draft PA/EIS/EIR Section 3.2, Air Resources, operation and maintenance of the Proposed Action or an action alternative would result in criteria pollutant emissions (see, e.g., Table 3.2-7, Estimated Maximum Daily Operation and Maintenance Emissions for Proposed Action). As noted in the analysis, "The annual and maximum daily emissions of all the criteria pollutants are below the respective federal *de minimis* levels and the MDAQMD thresholds; therefore, impacts associated with operation and maintenance would not be expected to result in or contribute to an exceedance of a federal or state AAQS" (p. 3.2-18). Additionally, it cannot be known with certainty that the offset GHG emissions described in Section 3.5, Climate Change, would co-occur with any offsets in emissions of criteria pollutants, nor is it known whether such potential offsets would occur within the Mojave Desert Air Basin or within the Western Mojave Desert Ozone Non-Attainment area.

96-4 The comment is noted. The comment does not address the adequacy or accuracy of the environmental analysis in the Draft PA/EIS/EIR and does not identify any other significant environmental issue requiring substantive response.

96-5 The comment is noted. The comment does not address the adequacy or accuracy of the environmental analysis in the Draft PA/EIS/EIR and does not identify any other significant environmental issue requiring substantive response.

96-6 The comment is noted. The comment does not address the adequacy or accuracy of the environmental analysis in the Draft PA/EIS/EIR and does not identify any other significant environmental issue requiring substantive response.

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APPENDIX L
Draft Mitigation Plans

L-1. Draft Dust Control Plan

L-2. Draft Vegetation Resources Management Plan

L-3. Draft Desert Tortoise Translocation Plan

L-4. Draft Burrowing Owl Mitigation and Monitoring Plan

L-5. Draft Habitat Compensation Plan

L-6. Draft Bird and Bat Conservation Strategy

L-7. Draft Raven Monitoring and Control Plan

L-8. Desert Pavement Protection Plan

L-9. Draft Water Quality Management Plan

L-10. Draft Groundwater Monitoring and Mitigation Plan

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APPENDIX L-1
Draft Dust Control Plan

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Dust Control Plan

Soda Mountain Solar Project

San Bernardino County, California

BLM Case No. CACA 49584

September 2014

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Dust Control Plan

Soda Mountain Solar Project

San Bernardino County, California
BLM Case No. CACA 49584

Submitted to:

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1 INTRODUCTION

Soda Mountain Solar, LLC (SMS), has applied to the U.S. Department of the Interior, Bureau of Land Management (BLM), for a right-of-way (ROW) grant that would authorize construction, operation, and decommissioning of the proposed Soda Mountain Solar project (project). The project consists of a 358-MW solar generating facility located approximately 6 miles southwest of Baker, CA. Project construction would involve vegetation removal, grading, and trenching to install the solar panels, construct access roads and facilities, and install underground collector cables. Project operation would involve panel washing twice annually and regular facility inspections throughout the life of the project. These activities have the potential to emit fugitive dust as described in the project Draft Plan Amendment and Environmental Impact Statement/Environmental Impact Report (PA/EIS/EIR). Mojave Desert Air Quality Management District (MDAQMD) Rule 403.2 requires preparation of a Dust Control Plan prior to conducting earthmoving activities for projects that will disturb more than 100 acres. The project will disturb approximately 2,557 acres; therefore, preparation and submittal of a Dust Control Plan to MDAQMD is required prior to project earthmoving activities.

This Dust Control Plan was developed in accordance with the MDAQMD Nuisance Rule 402, Fugitive Dust Rule 403, Fugitive Dust Control for the Mojave Desert Planning Area Rule 403.2, and Dust Control Plan Guidance (MDAQMD 1977a; 1977b; 1996; 2001).

2 PURPOSE OF THIS PLAN

Construction of the proposed facilities will result in fugitive dust. Fugitive dust is particulate matter (PM) that is suspended in the air by wind or human activities and does not come from a point source. Half of fugitive dust particles are 10 microns or smaller (PM_{10}), and PM_{10} can remain airborne for weeks and cause respiratory illness, lung damage, and premature death. People in California are exposed to unhealthful levels of PM_{10} more frequently than to any other air pollutant measured (California Environmental Protection Agency 2014). The factors that affect dust control include:

- Temperature, wind, and humidity;
- Size and weight of vehicles;
- Vehicle speed, frequency, and number of active vehicles;
- Soil characteristics (chemical composition, particle size distribution, organic components); and
- Day-to-day aggressiveness of mitigation efforts (e.g., application of water or dust suppressants).

Fugitive dust can be created directly from the activities involved in project construction, such as vegetation removal, grading, trenching, backfill, or topsoil replacement. Vehicles and equipment moving rapidly on unsurfaced roads and work areas can also create dust, while significant wind action on unprotected spoil piles or topsoil storage areas is yet another source of dust. These activities consist of a series of different operations, each with its own duration and potential for dust generation. Emissions from any single construction site can be expected 1) to have a definable beginning and an end, and 2) to vary substantially over different phases of the construction process. This contrasts with most other fugitive dust sources, where emissions are either relatively steady or follow a discernable annual cycle.

Air quality regulations require the use of control techniques to minimize fugitive dust emissions. The goal is to eliminate visible airborne fugitive dust to the extent possible, given the construction techniques and requirements. This plan is designed to reduce fugitive dust emissions from the project to a minimum and applies only to fugitive dust generated by construction activities and vehicle trips by support equipment on unpaved roads.

3 APPLICABLE RULES

The project site is within the jurisdiction of the MDAQMD, which regulates air pollutant emissions for all sources in the Mojave Desert Air Basin other than motor vehicles. This Dust Control Plan was prepared in accordance with the following MDAQMD rules applicable to the Soda Mountain Solar Project (BLM 2013):

- **Rule 402 – Nuisance**
  This rule prohibits discharge from any source whatsoever in such quantities of air contaminants or other material that cause injury, detriment, nuisance, or annoyance to any considerable number of persons or to the public, or which endanger the comfort, repose, health, or safety of any such persons or the public, or which cause, or have a natural tendency to cause injury or damage to business or property (MDAQMD 1977a).
- **Rule 403 – Fugitive Dust**
  This rule limits the emissions of fugitive dust or PM from a variety of activities and sources such as grading, construction, and storage sites. It includes a visible emissions property line standard, a sampling standard of 100 micrograms per cubic meter, and precautionary requirements to prevent trackout on paved public roads (MDAQMD 1977b).
- **Rule 403.2 – Fugitive Dust Control for the Mojave Desert Planning Area**
  This rule requires the preparation and approval of a dust control plan prior to commencing earth-moving activities. The plan may include measures such as implementing periodic watering, preventing trackout onto paved surfaces, covering loaded haul vehicles while operating on publicly-maintained paved surfaces, and stabilizing graded site surfaces upon completion of grading when subsequent development is delayed or expected to be delayed for more than 30 days (MDAQMD, 1996).
- **Attainment Plans**
  As required by the federal and California Clean Air Acts, air basins or portions thereof have been classified as in either "attainment" or "non-attainment" of each criteria air pollutant, based on whether or not the standards have been achieved. Jurisdictions of non-attainment areas are also required to prepare an air quality attainment plan that includes strategies for achieving attainment. The MDAQMD has several attainment plans that are applicable to the proposed project, including the Mojave Desert Planning Area Federal Particulate Matter Attainment Plan.

The District's Rule 403.2, Fugitive Dust Control for the Mojave Desert Planning Area, was developed to ensure that state and federal Ambient Air Quality Standards for PM_{10} will not be exceeded due to anthropogenic sources of fugitive dust within the Mojave Desert Planning Area; and to implement the control measures contained in the Mojave Desert Planning Area Federal PM_{10} Attainment Plan.

Dust control measures identified in this plan are consistent with MDAQMD rules and attainment plans for fugitive dust. In addition, the dust control measures are based on MDAQMD's Dust Control Plan Guidance (MDAQMD 2001).

4 PROJECT DESCRIPTION

4.1 LOCATION AND FACILITIES

As shown in Figure 1, the project is located approximately 6 miles southwest of the community of Baker, along Interstate 15 (I-15). The project consists of a 358-megawatt (MW) photovoltaic (PV) solar energy generating facility located on federal ROW administered by the BLM in a rural area of the Mojave Desert, east of the western Soda Mountains in unincorporated San Bernardino County. Solar array fields and project facility construction will disturb approximately 2,557 acres. The area of disturbance by project features is provided in Table 1. Figure 2 depicts the project layout.

Table 1: Area of Project Disturbance

Project Component	Area of Disturbance (acres)
Solar Arrays	2,227[1]
Substation, Switchyard, and Interconnection	40
Rasor Road Realignment	68
Access Roads	106
Berms	33
Collector Routes	24
Laydown Area	30
Temporary Desert Tortoise Exclusion Fence	29
Total	2,557

Notes:

[1] Solar array area of disturbance is calculated as all areas within the solar array security fence and within 30 feet outside of the solar array security fence, excluding other Project components. Project components included within the solar array security fence include the operation and maintenance buildings, warehouses, water tanks, wells, water treatment facility, and brine ponds. Impacts for these components are accounted for in the impacts for the solar arrays.

Source: BLM 2013.

Figure 1: Project Location

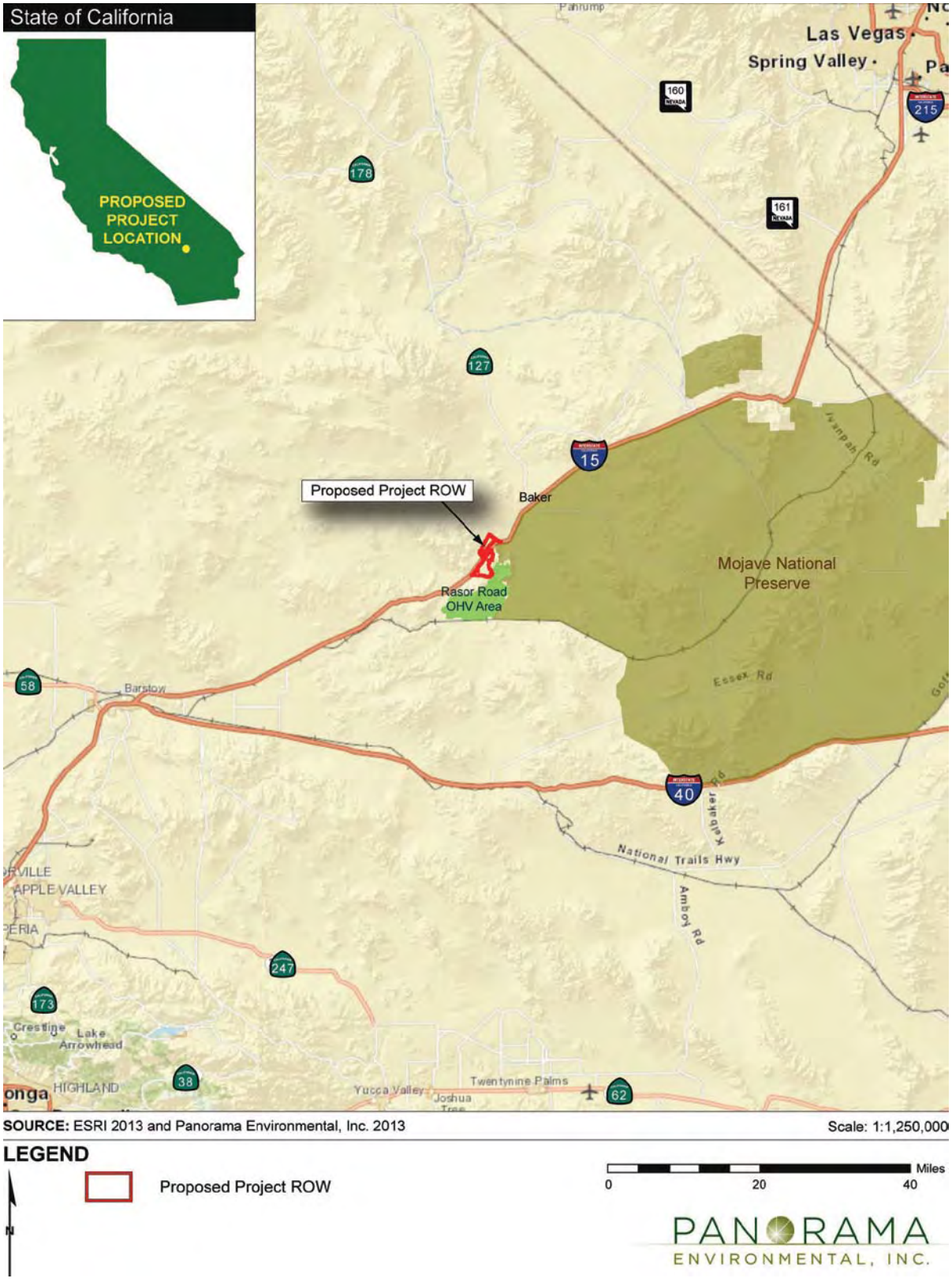
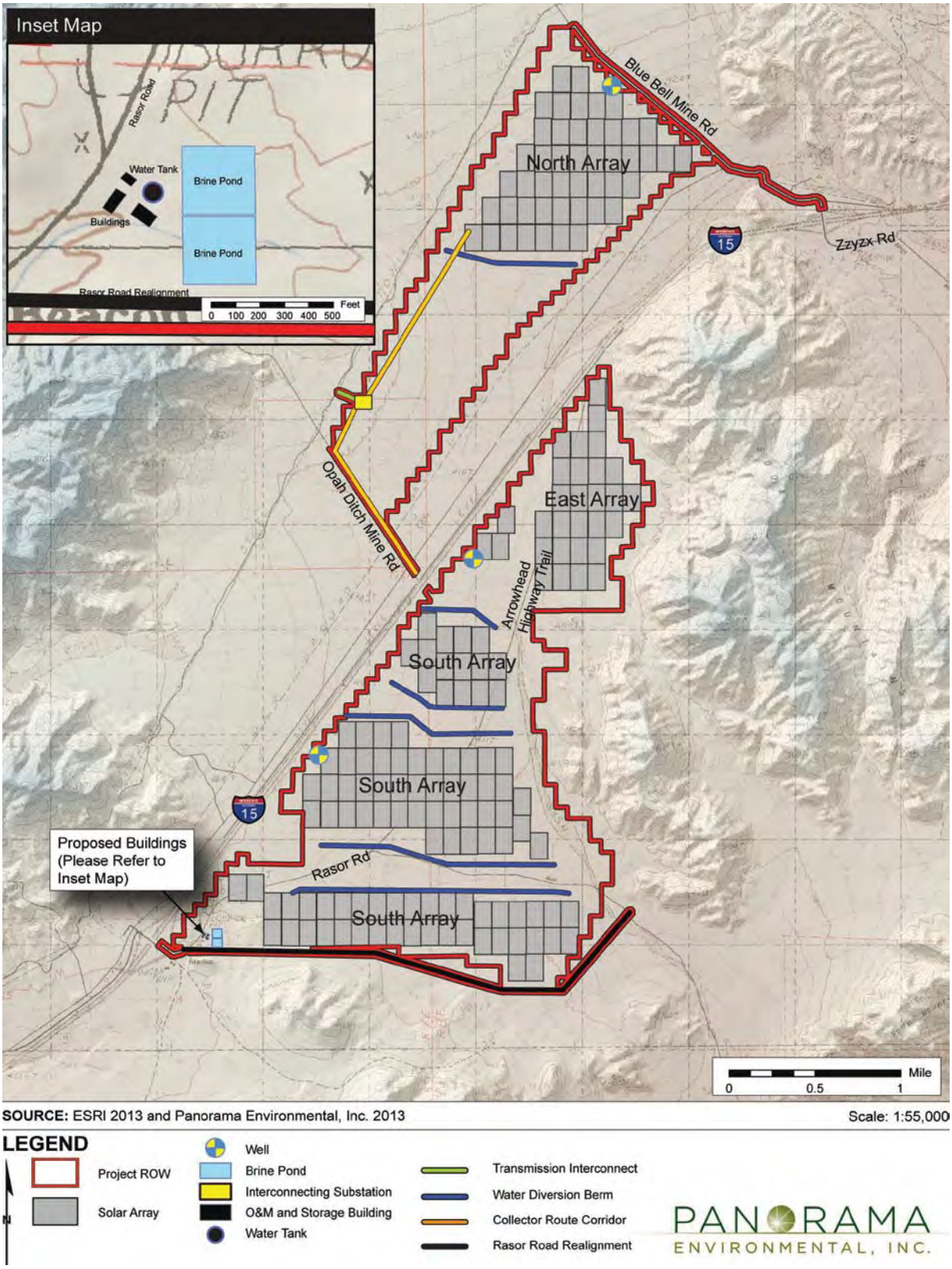


Figure 2: Proposed Project Layout



4.2 CONSTRUCTION

Construction is anticipated to occur over a 24- to 30-month period. Construction phasing will depend on the terms of the Power Purchase Agreement (PPA) with the local utility company, but is anticipated to comprise the following: 100 MW in Year 1, 125 MW in Year 2, and 125 MW in Year 3. The construction workforce would consist of an average of 175 direct labor workers, with a peak of to 250 directly employed labor workers during the height of construction. In addition to this direct labor workforce, approximately 25 to 40 additional workers at the site would engage in supervision, contract services, administration, and other non-direct labor activities.

The project would include the construction of several solar panel arrays, operation and maintenance buildings and storage areas, a substation, switchyard and appurtenant facilities, and associated roads and a short transmission intertie. Project construction would include the following main elements and activities (BLM 2013):

- Clearing, preparation, and grading of temporary laydown areas, switchyard area, and substation area;
- Surveying, clearing, and grading of internal road corridors to transport construction equipment, materials, and crews within the site;
- Improvement of Rasor Road to the main entrance of the solar facility;
- Rerouting of the portion of Rasor Road that is located in the proposed array fields to the southern perimeter of the array fields;
- Construction of earthen berms;
- Construction of water well(s);
- Construction of reverse osmosis facilities, including brine ponds (if necessary based on water quality of pumped groundwater);
- Construction of buildings;
- Construction of foundations and mounts for panel arrays, inverters, trackers, and medium-voltage transformers;
- Installation of the electrical collection system, including low-voltage circuits;
- Assembly and erection of solar panels;
- Construction and installation of the substation and switchyard;
- Solar panel commissioning and energizing;
- Final grading and drainage; and
- Restoration activities.

4.2.1 Site Clearing and Grading

Construction would commence with site clearing and grading of the laydown areas and the substation location. The construction contractor would then survey, clear, and grade road corridors to allow equipment, materials, and workers to be brought to the construction area.

Small temporary parking areas may be established adjacent to the array locations to allow direct access to work areas. Alternatively, larger central parking areas may be constructed, and vans or other vehicles would be used to bring workers, equipment, and materials to the area under construction. Materials and equipment would arrive on tractor-trailers at the staging area and would be brought directly to the installation location. After the initial solar arrays are installed and interconnected to the grid, they would begin generating power while additional PV blocks are constructed.

The solar arrays would be surveyed between 90 and 180 acres at a time. Within the surveyed area, larger vegetation would be cut or crushed as described below, and the ground would be prepared through isolated grading. The locations for the inverters, transformers, and buried electrical lines then would be surveyed.

Prior to construction, areas of the project site proposed for the location of the array blocks and other infrastructure would undergo partial removal of scrub vegetation; plants would be cut back leaving the root structure and about 6 inches of stem in place. Isolated grading would be undertaken at minor drainage washes along the alignment of the wash, and would be used to level isolated undulations. Grading would also be conducted along access roads through the array blocks. Up to 1,155 acres would be graded for the project (Panorama Environmental, Inc., 2013); additional areas would be subject to disc and roll or another type of ground treatment. The final area and limits of grading will be determined during detailed design, but will be within the footprint of disturbance analyzed in the PA/EIS/EIR. The staging area, road corridors, building and substation location, and areas for other infrastructure would be cleared and graded. Rocks or boulders removed from the array area would be used as fill within the earthen berms. The remaining fill to construct the earthen berms would be taken from areas immediately adjacent to the berms.

Trenches would be located along roadways and areas already disturbed by the installation process. Roads would be constructed at grade to maintain existing sheet/shallow flow through the site during storm events. In select locations of the site, cut-and-fill may be required. A site-specific stormwater prevention plan or best management practice plan is required and would provide a description of the erosion control methods planned for the site.

Draft grading plans would be developed by the SMS prior to the start of construction. The draft grading plans would include proposed contours, grading daylight lines, flow lines, grade breaks, potential drainage features, and spot elevations sufficient to demonstrate that streets, driveways, parking lots, and drainage grades meet minimum requirements. Final design plan sheets would be prepared at appropriate scale and would show layout and location of site grading improvements and drainage facilities. Earthwork quantities (i.e., cut, fill, and net volumes) would be shown on the plans. Design section sheets would be produced at appropriate scale and would contain site cross sections and other pertinent features for proposed grading features corresponding to those depicted on the grading plans.

4.2.2 Solar Array Assembly and Construction

Construction of the solar arrays is expected to take place at a pace of approximately 3 MW per week. Construction of the arrays is generally expected to proceed from north to south; however, construction phasing would ultimately be determined by the terms of the PPA. Array construction would begin with the installation of array support posts, which would be vibrated into the ground or bored or driven if necessary. Once the support structures are in place, solar panels would be attached to the support frame. The assembled groups of solar panels would be wired together into strings via connectors on the back of the modules. Assembled panel sections then would be connected to combiner boxes located throughout the arrays that would deliver power to the inverter. Inverters would be mounted on concrete pads or driven piles. Inverters and transformers would be brought in by tractor-trailers and delivered directly to the mounting pad sites.

Buried electrical lines for direct current (DC) array wiring and alternating current (AC) wiring between inverters and transformers would then be installed using trenching machines. The trenches would be approximately 1 to 2 feet wide and 2 to 4 feet deep. The trenched areas would be filled once the cables are buried. After this work is complete, and depending on the level of ground preparation chosen, the surveyors, vegetation cutters, graders, and trenchers would move on to the next block.

It is anticipated that the solar panels would require one washing during the construction phase prior to energizing and performance testing of the arrays in order to remove the dust that has accumulated on the panels during construction.

4.2.3 Collection Line Construction

The medium-voltage collection cables would be trenched at depths up to 4 feet using a trenching machine. The trenches would be approximately 1 to 2 feet wide. Multiple trenches may be placed adjacent to each other, depending on the number of collector circuits in a particular location. The cables would be manually placed within the trenches in layers (as necessary) followed by a backfill and compaction operation. Alternatively, a cable laybox would be used to automate the cable placement and backfill process. The main trenching operations would be for installation of DC cables from the combiner boxes to the inverter skids and installation of AC collector circuits between inverter skids and the substation. The exact locations would be determined during detailed design. The laydown areas (approximately 100 feet by 100 feet) would generally be staged close to the work fronts, distributed throughout the arrays, and within disturbance limits.

The collector circuits from the east and south arrays would be routed to the project substation by boring under I-15. The boring operation would be accomplished by constructing a boring pit on each side of I-15 to initiate and terminate the bore. The collector circuits would cross I-15 through 15 to 24 bores in a 150-foot-wide corridor at a 90-degree angle, and would be installed per Caltrans requirements. The collector cable would be installed by circuit in conduits, with each circuit contained in a single 6-inch diameter conduit (typical) spaced approximately 10 feet on center. Alternative design concepts for boring design may be considered based on project

requirements. SMS would coordinate closely with Caltrans and would secure the necessary encroachment permit for activities within Caltrans ROW. No overhead collector lines are proposed.

4.2.4 Substation and Switchyard Construction

At the same time the solar arrays are being constructed, separate crews would begin building the substation, switchyard, and the interconnection to the 500 kV transmission line. Los Angeles Department of Water and Power would be responsible for construction of the switchyard. One tower would be removed from the existing line and two turning structures would be constructed adjacent to the removed tower. The turning structures would direct the 500 kV transmission line into and out of the new switchyard. The substation and switchyard would be graded and compacted to an approximately level grade. Equipment would be staged adjacent to the site.

A substation and switchyard grounding grid would be installed as required. Multiple concrete pads and/or piers would be constructed as foundations for substation equipment and the remaining area would be graveled. Concrete piers and footings would be installed to support the transmission towers, switchyard, and substation buswork. Electrical transformers, switchgear, and related substation facilities would be designed and installed/constructed to transform the 34.5 kV power on the collection lines to the transmission line voltage. A chain-link fence would then be erected around the substation and switchyard.

4.2.5 On-site Building Construction

The on-site buildings are proposed to be pre-engineered metal buildings that would be fabricated off-site. Sections would be transported to the project site for erection and assembly. The buildings would be anchored to concrete foundations on site. The interior details and other finish work would be completed on site after anchoring.

4.2.6 Access Road Construction

Access road construction activities would include improvements to existing roads, the realignment of Rasor Road, and construction of new internal roads for panel access and site maintenance.

Existing site roads (mainly the southern entrance to the site, Blue Bell Mine Road, and the access road on the west side of the site parallel to the transmission lines) may require some reinforcement with rip-rap or crushed aggregate during construction and maintenance of the project. These additions would be limited to areas previously damaged by erosion or washed out in rain events or where sharp turns need to be widened to allow equipment deliveries. Most wash crossings would be at grade over wide channels with compacted native materials.

The relocation of Rasor Road would result in approximately 2.6 miles of newly constructed, 26 foot wide roadway. The road surface would consist of graded and compacted native material. Aggregate surface material is not proposed.

To access the interior of the site during construction and operation, approximately 14.5 miles of graded access and maintenance roadways would be constructed. Access roads would be 16 feet wide and maintenance roads would be 10 feet wide. These roads would consist of compacted native material and would be graded as necessary, but generally would follow the existing terrain. Larger boulders that could impede vehicle access would be removed. These permanent access roads would be compacted to meet load requirements for vehicle traffic over the life of the project.

4.3 OPERATION AND MAINTENANCE

Operational needs at the site include monitoring and optimizing the power generated by the solar arrays and interconnection with the transmission lines, operating the solar array tracking system, and conducting panel washing activities periodically through the year. During operation, it is anticipated that the proposed project would require a workforce in the range of approximately 25 to 40 workers, which include a mix of professional staff and maintenance and security personnel.

Maintenance activities would include inspecting, repairing, and maintaining the arrays and tracking systems and the Supervisory Control and Data Acquisition (SCADA) system; washing panels; and troubleshooting the collector lines and repairing damaged cables, which may necessitate some trenching. Additional maintenance would be required to maintain the administrative buildings, fencing and signage, roadways, and other ancillary facilities at the site. The majority of planned maintenance activities would be performed before sunrise, with repairs made at sundown. To ensure security of the facility, nighttime security and monitoring personnel would be employed.

The substation would be unmanned during operation; however, on-site personnel would visit the substation as needed to operate equipment or interface with the relaying and metering equipment. One 500-gallon diesel tank or 50-cubic-foot propane tank would be kept on site permanently for emergency power generation use in the event of an electrical outage. The emergency generator would be located adjacent to the ancillary buildings on the southwest side of the project site.

4.4 DECOMMISSIONING AND SITE RECLAMATION

When the proposed project reaches the end of its useful life, structures and equipment would be removed for reuse, or sold as scrap, and the land surface would be reclaimed. The decommissioning and site reclamation activities that would occur are anticipated to be substantially in conformance with those described in the draft Decommissioning and Closure Plan (BLM 2013). Because site conditions are likely to change over the life of the project and to assure that the Decommissioning and Closure Plan addresses all necessary conditions, the draft will be finalized and approved by the BLM before decommissioning and reclamation activities begin.

4.5 EQUIPMENT

Standard construction equipment would be used during construction, including earth-moving equipment (e.g., bulldozers, excavators, and backhoes) and road-building equipment (e.g., compactors, scrapers, and graders). Construction equipment would include air compressors, all-terrain passenger vehicles, backhoes, cranes, a drill rig, flat-bed trucks, a front-end loader, pick-up trucks, a pile driver, a trencher, and water trucks.

Over the approximately 24- to 30-month construction period, the Project would require approximately 3,000 truckloads of construction materials per month for delivery of components and construction materials, including concrete. Up to 90,000 truckloads would result over the total construction period, excluding travel by construction workers. If water is obtained from an off-site source during construction, an estimated 30 water transport truck trips per day would also be required. Average truck traffic would be approximately 120 trucks per day, 25 days per month. SMS would use a just-in-time delivery system with supplies and components delivered on a schedule to minimize on-site storage needs.

Table 2 provides a list of the equipment associated with the proposed project by project phase, including operation and maintenance.

Table 2: Equipment List	
Equipment Type (Construction)	Number
Air Compressors	6
Cranes	2
Excavators	6
Forklifts	11
Generator Sets	19
Heavy-duty Trucks (off-site material transportation)	100
Off-Highway Trucks and Tractors	19
Passenger Cars	250
Plate Compactors	4
Rubber Tired Dozer	4
Skid Steer Loaders	1
Sum Graders	1
Sweepers/Scrubbers	1
Tractors/Loaders/Backhoes	7
Trenchers	1
Other Construction Equipment	20
Other General Industrial Equipment	14
Equipment Type (Operation and Maintenance)	Number
Passenger Cars	38
Water Trucks	11

5 DUST CONTROL MEASURES

5.1 DUST CONTROL MEASURES IDENTIFIED BY MDAQMD DUST CONTROL PLAN GUIDANCE

For all earth moving activities, the Soda Mountain Solar Project will abide by the following dust control measures mandated in the MDAQMD's Dust Control Plan Guidance:

- Employ water to moisten earthen surfaces prior to disturbance and immediately after disturbance;
- Employ watering as an emergency measure during high wind events to stabilize actively eroding (dusting) surfaces;
- Ensure that loaded vehicles will not exceed 25 miles per hour on public and private earthen or gravel roads (this limit will be posted on permanent private roads);
- Ensure that bulk material carried on haul trucks operating on paved roads will be properly covered so as not to fall on to the paved surface;
- Promptly remove (flush or sweep) any visible material tracked from the project onto adjoining public paved roads (promptly is defined as not later than 24 hours);
- Follow a construction schedule that specifies the construction of parking lots and paved roads first, and upwind structures prior to downwind structures;
- Maintain the natural topography to the extent possible during grading and other earth movement; and
- Stabilize storage piles and disturbed surfaces which are idle for two weeks or more. Stabilization will be sufficient to prevent wind erosion.

5.2 DUST CONTROL MEASURES IDENTIFIED BY MDAQMD RULE 403.2

For all earth moving activities, the Soda Mountain Solar Project will abide by the following additional dust control measures based on Rule 403.2to minimize fugitive dust in the Mojave Desert Planning Area. Table 3 summarizes the Applicant Proposed Measures (APMs) included in the PA/EIS/EIR that address the Rule 403.2 requirements and the general approach to complying with the Rule 403.2.

Table 3: Rule 403.2 Dust Control Measures	
Rule 403.2 Requirement	SMS Proposed Measures to Meet Rule 403.2 Requirements
General Construction/Demolition Measures	
Use periodic watering for short-term stabilization of disturbed surface area to minimize visible fugitive dust emissions. For purposes of Rule 403.2, use of a water truck to maintain moist disturbed surfaces and actively spread water during visible dusting episodes shall be considered sufficient to maintain compliance.	APM 1 – The Applicant will use periodic watering for short-term stabilization of disturbed areas to minimize visible fugitive dust emissions. Use of a water truck to maintain surface moisture on disturbed areas and surface application of water during visible dusting episodes shall be considered sufficient to maintain compliance.
Take actions sufficient to prevent project-related trackout onto paved surfaces	APM 2 – The Applicant will apply best management practices to prevent project-related visible bulk materials transport (trackout) onto paved surfaces. Best management practices may include, but not be limited to the following: A. Use of wheel-washers (or equivalent) installed at all access points and laydown areas where trackout onto paved public roads could occur; B. Construction of stabilized construction site entrance/exit areas C. Implementation of regular street sweeping/cleaning of paved surfaces D. Installation of corrugated steel panels at all site exits.
Cover loaded haul vehicles while operating on publicly maintained paved surfaces.	APM 3 – The Applicant shall cover haul vehicles loaded with earthen materials while operating on publicly maintained paved surfaces.
Stabilize graded site surfaces upon completion of grading when subsequent development is delayed or expected to be delayed more than 30 days, except when such a delay is due to precipitation that dampens the disturbed surface sufficiently to eliminate visible fugitive dust emissions.	APM 4 – The Applicant shall stabilize graded site surfaces upon completion of grading when subsequent development is delayed or expected to be delayed more than 14 days, except when such a delay is due to precipitation that dampens the disturbed surface sufficiently to eliminate visible fugitive dust emissions.
Cleanup project-related trackout or spills on publicly maintained paved surfaces within 24 hours.	APM 5 – The Applicant will cleanup project-related visible bulk materials transport (trackout) or spills on publicly maintained paved surfaces within 24 hours.
Reduce non-essential earth-moving activity under high wind conditions. For purposes of Rule 302.2, a reduction in earth-moving activity when visible dusting occurs from moist and dry surfaces due to wind erosion shall be considered sufficient to maintain compliance.	APM 6 – The Applicant shall discontinue non-essential earth-moving activities under high wind conditions when wind speeds exceed 25 miles per hour and those activities result in visible dust plumes. All grading activities will be suspended when wind speeds are greater than 30 miles per hour.

Table 3 (*Continued*): Rule 403.2 Dust Control Measures	
Rule 403.2 Requirement	SMS Proposed Measures to Meet Rule 403.2 Requirements
Construction/Demolition Measures Disturbing 100 Acres or More	
Provide stabilized access route(s) to the project site as soon as is feasible. For purposes of Rule 302.2, as soon as is feasible shall mean prior to the completion of construction/ demolition activity.	The project is proposed in an area that currently has a stabilized exit from the freeway. SMS would use Best Management Practices (BMPs) such as gravel, rumble strips, and wheel washers if necessary to prevent trackout of material onto roads during construction.
Maintain natural topography to the extent possible.	SMS will maintain natural topography to the extent possible. Grading has been limited to less than 50 percent within the solar array areas.
Construct parking lots and paved roads first, where feasible.	No paved roads or paved parking areas are proposed as a part of the project. The project is a solar facility which involves minimal ongoing activity.
Construct upwind portions of project first, where feasible.	SMS will construct upwind portions of the project first, where feasible.
Weed Abatement Activities	
Weed abatement activities will not disrupt the soil crust to the extent that visible fugitive dust is created due to wind erosion.	SMS has prepared an Integrated Weed Management Plan for the project (C.S. Ecological Surveys and Assessments 2013). The proposed methods for weed abatement should minimally disturb the soil surface.
Fugitive Dust Control Measures Applicable to BLM	
Stipulate that all new authorizations for stationary emission sources obtain all necessary MDAQMD permits and satisfy all applicable State Implementation Plan (SIP) provisions, including project- or activity-specific Reasonably Available Control Measures (RACM).	APM 8 - The Applicant shall apply water to all unpaved roads and unpaved parking areas actively used during construction, except when moisture remains in the soils such that dust is not produced when driving on unpaved roads.
Control dust emissions from certain roads and routes as per the Wilderness classification in the California Desert Protection Act.	The project area is not classified as Wilderness in the California Desert Protection Act
Control dust emissions from certain roads and routes as identified through general BLM planning.	SMS will comply with all mitigation measures required in the Final EIS/EIR and BLM Record of Decisions.
Implement those PM_{10} control measures required to manage organized off-road events and/or competitions on public land.	No organized off-road events or competitions will be permitted within the project area.
Use BLM-standard road design and drainage specifications when maintaining existing roads or authorizing road maintenance and new road construction.	SMS will use BLM-standard road design and drainage specifications for new roads.
Include public educational information on PM_{10} emissions with BLM open area literature and on information signs in heavily used areas.	SMS would not produce any literature on BLM open areas or post signs in BLM open areas.

5.3 DUST CONTROL MEASURES IDENTIFIED BY MDAQMD FOR SOLAR DEVELOPMENT PROJECTS

The following dust mitigation measures will be implemented for all earth moving activities associated with the proposed solar development project:

- Signage shall be erected not later than the commencement of construction. A minimum 48 inch high by 96 inch wide sign containing the following shall be located within 50 feet of the project site entrance, meeting minimum text height, black text on white background, on one inch A/C laminated plywood board, with the lower edge between six and seven feet above grade, with the contact name of a responsible official for the site and a local or toll free number that is accessible 24 hours per day:

  "Soda Mountain Solar [four inch text]
  IF YOU SEE DUST COMING FROM [four inch text]
  THIS PROJECT CALL: [four inch text]
  [Contact Name], PHONE NUMBER XXX-XXXX [six inch text]
  If you do not receive a response, Please Call [three inch text]
  The MDAQMD at 1-800-635-4617 [three inch text]"

- Use a water truck to maintain moist disturbed surfaces and actively spread water during visible dusting episodes to minimize fugitive dust emissions.
- All parking areas will be stabilized with chemical, gravel, or asphaltic pavement sufficient to eliminate visible fugitive dust from vehicular travel and wind erosion. All other earthen surfaces within the project area will be stabilized by water application, natural vegetation, compaction, chemical dust suppressants, or other means sufficient to prohibit visible dust from wind erosion.

5.4 RULES 402 AND 403 DUST CONTROL MEASURES

The dust mitigation measures identified in Table 4 will be implemented for all earth moving activities associated with the proposed project to comply with Rules 402 and 403.

5.5 SAFETY MEASURES FOR DUSTY CONDITIONS

In areas adjacent to highways where dust could cause poor visibility, grading activities will be restricted to prevent unsafe conditions. Restrictions may include applying water as close to earth-moving equipment as possible, slowing the speed of construction equipment, spacing equipment further apart, increased traffic control, or shutting down operations. SMS will coordinate with the California Highway Patrol to ensure adequate traffic control measures are in place, including the possibility of using flaggers to control traffic if extreme low visibility conditions develop.

Table 4: Rule 402 and 403 Dust Control Measures	
Rule 402 and 403 Dust Control Measures	SMS Proposed Measures to Meet Rule 402 and 403 Requirements
Will not discharge from any source whatsoever such quantities of air contaminants or other material which cause injury, detriment, nuisance or annoyance to any considerable number of persons or to the public, or which endanger the comfort, repose, health or safety of any such persons or the public, or which cause, or have a natural tendency to cause, injury or damage to business or property.	In addition to the measures identified in Table 3, SMS will: • Clearly delineate construction boundaries, minimize areas of surface disturbance and preserve existing, native vegetation to the extent feasible. SMS will monitor visible dust during construction to ensure compliance with MDAQMD Rule 402 and 403. • APM 7 – The Applicant will limit the speed of vehicles traveling on unpaved roads and disturbed areas to 15 miles per hour. • APM 8 - The Applicant will apply water to all unpaved roads and unpaved parking areas actively used during construction, except when moisture remains in the soils such that dust is not produced when driving on unpaved roads.
Will not cause or allow the emissions of fugitive dust from any transport, handling, construction or storage activity so that the presence of such dust remains visible in the atmosphere beyond the property line of the emission source. *(Not applicable when the wind speed instantaneously exceeds 25 miles per hour, or when the average wind speed is greater than 15 miles per hour. The average wind speed determination shall be on a 15 minute average at the nearest official air-monitoring station or by wind instrument located at the site being checked.)*	
Will take every reasonable precaution to minimize fugitive dust emissions from wrecking, excavation, grading, clearing of land, and solid waste disposal operations.	
Will not cause or allow particulate matter to exceed 100 micrograms per cubic meter when determined as the difference between upwind and downwind samples collected on high volume samplers at the property line for a minimum of five hours. *(Not applicable when the wind speed instantaneously exceeds 25 miles per hour, or when the average wind speed is greater than 15 miles per hour. The average wind speed determination shall be on a 15 minute average at the nearest official air-monitoring station or by wind instrument located at the site being checked.)*	
Take every reasonable precaution to prevent visible particulate matter from being deposited upon public roadways as a direct result of operations. Reasonable precautions shall include, but are not limited to the removal of particulate matter from equipment prior to movement on paved streets or the prompt removal of any material from paved streets onto which such material has been deposited.	APM 2 - The Applicant shall apply BMPs to prevent Project-related visible bulk materials transport (trackout) onto paved surfaces. BMPs may include, but not be limited to, the following: • Use of wheel-washers (or equivalent) installed at all access points and laydown areas where trackout onto paved pub public roads could occur; • Construction of stabilized construction site entrance/exit areas • Implementation of regular street sweeping/cleaning of paved surfaces • Installation of corrugated steel panels at all site exits.

6 MONITORING AND RECORDKEEPING

Environmental Monitors will monitor and enforce the dust control measures included in this plan. The contractor will implement dust control as specified above, and the lead environmental monitor (EM) will be designated and responsible for making sure that dust control is effective and recorded. The lead EM will have authority over dust issues, and should have a fully trained backup able to serve in a similar capacity. It is the site coordinator's responsibility to:

- Read and understand dust control permit/s and plan and have them available at the job site
- Implement the dust control plan and ensure that all employees, workers, and subcontractors know their dust control responsibilities
- Use contingency control measures when primary controls are ineffective
- Monitor the worksite for compliance with the dust control plan
- Maintain a daily log monitoring the implementation and effectiveness of the control measures (see sample Dust Control Inspection Checklist in Appendix A).

7 RESPONSIBLE PARTIES

7.1 PLAN PREPARATION

The following individual(s) are responsible for the preparation of this Dust Control Plan:

Panorama Environmental, Inc.
1 Embarcadero Center, Suite 740
San Francisco, CA 94111
(650) 373-1200
Contact: Susanne Heim

7.2 PLAN IMPLEMENTATION

Soda Mountain Solar, LLC is responsible for the implementation of this Dust Control Plan.

Soda Mountain Solar, LLC
5275 Westview Drive
Frederick, MD 21703
(301) 228-8110
Contact: Adriane Wodey

8 REFERENCES

Bureau of Land Management (BLM). 2013. *Soda Mountain Solar Project Draft Plan Amendment/Environmental Impact Statement/Environmental Impact Report.* CACA #049584. Publication Index #: BLM/CA/PL-2014/002+1793. November 2013. Accessed September 5, 2014 at http://www.blm.gov/ca/st/en/fo/barstow/renewableenergy/soda_mountain.html.

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Appendix A: Dust Control Inspection Checklist

FUGITIVE DUST CONTROL

SELF-INSPECTION CHECKLIST

Fugitive Dust Source: _____

METHOD LOG

Date	Time	Control Method	Comment

APPENDIX L-2
Draft Vegetation Resources Management Plan

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Draft Vegetation Resources Management Plan

Soda Mountain Solar Project

San Bernardino County, CA
BLM Case No. CACA 49584

August 2013

One Embarcadero Center, Suite 740 San Francisco, CA 94111 650-373-1200
www.panoramaenv.com

DRAFT
VEGETATION RESOURCES MANAGEMENT PLAN
SODA MOUNTAIN SOLAR PROJECT
BLM CASE FILE NUMBER CACA 49584
SAN BERNARDINO COUNTY, CALIFORNIA

Prepared for:
U.S. Bureau of Land Management
Barstow Field Office
2601 Barstow Road
Barstow, CA 92311

Prepared by:
C.S. Ecological Surveys and Assessments
11331 Star Pine Road
Truckee, CA 96161

Under Contract to:
Panorama Environmental, Inc.
One Embarcadero Center, #740
San Francisco, CA 94111

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1.0 Introduction

Soda Mountain Solar, LLC (SMS) has requested a right-of-way (ROW) grant from the U.S. Bureau of Land Management (BLM) to construct, operate, and decommission the Soda Mountain Solar Project (project; BLM Case File #CACA-49584), a 350-megawatt (MW) solar photovoltaic energy generating facility. The project would be located in unincorporated San Bernardino County, California, approximately 6 miles southwest of Baker, on both sides of Interstate 15 (I-15) (Figure 1). The project site would be located within the West of Soda Lake 7.5' U.S. Geological Survey quadrangle, within the valley between the north and south Soda Mountains (Figure 1), west of the Mojave National Preserve.

The SMS Vegetation Resources Management Plan (VRMP) will be updated to conform to specific mitigation measures outlined in the SMS Draft Environmental Impact Statement/Environmental Impact Report (EIS/EIR) currently being prepared by BLM. The VRMP describes SMS's strategy to minimize adverse effects of the project to native vegetation, soils, and habitat, while recognizing that the primary mitigation for these impacts is the acquisition and long-term protection of off-site vegetation and habitat as described in the Habitat Compensation Plan (Panorama 2013a). The VRMP addresses the revegetation of sites that will be temporarily disturbed during construction or other project activities, salvage of native cactus from the site prior to construction, and on-site vegetation management during project operation and maintenance (O&M).

Most of the temporary disturbance areas will be within the solar arrays, in areas where existing vegetation will be trimmed to allow access for construction equipment. Additional temporary disturbance will be associated with infrastructure such as buried electrical connector routes, berms, roadways, and construction laydown areas. The implementation of the VRMP is intended to minimize dust, erosion, weed invasion, and fire hazard throughout the solar facility to the extent feasible. In addition, the VRMP is intended to prevent or minimize conditions that could attract wildlife to the site, where they likely would be at risk due to project construction, O&M, or decommissioning activities.

SMS has also prepared an Integrated Weed Management Plan (IWMP; CSESA 2013a) and a Decommissioning and Site Reclamation Plan (Panorama 2013b). Those two plans and the VRMP are intended to supplement one another. Together, they describe the overall approach to vegetation management, weed management, and site closure and reclamation to be implemented over the life of the project.

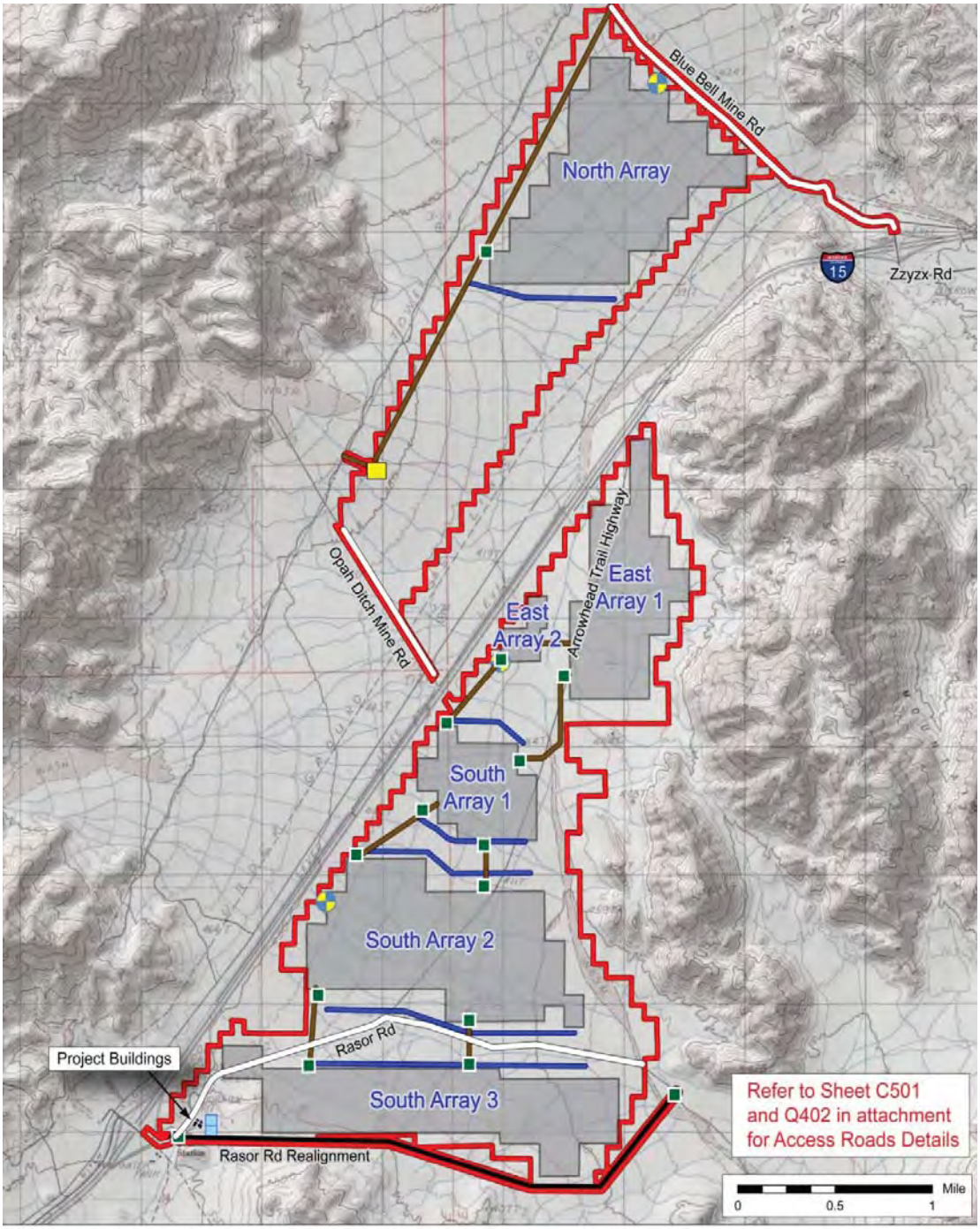
2.0 Project Background

2.1 Project Description

The proposed 350-MW photovoltaic solar electric power generating facility would be located within an approximately 4,179-acre ROW on BLM-administered lands within the West Mojave Planning Area (Figure 1). Major project components would consist of photovoltaic panels installed within three array areas (South, East, and North Arrays), O&M buildings and structures, water supply and stormwater infrastructure, and a substation and switchyard for interconnection to existing transmission. The project also would involve relocation of Rasor Road (Figure 2).

Figure 1 Regional Setting

Figure 2 Proposed Development



SOURCE: ESRI 2013 and Panorama Environmental, Inc. 2013

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LEGEND

- Proposed Project ROW
- Solar Array
- Interconnecting Substation
- Flood Protection Berm
- Inter Array Access Road
- Existing Access Road
- Rasor Road Realignment
- Well
- Desert Tortoise Guard

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2.2 Project Site Vegetation

Four vegetation alliances and two cover types (disturbed and developed ground) were observed during floristic surveys within the project ROW (Table 1; Figure 3). Creosote bush-white bursage scrub covers the majority of the project area (>90 percent). Cheesebush scrub is present within the larger drainages and washes. Creosote bush scrub is present in areas of desert pavement, and a small area of smoke tree woodland is present adjacent to Blue Bell Mine Road in the main drainage that passes under I-15 (Figure 3). The area of smoketree woodland will be designated as a sensitive area and avoided by the project. The far northwest corner of the South Array was mapped as disturbed ground. Existing roadways were mapped as developed ground.

Table 1. Vegetation Alliance and Cover Type Acreages.

Vegetation alliance/cover type	ROW acres
Creosote bush-white bursage scrub	4,052
Cheesebush scrub	54
Creosote bush scrub	35
Developed	28
Disturbed	9
Smoke tree woodland	1
Total	**4,179**

2.3 Structures and Facilities

The proposed project will consist of several main components: solar arrays (designated as North Array, East Arrays 1 and 2, and South Arrays 1, 2, and 3), an electrical substation and switchyard, access roads, drainage features, up to three wells, a reverse osmosis facility, brine ponds, collector lines, an O&M facility, and site fencing. The solar arrays will cover approximately 52 percent of the project area and would constitute the majority of the disturbance area.

SMS proposes to use site preparation techniques that will minimize the required volume of earth movement. Native shrubs would be trimmed in relatively flat areas with few rocks. In areas where the ground is too rough or uneven for installation of solar panels, smoothing techniques such as micro-grading or isolated cut-and-fill and roll will be used to smooth high spots. The cut material will be used to fill in low spots to prepare the site for construction. The entire solar field will be impacted by some form of soil disturbance from compaction caused by the passing of construction equipment, micro-grading, or disc-and-roll grading. Panel construction would permanently disturb 2,165 acres of on-site soils, either by direct soil disturbance or trimming and shading of vegetation. An additional 79 acres would be permanently disturbed from construction of support infrastructure. Estimated surface disturbance acreages are presented in Table 2 and are shown on Figure 4.

The Rasor Road realignment will result in approximately 2.6 miles of newly constructed roadway 26 feet wide. Approximately 14.5 miles of access roads 16 feet wide are also planned for the project. Solar panel rows would be spaced to prevent shading of adjacent panel rows and to allow access between the rows for panel maintenance. Access roads would be located between panel rows, and additional roads would be constructed within and around the project area to allow access to the substation, for fire suppression and maintenance of the electrical facilities (Figure 2).

Figure 3 Vegetation Associations

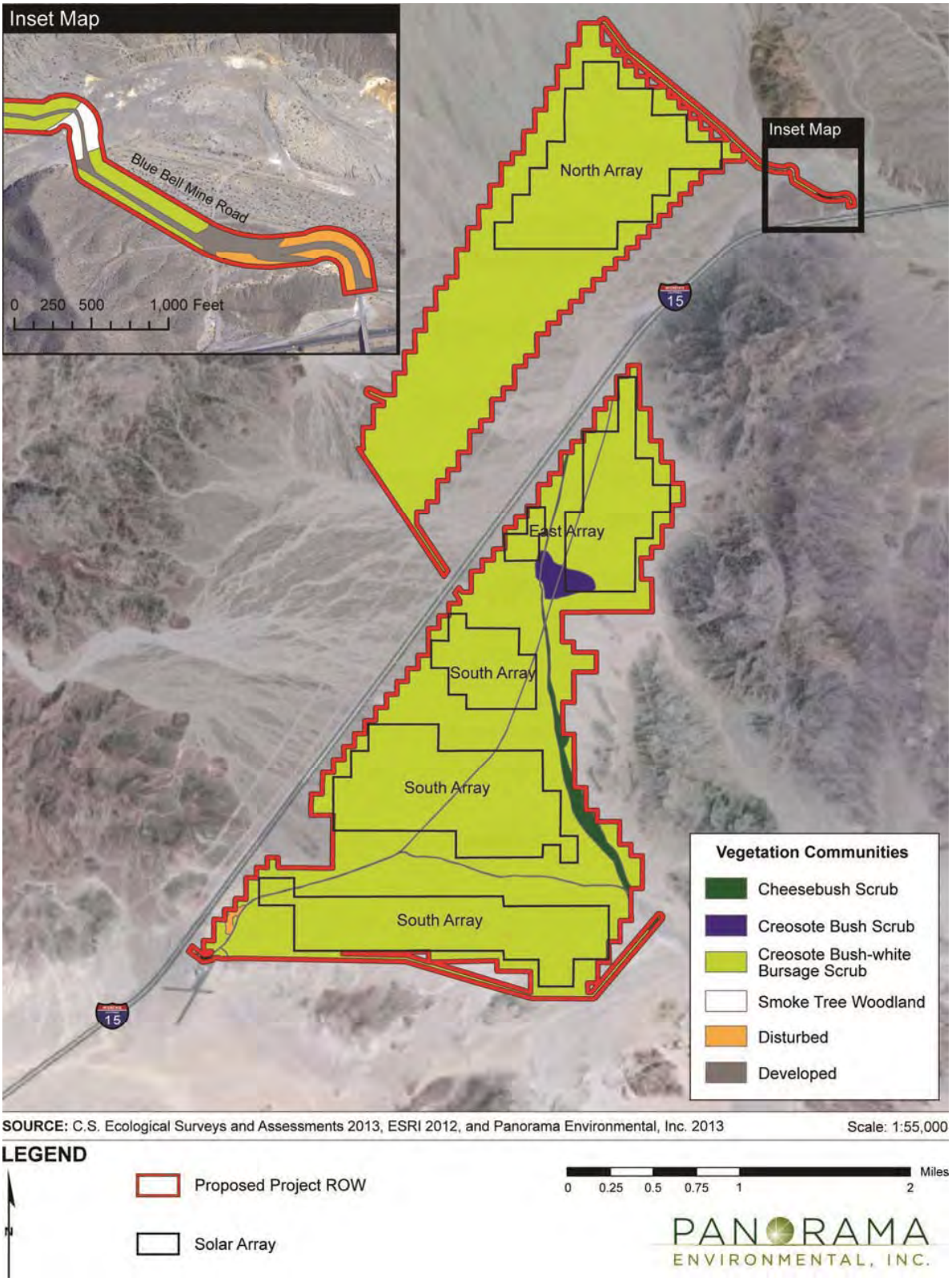


Table 2 Estimated Surface Disturbance (acres)

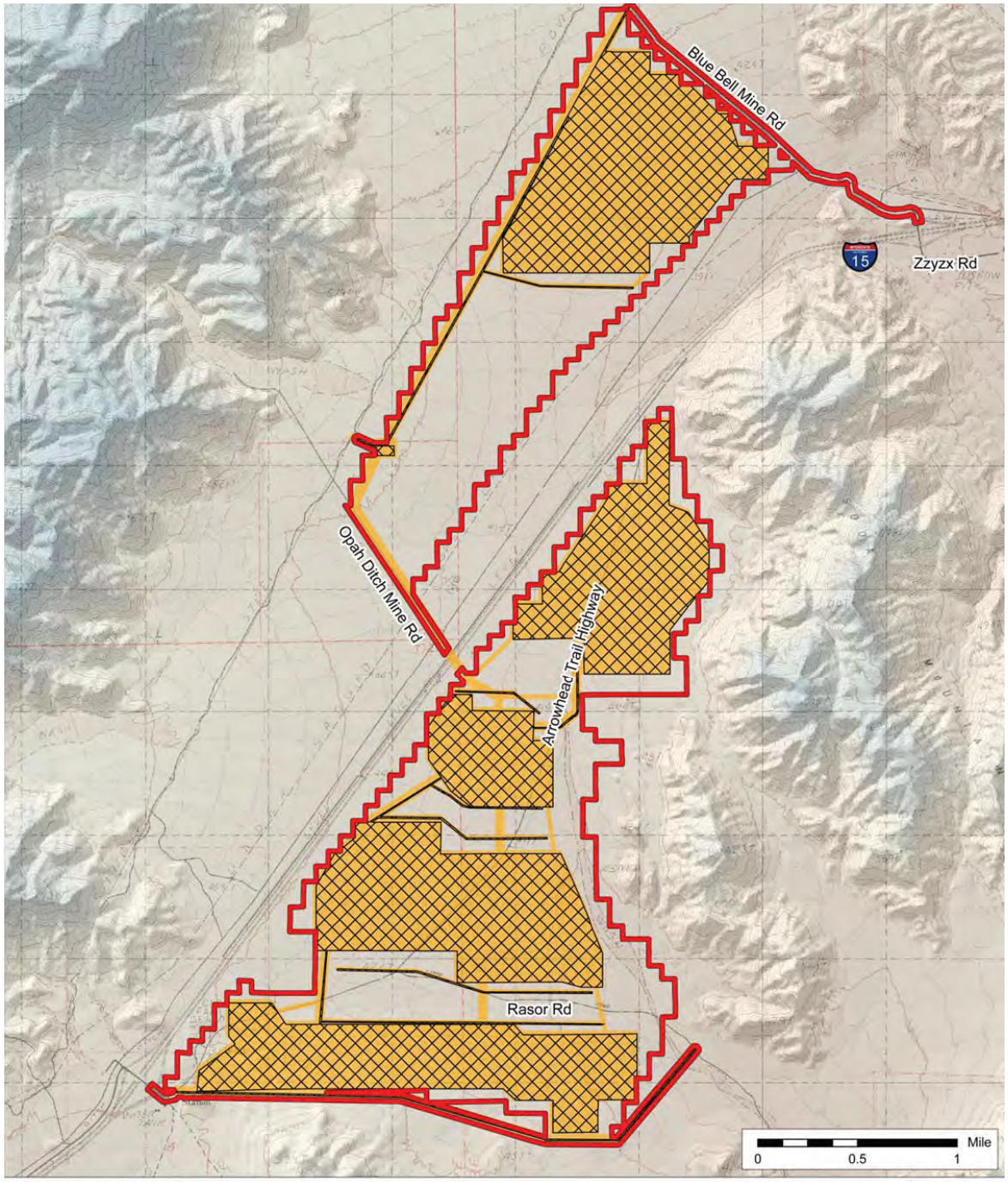
Component	Area of Temporary Disturbance During Construction[1]	Area Managed During Operation and Maintenance[1]	Total Area of Disturbance
Solar Arrays	81	2,165	2,246
Substation and Switchyard	25	15	40
Operations & Maintenance Buildings, Warehouses, and Water Tank	3	1	4
Project Wells (3)	0[2]	0[2]	0
Reverse Osmosis Facility	1	1	2
Brine Ponds	2	4	6
Rasor Road Realignment	55	13	68
Access Roads	74	20	94
Berms	1	25	26
Collector Routes	36	0	36
Laydown Area	30	0	30
Temporary Desert Tortoise Exclusion Fence	47	0	47
TOTAL	**355**	**2,244**	**2,599**

Notes

1 Acreages calculated for impacts are based on the best project information available at the time of preparation of this report. Minor changes to these acreages may occur as the project undergoes final engineering, but substantial changes are not expected.

2 Well sites are included within the solar array security fence. Impacts for the well sites are accounted for in the impacts for the solar arrays.

Figure 4 Plan View of Disturbance Areas



SOURCE: ESRI 2013 and Panorama Environmental, Inc. 2013

Scale: 1:50,000

LEGEND

Proposed Project ROW

Permanent Disturbance Area

Temporary Disturbance Area

N

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Vegetation between solar panel arrays and outside of access and maintenance roads would be allowed to re-grow. Vegetation underneath the panels would not be allowed to grow above 18 inches in order to prevent fire hazard and prevent disruption of panel performance.

O&M activities would require periodic access to the project components via the on-site road network for panel washing and other panel maintenance or repair activities. Roads would be maintained to minimize fugitive dust and prevent erosion. Fugitive dust would be minimized through surface application of water or palliatives as specified in the Dust Control Plan and/or required by the Mojave Desert Air Quality Management District. The access roads would be maintained free from significant vegetation through the use of targeted herbicide application, occasional scarifying, or weeding, as described in the IWMP, to reduce fire hazard and allow access to the panels.

The expected operational lifetime of the project is 30 years; however, the actual life of the project could be longer. The Decommissioning and Site Reclamation Plan will be implemented when permanent facility closure is appropriate. Closure strategies may include temporary "mothballing," removing old facilities and upgrading to newer solar technology, or complete removal of equipment and reclamation of the site to BLM-approved specifications. Full decommissioning of the site would involve removal and demolition of aboveground structures; removal of concrete foundations to a depth of 3 feet; removal of underground utilities within 3 feet of final grade; and excavation and removal of contaminated soils, if applicable.

3.0 Applicable Mitigation Measures

The VRMP was prepared to ensure project compliance with the Applicant Proposed Measures (AMs) listed below. The VRMP will be updated to conform to Mitigation Measures (MMs) included in the project EIS/EIR.

AM VEG-1: **Preconstruction Surveys for Rare or Special-status Plant Species and Cacti.** Before construction of a given phase begins, the Applicant will stake and flag the construction area boundaries, including the construction areas for the solar arrays and associated infrastructure; construction laydown, parking, and work areas; and the boundaries of all temporary and permanent access roads. A BLM-approved biologist will then survey all areas of proposed ground disturbance for rare or special-status plant species and cacti during the appropriate blooming period for those species having the potential to occur in the construction areas. All rare or special-status plant species and cacti observed will be flagged for transplantation.

AM VEG-2: **Vegetation Resources Management Plan.** The Applicant will prepare and implement a Vegetation Resources Management Plan (VRMP) that contains the following components:

- Vegetation salvage plans that discuss the methods that will be used to transplant cacti present within the proposed disturbance areas following BLM's standard operating procedures, as well as methods that will be used to transplant special-status plant species that occur within proposed disturbance areas.
- Restoration plans discussing the methods that will be used to restore any of the four native plant community types (creosote bush-white bursage scrub, cheesebush scrub, creosote bush scrub, and smoke tree woodland) present within the project right-of-way that may be temporarily disturbed by construction activities.
- Vegetation salvage and restoration plans that will specify success criteria and performance standards. SMS will be responsible for implementing the VRMP according to BLM requirements.

AM VEG-3 **Mitigate Direct Impacts to Rare or Special-status Plants.** To the extent feasible, the project will be designed to avoid impacts to the Emory's crucifixion-thorn population within the project ROW. No construction shall be allowed within a 100-foot buffer area around the Emory's crucifixion-thorn population. All other California Rare Plant Rank (CRPR) 1 and 2 plant occurrences within the Project ROW will be documented during preconstruction surveys. SMS will also provide a 100-foot buffer area surrounding each avoided occurrence, in which no construction activities will take place, if feasible. If avoidance is not feasible, SMS will provide on-site mitigation (e.g., vegetation salvage) for impacts to rare plants.

4.0 Rare and Special-status Plant and Cactus Salvage

4.1 Preconstruction Surveys

Prior to any grading or clearing activity, all work sites (including the entire solar facility site; all construction laydown, parking, and work areas; and all temporary and permanent access roads) will be surveyed by qualified biologists for specific rare and/or special-status biological resources in compliance with project AMs and MMs. The preconstruction clearance surveys will be completed prior to initiation of any ground-disturbing activities, including fence construction and any grading or clearing for small parking or logistics sites. For any off-road vehicle access to the project area before preconstruction clearance surveys are completed (e.g., for survey staking or soil testing), a biological monitor will accompany the work vehicle to ensure that no rare or special-status biological resources are disturbed. During all preconstruction clearance surveys, any rare or special-status plants or cacti (excluding cholla species) located will be flagged and their locations recorded using hand-held GPS units. These plants will be either salvaged from the site or, if specific work areas can be adjusted, the sites and a suitable buffer area will be avoided during construction. The Designated Biologist for the project will be responsible for determining the buffer distance, flagging, determining the avoidance area, and maintaining and inspecting the location during the construction phase of the project. The flagging for the buffer area will be removed after completion of construction activities. If the plants are to be salvaged, an avoidance buffer would be placed around the transplant site during construction.

In addition to cacti, the project owner will be responsible for flagging all CRPR 1 and 2 plants located within the project area. One or more qualified botanists will conduct preconstruction surveys throughout all areas to be disturbed, either concurrently with the wildlife crew(s) or during separate survey(s). All cacti and Emory's crucifixion-thorn (*Castela emoryi*) can be identified year-round. Surveys will be conducted for Emory's crucifixion thorn within the cactus salvage area. A 100-foot exclusion buffer will be placed around each Emory's crucifixion thorn where no project disturbance will occur, including cactus transplant activity. No other CRPR 1 or 2 species are known to occur at the proposed solar facility site. There is low potential for small-flowered androstephium (*Androstephium breviflorum*), a CRPR 2 species, to occur on sandy soils within the project area. This species must be surveyed for during its blooming period of March through April (URS 2009; CSESA 2012; CSESA 2013b). The survey schedule for cacti and rare and special-status plants is presented in Table 3.

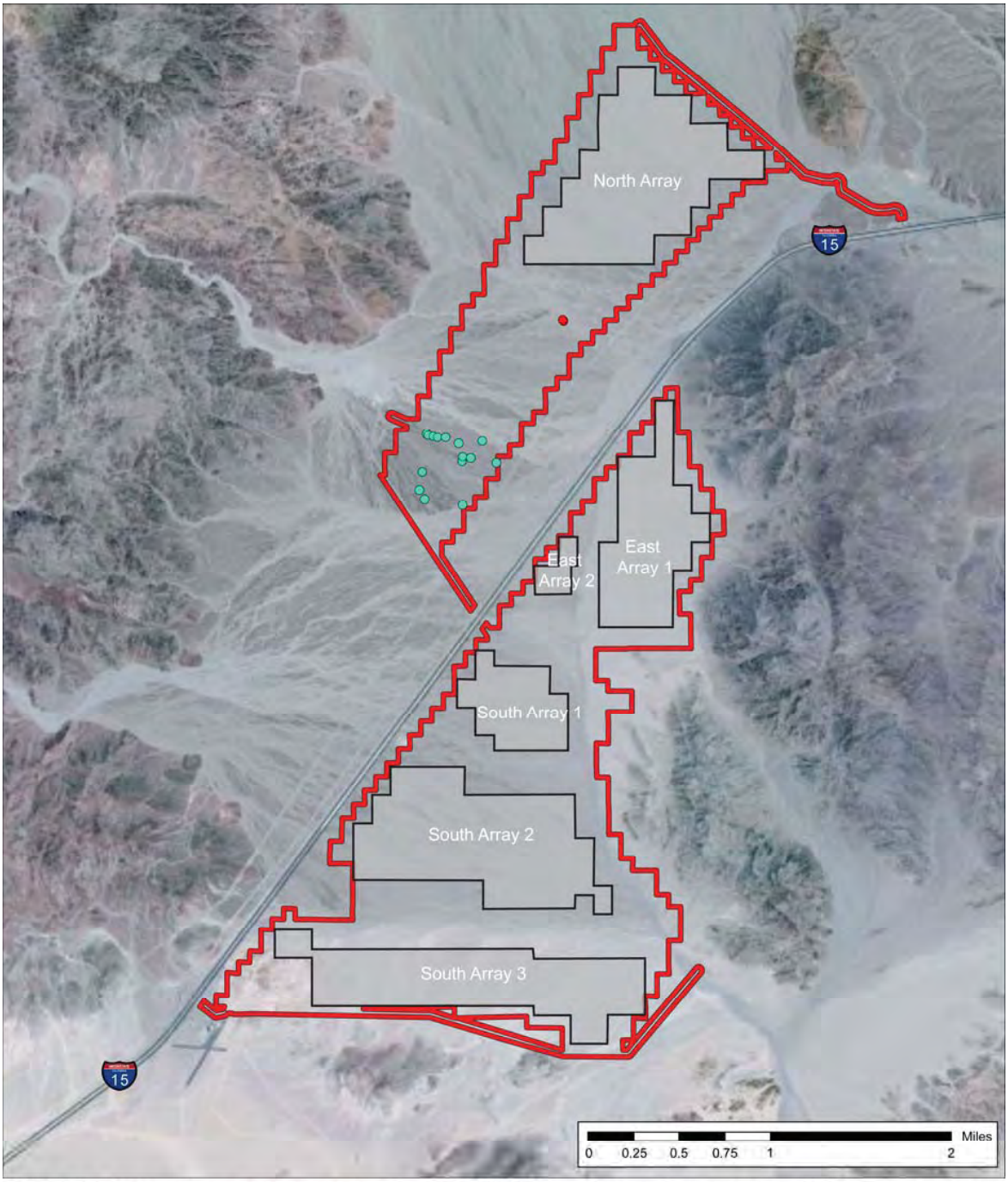
Previously surveyed locations of rare and special-status plants within the project ROW are presented on Figure 5. Previously surveyed locations of cacti within the project ROW are presented on Figure 6.

SMS does not propose to salvage CRPR 3 or 4 plants from the proposed work areas. These plants are not considered special-status by BLM or the California Department of Fish and Wildlife (CDFW).

Table 3 Preconstruction Cactus and Rare and Special-status Plant Survey Schedule Figure 5 Rare Plant

Species	Preconstruction survey season	Locations
Cacti (excluding cholla species)	Year-round	All disturbance areas
Small-flowered androstephium	Spring (March–April)	Sandy habitat, southern-most array only
Emory's crucifixion-thorn	Year-round	Known locations (Figure 5)

Locations



SOURCE: C.S. Ecological Surveys and Assessments 2012 and 2013, ESRI 2012, and Panorama Environmental, Inc. 2013 Scale: 1:55,000

LEGEND

N

Proposed Project ROW

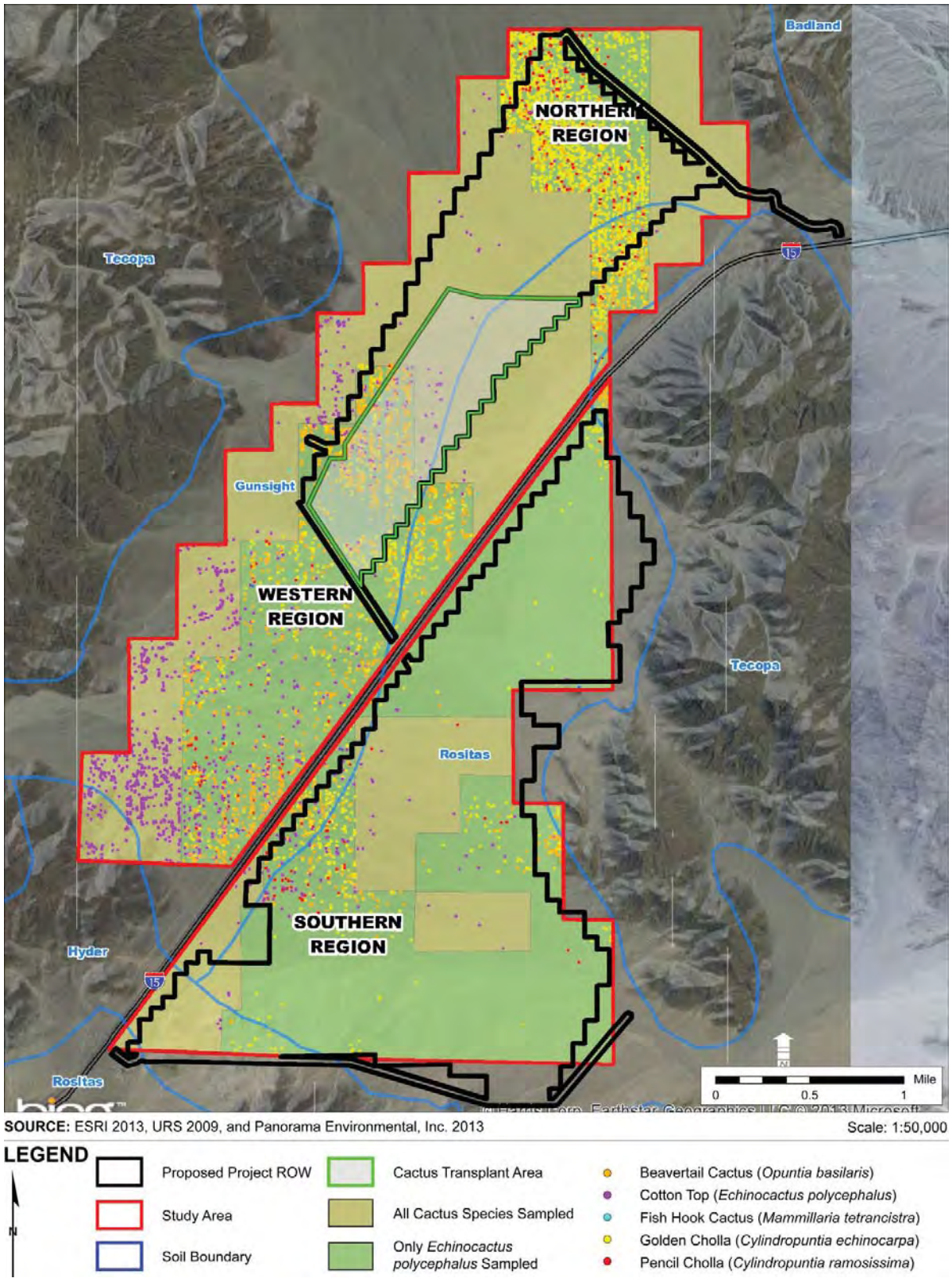
Solar Array

Emory's Crucifixion-thorn (*Castela emoryi*)

Utah Vine Milkweed (*Funastrum utahense*)

PANORAMA ENVIRONMENTAL, INC.

Figure 6 Map of Cactus Locations within Sampled Areas and Translocation Areas



4.2 Replanting Locations

All salvaged plants will be transplanted onto BLM lands within the project ROW, adjacent to and as near as is feasible to the salvage locations. Planting sites may be in revegetation areas within temporarily disturbed work sites, or elsewhere within the ROW, away from disturbance sites. Proposed cacti transplant areas are shown on Figure 6.

4.3 Rare and Special-status Plant Salvage

The current project development plan avoids all impacts to federal- and state-listed plants, BLM sensitive species, and plants with a CRPR of 1 or 2; however, if any of these species are encountered during preconstruction surveys the BLM policy requires salvage and transplantation of such plants (BLM 2013). Two plant species (blue palo verde [*Parkinsonia florida*] and honey mesquite [*Prosopis glandulosa*]), which are protected from commercial harvest under the California Desert Native Plants Act (CDNPA), are located within areas proposed for construction. These trees will be avoided and maintained in place, where possible. Three blue palo verde and one honey mesquite tree occur within the area proposed for solar development. If these trees are impacted by the project, mitigation would occur through off-site habitat compensation.

4.4 Cactus Salvage

BLM policy requires salvage and transplantation of most yucca species (Joshua trees and yucca) and cacti, but not cholla cacti (*Cylindropuntia* sps.). No yucca species (e.g., Joshua tree and Mojave yucca) have been located on the project site, and SMS does not anticipate any need to salvage or relocate yucca.

Excluding cholla species, three cactus species were located on the project site: cottontop cactus (*Echinocactus polycephalus*), fish-hook cactus (*Mamillaria tetrancistra*), and beavertail cactus (*Opuntia basilaris* var. *basilaris*) (URS 2009; CSESA 2012; CSESA 2013). Fish-hook cactus was scarce throughout the project ROW but was generally more common within the North Array. Cottontop cactus and beavertail cactus were more common throughout the project site but higher densities of both species were observed within rocky drainages and desert pavement, with lower densities on sandier soils within the South Array. Any of these cactus species could be found on the project site during preconstruction clearance surveys. These cactus species will be salvaged for relocation according to the methods outlined in Section 4.4.1.

Any company conducting cactus salvage shall have a minimum of 5 years of experience working regularly with salvage of native and protected/sensitive plant species. This experience should include collection, transplantation, non-irrigated re-vegetation, and maintenance operations within the Mojave Desert. Qualifications will be submitted to BLM for approval prior to initiation of salvage work.

4.4.1 Cactus Salvage Procedure

4.4.1.1 Salvage of Entire Cactus Plant

The schedule for salvage of all cactus will follow the guidelines outlined in Table 4. The salvage methods apply to non-segmented cactus species and small (<1 foot in diameter) segmented cactus. Fish-hook cactus and cottontop cactus are the only non-segmented cacti species that have been observed within the project ROW. It is possible that large non-segmented cacti may be encountered that would require a Bobcat or small tractor during salvage operations. Smaller cactus salvage will be completed using hand tools, without need for tractors or other specialized equipment. Access and transport of all cactus species will be via pickup truck, sport utility vehicle, or a similar vehicle. The work crew will drive on existing roads as near as possible to each recorded cactus location. Depending on distance or other logistics, the crew may drive

Table 4 Cactus Salvage, Planting, and Maintenance Schedule

Salvage Season	Transplantation Season	Watering and Maintenance
Fall or winter (preferred)	Fall or winter	Water sufficiently to keep the soil in the rooting area slightly damp after transplanting and until new root development begins and the plant becomes established
Spring	Fall or winter	Water sufficiently to keep the soil in the rooting area slightly damp after transplanting and until new root development begins and the plant becomes established
Summer	Fall or winter	Water sufficiently to keep the soil in the rooting area slightly damp after transplanting and until new root development begins and the plant becomes established

off-road to the cactus location. Off-road driving will follow biological monitoring guidelines for the project to ensure that no rare or special-status resources of any kind are disturbed by driving. The cactus will be salvaged as follows:

1. To the extent feasible, cactus plants will be salvaged during fall or winter to minimize transplantation stress during the early spring active growth season or during extreme summer heat.
2. The north-facing side of each plant will be marked by securely tying a tag or colored flagging to the spines. Each plant will be assigned a unique identification number, also affixed to the plant.
3. For each salvaged plant, a brief plant-specific description and microsite description will be recorded, including short descriptions of root depth, depth of the stem in the soil, topography, hydrology, shade, and soil texture at the salvage site. A photo of each plant may also be included in this description.
4. Each plant will be dug out carefully, to avoid root damage. Salvage crews will begin digging no closer than 6 inches to the base of the plant, and farther from the base, depending on plant size.
5. The cactus will be carefully excavated with a shovel or mechanical blade just below the root depth of the plant, generally 4 to 8 inches below the soil surface.
6. The plant will be lifted out with a shovel or mechanical blade, heavy gloves, or other equipment as needed to avoid damaging the plant.
7. Any damaged roots will be trimmed, using scissors or a knife disinfected in a 10 percent bleach solution. Undamaged roots will not be trimmed. Cutting tools will be disinfected prior to trimming any individual plant's roots.
8. Fungicide or sulfur will be applied to roots to decrease the risk of infection and to improve callusing.
9. Roots will be allowed to dry (or callus) for 3 days to 2 weeks. They will be kept within a shade structure and protected from overheating or strong wind during the callus period.
10. Following the root callus period, cacti will be transported to the replanting location and replanted.

Cacti salvaged during spring or summer may be held over in the shade structure and protected from wind and heat until fall for transplantation.

4.4.1.2 Propagation of Cactus Pads from Segmented Cacti

Segmented cacti greater than 2 feet in diameter will be salvaged through propagation of pad cuttings. Beavertail cactus (*Opuntia basilaris* var. *basilaris*) has segments or pads that can be easily cut from the plant. Individual cacti too large for transplanting will have three or four pads removed by either cutting or detaching the pad from the main plant. Size of cuttings will vary. Cactus pad salvage will occur as follows:

1. All salvaged pads will be planted in the fall (October through November).
2. Using a clean, sharp knife (sterilized in a 10 percent bleach solution) the pad or segment will be cut at the attachment or constriction.
3. The cactus will be dried in a cool, shaded location for at least 10 days, until a protective callus covers the incision point. Pads harvested or cut during the spring or summer season may be stored in cool, dry, shaded locations until the fall season.
4. Once the protective callus has formed, the cactus will be transplanted on site by excavating a shallow hole 1 inch deep and setting the callus end of the pad in the hole. The pad does not need to be upright.

4.4.2 Cactus Planting and Maintenance

4.4.2.1 Non-segmented Cactus

Each whole cactus will be replanted at a microsite selected to resemble its salvage site, as described in the plant-specific notes (Section 4.4.1.1). The location of each planting will be recorded with a hand-held GPS unit. Whole cacti will be replanted in the same north orientation as determined by the markings on each plant. The cacti will be planted in holes somewhat deeper than the original root system, and the remaining roots will be spread across the bottom of the hole. Soil will be replaced over the roots so that the plant itself is held in place at its original stem soil depth. Soil will be tamped around the plant so that there are no air pockets around the roots, and formed into a small basin to hold irrigation or rainwater.

The plants will be well-watered when they are planted. The soil moisture will be checked at rooting depth before subsequent watering to avoid overly wet soils. The cacti will be watered sufficiently to keep the soil in the rooting area slightly damp after transplanting and until new root development begins and the plant becomes established. Plants will be transplanted during fall or winter and watered weekly over a 60-day period to facilitate their establishment and survival.

Following the establishment period, transplanted cacti may be watered regularly during normal rainfall seasons for the area (i.e., August through April) at reduced frequency to facilitate establishment and growth, for a period of 2 years. The irrigation schedule will vary according to natural rainfall. If natural rainfall is well above average, then no irrigation may be necessary. If natural rainfall is average or below average, irrigation will be scheduled to mimic a year of above-average rainfall. Irrigation may use any appropriate method, either by directly watering the plants by hand or by using methods described by Bainbridge (2007).

4.4.2.2 Segmented Cactus

Beavertail cactus may be salvaged by cutting individual pads or segments (as described in Section 4.4.1.2). The pad may be planted once a callus has formed on the cut end of the pad. Pads will be stored and planted in the fall. Pads should not be watered at the time of planting. Once roots grow, usually within 1 month, the pad can be watered. Watering of the pad before roots are present can cause a pad to mold or become infected with fungus. Pads should be planted in a shallow hole (i.e., approximately 1 inch deep), within similar substrate to that in which the donor plant was found. Pads do not need to be upright but

may lay on the surface with the callus end of the pad within the hole and covered with 1 inch of soil. Plants should be monitored for root growth. Once roots establish they should be on the same watering schedule as individual cactus transplants.

4.4.3 Cactus Salvage Success Criteria and Monitoring

Transplanted cacti will be monitored at least monthly through the first three months following transplantation to record qualitative observations including survival and any need for additional water, shade, wind shelter, or protection from animals or erosion. Overall survival and any monitoring recommendations will be recorded during each monitoring visit and submitted to the Designated Biologist for inclusion in annual monitoring reports. Following the initial three-month period, monitoring visits may be reduced to quarterly for 3 years.

The cactus transplantation success criterion will be 75 percent survival after 3 years. If this criterion is not met, then the project owner will implement one of the following remedial measures:

- Plant additional cacti from an off-site location within the vicinity of the Soda Mountains, if such plants become available through another project (including renewable energy projects or any other project on private or public land that may result in removal of cacti). The additional plantings must offset any discrepancy between 3-year monitoring results and the success criterion at a 2:1 ratio.
- Harvest, prepare, and plant additional beavertail cactus pads salvaged from cacti present within the project area. No more than 20 percent of pads may be taken from any one plant. The additional plantings must offset any discrepancy between 3-year monitoring results and the success criterion at a 2:1 ratio.

5.0 Reclamation/Revegetation

The temporary impacts of some construction (e.g., areas covered by solar panels, staging areas, materials and equipment, laydown areas, temporary work areas, and access routes within the project ROW) are considered to have long-term impacts to vegetation and habitat due to the slow recovery time and growth of vegetation in the desert. Long-term and permanent impacts of the project to native vegetation and habitat will be mitigated mainly through off-site acquisition and preservation of habitat. The temporary disturbance sites will be revegetated to stabilize soils; maximize the likelihood of vegetation recovery over time; and minimize soil erosion, dust generation, and weed invasion. This section of the VRMP will be updated to conform to mitigation requirements upon completion of the EIS/EIR, if needed.

The project owner will contract with a qualified Reclamation Specialist to evaluate and prescribe specific reclamation measures at each work site. The Reclamation Specialist will coordinate with the project Designated Biologist and with the project owner to ensure that the prescriptions are implemented as written.

5.1 Site Preparation

SMS does not anticipate substantial grading or soil removal at any temporary disturbance site. Topsoil may be salvaged in select locations (e.g., at the substation or around the turning structures) at the direction of the Reclamation Specialist. The salvaged topsoil would be temporarily stored adjacent to the area of grading/removal and within the area of temporary or permanent project impacts. Temporary disturbance will generally result from rock removal, micrograding, isolated cut-and-fill and roll, or scarifying work areas

(blading without substantial soil movement). In some cases, disturbance may consist of trimming woody vegetation or crushing vegetation in place and driving over the work area. These site treatments will cause soil compaction and either degradation or elimination of native vegetation.

Site preparation measures prior to reclamation work will be determined on a site-by-site basis, based on the advantages and disadvantages of soil treatment or site preparation methods to restore natural contours, protect the site from erosion damage by wind or water, and maximize the likelihood of vegetation recovery.

Soil decompaction can increase soil vulnerability to weeds or erosion, increase dust, or cause further damage to surviving rootstocks that may be present. The Reclamation Specialist will evaluate soil compaction and prescribe either no treatment, limited treatment using hand tools, depending on specific circumstances, or light harrowing. Areas where soil is decompacted will be covered with native mulch or chipped native vegetation to control dust and erosion, and may be seeded with native seed, where appropriate.

Where construction disturbance causes alterations to natural channel morphology or runoff patterns, the Reclamation Specialist will prescribe recontouring, soil compaction, placement of native rock, or application of local native mulch including local rock or chipped native vegetation. Efforts will be made to use on-site native materials in order to reduce the risk of introducing invasive nonnative plants to the project site. A site-specific approach involving soil contouring, including construction of berms stabilized by native rock and mulch and placement of local rock to increase roughness, will be used to recreate the existing site micro-topography, thereby reducing impacts to native vegetation and wildlife. If necessary off-site materials such as certified weed-free straw bales, straw wattles, or other erosion control materials may be used for temporary erosion control.

Where feasible, mulch used for erosion control will be produced from native vegetation cleared from the site itself. SMS anticipates that the temporary disturbance sites will be too small to warrant soil imprinting or will be inaccessible to equipment (temporary disturbance within the solar field).

5.2 Plant Materials

SMS may re-seed temporarily disturbed areas with a native seed mix. The determination of whether to re-seed and seeding rates (i.e., pounds per acre), if re-seeding is to occur, will be determined by the Reclamation Specialist, based on the nature of disturbance and condition of soils and evidence (if any) of re-sprouting from remaining rootstocks. The seed mix will consist primarily or exclusively of native early-successional species, listed in Table 5. There will be no re-seeding on sites where construction-phase disturbance is limited to mowing or “drive and crush” techniques unless these areas show inadequate natural recovery (e.g., re-sprouting rootstocks) or excessive soil compaction that may inhibit seed germination.

SMS will arrange for adequate seed supplies well in advance of scheduled seeding for each temporarily disturbed site for which seeding is deemed necessary. Due to the unpredictable rainfall and drought conditions throughout the Mojave Desert region, seed cannot be reliably collected or acquired in any given year. Immediately following the Notice to Proceed, the Reclamation Specialist or Designated Biologist will estimate the total number of acres to be re-seeded and determine quantities of seed needed. SMS will collect seed or will contract with suppliers or collectors to acquire and store enough seed for all projected re-seeding work. The Reclamation Specialist will be responsible for maintaining a seed inventory, based on the sample format shown in Table 6.

Table 5 Native On-site Species Suitable for Revegetation Seed Mix

Scientific name	Common name	Habitat type
Ambrosia dumosa	White bursage	Creosote scrub
Ambrosia salsola	Burrobrush	Wash
Bebbia juncea var. *aspera*	Sweetbush	Wash
Chaenactis stevioides	Esteve's pincushion	Creosote scrub
Encelia farinosa	Brittlebush	Wash
Encelia frutescens	Button brittlebush	Wash
Geraea canescens	Hairy desert sunflower	Creosote scrub
Gutierrezia microcephala	Threadleaf snakeweed	Creosote scrub
Malacothrix glabrata	Smooth desert dandelion	Creosote scrub
Cryptantha angustifolia	Panamint cryptantha	Creosote scrub
Phacelia distans	Distant phacelia	Creosote scrub
Atriplex hymenelytra	Desert holly	Creosote scrub
Atriplex polycarpa	Cattle saltbush	Creosote scrub
Eriogonum inflatum	Desert trumpet	Creosote scrub
Aristida adscensionis	Sixweeks threeawn	Creosote scrub
Bouteloua aristidoides var. *aristidoides*	Needle grama	Creosote scrub
Bouteloua barbata var. *barbata*	Sixweeks grama	Creosote scrub
Dasyochloa pulchella	Fluff grass	Creosote scrub
Hilaria rigida	Big galleta	Creosote scrub

Table 6 Sample Seed Inventory Management Format

Species (Latin and common names)	On hand (lb.)	On order (lb.)	Quantity needed for upcoming years (lb.)				
			Year 1	Year 2	Year 3	Year 4	Year 5

Total seeding rate will be no less than 20 pounds per acre. Specific proportions will be based upon seed availability and recommendations of the Reclamation Specialist. Depending on seed availability, other native species occurring on the site or nearby at similar exposure and elevation may be selected to replace those above. All seed to be used in revegetation will originate from the Mojave Desert region of California, between approximately sea level and 3,000 feet elevation. Any seed from vendors or contracted collectors will be certified weed-free. The project owner may collect seed on site from project areas to be mowed or graded. The collection of adequate seed supplies will likely necessitate repeated visits to any given collection area, depending on seasonality and annual productivity of the target plants. If seed is purchased from a vendor or contract seed collector, SMS will require the supplier to provide location and elevation for each seed lot, and will not purchase or use seed originating outside these geographic and elevational bounds. The project owner will be responsible for acquiring adequate seed to implement this plan. Seed collections by the project owner or its contractors or vendors will be made according to the following guidelines:

- Seed collection from plants to be removed or mowed for project construction will be unrestricted.
- No seed will be collected from designated Wilderness Areas or the Mojave National Preserve.
- Any seed collection on public lands will be done only under authorization from BLM.
- No more than 40 percent of seeding plants in any collection area will be harvested and no more than 10 percent of mature seed on any single plant will be harvested (excluding plants within project disturbance areas).
- Access to collection areas will be via open, designated routes, or on foot; there will be no cross-county vehicle travel.
- Collectors will record and track seed lots, including collection date, collection location, elevation, dominant species at location, stand conditions, test data, bulk weight, and net weight (as pure live seed).

5.3 Seeding Methods and Schedule

Temporary disturbance areas will generally be small or inaccessible to equipment (such as seed drill or hydroseeding equipment). Therefore, seed will be broadcast using manually operated, cyclone-type bucket spreaders, mechanical seed spreaders, blowers, or rubber-tired all-terrain vehicles equipped with mechanical broadcast spreaders. Seed in the spreader hoppers will be mixed to discourage separation of the component seed types. Where broadcast seeding is employed, seeded areas may be raked or harrowed to cover the seed, at the direction of the project Reclamation Specialist.

Re-seeding will be scheduled to minimize potential seed loss to granivorous birds and small mammals and maximize exposure to seasonal rainfall. Seeding will be done in late summer or early fall, to ensure that seed is in place prior to the onset of seasonal rain in late fall or early winter. Later seeding is likely to result in failed germination due to inadequate moisture availability.

Due to the arid climate and variable rainfall, germination and establishment success of seeded plants is not predictable. Low germination success in the first year following re-seeding may be consistent with the goal of this plan (i.e., to prevent or minimize further site degradation) during dry years, when erosion and weed cover are not problematic. However, SMS may need to take additional measures to minimize dust generation from sites where adequate plant cover does not re-establish (see Section 5.6).

5.4 Reclamation/Revegetation Site Maintenance

Reclamation and revegetation sites will not be irrigated. The sites will be monitored for weed presence and abundance, and weed control will be implemented as needed, according to the IWMP. Additional maintenance activities will consist of erosion control, soil stabilization, or other measures as needed, based on the results of monitoring.

5.5 Success Criteria

If the following success criteria have not been met within 3 years of project construction, the project owner will be responsible for implementing remediation measures, as needed. Following remediation work, the site will be subject to the success criteria and monitoring period as required for the initial reclamation, revegetation, or restoration.

1. At temporarily disturbed areas treated by vegetation trimming, drive and crush, or similar disturbance, at least 80 percent of the species observed within the area will be native species that naturally occur in local desert scrub habitats.
2. At temporarily disturbed areas treated by grading or scarification, which have resulted in loss of native soils and rootstocks, at least 60 percent of the species observed within the area will be native species that naturally occur in local desert scrub habitats.
3. Cover and density of nonnative plant species within the temporarily disturbed areas will be no more than twice their cover and density in comparable adjacent lands that have not been disturbed by the project.
4. Soil stability and potential for erosion or dust source will be comparable to adjacent lands that have not been disturbed by the project.

5.6 Monitoring, Remediation, and Reporting

Following implementation of reclamation or revegetation measures, each temporarily disturbed site will be monitored annually to evaluate success, in terms of the success criteria listed in Section 5.5. Monitoring will continue for a period of no less than 2 years or until the defined success criteria are achieved. Remediation activities (such as additional planting, removal of nonnative invasive species, or erosion control) will be taken during this 2-year period to ensure the success of the reclamation effort, if necessary. If mitigation fails to meet the established performance criteria after the 2-year maintenance and monitoring period, monitoring and remedial activities will extend beyond the 2-year period until the criteria are met.

If a fire or flood damages a reclamation site within the 2-year monitoring period, the Applicant will be responsible for a one-time replacement. If a second fire or flood occurs, no replanting will be required, unless the damage is caused by the Applicant's activities (as determined by BLM or other firefighting agency investigation).

Throughout the construction, operation, and decommissioning phases, and for a minimum of 3 years following completion of decommissioning, the Designated Biologist and Reclamation Specialist will be responsible for providing annual Vegetation Management Progress Reports (VMPRs) to BLM and CDFW for review and approval. After 3 years VRPRs will be submitted every 3 to 5 years during project operation. Each VMPR will include the following:

- Brief summary of project construction, O&M, or decommissioning status, with a list of all temporarily disturbed sites treated or monitored during the preceding year.
- Summary of reclamation or revegetation progress and results since previous report, including a

map of all reclamation or revegetation activity since previous report.
- Seed inventory accounting of materials acquired or used since previous report, and materials needed for the coming 5-year period.
- Summary of monitoring results and completion status for all sites.
- Recommendations as applicable for remedial work such as re-seeding, erosion control, weed control, or other maintenance activity.
- Representative site photographs.
- Notation of any other pertinent concerns (e.g., vehicle trespass).

6.0 Operations and Decommissioning Phases

Throughout the O&M phase, on-site vegetation management will consist of vegetation control (e.g., mowing) to maintain shrub height below 18 inches to prevent interference with solar panels, minimize fire hazard, and minimize wildlife attraction. The Designated Biologist will inspect vegetation throughout the project area annually to identify hazardous vegetation or barren areas that may be susceptible to erosion or other damage. All mowed or cut plant material will be collected and stored for use on site as mulch. Weed control during the project O&M phase will be conducted as described in the IWMP. Vegetation management during project decommissioning will be completed according to the Final Closure Plan, which will be prepared 5 years prior to project closure.

7.0 Designated Biologist and Reclamation Specialist Responsibilities

7.1 Designated Biologist

The Designated Biologist, to be designated by the project owner and approved by the BLM and CDFW, will be responsible for managing and implementing the VRMP, as follows:

- Ensure that no off-road vehicle access occurs on the site until preconstruction surveys and special-status plant salvage, desert tortoise clearance, and other rare or special-status species clearance or exclusion, have been completed.
- Ensure that no off-road vehicle access occurs off site for seed collection or other project-related activities, except as specifically authorized according to final BLM project authorization.
- Schedule all preconstruction clearance surveys for all project components, which will include seasonal surveys for all rare or special-status plants in the areas where they have been previously documented.
- Ensure that each person assigned to surveying, salvage, transplantation, seed collection, re-seeding, monitoring, or any other aspect of the VRMP is qualified for each task (e.g., botanists conducting preconstruction surveys and seed collection must be qualified in locating and identifying plants of the area; workers responsible for salvage, transplantation, seeding, and maintenance must be qualified in nursery or landscaping practice).
- For rare or special-status plant locations to be avoided by adjusting the work area, designate and mark a buffer area surrounding the location and will be responsible for monitoring the site throughout the construction phase of the project.
- Review the qualifications and recommendations of the contracted Reclamation Specialist, and support coordination among the Reclamation Specialist, resource agencies, and project owner.
- Review plans and recommendations made by the Reclamation Specialist.
- Review planting materials, erosion control materials, and other materials to ensure weed-free

certification.

- Communicate with the project owner and resource agencies regarding reclamation and revegetation activities.
- Coordinate reclamation activities with other project activities including construction and maintenance work as well as mitigation and compliance requirements such as implementing the IWMP.
- Conduct annual O&M-phase inspections to identify accumulated dead vegetation, wildlife attractants, barren soils, or other areas susceptible to erosion or likely dust sources; coordinate with Reclamation Specialist to implement site treatment as needed.
- Prepare and submit monitoring reports to the project owner and BLM.

7.2 Reclamation Specialist

The Reclamation Specialist will be designated by the project owner and approved by BLM and CDFW. The Reclamation Specialist will be responsible for site-specific reclamation activities and for supporting the Designated Biologist in managing and implementing the VRMP, as follows:

- Review all temporary disturbance sites to evaluate soil compaction, vegetation condition, susceptibility to erosion, weed invasion, or as dust sources, and specify site-specific treatments such as erosion control, soil treatment, soil decompaction, mulch application, or re-seeding for each site.
- During the O&M phase, review barren soils or other areas identified by the Designated Biologist to evaluate soil compaction, vegetation condition, susceptibility to erosion, weed invasion, or as dust sources, and specify site-specific treatments such as erosion control, soil treatment, soil decompaction, mulch application, or re-seeding for each site.
- Estimate overall project seed requirements; update estimates as needed; and coordinate with the Designated Biologist and project owner to obtain and maintain seed inventory.
- Oversee and manage site treatments, including soil treatments, erosion control, re-seeding, and other requirements.
- Oversee monitoring and evaluate success at each reclamation or revegetation site.
- Plan and direct follow-up remedial work as needed to meet success criteria.
- Prepare and submit annual reports to the project owner and resource agencies in coordination with the Designated Biologist.

8.0 Literature Cited

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APPENDIX L-3
Draft Desert Tortoise Translocation Plan

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Desert Tortoise Translocation Plan

Soda Mountain Solar Project

San Bernardino County, CA
BLM Case Number CACA 49584

September 2014

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PANORAMA
ENVIRONMENTAL, INC.

Desert Tortoise Translocation Plan

Soda Mountain Solar Project

San Bernardino County, CA
BLM Case Number CACA 49584

Submitted to:

United States Department of the Interior
Bureau of Land Management
California Desert District Office
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1 INTRODUCTION

1.1 PROJECT OVERVIEW

The proposed Soda Mountain Solar Project (project) includes construction, operation, maintenance, and decommissioning of a 350-megawatt (MW) photovoltaic solar electric power generating facility on federal land managed by the U.S. Department of Interior, Bureau of Land Management (BLM). The project is proposed by Soda Mountain Solar, LLC (SMS), under BLM case number CACA 49584. The project is located approximately 6 miles southwest of Baker, California, as shown in Figure 1.1-1.

The project includes approximately 2,165 acres of solar panel arrays. The proposed BLM right-of-way (ROW) is approximately 4,179 acres. The project includes an interconnection to the City of Los Angeles Department of Water and Power (LADWP) Marketplace to Adelanto 500-kilovolt (kV) transmission line, which is adjacent to the proposed ROW. The project layout is shown in Figure 1.1-2.

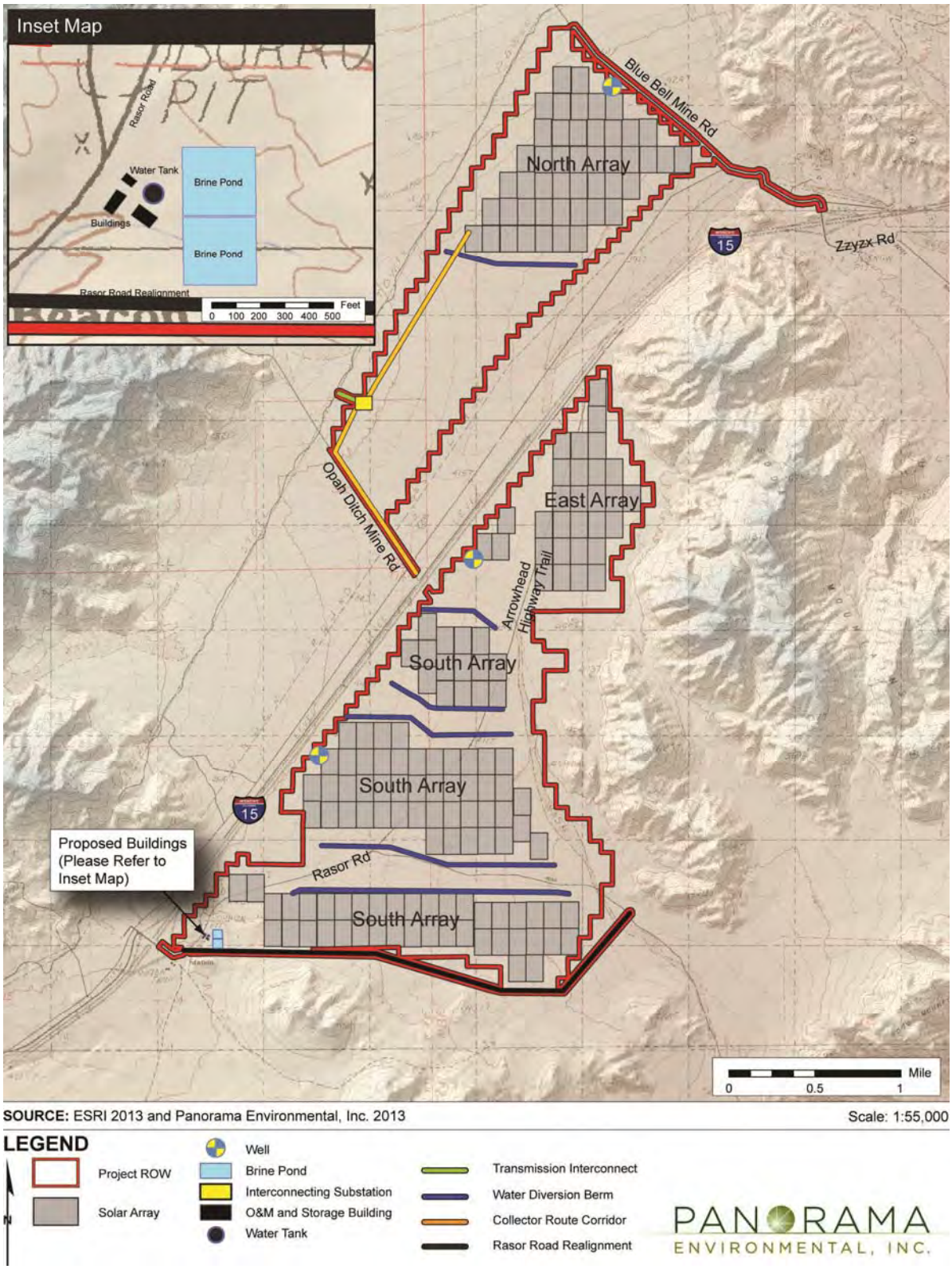
The project is more fully described in the project Plan of Development (RMT 2011), the SMS Addendum to the Plan of Development (SMS 2013), and the Draft Environmental Impact Statement/Environmental Impact Report (EIS/EIR) (BLM 2013).

1.2 ENVIRONMENTAL IMPACT STATEMENT/ENVIRONMENTAL IMPACT REPORT

The Draft EIS/EIR for the project was released for public review on November 29, 2013. The public review period ended on March 3, 2014. SMS revised this DTTP to include mitigation measures outlined in the Draft EIS/EIR related to desert tortoise translocation. The relevant mitigation measures are provided below. These measures may be subject to revision in the Final EIS/EIR or Record of Decision. The final mitigation measure language would supersede the measures provided below.

Figure 1.1-1: Project Location

Figure 1.1-2: Project Layout



Mitigation Measure 3.4-2a: Desert Tortoise Protection. The Applicant/Owner shall undertake appropriate measures to manage the construction site and related facilities in a manner to avoid or minimize impacts to desert tortoise. Methods for clearance surveys, fence specification and installation, tortoise handling, artificial burrow construction, egg handling, and other procedures shall be consistent with those described in the USFWS' 2009 Desert Tortoise Field Manual (USFWS, 2009d) or more current guidance provided by CDFW and USFWS. The Applicant/Owner shall also implement all terms and conditions described in the Biological Opinion to be prepared by USFWS. These measures include, but are not limited to, the following:

1. Desert Tortoise Fencing along I-15. If required by the USFWS, to avoid increases in vehicle-related mortality from disruption of local movement patterns along the existing ephemeral wash systems, desert tortoise-proof fencing shall be installed along the existing freeway right-of-way fencing on both sides of I-15 for the entire east-west dimension of the Project site. The tortoise fencing shall be designed to direct tortoises to existing undercrossing to provide safe passage under the freeway, and shall be regularly inspected and maintained for the life of the Project.
2. Desert Tortoise Exclusion Fence Installation. To avoid impacts to desert tortoises, permanent desert tortoise exclusion fencing shall be installed along the permanent perimeter security fence and temporarily installed along road corridors during construction. The proposed alignments for the permanent perimeter fence and temporary fencing shall be flagged and surveyed within 24 hours prior to the initiation of fence construction. Clearance surveys of the perimeter fence and temporary fencing areas shall be conducted by the Designated Biologist(s) using techniques outlined in the USFWS' 2009 Desert Tortoise Field Manual and may be conducted in any season with USFWS and CDFW approval. Biological Monitors may assist the Designated Biologist under his or her supervision. These fence clearance surveys shall provide 100 percent coverage of all areas to be disturbed and an additional transect along both sides of the fence line covering an area approximately 90 feet wide centered on the fence alignment. Transects shall be no greater than 15 feet apart. All desert tortoise burrows and burrows constructed by other species that might be used by desert tortoises shall be examined to assess occupancy of each burrow by desert tortoises and handled in accordance with the USFWS' 2009 Desert Tortoise Field Manual. Any desert tortoise located during fence clearance surveys shall be handled by the Designated Biologist in accordance with the USFWS' 2009 Desert Tortoise Field Manual (USFWS, 2009d).
    a. Timing, Supervision of Fence Installation. The exclusion fencing shall be installed prior to the onset of site clearing and grubbing. The fence installation shall be supervised by the Designated Biologist and monitored by the Biological Monitors to ensure the safety of any tortoise present.

b. Fence Material and Installation. The permanent tortoise exclusionary fencing shall be constructed in accordance with the USFWS' 2009 Desert Tortoise Field Manual (Chapter 8 - Desert Tortoise Exclusion Fence).
c. Security Gates. Security gates shall be designed with minimal ground clearance to deter ingress by tortoises. The gates may be electronically activated to open and close immediately after the vehicle(s) have entered or exited to prevent the gates from being kept open for long periods of time. Cattle grating designed to safely exclude desert tortoise shall be installed at the gated entries to discourage tortoises from gaining entry
d. Fence Inspections. Following installation of the desert tortoise exclusion fencing for both the permanent site fencing and temporary fencing in the utility corridors, the fencing shall be regularly inspected. If tortoise were moved out of harm's way during fence construction, permanent and temporary fencing shall be inspected at least two times a day for the first 7 days to ensure a recently moved tortoise has not been trapped within the fence. Thereafter, permanent fencing shall be inspected monthly and during and within 24 hours following all major rainfall events. A major rainfall event is defined as one for which flow is detectable within the fenced drainage. Any damage to the fencing shall be temporarily repaired immediately to keep tortoises out of the site, and permanently repaired within 48 hours of observing damage. Inspections of permanent site fencing shall occur for the life of the Project. Temporary fencing shall be inspected weekly and, where drainages intersect the fencing, during and within 24 hours following major rainfall events. All temporary fencing shall be repaired immediately upon discovery and, if the fence may have permitted tortoise entry while damaged, the Designated Biologist shall inspect the area for tortoise.

3. Desert Tortoise Clearance Surveys within Solar Arrays. Clearance surveys shall be conducted in accordance with the USFWS Desert Tortoise Field Manual (USFWS, 2009d) (Chapter 6 – Clearance Survey Protocol for the Desert Tortoise – Mojave Population) and shall consist of two surveys covering 100 percent the Project area by walking transects no more than 15 feet apart. If a desert tortoise is located during the second survey, a third survey shall be conducted. Each separate survey shall be walked in a different direction to allow opposing angles of observation. Clearance surveys of the plant site may only be conducted when tortoises are most active (April through May or September through October) unless the Project receives approval from CDFW and USFWS. Clearance surveys of linear features may be conducted during any time of the year. Any tortoise located during clearance surveys of solar arrays shall be translocated or relocated and monitored in accordance with the Desert Tortoise Translocation Plan (DTTP; Mitigation Measure 3.4-2b)

a. Burrow Searches. During clearance surveys all desert tortoise burrows and burrows constructed by other species that might be used by desert tortoises shall be examined by the Designated Biologist, who may be assisted by the Biological Monitors, to assess occupancy of each burrow by desert tortoises and handled in accordance with the USFWS Desert Tortoise Field Manual (USFWS, 2009d). To prevent reentry by a tortoise or other wildlife, all burrows shall be collapsed once absence has been determined in accordance with the DTTP. Tortoises taken from burrows shall be translocated as described in the DTTP.
b. Burrow Excavation/Handling. All potential desert tortoise burrows located during clearance surveys shall be excavated by hand, tortoises removed, and burrows collapsed or blocked to prevent occupation by desert tortoises in accordance with the DTTP. All desert tortoise handling and removal and burrow excavations, including nests, shall be conducted by the Designated Biologist, who may be assisted by a Biological Monitor in accordance with the USFWS Desert Tortoise Field Manual (USFWS, 2009d).

4. Monitoring Following Clearing. Following the desert tortoise clearance and removal from the power plant site and utility corridors, workers and heavy equipment shall be allowed to enter the Project site to perform clearing, grubbing, leveling, and trenching activities. A Designated Biologist or Biological Monitor shall be on-site for clearing and grading activities to move tortoises missed during the initial tortoise clearance survey. Should a tortoise be discovered, it shall be relocated or translocated as described in the DTTP.
5. Reporting. The Designated Biologist shall record the following information for any desert tortoises handled: a) the locations (narrative and maps) and dates of observation; b) general condition and health, including injuries, state of healing and whether desert tortoise voided their bladders; c) location moved from and location moved to (using GPS); d) gender, carapace length, and diagnostic markings (i.e., identification numbers or marked lateral scutes); e) ambient temperature when handled and released; and f) digital photograph of each handled tortoise. Desert tortoise moved from within Project areas shall be marked and monitored in accordance with the DTTP.

Mitigation Measure 3.4-2b: Desert Tortoise Translocation Plan. The Applicant/Owner shall develop and implement a USFWS-approved Desert Tortoise Translocation Plan (DTTP). The DTTP shall include measures to minimize the potential for repeated translocations of individual desert tortoises. The goals of the DTTP shall be to: relocate all desert tortoises from the Project site to nearby suitable habitat; minimize impacts on resident desert tortoises outside the Project site; minimize stress, disturbance, and injuries to relocated/translocated tortoises; and assess the success of the translocation effort through monitoring. The final DTTP shall be based on the draft Desert Tortoise Translocation Plan

prepared by the Applicant/Owner (Panorama Environmental, Inc., 2013d) and shall include all revisions deemed necessary by BLM, USFWS, and CDFW.

1.3 BIOLOGICAL ASSESSMENT/BIOLOGICAL OPINION

BLM prepared a Biological Assessment (BA) for the proposed project in November 2013. USFWS is currently preparing the Biological Opinion.

1.4 DESERT TORTOISE

The desert tortoise (*Gopherus agassizii*) is listed as threatened under the federal Endangered Species Act (USFWS 2013). It is also listed as threatened under the California Endangered Species Act (CDFW 2000). No live desert tortoises were located within the project ROW during a spring 2009 protocol-level survey. One live desert tortoise was located within the project ROW during a spring 2013 protocol-level survey. Based on the survey results it is estimated that at least two desert tortoises may be encountered during project activities.

1.5 DESERT TORTOISE TRANSLOCATION PLAN

This Desert Tortoise Translocation Plan (DTTP) outlines the process leading up to and including translocation of desert tortoise that may be impacted by construction of the proposed project. This DTTP addresses the 11 steps outlined in the *Translocation of Mojave Desert Tortoises from Project Sites: Plan Development Guidance* (Guidance) (USFWS 2011a). While fewer than five desert tortoises have been identified within the Soda Mountain Valley, this DTTP identifies recipient sites in case desert tortoises are located within the project area during construction. The presentation of information in the DTTP is outlined in Table 1.5-1.

The purposes of the DTTP are to provide:

- Estimates of the number of desert tortoises that may be present on the project site
- Detailed descriptions of the methods to be used to translocate any tortoises present on the project site at the time of project construction in order to avoid and minimize potential "take" of desert tortoises during the construction, operation, maintenance, and decommissioning phases of the project

The mitigation goals of the DTTP, consistent with Mitigation Measure 3.4-2b, are to:

- Relocate all desert tortoises from the project site to nearby suitable habitat
- Minimize impacts on resident desert tortoises outside the project site
- Minimize stress, disturbance, and injuries to relocated/translocated desert tortoises
- Assess the success of the translocation effort through monitoring

1.6 AGENCY COORDINATION

Mitigation Measure 3.4-2b in the Draft EIS/EIR states that the final DTTP shall be based on the draft DTTP and shall include all revisions deemed necessary by BLM, USFWS, and CDFW. CDFW and BLM provided comments during DTTP drafting. SMS submitted the DTTP to CDFW and USFWS for review and comment. SMS discussed CDFW's comments with CDFW. SMS also discussed the DTTP with USFWS. SMS subsequently made revisions to the DTTP based on this agency coordination.

Table 1.5-1: DTTP Steps and Locations in the DTTP

DTTP Step	Location in DTTP
1. Determine the need for translocation of desert tortoises.	The need for translocation is discussed in Section 2.
2. Estimate the number of desert tortoises that will be affected at the project site.	The estimated number of desert tortoises is presented in Section 3.
3. Identify potential recipient and control sites for projects.	Recipient sites are identified and discussed in Section 4. Control sites are not required when the number of tortoises expected to be translocated is equal to or less than five (USFWS 2011a, Table 1). Two tortoises are estimated to require translocation; therefore, no control sites are necessary and none have been analyzed.
4. Estimate desert tortoise abundance at agreed-upon potential recipient and control sites.	Desert tortoise abundance is estimated for potential recipient sites in Section 4. As stated above, no control sites are necessary and none have been analyzed.
5. Develop the translocation plan and associated effectiveness monitoring program.	The translocation plan is described in Sections 5. Translocation monitoring is described in Section 6.
6. Confirm desert tortoise abundance at the potential recipient and control sites as in situ health assessment sampling is conducted and transmitters are attached.	Desert tortoise abundance will be confirmed at the potential recipient sites only if Option 2 is used for translocation. Abundance surveys are discussed in Section 5.4.1, Option 2: Translocation to Recipient Area. Control sites are not required when the number of tortoises expected to be translocated is equal to or less than five (USFWS 2011a, Table 1). Approximately two tortoises are expected to be translocated; therefore, no control sites are necessary and none have been analyzed.
7. Determine if desert tortoises on the project site will be held in situ or ex situ.	In situ detention of desert tortoise is discussed in Section 5.3.4.
8. Construct project fencing, conduct protocol clearance surveys of the project site, and perform health assessments.	Surveys are discussed in Section 5.2. Health assessments are discussed in Sections 5.3.2 and 6.1.
9. Translocate desert tortoises following acceptance of translocation review package.	The Translocation Review Package is discussed in Section 5.4. Translocation is discussed in Section 6.
10. Implement post-translocation monitoring (30-year minimum) and adaptive management to evaluate effectiveness of translocation as a take-minimization measure.	Monitoring of translocatees, residents, and controls is not required by USFWS when there are five or fewer translocatees (USFWS 2011a, Table 1); however, CDFW does require monitoring for at least 5 years. Post-translocation monitoring is described in Section 6.

Table 1.5-1 (*Continued*): DTTP Steps and Locations in the DTTP

DTTP Step	Location in DTTP
11. Compile and synthesize data throughout duration of translocation and monitoring.	Data will be collected through the pre-translocation process and during translocation, as described in Sections 5.2.4. Monitoring of translocatees, residents, and controls is not required when there are five or fewer translocatees (USFWS 2011a, Table 1) ; however, CDFW does require monitoring for at least 5 years. Post-translocation monitoring is described in Section 6.

2 NEED FOR TRANSLOCATION

2.1 DESERT TORTOISE POPULATION ON SITE

The project area is located within the range of desert tortoise. It is in creosote bush scrub habitat, has annual precipitation between 5 and 20 centimeters, is at an elevation between 100 and 1,525 meters, and has friable soils for burrow construction. It is located in the Western Mojave Recovery Unit (USFWS 2011c: Figure 10). The project has been designed to minimize impacts on high-quality desert tortoise habitat. The project site does not contain high-quality desert tortoise habitat and was selected in part because it is not located within a Desert Wildlife Management Area.

Several characteristics of the project area indicate the project area does not support a high-density tortoise population. The substrate and vegetation are not ideal desert tortoise habitat. Desert tortoise occur most commonly on gently sloping terrain (bajadas) consisting of sand- and gravel-rich soils where there is sparse cover of low-growing shrubs. Soils normally must be friable enough for digging burrows, yet firm enough so that burrows do not collapse (USFWS 2011c). Tortoises generally cannot construct burrows in rocky soils or shallow bedrock (USFWS 2011c); however, tortoises are known to inhabit rock burrows (Campbell 2014). The project site contains abundant rocks and cobbles, thereby reducing the ability of tortoises to burrow in the area.

Tortoise habitat is ideal where vegetation diversity and production is high (Nussear et al. 2009). Vegetation in the project area has low shrub species diversity. The project area is sparsely vegetated and includes six vegetation communities/land types: creosote bush-white bursage scrub, cheesebush scrub, creosote bush scrub, developed, disturbed, and smoke tree woodland. Community/land types are based on dominant vegetation composition and density observed during field surveys of the project area. Soils within the action area are predominantly sand and silty sand. The alluvial fans within the project area include gravelly soils with boulders and steep slopes. There is some desert pavement development on the southern polygons. Although desert pavement may not be used much by tortoises due to its lack of cover and forage, tortoises do use washes on the periphery of desert pavement. Washes on the project area tend to be small and tortoise sign was not observed in the washes (Kiva 2012a).

Suitable habitat for desert tortoise was identified for the Draft Desert Renewable Energy Conservation Plan Baseline Biology Study (CEC 2012) using a geographic information system (GIS) model that built on the results of the model developed by Nussear et al. (2009). Potential suitable habitat was first defined in this model as those areas with a predicted probability of desert tortoise habitat suitability of 0.6 or greater. The 4,179-acre project area had a Suitability Index of 0.6 to 0.8 (Nussear et al. 2009) indicating suitable habitat for desert tortoise.

Habitat, soils, and the Suitability Index from Nussear et al. (2009) indicate desert tortoise should be present within the action area. Surveys conducted for the project realignment indicate tortoise are present in low numbers along the eastern edge of the 4,179-acre project site. The Suitability Index correctly predicted that tortoises will be present within the project area but surveys conducted by URS (2009) and the current surveys conducted by Kiva Biological (2012 and 2013) indicate that abundance of tortoise is low. Bury et al. (1994) report that higher tortoise densities are found between 350 to 1,000 meters (1,000 to 3,000 feet). Woodman (2012) has found that higher densities (>20 per square mile) are found at elevations between 550 and 1,000 meters (1,800 to 3,100 feet). Elevations at the site, which range from 400 to 500 meters (1,300 to 1,650 feet), are in the lower range reported in Bury et al. (1994), are below Woodman's observed elevations, and may be a primary reason for the low tortoise densities in the region.

It is also likely that the presence of Interstate 15 (I-15) has reduced the habitat suitability of the project site. Studies of tortoise presence along highways reveal that tortoise densities and sign increase farther from a highway, and high-volume highways can result in decreases in tortoise sign up to 13,000 feet (4,000 meters) from highways (Hoff and Marlow 2002). Tortoise sign has been identified along the margins of the Soda Mountain valley, and no sign has been located near the freeway. The low abundance of desert tortoise in the interior of the valley may therefore be attributed to the presence of I-15, which traverses the valley center.

The best potential habitat for desert tortoise is at the perimeter of the valley and outside of the project area. Surveys have located sign and one live tortoise in the perimeter area outside of the proposed solar array area. The substrate on the perimeter area is more friable with greater burrowing potential. The project will generally not affect these higher-quality habitat areas because the arrays and other components will be located in the interior of the valley. The project, therefore, minimizes impacts on desert tortoise habitat and desert tortoise in the area.

2.2 DESERT TORTOISE CONNECTIVITY

The project configuration will not substantially affect desert tortoise connectivity because the project site is not located in a desert tortoise connectivity corridor. This section provides a summary of desert tortoise connectivity through the project site. Refer to the Biological Resources Technical Report (Panorama 2013) for a full discussion of desert tortoise connectivity in the project region.

Several studies have been and are currently being conducted on desert tortoise connectivity corridors in the project region. These studies suggest that the project area is not a connectivity corridor for desert tortoise. The project area was not included in a desert tortoise linkage corridor in *A Linkage Network for the California Deserts* (Penrod et al. 2012). *Making Molehills Out of Mountains: Landscape Genetics of the Mojave Desert Tortoise* (Hagerty et al. 2010) describes the Baker Sink, Soda Lake, and Mojave wash east and south of the project area as landscape barriers to tortoise movement. The *Revised Recovery Plan for the Mojave Population of the Desert Tortoise* (USFWS 2011c) suggests that Baker Sink through Soda Lake may be a movement barrier

between the Eastern Mojave recovery unit and the Western Mojave recovery unit (USFWS 2011c). Hagerty et al. (2010) further found that the Baker Sink was significantly correlated with genetic difference between populations. The U.S. Geological Survey model of habitat suitability (Nussear et al. 2009) also identifies the Baker Sink as being unsuitable habitat for desert tortoise in the Western Mojave. Desert tortoise are known to occur in the Baker sink and have been found around the Soda Lake area indicating that a small population of desert tortoise may occur within the Baker sink and Soda Lake (Jones 2014).

Project area and project region surveys suggest little to no connectivity through the project area due to the low abundance of tortoise in the area. Protocol surveys of the project area conducted in 2013 found one live tortoise, burrows, scat, and one carcass at the base of the mountains on the south side and four carcasses on the north side. The low numbers and limited distribution of tortoise and sign indicate that desert tortoise do not heavily use the area (Kiva 2012a and 2013). Recent observations of tortoise sign and an individual desert tortoise in the Baker Sink just north of the town of Baker indicate that the Baker Sink may not be a complete barrier to tortoise connectivity (Otahal 2013).

3 ESTIMATE OF AFFECTED DESERT TORTOISE

This section presents summaries of desert tortoise survey results and a habitat suitability analysis for the project area, followed by an estimate of the number of desert tortoise that could be affected by the project. Refer to the *Biological Resources Technical Report* (Panorama 2013) and desert tortoise survey reports (Kiva 2012a; Kiva 2012b; Kiva 2013) for a full discussion of survey results and desert tortoise habitat in the project area.

3.1 SURVEY RESULTS

Several surveys have been conducted on the site during spring and fall. Table 3.1-1 provides a summary of survey findings. Figure 3.1-1 shows the survey areas described in Table 3.1-1 and Figure 3.1-2 shows the locations of the survey results.

There is an anecdotal account of a desert tortoise on Opah Ditch Road near the western edge of the ROW area in 2001 (Jones 2013). This sighting was not part of a formal survey and was not formally recorded.

3.2 POPULATION ESTIMATE

The equation in Appendix 1 to the *2010 Pre-project Field Survey Protocol for Potential Desert Tortoise Habitats* (USFWS 2010) was used to estimate tortoise abundance in the project area:

$$(\#\ of\ tortoises) = \frac{1\ tortoise}{(0.80)(0.63)}\left(\frac{4{,}179\ acres}{4{,}179\ acres}\right) = 2\ tortoises$$

Rainfall was 1.79 inches (>1.5 inch) during the winter preceding the 2013 survey (WRCC 2013). The probability that a tortoise will be above ground during the 2013 survey is, therefore, 0.8 (USFWS 2010). Three different sizes of burrows were identified on the eastern edge of the Soda Mountain valley indicating that there may be three desert tortoises in the project area or vicinity. The limited sign of desert tortoise on site, combined with identification of only one live tortoise during one of several project area surveys, indicate that there are likely fewer than five desert tortoises inhabiting the project site. The actual number of desert tortoises on the project site as of the commencement of construction cannot be determined from field survey data alone, due to the possibility that tortoises may have been overlooked during surveys (e.g., underground in burrows, eggs in an underground nest, and juveniles in various types of refugia) or may have moved onto the site after surveys were completed. The DTTP anticipates that five or fewer tortoises are present on the project site, and will necessitate translocation prior to construction. The desert tortoise population in the Soda Mountain valley is considered depleted with fewer than 2.2 desert tortoise per square kilometer.

Table 3.1-1: Desert Tortoise and Other Surveys Results

Survey	Survey Area	Live Tortoise	Scat	Burrows	Carcasses	Rock Shelters
2001 Desert Tortoise Survey at Opah Ditch (outside SMS)*	115-acres in Opah Ditch area	0	9	5	3	3
2009 SMS Desert Tortoise Survey (including QA/QC surveys at 10-foot [3-meter] spacing)*	6,770-acre 2009 ROW	0	1 (ZOI)	0	0	0
2012 SMS Desert Tortoise Supplemental 220-acre Survey*	220 acres and ZOI	0	20 (ZOI)	8 (SMS) 2 (ZOI)	1 (SMS) 1 (ZOI)	0
2012 Geotechnical Study Desert Tortoise Survey*	17 acres and 10-meter transects on either side of 5.3 miles of access routes	0	0	0	0	0
Fall 2012 Botanical Survey	4,075-acre potential impact area[1]	0	1	3 (SMS)	1 (ZOI)	0
Spring 2013 Desert Tortoise Survey*	4,179-acre 2013 ROW and ZOI	1[2]	6 (ZOI)	18 (SMS) 5 (ZOI)	3 (SMS) 2 (ZOI)	0

Note:

[1] The 2012 plant survey area was smaller than the fall 2012 ROW because area south of the North Array was unlikely to be subject to surface disturbance.

[2] Note that, although USFWS desert tortoise survey protocol requires recording tortoise of greater than 160 mm midline carapace length (MCL), no tortoise equal to or less than 160 mm midline carapace length (MCL) were located during this survey.

SMS: Soda Mountain Solar ROW Area ZOI: zone of influence

* Conducted according to USFWS desert tortoise survey protocol.

Sources: AMEC 2001; URS 2009; Caithness 2010; Kiva 2012a; Kiva 2012b; Kiva 2013; CSESA 2012

Figure 3.1-1: Survey Locations

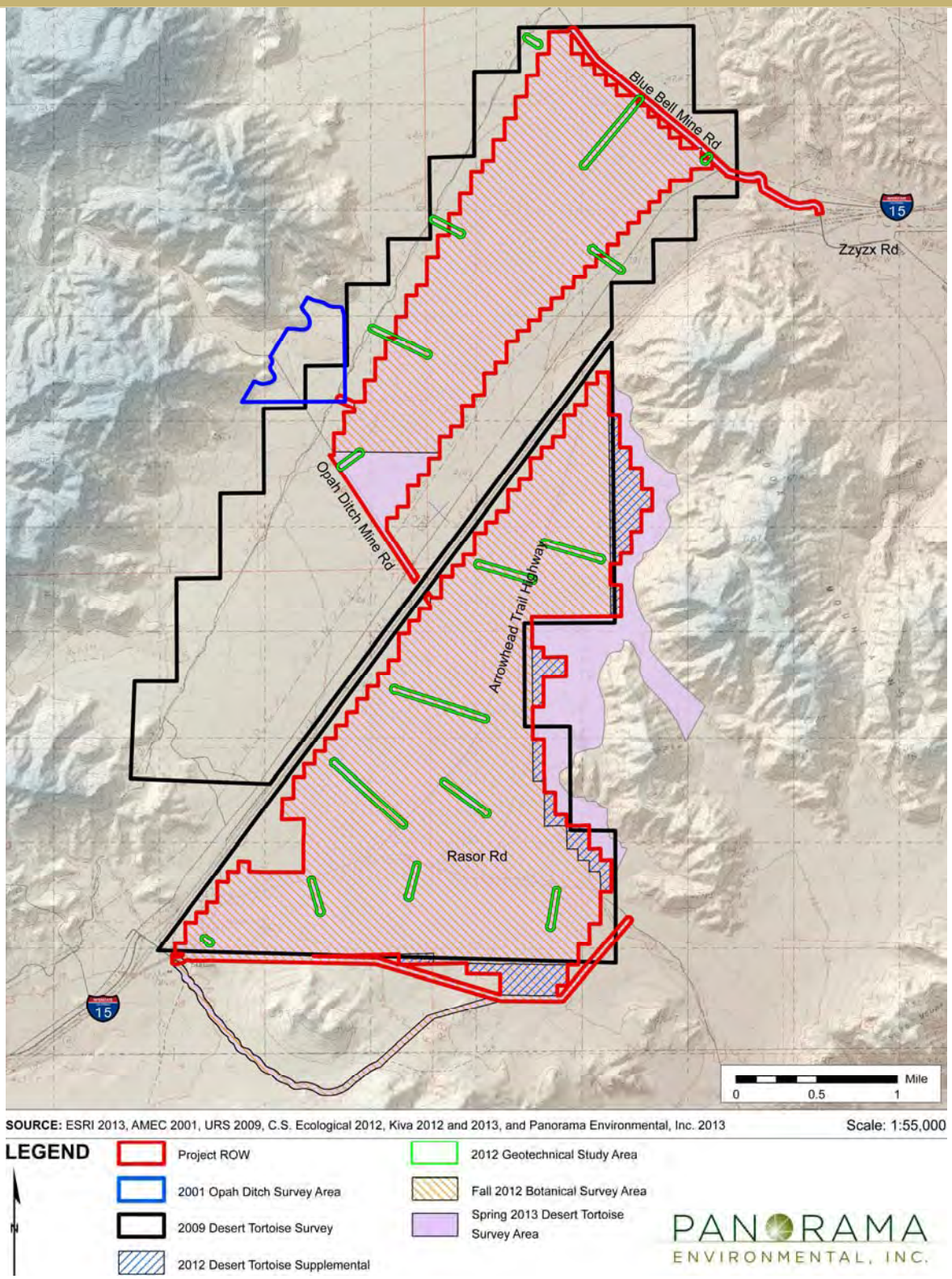
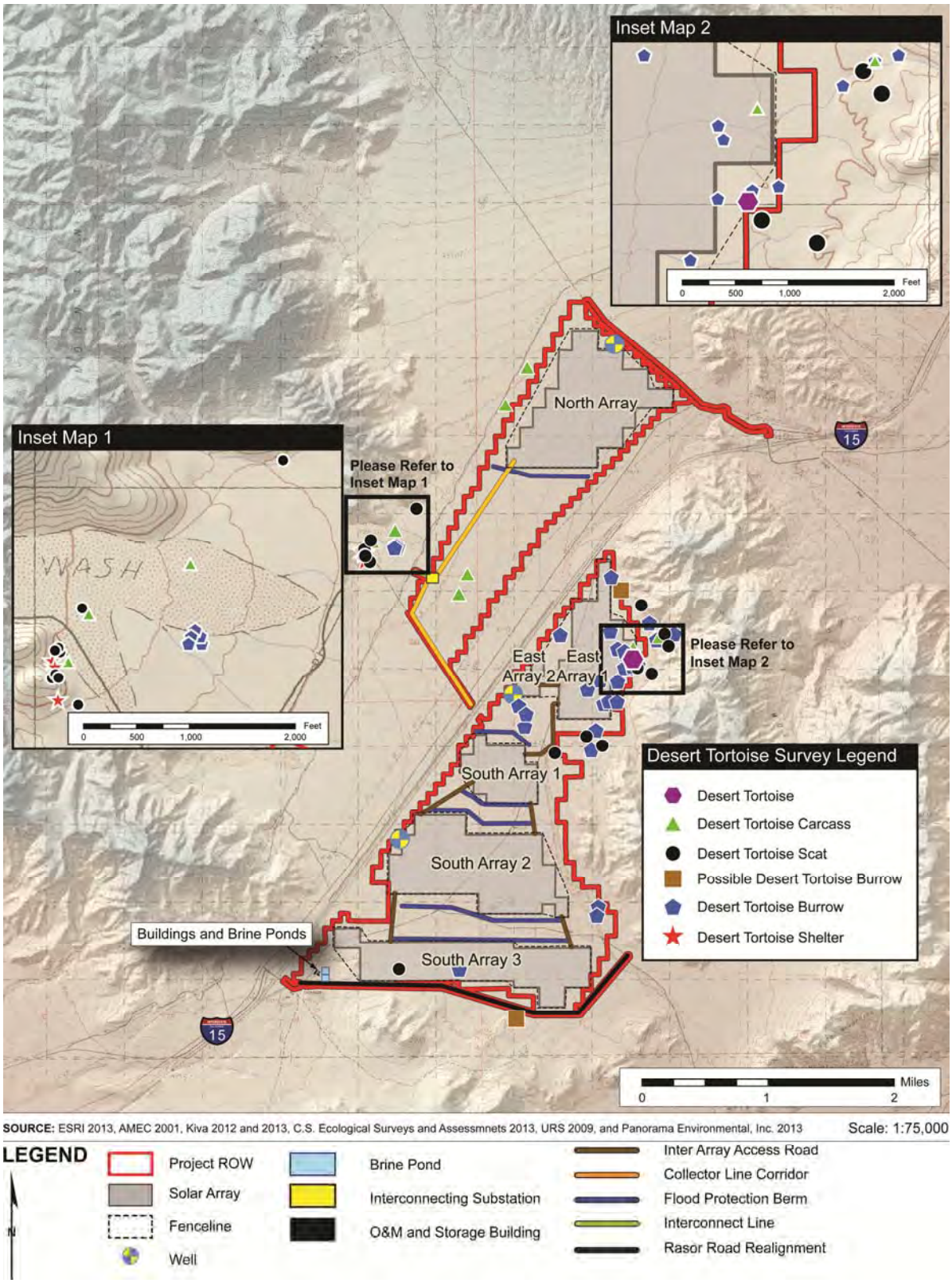


Figure 3.1-2: Desert Tortoise Sign and Tortoise Locations



4 POTENTIAL RECIPIENT AREAS

4.1 POTENTIAL RECIPIENT AREAS SELECTION PROCESS

4.1.1 Selection Criteria

The following site criteria, as described in the Guidance (USFWS 2011a), were applied to identify potential recipient sites:

- Contains suitable habitat for desert tortoises of all life stages
- Disease prevalence in resident population less than 20 percent
- Is at least 10 kilometers (6.2 miles) away from major, unfenced roadways
- Is within 40 kilometers (24.9 miles) of project site without natural barriers of movement between the recipient site and project site
- Occurs on lands where desert tortoise have been depleted or extirpated but where habitat is suitable
- Is free of detrimental ROWs and other encumbrances
- Will be managed for conservation to prevent any future impacts

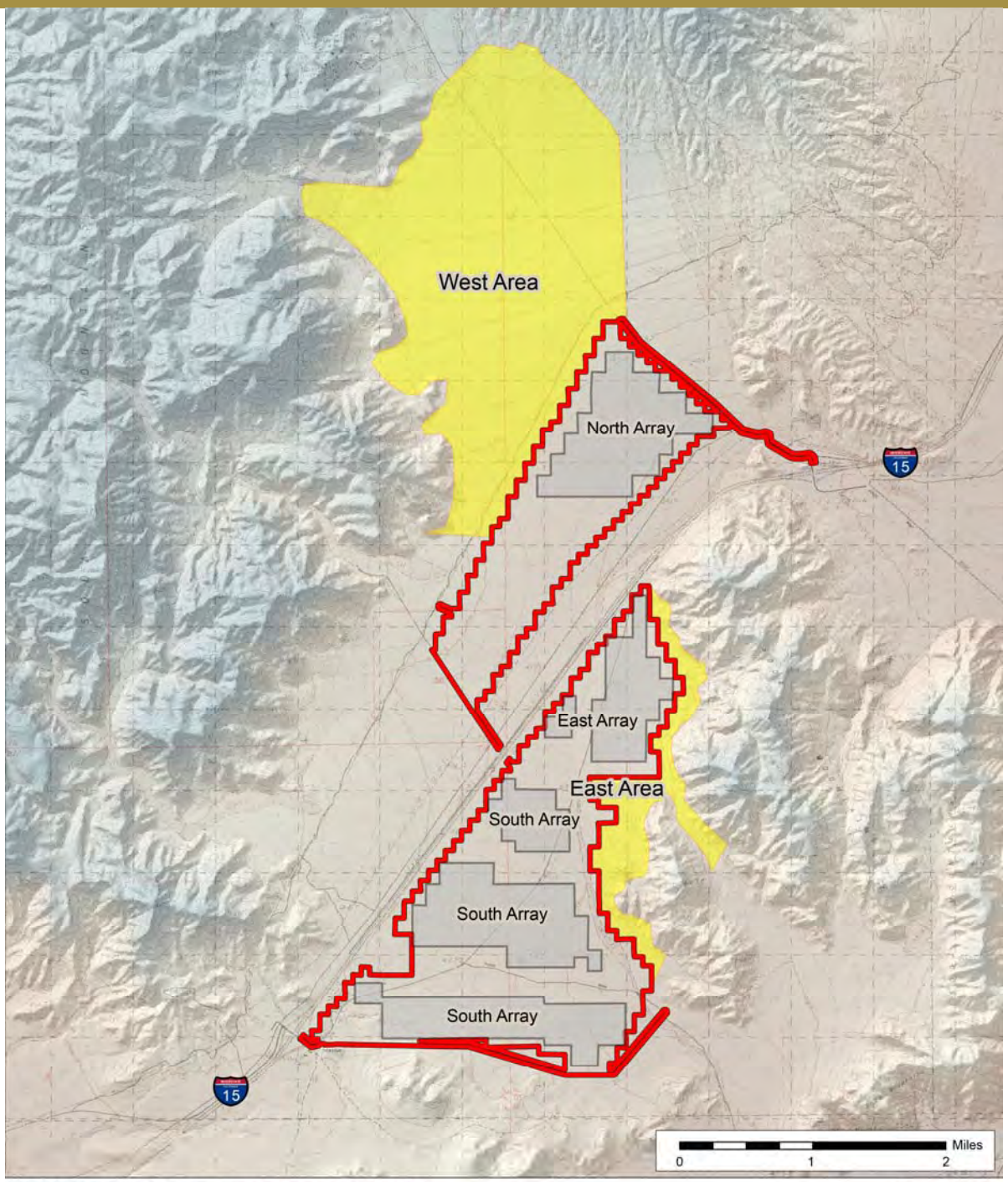
The first three criteria are mandatory. The distance from highways listed in criterion 3 can be reduced from 10 kilometers, however, if tortoise exclusion fencing installation and maintenance is included as a minimization measure. Fencing of I-15 will, therefore, be required to use areas within the Soda Mountain valley as recipient areas.

Recipient areas were chosen with the goal of using areas in the Soda Mountain valley in order to keep tortoises in or near their home range and minimize overall disturbance to the extant desert tortoise population in the project area.

4.1.2 Potential Recipient Areas

Two potential recipient areas have been identified for translocation of desert tortoise. These two areas are shown in Figure 4.1-1. Table 4.1-1 describes how each recipient area meets the selection criteria defined above. Table 4.1-2 includes information on the recipient area size, survey results, and depleted status. Should a currently unsurveyed recipient area be considered for tortoise translocation, the area would be subject to a 100-percent coverage, protocol-level desert tortoise survey, as described in Section 5.2.4.

Figure 4.1-1: Potential Recipient Areas



SOURCE: ESRI 2013 and Panorama Environmental, Inc. 2013

Scale: 1:75,000

LEGEND

Proposed Project ROW

Desert Tortoise Recipient Area

Solar Array

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Table 4.1-1: Suitability of Potential Recipient Areas

Criterion	East Recipient Area Conditions	West Recipient Area Conditions
Contains suitable habitat for desert tortoises of all life stages	**Yes.** The vegetation and habitat of this recipient area are similar to that of the project site. Desert tortoise sign, including burrows and scat, were identified within this recipient area indicating the presence of desert tortoise and suitable habitat.	**Yes.** The vegetation and habitat of the relocation area are similar to that of the project site. The recipient area is adjacent to the project area and includes areas along the perimeter of the valley that are expected to have habitat quality. The area was modeled as suitable habitat by USGS (Nussear et al. 2009).
Disease prevalence in resident population less than 20 percent	**Yes.** No desert tortoise were observed within the recipient site during 2013 protocol surveys. The translocated tortoise population is expected to be the same as the resident population because translocated tortoises will be kept in the valley. Therefore, disease prevalence should not change due to translocation.	**Yes.** There is no known resident population within the recipient area. The translocated tortoise population is expected to be the same as the resident population because translocated tortoises will be kept in the valley. Therefore, disease prevalence should not change due to translocation. 100 percent protocol surveys will be conducted to locate tortoises and test for disease in the translocation area if the site needs to be used for translocation.
Is at least 10 kilometers (6.2 miles) away from major, unfenced roadways, or desert tortoise exclusion fencing installation and maintenance is included as a minimization measure	**Yes.** I-15 is within 10 kilometers of the recipient area. SMS will install desert tortoise exclusion fencing along I-15 to prevent desert tortoise access to I-15.	**Yes.** I-15 is within 10 kilometers. The Xpress West project is required to install tortoise fencing on the west side of I-15 (USDOT 2011). SMS will install desert tortoise exclusion fencing along I-15 to prevent desert tortoise access to I-15 if it is not installed by Xpress West prior to translocation to the West Recipient Area.
Is within 40 kilometers (24.9 miles) of project site without natural barriers of movement between the recipient site and project site	**Yes.** The recipient area is adjacent to the project site. There are no natural barriers between the recipient site and the project site.	**Yes.** The recipient site is adjacent to the project site. There are no natural barriers between the recipient site and the project site.
Occurs on lands where desert tortoise have been depleted or extirpated but where habitat is suitable	**Yes.** No desert tortoise were observed within the area during surveys.	**Yes.** No desert tortoise were observed within the area during surveys. Desert tortoise carcasses occurred in the area indicating that the area is suitable for desert tortoise and desert tortoise occur nearby. The carcasses were in the vicinity of the transmission lines. The tortoises may have been predated by ravens.

Table 4.1-1 (*Continued*): Suitability of Potential Recipient Areas

Criterion	East Recipient Area Conditions	West Recipient Area Conditions
Is free of detrimental ROWs and other encumbrances	**Yes.** A portion of the East Recipient Area is shown within the SMS proposed ROW. The SMS ROW will be revised in the ROD and the final translocation area will reflect only those areas of the East Translocation Area on Figure 4.1-1 that are outside of the Final SMS ROW..	**Yes.** There is a subtransmission line ROW and a transmission line ROW oriented southwest-northeast through the area. These ROWs and associated transmission line will not impede tortoise travel through the area because they are either below or above ground level. Blue Bell Mine Road passes through the area in a southeast-northwest orientation. This road is not thought to be heavily used and will not impede tortoise travel through the area. The risk of injury will be very low due to the limited traffic on this road.
Will be managed for conservation to prevent any future impacts	**Yes.** The area is on land managed by BLM. Part of the area is within the SMS ROW. SMS will work with BLM to identify methods to manage the land to prevent future impacts.	**Yes.** The area is on land managed by BLM. SMS will work with BLM to ensure the area remains viable habitat.

Table 4.1-2: Proposed Soda Mountain Solar Recipient Areas

Recipient Area	Acres	USGS Model (0 – 1)	Survey Status	Depleted Status[1]	Estimated Density	Maximum Post-Translocation Capacity[2]
East	446	0.4 – 0.5[3]	100% protocol surveys in 2013	Yes: 0 live tortoise observed; burrows, scat and carcasses observed	0[3]	10
West	240	0.7 – 0.8	100% protocol survey in 2009	Yes : 0 live tortoise observed; carcasses	0	5
	2,900	0.7 – 0.8	720 acres covered by zone of influence surveys in 2009	Assumed to be depleted; 0 live tortoise or sign observed during zone of influence surveys	0	64
Summary	966	--	Protocol surveys in 2013	Yes	0	21
	855	--	Protocol surveys in 2009	Yes	0	18
	Up to 2,900	--	No protocol surveys	Assumed to be depleted	0	64

Notes:

[1] Maximum depleted-area density is 2.15 tortoises/km^2 for the Western Mojave Recovery Unit. Density estimates calculated per USFWS guidelines.

[2] Maximum recipient and translocatee density is 5.55 tortoises/km^2 for the Western Mojave Recovery Unit.

[3] The USGS model shows that the East Recipient Area has low habitat suitability for desert tortoise due to the presence of mountains in the 1-km blocks that are the model units of analysis. The survey results indicate that this area provides good quality habitat for desert tortoise.

Recipient areas are defined as depleted or non-depleted. According to the Guidance (USFWS 2011a), an area is depleted if it satisfies three factors:

- The density is below the density thresholds identified in Table 2 of the Guidance (2.15 tortoises per square kilometer pre-translocation, 5.55 tortoises per square kilometer post-translocation).
- There is suitable habitat.
- There is a lack of sign or a preponderance of desert tortoise shells.

5 TRANSLOCATION METHODS

5.1 OVERVIEW

The pre-translocation activities described below will be revised as needed to comply with the terms and conditions contained in any Biological Opinion (BO) and Incidental Take Permit or Consistency Determination issued by the U.S. Fish and Wildlife Service (USFWS) and the California Department of Fish and Wildlife (CDFW) for the project.

Any desert tortoises that are found on the project site during preconstruction clearance surveys will be either translocated to a recipient site or removed from the wild, depending upon disease status and resource agency direction. The survey, testing, and translocation procedures are briefly summarized here as an overview. First, the project site will be fenced to prevent desert tortoises from entering it during construction and potentially throughout the life of the project, depending on agency direction. Second, all desert tortoises within the fenced boundaries will be located by field biologists and their health conditions will be assessed visually. For tortoises >100 mm MCL that appear healthy, blood will be drawn to determine upper respiratory tract disease (URTD) status, including infection with herpesvirus and Mycoplasma (*M. agassizii* and *M. testudineum*), and they will be allowed to move about all or part of the fenced project site, pending results of the disease test. Blood samples will be sent to the Mycoplasma Research Laboratory, University of Florida, Gainesville to be tested using an enzyme-linked immunoabsorben assay. All live tortoises >100 mm MCL will be fitted with radio transmitters. Tortoises small than 100 mm MCL may be monitored visually, by regularly confirming their locations, until they are removed from the project site. Tortoises showing visual signs of illness or injury will be held in quarantine facilities on the project site as described in Section 5.3.4 to prevent them from interacting with other tortoises, until they are removed from the site for transport to a suitable care facility.

Construction of the project will not take place in any given portion of the project site until all tortoises throughout the project site have been either translocated off site or held in fenced areas or quarantine enclosures elsewhere on the project site pending translocation or transport to a care facility. Holding areas will be away from work areas and protected by exclusion fencing so that tortoises cannot access the work areas. Blood samples will be sent to a laboratory for disease assay. No tortoises will be translocated from the site until the test results are returned. Depending upon the results of the visual health assessment and laboratory disease test, tortoises may be translocated to the selected recipient site or may be removed from the wild. After all preconstruction clearance surveys and visual health evaluations are complete, the Designated Biologist and Resource Agencies (USFWS and CDFW) will tentatively determine the

number of tortoises to be removed from the site. The Designated Biologist will prepare a Disposition Plan for each tortoise. Desert tortoise will then be translocated according to the agency approved Disposition Plan.

5.2 SURVEYS

5.2.1 Preconstruction Perimeter Fence Survey

Desert tortoise exclusion fencing will be installed at the perimeter of project construction areas (i.e., solar array areas, project buildings, substation/switchyard, earthen berms, and along the edge of access roads and collector line corridors). The fence locations will be determined during final design and will enclose areas of project activity. The fenceline and a 30-foot-wide buffer will be surveyed for desert tortoise before construction of the fence and according to the USFWS Desert Tortoise Field Manual (Chapter 6—Clearance Survey Protocol for Desert Tortoise—Mojave Population) (USFWS 2009) and as described in Mitigation Measure 3.4-2a. Two surveys will be conducted. A third survey will be conducted if desert tortoise(s) are located during the second survey. Tortoises found in the fenceline survey area or spotted within 50 meters of the fenceline survey area will be:

- Assigned a USFWS identification number.
- Given a health assessment (described in Section 5.3.2).
- Fitted with a transmitter. Tortoises that are too small to accept a transmitter (i.e., no transmitter is available that is 10 percent or less of the tortoise's body weight) will be treated as a translocatee and held in situ, as described in Section 5.3.
- Moved into habitat adjacent to and outside the fenceline. The tortoise will be moved into an empty burrow if clearance of the fence area takes place outside the tortoise active season (i.e., from November to March and from June to August).

Any of the moved tortoises that return to the project site before completion of fence construction will be treated as a translocatee, as detailed beginning in Section 5.3. Desert tortoises remaining outside the fenceline prior to completion of the fence will be deemed residents. USFWS procedures will be followed to clear and handle the desert tortoises.

5.2.2 Project Site Preconstruction Clearance Survey

The project site preconstruction clearance survey will be conducted during the desert tortoise active season (April through May and September through October) unless otherwise agreed to by USFWS. Surveys will be conducted according the USFWS Desert Tortoise Field Manual (Chapter 6—Clearance Survey Protocol for Desert Tortoise—Mojave Population) (USFWS 2009) and as described in Mitigation Measure 3.4-2a. Two surveys would be conducted. A third survey would be conducted if desert tortoise(s) are located during the second survey. Any tortoise scat will be collected on each pass of a transect, per the Guidelines. USFWS procedures will be followed to clear and handle the desert tortoise.

5.2.3 Linear Facilities Preconstruction Clearance Survey

The linear facilities preconstruction clearance survey(s) will be conducted at any time throughout the year. Linear facilities for this project will include the buried collector lines between arrays and connecting to the substation. Located desert tortoises will be undisturbed and allowed to clear the site without assistance or interference. Surveys will be conducted according the USFWS Desert Tortoise Field Manual (Chapter 6—Clearance Survey Protocol for Desert Tortoise—Mojave Population) (USFWS 2009) and as described in Mitigation Measure 3.4-2a. Two surveys would be conducted. A third survey would be conducted if desert tortoise(s) are located during the second survey. Tortoises will be moved if necessary to reduce the potential for harm from construction activities, but will not be moved more than 500 meters in such a scenario. USFWS procedures will be followed to clear and handle the desert tortoise.

5.2.4 Recipient Area Survey

Surveys are required for recipient areas used for translocation. The East recipient areas was subject to a 100 percent coverage protocol-level survey for desert tortoise in 2013. Recipient areas to be used for translocation would be identified after completing surveys of the perimeter fence, the project area, and linear facilities. If the West recipient area is needed for translocation, it would be surveyed according to the most recent USFWS Pre-project survey protocol and during the highest activity period of desert tortoise. The survey would cover an area large enough to accommodate the number of tortoises encountered during clearance surveys. The recipient area survey would be conducted immediately after the clearance surveys.

5.2.5 Construction Monitoring

A Designated biologist will be on-site during clearing and grading activities to move any desert tortoise that have moved back into the construction area or that were missed during the pre-construction clearance surveys. Desert tortoise found during construction will be translocated as described in this plan.

5.2.6 Data Collection

Data will be collected during clearance surveys as described in this section. The same data will be collected again on tortoises held in the interim in situ on the day that the tortoise is translocated from the project site. The data will include:

- Date
- Time
- Temperature (°C)
- Project Name
- Site type (project/recipient/control)
- Landowner (BLM)
- Permit/BO #
- Coverage #
- Field crew vendor
- Surveyor (first and last name)
- ID#
- MCL (mm)
- Sex
- UTM (Easting)
- UTM (Northing)
- Location (e.g., burrow)
- Transmitter manufacturer
- Transmitter serial #
- Transmitter frequency
- Transmitter install date
- Battery life (months)
- Status (alive/dead/lost)

5.3 INTERIM DESERT TORTOISE HOLDING AND MONITORING

Desert tortoises will only be handled by biologists who are authorized by USFWS and CDFW to do so (i.e., the project Designated Biologist and any Biological Monitor with appropriate qualifications), and any handling of desert tortoises will follow specific terms of agency permits or Memoranda of Understanding, including daily, seasonal, and air or ground temperature limitations on handling. Tortoises located on site during the desert tortoise preconstruction clearance survey and tortoises located on site during the desert tortoise exclusion fencing survey that return inside the fenceline will be held in situ if they appear healthy until blood is drawn, test results are received, and the Translocation Review Package (Section 5.4) is prepared and approved by USFWS and CDFW. Visual health assessments will be conducted by biologists approved and permitted by BLM, USFWS, and CDFW to conduct such assessments, following USFWS guidance (2011a). Visual health assessments will be performed upon locating tortoises during preconstruction field surveys, prior to translocation. At a minimum, for all desert tortoises handled, the Designated Biologist will mark the animals with unique identification numbers as assigned by USFWS and record data as recommended by USFWS (2011a; 2011b), and as required in Mitigation Measure 3.4-2a, including:

- Locations (narrative and maps) and dates of observation
- General condition and health, including injuries, state of healing, and whether desert tortoise voided its bladder during handling
- Locations the tortoise is moved from and moved to (GPS coordinates)
- Gender, midline carapace (shell) length, weight, and diagnostic markings (i.e., identification numbers or marked lateral scutes [shell segments])
- Ambient temperature when handled and released
- Digital photograph of each desert tortoise handled

Tortoises that appear to be healthy will either be (1) fitted with a radio transmitter and allowed to move throughout all or part of the project area (i.e., within the tortoise exclusion fence and away from the project construction area); or (2) fitted with a radio transmitter and held within a fenced 100-meter radius enclosure surrounding the active or occupied burrow to enable subsequent relocation. No tortoise will be held on the site for longer than 18 months.

Tortoises that do not appear healthy will be held in quarantine pending health assessment results. Pen design is discussed in Section 5.3.4, Detention, Non-transmittered Tortoises. Tortoises with positive URTD test results will be held in situ, pending preparation and approval of a Disposition Plan and relocation in consultation with USFWS and CDFW. If test results are inconclusive, the animal will be held in a quarantine enclosure until results of a second test are available.

5.3.1 Transmittering

All tortoises >100 mm MCL will be fitted with a transmitter. If a small desert tortoise is identified that cannot be fitted with a transmitter, an interim holding pen will be constructed as described in Section 5.3.4, Detention, Non-transmittered Tortoises. Healthy tortoises will not be placed in the same pen as unhealthy tortoises.

5.3.2 Health Assessment

A health assessment will be conducted on translocatee tortoises upon locating the tortoise and prior to translocation. Qualified biologists (those approved and permitted by USFWS and CDFW) will conduct health assessments. The health assessment will follow USFWS guidance in *Health Assessment Procedures for the Desert Tortoise (Gopherus agassizii): A Handbook Pertinent to Translocation* (Handbook) (USFWS 2011b). The qualified biologist will make a recommendation as to whether the tortoise is fit to be translocated according to the algorithm contained in Appendix G of the Handbook health assessment; documentation will be submitted to USFWS.

5.3.3 USFWS Identification

Each tortoise will be assigned a USFWS identification number that is unique to the tortoise.

5.3.4 Detention

Transmittered Tortoises

Transmittered tortoises will be monitored in situ and will not be detained. Transmittered tortoises will be monitored on the project site via telemetry at least once per month until translocation. Data listed in Section 5.2.4 will be collected once monthly until translocation.

Non-transmittered Tortoises

Tortoises with visual evidence of injury or illness or positive URTD test results will be held in quarantine enclosures on the project site, pending preparation and approval of a Disposition Plan and relocation in consultation with USFWS and CDFW. If test results are inconclusive, the animal will be held in a quarantine enclosure until results of a second test are available. The specific locations of the enclosures will be determined by the Designated Biologist prior to initiation of preconstruction clearance surveys, in consultation with BLM, USFWS, and CDFW. The Designated Biologist may recommend holding them at an alternate off-site facility, pending approval of BLM, USFWS, and CDFW.

Tortoises will be penned individually unless individuals were found in the same burrow, in which case they may be placed together. Pens will be built similar to the pens in Section I.A of *Temporary Captive Care of Wild Mojave Desert Tortoises: Examples of Protocols Used at the Desert Tortoise Conservation Center* (SDZG 2010). Data listed in Section 5.2.4 will be collected once monthly. Quarantined tortoises will be monitored in accordance with surveillance recommendations of San Diego Zoo Global. The quarantine period will not exceed 18 months. Every attempt will be made to translocate or transport each animal within 18 months of the date it was initially discovered.

5.4 TRANSLOCATION REVIEW PACKAGE

A translocation review package will be submitted to USFWS and CDFW after conducting the health assessment so that the agencies can concur on the disposition plan for the translocatee tortoises. The translocation review package will be submitted at least two weeks prior to the planned translocation. No tortoises will be translocated prior to USFWS and CDFW approval. The package will include:

- Disposition plan (Appendix H to the Handbook) that describes what will be done with the subject tortoise; must be completed in the fall or spring season when translocation will occur
- Photographs of the translocated tortoise
- Health assessment data sheets for the tortoise
- Recipient area density information, including USFWS Pre-project Survey Protocol
- Maps of the recipient area showing location of any recipient tortoises and the proposed release site of the translocate
- Selected release points for desert tortoises (release sites will be unoccupied shelter sites, such as unoccupied burrows, areas within rock outcrops, or areas shaded by shrubs)
- Project site maps showing project site distribution of translocatee tortoises that will be moved less than 500 meters
- Other relevant information that provides rationale or clarity for the suggested disposition of tortoises

5.4.1 Disposition Options

There are two disposition options for desert tortoise that are held in situ. Desert tortoise will either be translocated to a recipient area or relocated to USFWS- and CDFW-approved program. Potential recipient areas are located adjacent to the project area to allow translocation of desert tortoise as close to their current location as possible while moving tortoise into suitable habitat (refer to Table 4.1-1 and Figure 4.1-1). Desert tortoise would be moved to the nearest recipient area unless the desert tortoise tests positive for URTD. Tortoises with positive URTD test results will be relocated in consultation with USFWS and CDFW. Options may include adopting desert tortoise out through the California Tortoise and Turtle Club or requiring a necropsy for desert tortoise that are too ill to adopt out.

5.5 TRANSLOCATION

Desert tortoises will be translocated during their spring activity periods (April 1 through May 31), well enough in advance of the summer inactive period to enable each tortoise to acclimate to the recipient site and to locate or build a suitable burrow. Release dates will be proposed in each Disposition Plan, to be reviewed and approved by the USFWS, CDFW, and BLM.

A health assessment will be conducted (without biological sampling) no more than one day before translocation of the translocatee tortoise. This health assessment will be used to confirm that the tortoise is healthy and can be translocated. Tortoises that were initially cleared for translocation but that no longer satisfy the algorithm in the Handbook will not be translocated prior to additional discussions with USFWS. Additional biological samples of such a tortoise will be submitted to USFWS and CDFW. Healthy appearing tortoises will be hydrated according to the most current agency guidance or protocols.

Unhealthy or infected desert tortoises will be sent a facility identified in consultation with USFWS and CDFW. The agencies and facility will be notified of the number of tortoises that will be placed at the facility prior to transport of the tortoise to the facility.

All translocations will take place between 0700 and 1600 hours (7:00 AM and 4:00 PM), and while air temperature is between 18° and 30°C (65-85°F). Temperatures will be taken at approximately 2 inches above ground in a shaded area. Tortoises will only be released if temperatures are not forecast to exceed 32°C (90°F) within 3 hours of release and if daily low temperatures are not forecast to be cooler than 10°C (50°F) for one week following the release date.

6 POST-TRANSLOCATION

Monitoring of translocatees, residents, and controls is not required by USFWS when there are five or fewer translocatees (USFWS 2011a, Table 1); however, CDFW has requested monitoring with for 5 years post-translocation. No formal post-translocation monitoring of recipient and control sites is proposed due to the low number of desert tortoise in the project area and proposed recipient areas. Transmitters will be left on desert tortoise, and translocated desert tortoise will be monitored for 5 years after translocation. Monitoring will consist of reviewing transmitter data quarterly to determine tortoise location and activity. Transmitter data will be submitted to CDFW annually.

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APPENDIX L-4
Draft Burrowing Owl Mitigation and Monitoring Plan

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Draft Burrowing Owl Mitigation and Monitoring Plan

Soda Mountain Solar Project

BLM Case No. CACA 49584

August 2014

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Draft Burrowing Owl Mitigation and Monitoring Plan

Soda Mountain Solar Project

BLM Case No. CACA 49584

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Appendices

Appendix A Staff Report on Burrowing Owl Mitigation

Appendix B Users Guide to Installation of Artificial Burrows for Burrowing Owls

List of Acronyms

APM	Applicant Proposed Measure
BLM	Bureau of Land Management
BO	Biological Opinion
BOMMP	Burrowing Owl Mitigation and Monitoring Plan
CDFG	California Department of Fish and Game
CDFW	California Department of Fish and Wildlife
CEC	California Energy Commission
CESA	California Endangered Species Act
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
IES	Illuminating Engineering Society
LADWP	Los Angeles Department of Water and Power
NFWF	National Fish and Wildlife Foundation
REAT	Renewable Energy Action Team
ROW	Right-of-Way
SMS	Soda Mountain Solar, LLC
USFWS	United States Fish and Wildlife Service
WEAP	Workers' Environmental Awareness Program
WEMO	West Mojave Plan

1 INTRODUCTION

1.1 PROJECT OVERVIEW

Soda Mountain Solar, LLC (SMS), has proposed to construct a 358-megawatt solar photovoltaic (PV) facility (project) on land administered by the U.S. Bureau of Land Management (BLM). A right-of-way (ROW) of 4,179 acres (1691 hectares) has been requested from BLM. The BLM case number for the project is CACA 49584. The project would disturb approximately 2,600 acres (1,052 hectares) of land. The project is located approximately 6 miles (9.7 kilometers) southwest of Baker, California (Figure 1.1-1).

The major components of the project include:

- PV panel arrays (North, South, and East Arrays), inverters, medium-voltage collector transformers, and ancillary equipment
- Unpaved access roads between the arrays
- 34.5-kilovolt undergrounded collector lines to connect the panel arrays to the substation
- Substation and switchyard for interconnection to the adjacent, existing transmission line
- Water wells
- Water storage tanks
- Reverse osmosis water treatment system and associated brine ponds
- Control room/office building, maintenance facility, storage warehouse, and other ancillary structures
- Temporary storage facility for materials and supplies required during construction
- Earthen berms

The project components are shown in Figure 1.1-2.

Detailed descriptions of the project and alternatives can be found in Chapter 2 of the Soda Mountain Solar Project Draft Plan Amendment/Environmental Impact Statement/Environmental Impact Report (EIS/EIR; BLM 2013).

Figure 1.1-1: Project Location

SOURCE: ESRI 2013 and Panorama Environmental, Inc. 2013

Scale: 1:1,250,000

LEGEND

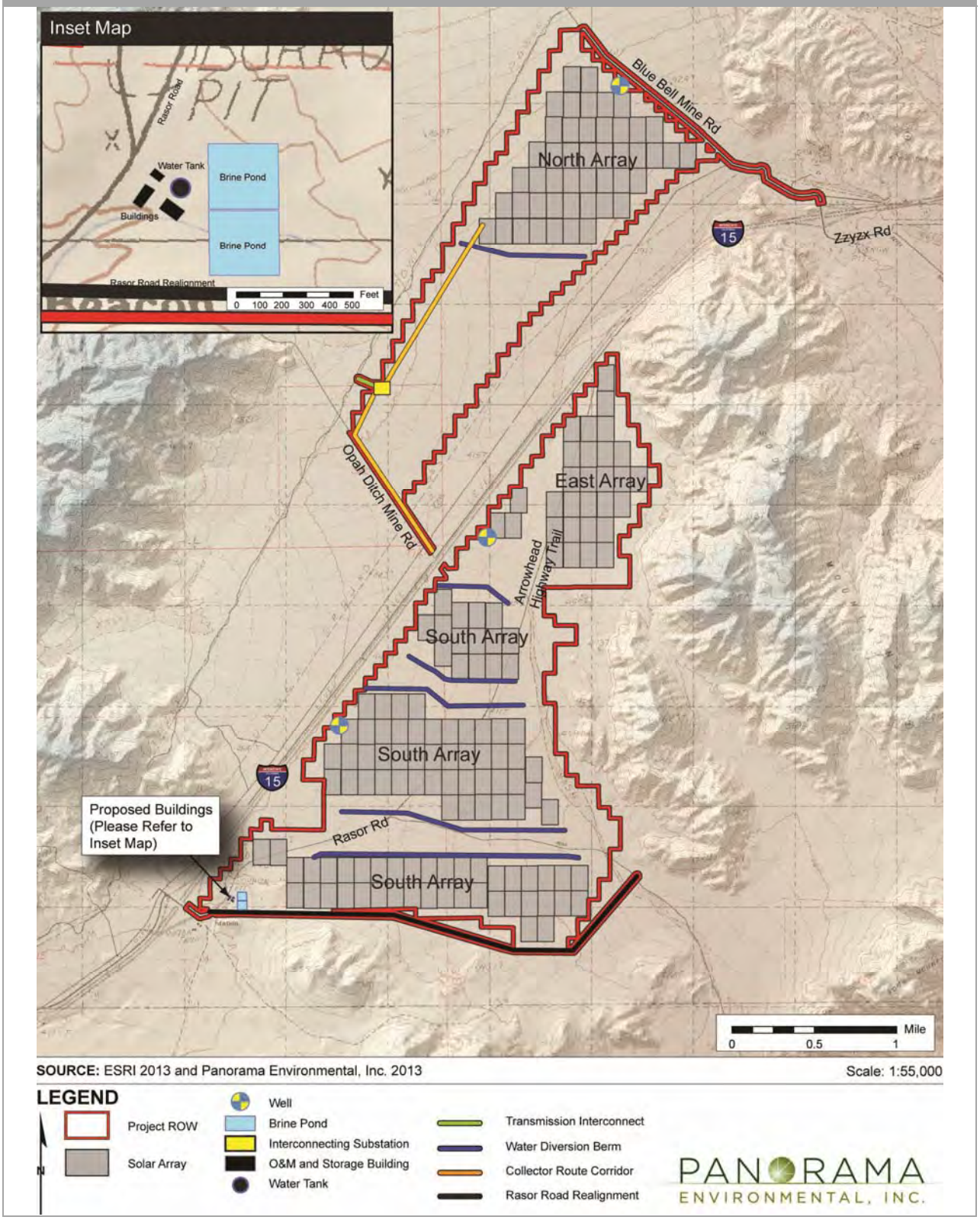
Proposed Project ROW

N

Miles 0 20 40

PANORAMA ENVIRONMENTAL, INC.

Figure 1.1-2: Project Layout



1.2 PLAN PURPOSE

Burrowing owls (*Athene cunicularia*) are listed as a Species of Special Concern by the California Department of Fish and Wildlife (CDFW), a Bird of Conservation Concern by the U.S. Fish and Wildlife Service (USFWS), and a Sensitive Species by the BLM (CDFW 2013). Preliminary analyses of breeding populations detected modest breeding range retraction throughout the state of California in a study conducted between the CDFW, Point Blue Conservation Science, and Western Field Ornithologists (Gervais et al. 2008). The California Department of Fish and Game (currently known as the California Department of Fish and Wildlife, or CDFW) issued a *Staff Report on Burrowing Owl Mitigation*, which included "Department-recommended burrowing owl and burrow survey techniques and mitigation measures intended to offset the loss of habitat and slow or reverse further decline of this species" (CDFW 2012).

This Burrowing Owl Mitigation and Monitoring Plan (BOMMP) outlines strategies to avoid, minimize, and mitigate impacts to burrowing owls during construction, operation, and decommissioning of the proposed project.

This BOMMP follows the guidance in the *Staff Report on Burrowing Owl Mitigation* (CDFW 2012; Appendix A). The *Staff Report on Burrowing Owl Mitigation* (CDFW 2012) includes "Department-recommended burrowing owl and burrow survey techniques and mitigation measures intended to offset the loss of habitat and slow or reverse further decline of this species" and is currently being used by CDFW as guidance for burrowing owl mitigation (Campbell, written communication 2014).

1.3 OBJECTIVES

The BOMMP objectives include:

1. Identify potential impacts to burrowing owls in the project area
2. Provide specific measures intended to avoid, minimize, and/or compensate for impacts
3. Specify monitoring requirements for burrowing owl activity in the project area
4. Identify reporting requirements to document the effectiveness of burrowing owl mitigation measures

1.4 BURROWING OWL NATURAL HISTORY

Burrowing owls are unique among the North American owls in that they nest and roost in abandoned burrows, and in California, especially those created by California ground squirrels (*Otospermophilus beecheyi*), kit fox (*Vulpes macrotis*), desert tortoise (*Gopherus agassizii*), and other wildlife. Burrowing owls have a strong affinity for previously occupied nesting and wintering habitats. They often return to burrows used in previous years, especially if they were successful at reproducing there in previous years (Gervais et al. 2008).

The southern California breeding season is from February to August, with peak of breeding activity from April through July.

Burrowing owls occur across most of the California's southern deserts. As in other Mojave Desert regions, populations in San Bernardino County are widely scattered with overall low population numbers (Gervais et al. 2008). Burrowing owls tend to be opportunistic feeders. Their diet consists primarily of medium to large arthropods, including spiders, beetles and grasshoppers. Small mammals, especially mice and voles (*Microtus, Peromyscus*, and *Mus* spp.), are also important food items for this species. Other prey animals include reptiles and amphibians, young cottontail rabbits, bats, and birds, such as sparrows and horned larks. Consumption of insects increases during the breeding season.

Threats to burrowing owls identified in the West Mojave Plan (WEMO) and by CDFW include (BLM 2005; Gervais et al. 2008):

- Urban development and pest eradication that decrease prey and burrow availability, degrade habitat quality, and may increase mortality risk
- Direct mortality from humans (including vehicle collision), pesticides, habitat degradation, destruction, and loss, and predators
- Subtle adverse effects to suitable habitat result from grazing, invasion of non-native plants, alteration of flood patterns through flood control, and erosion.

2 BACKGROUND

2.1 PROJECT LOCATION AND SITE DESCRIPTION

The proposed SMS project is located in a rural, undeveloped area of the Mojave Desert. The project area is bisected by Interstate 15 (I-15) and is located in an intermontane desert valley composed of alluvial fan deposits and surrounded by the Soda Mountains. The project will be entirely located on BLM lands. Portions of the project area are located within the BLM-designated utility corridor. The utilities in the corridor (and adjacent to the proposed project ROW) includes two transmission lines, a distribution line, telephone line, fiber optic line, fuel pipeline, and a cellular tower.

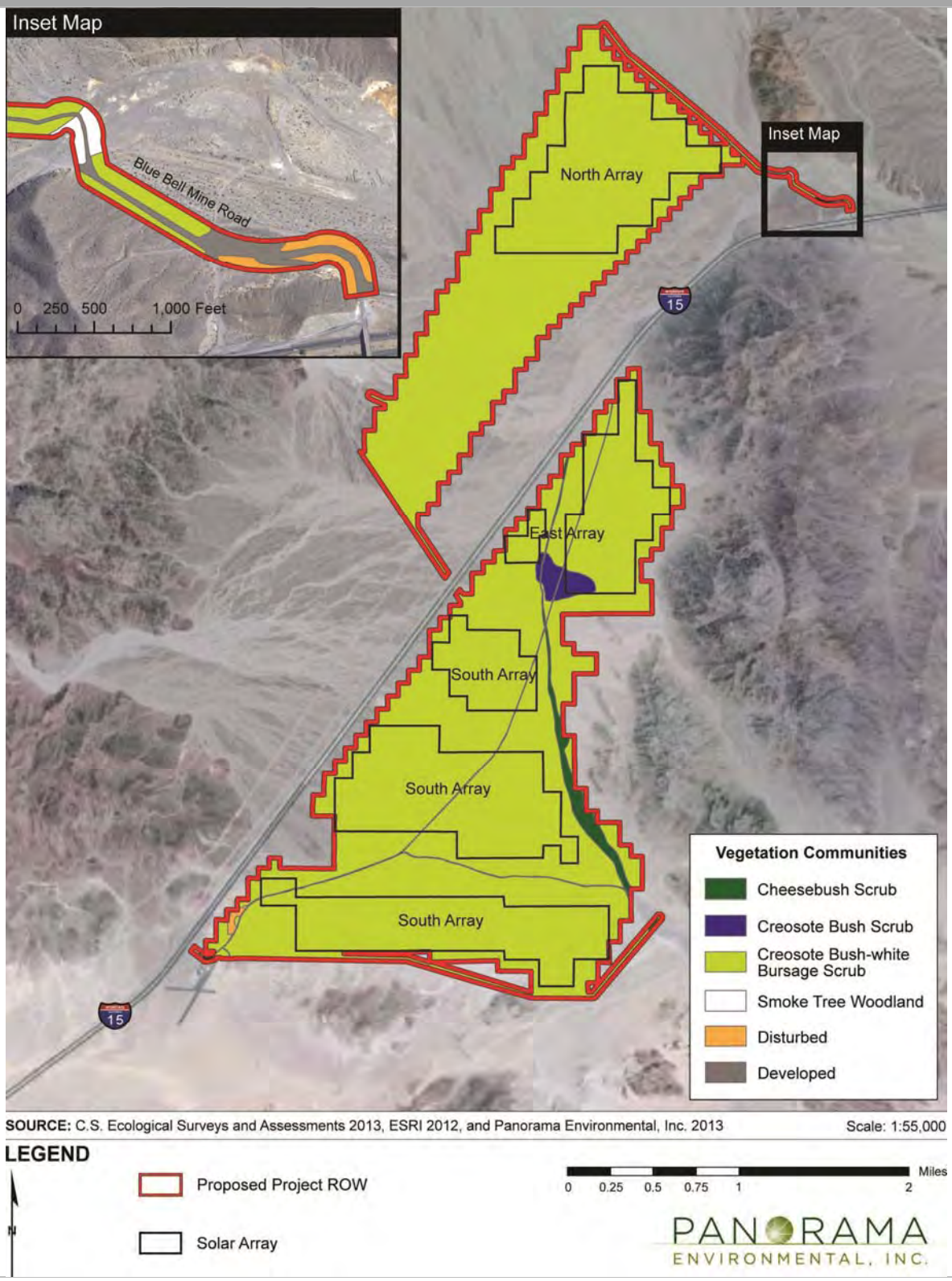
2.2 VEGETATION AND HABITAT

The project area is sparsely vegetated and includes six vegetation communities/land types (CSESA 2013a), as shown in Figure 2.2-1:

1. Creosote bush-white bursage scrub (*Larrea tridentata–Ambrosia dumosa*)
2. Cheesebush scrub (*Ambrosia salsola)*
3. Creosote bush scrub (*Larrea tridentata*)
4. Smoke tree woodland (*Psorothamnus spinosus*)
5. Developed
6. Disturbed

Soils within the action area are predominantly sand, silty sand, and gravelly soils. Gravelly soil comprises between 10 and 50 percent of the area while fine-grained silts and clays comprises between 5 and 20 percent (DYA 2010). The alluvial fans within the study area include gravelly soils with boulders and steep slopes. There is some desert pavement development on the southern portion of the project area. Elevation on the site is between 1,300 to 1,650 feet (400 to 500 meters). The entire site is presumed suitable habitat for burrowing owls because adequate burrows were found throughout the project ROW.

Figure 2.2-1: Vegetation Communities



2.3 BURROWING OWL SURVEYS AND RESULTS

Incidental observations of burrowing owl were documented during desert tortoise and rare plant surveys in the fall of 2012. No burrowing owls were observed during avian point counts in the spring and fall of 2009. Focused burrowing owl surveys, including Phase II census mapping and Phase III breeding season surveys, were conducted in the spring of 2013.

2.3.1 Incidental Observations

No burrowing owls were observed during the spring and fall 2009 avian point count surveys (URS 2010). A total of 13 live burrowing owls were incidentally observed during the fall 2012 rare plant and desert tortoise surveys. Kiva Biological personnel observed four burrowing owls during desert tortoise surveys of the 220 acres (89 hectares) along the east edge of the Southern Project Area (Kiva Biological Consulting 2013). The CS Ecology Surveys and Assessments survey crew observed nine burrowing owls during rare plant surveys of the entire project site in fall 2012 (CSESA 2012) (Figure 2.3-1).

2.3.2 Spring 2013 Surveys

The spring 2013 burrowing owl surveys followed the Burrowing Owl Consortium (1993) protocols. Kiva Biological Consulting (2013) conducted a Phase II burrowing owl survey of the project site between April 8 and May 11, 2013. During the pre-work meetings of the spring 2013 surveys, Peter Woodman stressed the importance of searching each burrow for signs of burrowing owl use. The Phase II burrowing owl burrow surveys were conducted in conjunction with protocol desert tortoise surveys with CDFW concurrence (Campbell, written communication 2013). Burrowing owl surveys were conducted by walking transects spaced at 33 feet (10 meters) over the entire project site and within a buffer of approximately 500 feet (150 meters) of the project ROW. The 500-foot (150-meter) wide buffer was surveyed around the entire right-of-way except the west edge of the South Project Area, where the buffer overlapped with Interstate 15. All desert tortoise, canid, and badger burrows, as well as all burrowing owl sign (whitewash, pellets, feathers, dead or live burrowing owls), were marked and recorded using Garmin GPS units.

The Phase III surveys consisted of four site visits that occurred during the peak of the breeding season (between April 15 and July 15). Phase III surveys were conducted on April 28/29, May 21/22, June 12/13, and June 25/26, 2013. Nine to 12 hours were spent during each survey period checking all of the burrows that had burrowing owl sign during the 100% coverage burrowing owl survey, 30 to 40 additional tortoise, canid, or badger burrows, and walking throughout the site. Surveys were conducted between one hour before and two hours after sunrise and two hours before and one hour after sunset. A minimum of three hours was spent during the nights of the last three site visits. No tapes were played but the observer listened for calling owls for a minimum of one to two hours in each project area north and south of I-15. Observations were conducted from multiple fixed points to provide visual coverage of the site using spotting scopes and binoculars. Surveys were conducted during weather that was conducive to observing owls outside their burrows. There were no heavy rain, high winds (> 20 miles per

hour (32 kilometers per hour)), nor dense fog during surveys. Mike Bassett conducted the Phase III survey in April and Peter Woodman conducted the final three Phase III surveys.

2.3.3 Phase II Survey Results

During the spring 2013 Phase II burrow surveys, between April 8 and May 11, 2013, no owls were observed in the entire project site. 237 burrows were recorded in the survey area. 50 burrows were observed with some type of associated owl sign. The observed signs showed some degradation; none appeared to be from spring 2013. No owl tracks were observed at any burrow (Kiva Biological Consulting 2013).

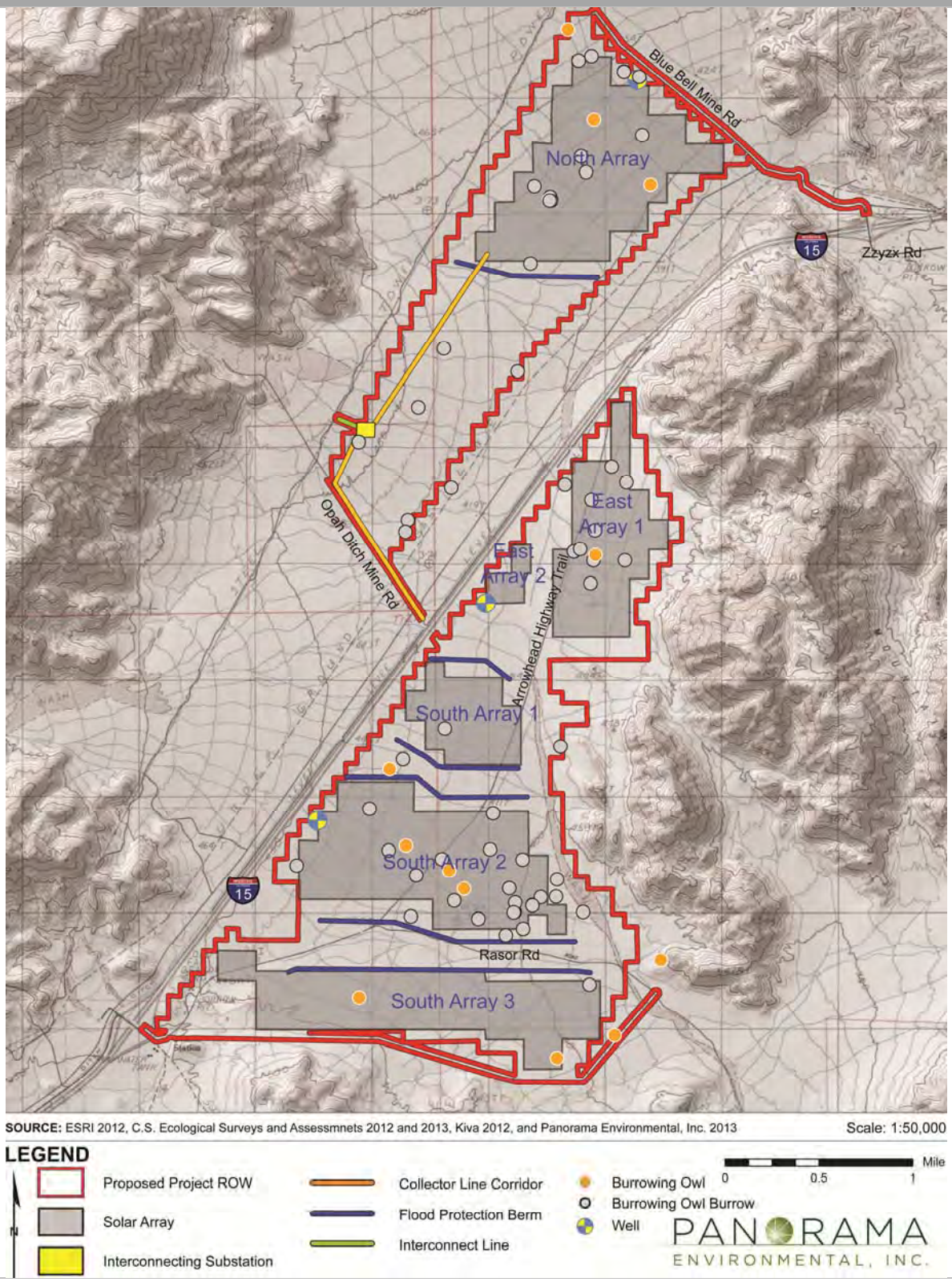
Very few insects were observed during the spring 2013 surveys although no quantitative assessments were conducted. Burrowing owl food and water resources may have been scarce in spring 2013. The water closest to the project site is at Zzyzx, approximately 4 miles (6.4 kilometers) east (Kiva Biological Consulting 2013).

2.3.4 Phase III Results

No owls were observed or heard during the Phase III surveys on April 28 and 29, May 21 and 22, June 12 and 13, and June 25 and 26, 2013. No additional sign was observed at any of the 50 burrows at which sign had been previously observed. No new sign was observed at any of the other tortoise or canid burrows that were inspected. No owls were heard calling during the pre-dawn or nighttime surveys (Kiva Biological Consulting 2013).

It does not appear that burrowing owls used the Soda Mountain Solar site in spring 2013. However, it is known that burrowing owls utilized the site in fall 2012 (CSESA 2012). Based on the number of burrowing owls and amount of sign observed at the 50 burrows with owl sign, burrowing owls may use the site substantially. The burrowing owls observed in the fall were using the project area for forage during migration and were not observed on the site during the spring surveys. The site may be used primarily as habitat for migrating burrowing owls in the fall and winter. It is assumed, however, that burrowing owls use the site for nesting during years with adequate food supplies due to the presence of burrows, owls using the site in the fall, and suitable adjacent foraging habitat (Kiva Biological Consulting 2013).

Figure 2.3-1: Burrowing Owl Locations



3 BURROWING OWL IMPACTS

Impacts to burrowing owls were analyzed in the Draft EIS/EIR for the project. The Draft EIS/EIR summary of impacts to burrowing owls is provided below.

3.1 CONSTRUCTION

Up to 48 recently active owl burrows and 9 individual owls were observed in the burrowing owl study area, generally concentrated within the study area for the South Arrays (Figure 3.4-3) (Panorama Environmental, Inc., 2013a; Kiva, 2013b). It is anticipated that all identified active burrows on the Project site would be removed during Project construction as described in APM 45. Burrowing owl nesting may occur in association with abandoned kit fox burrows throughout the Project site, and the entire site is considered to provide suitable burrowing owl foraging habitat.

In addition to direct impacts on individual owls and burrows, burrowing owl survival can be indirectly affected by human disturbance and foraging habitat loss even when impacts to individual owls and burrows are avoided.

3.2 OPERATIONS AND MAINTENANCE

Operation and maintenance actions have a low likelihood of affecting burrowing owls because activities would largely occur within the developed solar arrays and developed areas. These activities would not remove burrowing owl breeding or foraging habitat, and would occur only on approved Project access roads and within permanent work areas.

3.3 CUMULATIVE IMPACTS

The burrowing owl cumulative impact analysis evaluated impacts of the Soda Mountain Solar project in combination with projects proposed within a 10 mile (16 kilometer) radius of the project. Four projects are proposed within 10 miles (16 kilometers) of the Soda Mountain Solar project. These projects include:

- XpressWest High Speed Passenger Rail
- Calnev Pipeline Expansion
- Silurian Valley Wind
- Silurian Valley Solar

The four identified cumulative projects would presumably result in impacts to burrowing owl similar to those for the Project. Such effects include the direct loss of suitable habitat, loss of individual animals, or indirect effects from human presence that result in changes to habitat quality during construction, operation and maintenance, and decommissioning.

4 MITIGATION MEASURES

The following measures are designed to avoid or reduce impacts to burrowing owls during construction, operation, maintenance, and decommissioning of the project.

4.1 AVOIDANCE MEASURES

The avoidance measures below include both the SMS APMs from the Plan of Development and Mitigation Measures from the Draft EIS/EIR. The Mitigation Measures may be revised in the Final EIS/EIR or Record of Decision. If there is any discrepancy between the Mitigation Measure language in this document and the agency approved Mitigation Measures, the agency approved Mitigation Measures will supersede the measure language listed below.

4.1.1 Worker Environmental Awareness Program

APM 44 and Mitigation Measures 3.4-1c and 3.4-5b require the implementation of a Worker Environmental Awareness Program (WEAP) to educate workers about environmental issues associated with the project and the mitigation measures that will be implemented at the site, including nest awareness and non-disturbance exclusion zones.

> **APM 44:** The Applicant will implement a WEAP to educate workers about the environmental issues associated with the Project and the mitigation measures that will be implemented at the site, including nest awareness and non-disturbance exclusion zones.
>
> **Mitigation Measure 3.4-1c: Worker Environmental Awareness Program.** Prior to Project initiation, the Designated Biologist shall develop and implement the WEAP, which shall be available in English and Spanish. Wallet-sized cards summarizing the information shall be provided to all construction and operation and maintenance personnel. The WEAP shall include the following:
>
> 1. An explanation of the sensitivity of the vegetation communities and special-status plant and wildlife species within and adjacent to work areas, and proper identification of these resources.
> 7. Biology and status of the desert tortoise, golden eagle, burrowing owl, other nesting birds, kit fox, and American badger and measures to reduce potential effects to these species.
> 8. Actions and reporting procedures to be used if desert tortoise, burrowing owl, other nesting birds, kit fox, or American badger are encountered.
> 9. An explanation of the function of flagging that designates authorized work areas.
> 10. Driving procedures and techniques to reduce mortality of wildlife on roads.

11. Discussion of the federal and state Endangered Species Acts, Bald and Golden Eagle Protection Act, and the Migratory Bird Treaty Act and the consequences of non-compliance with these acts.
12. The importance of avoiding the introduction of invasive weeds into the Project area and surrounding areas.
13. A discussion of general safety protocols such as hazardous substance spill prevention and containment measures and fire prevention and protection measures.
14. A review of mitigation requirements.

Mitigation Measure 3.4-5b: **Operation and Maintenance Education Program**. A WEAP shall be implemented during the construction and operation phase of the Project to alert workers to the hazards posed by ongoing operations to common and special-status wildlife species. The WEAP shall include the same program elements discussed in Mitigation Measure 3.4-1c.

4.1.2 Avoid Disturbance to Nesting Birds

APM 55 and Mitigation Measure 3.4-4 require that vegetation clearing shall take place outside of the burrowing owl breeding season (February 1 to August 31), when feasible and pre-construction surveys for burrowing owls prior to vegetation clearing if vegetation clearing during the breeding season cannot be avoided. APM 45 proposes burrowing owl exclusion to passively evict owls from the project area prior to construction.

APM 55: The Applicant will clear vegetation outside of the bird breeding season to the maximum extent practicable. Preconstruction avian clearance surveys will be conducted by a qualified biologist for vegetation clearing during the bird breeding season (February 1 through August 31). If a nest(s) is identified in the preconstruction avian clearance surveys, a qualified monitor will be on site during vegetation removal in order to enforce non-disturbance buffers and stop activities as necessary should construction disturb nesting activity.

Mitigation Measure 3.4-4: Avoid Disturbance to Nesting Birds. Vegetation clearing shall take place outside of the general avian breeding season (February 15 to September 1), when feasible. If vegetation clearing cannot occur outside the avian breeding season, the Designated Biologist/Biological Monitor(s) shall conduct a preconstruction survey for nesting birds no more than three (3) days prior to vegetation clearing. If no active nests are found, clearing can proceed. If active nests are found, no clearing shall be allowed within 150 feet (for passerines) to 250 feet (for raptors) of the active nests until the Designated Biologist determines the nest is no longer active or the nest fails. The Designated Biologist/Biological Monitor(s) shall submit the results of the pre-construction nesting bird surveys to the BLM, USFWS, and CDFW.

4.2 MINIMIZING MEASURES

4.2.1 Burrow Exclusion

APM 45 requires passive exclusion of burrowing owls prior to construction.

> **APM 45:** Burrowing owls occupying burrows on site will be passively relocated outside the nesting season or after a qualified biologist determines that the burrow does not contain eggs or chicks and after consultation with CDFW. Prior to construction and passive relocation, artificial burrows will be installed in areas that would not be disturbed during construction at a ratio of 5:1 for each burrow that will be destroyed by project construction. Passive relocation will be conducted prior to construction and according to the Burrowing Owl Consortium Guidelines (CBOC 1993).

Burrowing owl exclusion is discussed further in Section 5.2. Burrows will be excavated using hand tools to prevent reoccupation once the burrow is empty.

4.2.2 Weed Management

APM 50 requires SMS implement an Integrated Weed Management Plan (CSESA 2013b) to control weed infestations and the spread of noxious weeds on the project site. Weed management is important to maintain burrowing owl habitat near the project.

4.2.3 Speed Limits

Mitigation Measure 3.4-1d requires implementing speed limits within the project area.

> **Mitigation Measure 3.4-1d: Speed Limits.** Speed limits along all access roads outside of permanent desert tortoise fencing shall not exceed 15 miles per hour to minimize dust during construction activities. Speed limits within permanent desert tortoise fencing shall not exceed 25 miles per hour to minimize impacts during operations and maintenance. Nighttime vehicle traffic associated with Project activities shall be kept to a minimum volume and speed to prevent mortality of nocturnal wildlife species.

The implementation of speed limits would minimize impacts to wildlife including burrowing owls from vehicle collisions during operations and maintenance and dust during construction activities.

4.2.4 Lighting and Visual Specifications to Minimize Bird Impacts

Mitigation Measure 3.18-1 requires lighting and visual controls that would reduce the amount of light visible from off-site locations and would reduce but not completely avoid the potential effects of nighttime lighting on wildlife. Mitigation Measure 3.4-1e supplements these requirements to provide further protections for birds from the effects of on-site lighting.

Mitigation Measure 3.18-1: Siting and Design. Visual design elements shall be integrated into the construction plans, details, shop drawings and specifications; these shall include, but not be limited to, grubbing and clearing, vegetation thinning and clearing, grading, revegetation, drainage, and structural plans. Visual design elements within the plans shall be measureable and monitored while under construction, while operational, and when decommissioned.

The plans shall include a Glint and Glare Assessment, Mitigation, and Monitoring plan that accurately assesses and quantifies potential glint and glare effects and determines the potential health, safety, and visual impacts associated with glint and glare. The assessment shall be conducted by qualified individuals using appropriate software and procedures. The assessment results shall be made available to the BLM in advance of Project approval. (BLM 2013b) A careful study of the site shall be performed to identify appropriate colors and textures for materials; both summer and winter appearance shall be considered as well as seasons of peak visitor use (September 15 to April 15). Visual design elements to be integrated into construction plans, details, shop drawings and specifications must at a minimum include:

1. Locate or screen solar collectors to avoid off-site glare – Where significant off-site glare is unavoidable, employ materials to reduce the effect such as fencing with privacy slats, earthen berms, or vegetative screening,
2. Vary the grid layout to reduce contrast caused by long straight roads – Employ an off-set in the grid layout to reduce visual contrast caused by long straight roads and, to the extent possible, arrays. The result shall be that no road extends from one side of the solar field to the other in a straight line. To further reduce contrast caused by exposing un-oxidized soils and rock in roadways, at select locations of concern from KOPs, spot applications of a product such as Permeon shall be used to dull and darken the ground plane in a short time.
3. Minimize project footprint and associated disturbance – Perimeter clearing for a patrol road (typically 20 feet) inside and outside of the Project fenceline shall be minimized (maximum 16 feet) with consideration of the local fire regime. Vegetation shall not be fully cleared but cut to 6-inch height to retain texture over the ground plane.
4. Color treat structures to reduce contrasts with the existing landscape – In order to ensure the implementation of APM 42 and supplement its requirements to address adverse impacts, the Applicant shall color treat all operation and maintenance facilities, frames, tracker structures, PCS, and water tank facilities using a BLM standard environmental color that is identified through a site study for color and texture selection and approved by the BLM. Grouped structures shall be treated with the same color. Further:
    a. Security fencing shall be coated with black poly-vinyl or other visual contrast reducing color.

b. Materials, coatings, or paints having little or no reflectivity shall be used whenever possible.
c. Materials, coating, or paints having little or no specular or reflective qualities shall be used on structures including, but not limited to, buildings, tanks, fences, fence railings, poles, aboveground pipes and culverts, and reverse sides of signs and guardrails. Substation equipment shall be specified with a low-reflectivity neutral finish. Insulators at substations and on takeoff equipment shall be non-reflective and non-refractive. The surfaces of substation structures shall be given low-reflectivity finishes with neutral colors that contrast minimally with the surrounding landscape. Chain-link fences are to have a dulled, darkened finish to reduce contrast.

5. Lighting – In order to ensure the implementation of APM 43 and supplement its requirements to address adverse impacts, all permanent lighting, except as required to meet minimum safety and security requirements, shall use full cutoff luminaires, which are fully shielded (i.e., not emitting direct or indirect light above an imaginary horizontal plane passing through the light source), and must meet the Illuminating Engineering Society (IES) glare requirement limiting intensity of light from the luminaire in the region between 80 and 90 degrees from the ground. All fixtures must be mounted properly, at the proper angle. Further:
   a. Construction and permanent lighting – Except as required to meet safety and security requirements, lighting shall be minimized during construction and operation. Lighting shall be mounted and directed to focus light only on the intended area, and to avoid light spill and off-site light trespass. Lights pointing upward or horizontal are to be avoided. During construction, localized and portable lighting shall be used where and when the work is occurring. Lighting is to be powered by generators and have switches to cut power when lighting is not required by construction.
   b. Facility lighting – Lighting for facilities shall not exceed the minimum number, intensity, and coverage required for safety and basic security. Lighting shall be amber in color when accurate color rendition is not required. Use low-pressure sodium lamps or yellow LED lighting, or equivalent. No bluish-white lighting shall be used in permanent outdoor lighting.
   c. Area lighting – All area lighting shall be divided into separately controlled zones to focus lighting on smaller areas where tasks are being performed and to avoid illuminating unused space. Area lighting is to be controlled by timers, sensors, or switches available to facility operators. The facility operators are to identify those components/structures that do not require continuous lighting for safety reasons. Area lights are only to

be switched on when there is a specific need (e.g., cleaning panels at a solar facility, persons occupying an area, or alarm situation).

d. Lighting plan – A lighting plan shall be prepared that documents how lighting will be designed and installed to minimize night-sky impacts during facility construction and operation. Lighting for facilities shall not exceed the minimum number of lights and brightness required for safety and security, and shall not cause excessive reflected glare. Low-pressure sodium light sources shall be used to reduce light pollution. Full cut-off luminaires shall be used to minimize uplighting. Lights shall be directed downward or toward the area to be illuminated. Light fixtures shall not spill light beyond the Project boundary. Lights in highly illuminated areas that are not occupied on a continuous basis shall be equipped with switches, timer switches, or motion detectors so that the lights operate only when the area is occupied. Where feasible, vehicle-mounted lights shall be used for night maintenance activities. Wherever feasible, consistent with safety and security, lighting shall be kept off when not in use. The lighting plan shall include a process for promptly addressing and mitigating complaints about potential lighting impacts.

6. Vegetation and ground disturbance associated with access road construction, and distribution line installations shall be minimized and take advantage of existing clearings wherever feasible.
7. Along all off-site access roads, all off-site distribution line corridors, and all internal access roads 16 feet or wider, graveled surfaces, areas to be permanently cleared of vegetation, and (if applicable) cut slopes shall be treated with rock stains or other color treatment appropriate with the surrounding landscape.
8. Openings in vegetation for facilities, structures, and roads shall be feathered and shaped to repeat the size, shape, and characteristics of naturally occurring openings.
9. The distribution line shall utilize nonspecular conductors and nonreflective coatings on insulators.

Mitigation Measure 3.4-1e: Lighting Specifications to Minimize Bird and Bat Impacts. The Applicant/Owner shall minimize night lighting during construction by using shielded directional lighting that is pointed downward, thereby avoiding illumination to adjacent natural areas and the night sky.

As a component of the lighting plan required in Mitigation Measure 3.18-1, all exterior lighting at operation and maintenance facilities, substations, and appurtenant structures shall be of the lowest illumination required for security and human safety. The Applicant/Owner shall install and continuously use and maintain lights with motion or heat sensors and switches to keep lights off when not required. Light fixtures shall be fully shielded and directed downward to minimize illumination above the horizontal plane.

The Applicant/Owner shall minimize use of high-intensity lighting and steady-burning or bright lights such as sodium vapor, quartz, halogen, or other bright spotlights.

4.2.5 Buffers

If active burrows are found, they will be avoided using non-disturbance buffers created by Scobie and Faminow (2000), as shown in Table 4.2-1. The non-disturbance buffers may be reduced by the Designated Biologist based on compelling evidence that the reduced buffer will not impact nesting activity (e.g., concealment of the nest site by vegetation or topography, level of project activity and noise within the reduced buffer, level of previous activity or vehicle noise in the area).

The Designated Biologist shall increase the buffer if burrowing owls show signs of intolerance to construction activities within a reduced buffer zone.

Table 4.2-1 Burrowing Owl Non-Disturbance Buffer Zones

Location	Time of Year	Level of Disturbance		
		Low	Medium	High
Occupied Burrow	April 1 – Aug 15	200 meters	500 meters	500 meters
Occupied Burrow	Aug 16 – Oct 15	200 meters	500 meters	500 meters
Occupied Burrow	Oct 16 – Mar 31	50 meters	100 meters	500 meters

Source: CDFG 2012

5 ARTIFICIAL BURROW AND EXCLUSION

Burrows within the project area will be excluded and artificial burrows will be constructed in the Soda Mountain Valley prior to project construction. Documentation of burrow exclusion and artificial burrow construction will be submitted to CDFW prior to the start of construction. Capture and relocation (translocation) of burrowing owls will not be conducted for the project. CDFW prohibits the translocation of burrowing owls except in the case of scientific research (FGC §1002) or for a NCCP conservation strategy (CDFG 2012).

5.1 BURROW EXCLUSION AND CLOSURE

Unoccupied burrows will be excluded by excavating and collapsing the burrows, using hand tools. A qualified biologist will scope inactive burrows prior to collapse to confirm the burrow is unoccupied. Burrows will be re-collapsed if ground squirrels excavate and restore burrows.

In the event that an occupied burrow cannot be avoided, passive relocation of burrowing owls will be conducted prior to construction and according to the CDWF's Staff Report on Burrowing Owl Mitigation (CDFG 2012). APM 45 requires that burrowing owls occupying burrows on site will be passively relocated outside the nesting season or after a qualified biologist determines that the burrow does not contain eggs or chicks and after consultation with CDFW. Mitigation Measure 3.4-1e further requires that passive relocation shall occur only if the qualified biologist verifies that juveniles from the occupied burrows are foraging independently and are capable of independent survival.

Occupied burrow exclusion shall be conducted with the use of one-way doors (Trulio 1995; Clark and Plumpton 2005). Burrow exclusion will be performed only by qualified biologists during the "non-breeding season, before breeding behavior is exhibited and after the burrow is confirmed empty by site surveillance and/or scoping" (CDFG 2012). Burrows will be excavated using hand tools after they are determined to be vacant. Photographs will be taken during the exclusion process. Burrowing owls may be banded for monitoring purposes, if deemed appropriate by CDFW. Banding of burrowing owls would only be conducted by a qualified biologist approved by CDFW with a Scientific Collection Permit for burrowing owls.

Excluded and closed burrows will be photographed to demonstrate the success and sufficiency of the burrow exclusion and closure. The burrow exclusion and closure would occur within 14 days of the start of construction and vegetation removal activities in a work area. Burrowing owl exclusion and burrow closure will continue until all burrows within the work area have been fully excluded and collapsed.

The project site will be monitored throughout the duration of construction as described in Measure 3.4-1b.

Mitigation Measure 3.4-1b: Biological Monitoring during Construction. Biological Monitor(s) shall be employed to assist the Designated Biologist in conducting pre-construction surveys and monitoring ground disturbance, grading, construction, operation and maintenance, decommissioning, and restoration activities. The Biological Monitor(s) shall have sufficient education and field experience to understand resident wildlife species biology, have experience conducting desert tortoise, burrowing owl, kit fox, and badger field monitoring, and be able to identify these species and their sign (including active burrows). The Designated Biologist shall submit a resume, at least three (3) references, and contact information for each prospective Biological Monitor to the BLM, and the Wildlife Agencies for approval. To avoid and minimize effects to biological resources, the Biological Monitor(s) will assist the Designated Biologist with the following:

1. Be present during construction activities that take place in suitable habitat for desert tortoise, burrowing owl, kit fox, badger, or other protected species to prevent or minimize harm or injury to these species.
2. Activities of the Biological Monitor(s) include, but are not limited to, ensuring compliance with all avoidance and minimization measures; monitoring for desert tortoise, burrowing owl, kit fox, badger, and other protected species; halting construction activity in the area if an individual is found; and checking the staking/flagging of all disturbance areas to be sure that they are intact and that all construction activities are being kept within the staked/flagged limits. If a desert tortoise, burrowing owl, kit fox, badger, or other protected species is found within a work area, the Biological Monitor(s) shall immediately notify the Designated Biologist, who shall determine measures to be taken to ensure that the individual is not harmed.
3. Inspect the Project area for any special-status wildlife species.
4. Ensure that potential habitats within the construction zone are not occupied by special-status species (e.g., potential burrows or nests are inspected).
5. In the event of the discovery of a non-listed, special-status ground-dwelling animal, recover and relocate the animal to adjacent suitable habitat at least 200 feet from the limits of construction activities.
6. At the end of each work day, inspect all potential wildlife pitfalls (e.g., trenches, bores, other excavations) for wildlife and remove wildlife as necessary. If the potential pitfalls will not be immediately backfilled following inspection, the Biological Monitor(s) will ensure that the construction crew slopes the ends of the excavation (3:1 slope) to provide wildlife escape ramps or will ensure that the construction crew completely and securely covers the excavation to prevent wildlife entry.
7. Inspect the site to help ensure trash and food-related waste is place in closed-lid containers and to ensure that workers do not feed wildlife. Also inspect the work area each day to ensure that no microtrash (e.g., bolts, screws, etc.) is left behind.

5.2 ARTIFICIAL BURROW

APM 45 requires that, prior to construction and passive relocation, artificial burrows be installed in areas that would not be disturbed during construction at a ratio of 5:1 for each burrow that will be destroyed by project construction. Artificial burrows will remain for the duration of the project.

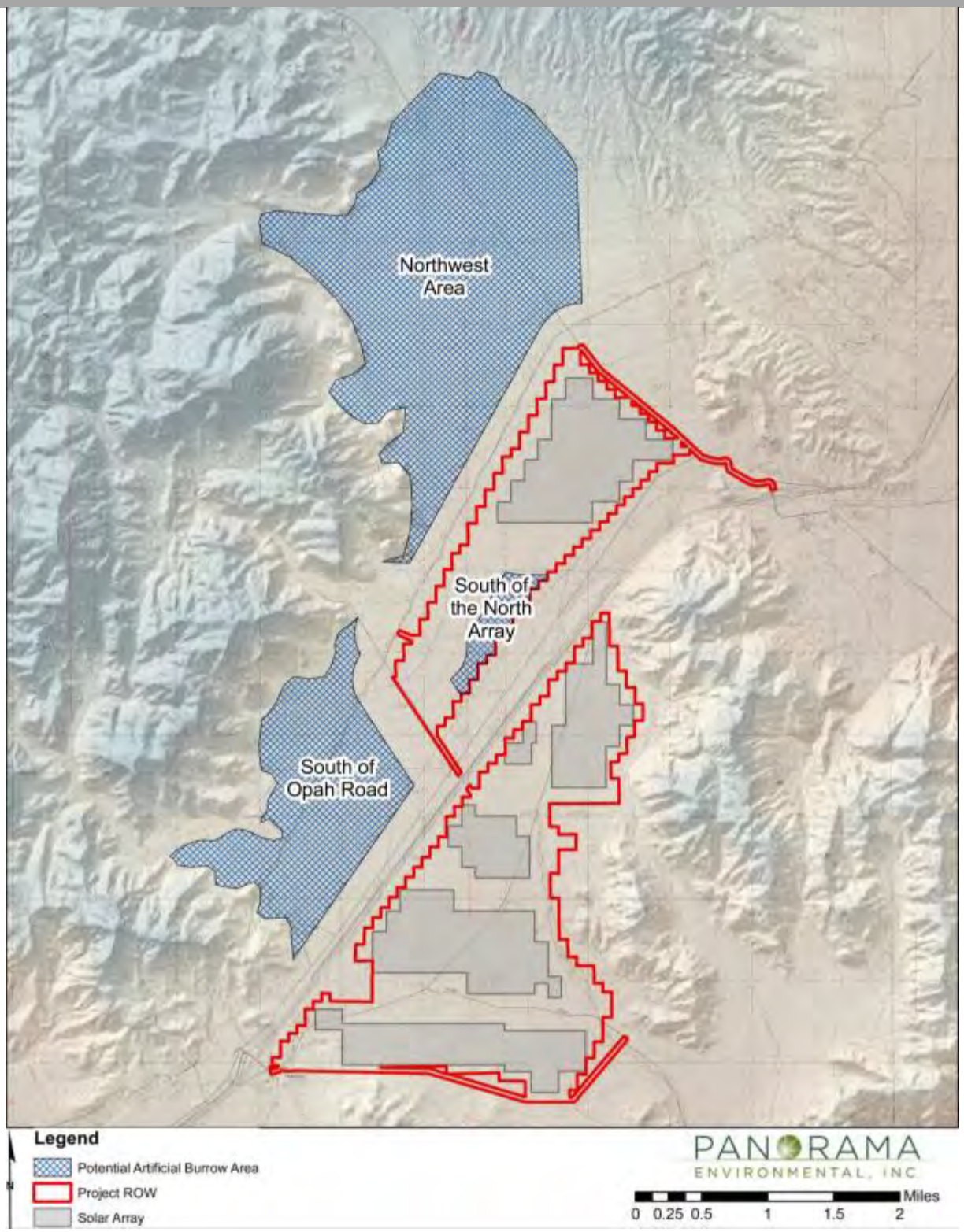
5.2.1 Location

Artificial burrows will be placed outside of the area of active construction and approximately 1,640 feet (500 meters) from the project area. The CDFW Staff Report cites literature that suggests artificial burrows should be located less than 328 feet (100 meters) from the natural burrow (CDFG 2012). Artificial burrows less than 328 feet (100 meters) from the natural burrow are not feasible in this instance because of the size of the project and the intent to move burrows out of the sphere of influence of construction. Burrows are proposed outside of the 1,640-foot (500 meter) buffer distance to ensure that burrowing owls using the artificial burrows are not disturbed by construction activities. Burrowing owls routinely range up to 0.9 miles (1.4 kilometers) from their burrow for foraging (Bloom and England, oral communication 2014). The artificial burrows would therefore be within the normal range of burrowing owls that use the project site.

Potential artificial burrow location areas are shown in Figure 5.2-1. Artificial burrows will be placed in favorable sites within the relocation areas. Favorable sites have low vegetation around the burrow and a close perching location, usually "low mounds (e.g., 17-20 cm; Belthoff and King 2002, Poulin et al. 2005) or short perches (<23 inches [60 cm]) outside (in front of) the burrow" (Johnson et al. 2010). The location of the artificial burrow(s) will be selected by a qualified biologist to verify that construction of the new burrow(s) will not adversely affect existing burrow colonies in the replacement areas. Artificial burrow sites will be chosen based on similarity of the occupied burrow site(s) and the artificial burrow(s) sites (e.g., vegetation, habitat type(s), fossorial species use in the area, and other features. The artificial burrow location(s) will be documented by the qualified biologist or biological monitor, and the following information will be submitted to CDFW:

- GPS point (latitude and longitude) of the artificial burrow(s);
- Artificial burrow proximity to the project activities, roads, and drainages;
- Artificial burrow proximity to other burrows and entrance exposure;
- Photograph(s) of the artificial burrow

Figure 5.2-1: Potential Areas for Artificial Burrow Construction



5.2.2 Installation

Artificial burrows will be installed prior to construction within the project area and after the relocation sites have been surveyed. Burrows will be installed in clusters of a minimum of two (or three) burrows at 16 to 33 feet (5 to 10 meters) apart (Johnson et al. 2010). Clusters will be placed 360 to 985 feet (110 to 300 meters) apart (Green and Anthony 1989). The results of the burrowing owl surveys and incidental observations indicate that the project site is used primarily by migratory owls in the fall and winter. Burrows are more easily detected by burrowing owls when they are slightly elevated within a mound or several mounds in a 100-acre (40.5-hectare) or smaller area (Bloom and England, oral communication 2014). Each mound would contain two to three burrows and would be up to 4 feet (1.2 meters) high. Burrow entrances would be approximately 1.5 to 2.5 feet (0.5 to 0.8 meters) high. The mound would generally have a diameter of about 20 feet (6 meters).

Burrows will be installed following guidance from Barclay (2008) and (2011) and Johnson et al. (2010, Appendix B), as recommended in the CDFW Staff Report (CDFG 2012). Installation will include:

- Safely digging holes for the intended burrows and along the length of the pipe
- Backfilling holes by hand
- Implementing measures to prevent predators from digging up burrows
- Recording burrow location
- If necessary, installing artificial perch outside (in front of) burrows

5.2.3 Design

Materials used for constructing the burrows will include 55 gallon plastic barrels, 2.5 gallon buckets, drain line, sealant, and predator-prevention materials. Tunnels will gently slope downward (15-20°) toward the nest chamber. Specific design diagrams and pictures for artificial burrows, predator-proofing patio, and artificial perches can be found in Appendix B.

5.2.4 Monitoring and Maintenance

Monitoring will include a spring and winter survey of the natural and artificial burrows to ensure that burrowing owls have not returned to collapsed natural burrows within the project area and to determine if burrowing owls are using natural and/or artificial burrows within the relocation areas. Cleaning and maintenance and/or artificial burrow replacement will be conducted on a quarterly basis as part of ongoing management practice as necessitated by any long-term reliance on artificial burrows. Maintenance will be conducted for the life of the project to ensure entrances remain open and burrows remain inhabitable.

6 COMPENSATORY MITIGATION

APM 73 proposes compensatory habitat mitigation at a 1:1 ratio for impacts to suitable desert tortoise habitat. Mitigation Measure 3.4-2d requires SMS provide compensatory mitigation for desert tortoise in the West Mojave or East Mojave Desert Tortoise Recovery Unit. The requirements for acquisition, initial improvement, and long-term management of compensation lands are detailed in Mitigation Measure 3.4-2d. The burrowing owl compensation lands may be nested within the compensatory mitigation lands for desert tortoise due to the similarity in habitat characteristics. The nested mitigation concept allows all or any portion of acquired compensation lands to fulfill the mitigation obligation for more than one mitigated resource to the extent that the acquired land meets the habitat occupancy or suitability requirements for multiple mitigated resources. The Memorandum of Understanding between BLM and CDFW dated November 27, 2012, states the following with respect to nesting of compensatory mitigation:

> *To the maximum extent possible consistent with federal and state law, the BLM and CDFG* [now CDFW] *will seek to avoid duplicative mitigation and may each credit compensatory mitigation measures required by the other agency as part of the compensatory mitigation required under its own laws.*

SMS may satisfy the requirements of compensatory mitigation by depositing funds into the Renewable Energy Action Team (REAT) Account established with the National Fish and Wildlife Foundation (NFWF) in lieu of acquiring lands itself. Habitat compensation and management of compensation lands is further addressed in the project's Habitat Compensation Plan (Panorama Environmental, Inc. 2013b).

7 MONITORING AND REPORTING

7.1 COMPLIANCE MONITORING BY THE DESIGNATED BIOLOGIST

Mitigation Measures 3.3-1 and 3.4-1a require SMS to assign a Designated Biologist to the project. The Designated Biologist shall be approved by the BLM, USFWS, and CDFW (as appropriate) prior to ground-disturbing activities. The Designated Biologist will meet the minimum qualifications presented in Mitigation Measure 3.3-1 and the CDFW Staff Report (CDFG 2012):

1. Bachelor's degree in biological sciences, zoology, botany, ecology, or a closely related field;
2. Three years of experience in field biology or current certification of a nationally recognized biological society, such as The Ecological Society of America or The Wildlife Society;
3. Have at least one year of field experience with biological resources found in or near the Project site;
4. Meet the current USFWS Authorized Biologist qualifications criteria (www.fws.gov/ ventura/speciesinfo/protocols_guidelines), demonstrate familiarity with protocols and guidelines for the desert tortoise, and be approved by the USFWS;
5. Possess a California Endangered Species Act (CESA) Memorandum of Understanding pursuant to Section 2081(a) for desert tortoise;
6. Familiarity with the species and its local ecology;
7. Experience conducting habitat assessments and non-breeding and breeding season surveys, or experience with these surveys conducted under the direction or an experienced surveyor;
8. Familiarity with the appropriate state and federal statutes related to burrowing owls, scientific research, and conservation;
9. Experience with analyzing impacts of development on burrowing owls and their habitat.

Mitigation Measure 3.4-1a necessitates the Designated Biologist be employed for the period during which on-going construction and post-construction monitoring and reporting by an approved biologist is required. Each successive Designated Biologist shall be approved by the BLM's Authorized Officer. The Designated Biologist shall have the authority to ensure compliance with all measures set forth in the Biological Opinion (BO) and CESA Section 2081 take authorization and with all mitigation measures included herein, and will be the primary agency contact for the implementation of these measures. The Designated Biologist will have the authority and responsibility to halt any project activities that are in violation of the terms of

the BO, Section 2081 take authorization, or project mitigation measures. A list of responsibilities of the Designated Biologist is summarized below.

To avoid and minimize effects to biological resources, the Designated Biologist shall:

1. Notify the BLM's Authorized Officer and USFWS at least 14 calendar days before initiation of ground-disturbing activities.
2. Immediately notify the BLM's Authorized Officer in writing if the Applicant/Owner does not comply with any of the mitigation measures or terms of the BO and/or the Section 2081 take authorization including, but not limited to, any actual or anticipated failure to implement such measures within the periods specified.
3. Conduct compliance inspections daily during on-going construction as clearing, grubbing, and grading are completed, and submit a monthly compliance report to BLM's Authorized Officer until construction is complete.

7.2 TAKE AVOIDANCE (PRE-CONSTRUCTION) SURVEYS

Mitigation Measure 3.4-1f identifies the pre-construction survey requirements.

> **Mitigation Measure 3.4-1f: Burrowing Owl Protection Measures.** No more than 30 days prior to the start of construction, a pre-construction survey for burrowing owls in conformance with the CDFW Staff Report on Burrowing Owl Mitigation (CDFG 2012) shall be completed within suitable habitat at every work area and within a 150 meter buffer zone of each work area. The Applicant/Owner shall submit the results of the pre-construction survey to BLM's Authorized Officer and CDFW. The Applicant/Owner shall also submit evidence of conformance with federal and state regulations regarding the protection of the burrowing owl by demonstrating compliance with the following:
>
> 1. Unless otherwise authorized by BLM and CDFW, no disturbance shall occur within 160 feet (50 meters) of occupied burrows during the non-breeding season (September 1 through January 31) or within 650 feet (500 meters) during the breeding season (February 1 through August 31).
> 2. Occupied burrows shall not be disturbed during the nesting season (February 1 through August 31). In the event that an occupied burrow absolutely cannot be avoided (e.g., due to physical or safety constraints), passive relocation of owls may be implemented prior to construction activities only if a qualified biologist approved by BLM verifies through non-invasive methods that either the birds have not begun egg-laying and incubation or that juveniles from the occupied burrows are foraging independently and are capable of independent survival. Eviction outside the nesting season may be permitted pending evaluation of eviction plans (developed in accordance with BLM protocol for burrowing owls) by CDFW and receipt of formal written approval from BLM authorizing the eviction. A Burrowing Owl Mitigation and Monitoring Plan shall be submitted to the

BLM's Authorized Officer and CDFW for review and approval prior to passive relocation.

3. Unless otherwise authorized by BLM, a 650-foot buffer within which no activity will be permissible will be maintained between Project activities and nesting burrowing owls during the nesting season. This protected area will remain in effect until August 31 or at BLM's discretion and based upon monitoring evidence, until the young owls are foraging independently.
4. If accidental take (disturbance, injury, or death of owls) occurs, the Designated Biologist will be notified immediately.
5. Impacts to active burrowing owl territories shall be mitigated at a 1:1 ratio through a combination of off-site habitat compensation and/or off-site restoration of disturbed habitat capable of supporting this species. The acquisition of occupied habitat off-site shall be in an area where turbines would not pose a mortality risk. Acquisition of habitat shall be consistent with the CDFW Staff Report on Burrowing Owl Mitigation (CDFG 2012). The preserved habitat shall be occupied by burrowing owl and shall be of superior or similar habitat quality to the impacted areas in terms of soil features, extent of disturbance, habitat structure, and dominant species composition, as determined by a qualified ornithologist. The site shall be approved by BLM. Land shall be purchased and/or placed in a conservation easement in perpetuity and managed to maintain suitable habitat. The off-site area to be preserved can coincide with off-site mitigation lands for permanent impacts to sensitive vegetation communities, with the approval of the BLM and CDFW.

APM 46 requires pre-construction clearance surveys be conducted within 2 weeks of ground disturbance or vegetation removal in all active work areas during the breeding season (February 1 through August 31) to identify active bird nests. APM 57 further requires that surveys for burrowing owl will be conducted in suitable burrowing owl habitat prior to construction and if construction is suspended for 2 weeks or more. The survey protocol will follow the *Staff Report on Burrowing Owl Mitigation (*CDFG 2012). If active burrows are found they will be avoided using non-disturbance buffer zones, as described in the table included in 4.2.4, Buffers.

7.3 BIOLOGICAL MONITORING DURING CONSTRUCTION

Mitigation Measure 3.4-1b requires that Biological Monitor(s) be employed to assist the Designated Biologist in conducting pre-construction surveys and monitoring ground disturbance, grading, construction, operation and maintenance, decommissioning, and restoration activities. The requirements for Biological Monitor(s) are listed under section 5.1, Burrow Exclusion and Closure, of this BOMMP.

7.4 NEST MONITORING

APM 47 requires monitoring of burrowing owl nests during the breeding season.

> **APM 47:** Monitoring of any active nests within or adjacent to the work areas will be conducted until nestlings have fledged and dispersed. Ongoing breeding-season monitoring of work areas will be conducted throughout the duration of construction.
>
> Nest monitoring results will be recorded in a Nest Check Form. Typically a nest check will have a minimum duration of 30 minutes, but may be longer or shorter, or more frequent than one check per day, as determined by the Designated Biologist based on the type of construction activity (duration, equipment being used, potential for construction-related disturbance) and other factors related to assessment of nest disturbance (weather variations, pair behavior, nest stage, nest type, species, etc.). The Designated Biologist will record the construction activity occurring at the time of the nest check and note any work exclusion buffer in effect at the time of the nest check. Non-Project activities in the area should also be recorded (e.g., adjacent construction sites, roads, commercial/industrial activities, recreational use, etc.). The Designated Biologist will record any sign of disturbance to the active nest, including but not limited to parental alarm calls, agitated behavior, distraction displays, nest fleeing and returning, chicks falling out of the nest or chicks or eggs being predated as a result of parental abandonment of the nest.
>
> Should the Designated Biologist determine project activities are causing or contributing to nest disturbance that might lead to nest failure, the Designated Biologist coordinate with the Construction Manager to limit the duration or location of work, and/or set other limits related to use of project vehicles, and/or heavy equipment if the Designated Biologist determines that project activities are causing or contributing to nest disturbance that might lead to nest failure. Any changes or limits to project work will be described and reported in regular monitoring and compliance reports.

Monitoring of natural and artificial burrows will be conducted on a quarterly basis for throughout the duration of construction and for 1 to 3 years after operation. Quarterly cleaning and maintenance of artificial burrows and/or artificial burrow replacement will be conducted to ensure entrances remain open and burrows remain inhabitable. Collapsed natural burrows within the project area will be monitored and re-collapsed if ground squirrels have excavated and restored burrows to discourage the return of burrowing owls. Artificial and natural burrows within the relocation sites will be monitored to determine if burrowing owls are using burrows within the relocation areas. Monitoring reports will be submitted annually to CDFW.

7.5 MONITORING DURING OPERATION

Post-construction monitoring would occur intensively for at least 1 year and up to 3 years after operation begins. The monitoring program will be extended beyond 1 year if further study will result in an improved understanding of avian reactions to the project. The Designated Biologist

will coordinate with BLM, USFWS, and CDFW at the end of the first-year operational monitoring effort to present the results of the monitoring and determine if additional monitoring is needed. Incidental monitoring will be conducted throughout the operational life of the project. Monitoring procedures for burrowing owls and other avian species are described further in the Bird and Bat Conservation Strategy (Panorama Environmental, Inc. 2014).

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APPENDIX A

STAFF REPORT ON BURROWING OWL MITIGATION

Staff Report on Burrowing Owl Mitigation

State of California

Natural Resources Agency

Department of Fish and Game

March 7, 2012[1]

[1] This document replaces the Department of Fish and Game 1995 Staff Report On Burrowing Owl Mitigation.

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INTRODUCTION AND PURPOSE

Maintaining California's rich biological diversity is dependent on the conservation of species and their habitats. The California Department of Fish and Game (Department) has designated certain species as "species of special concern" when their population viability and survival is adversely affected by risk factors such as precipitous declines or other vulnerability factors (Shuford and Gardali 2008). Preliminary analyses of regional patterns for breeding populations of burrowing owls (*Athene cunicularia*) have detected declines both locally in their central and southern coastal breeding areas, and statewide where the species has experienced modest breeding range retraction (Gervais et al. 2008). In California, threat factors affecting burrowing owl populations include habitat loss, degradation and modification, and eradication of ground squirrels resulting in a loss of suitable burrows required by burrowing owls for nesting, protection from predators, and shelter (See Appendix A).

The Department recognized the need for a comprehensive conservation and mitigation strategy for burrowing owls, and in 1995 directed staff to prepare a report describing mitigation and survey recommendations. This report, "1995 Staff Report on Burrowing Owl Mitigation," (Staff Report) (CDFG 1995), contained Department-recommended burrowing owl and burrow survey techniques and mitigation measures intended to offset the loss of habitat and slow or reverse further decline of this species. Notwithstanding these measures, over the past 15+ years, burrowing owls have continued to decline in portions of their range (DeSante et al. 2007, Wilkerson and Siegel, 2010). The Department has determined that reversing declining population and range trends for burrowing owls will require implementation of more effective conservation actions, and evaluating the efficacy of the Department's existing recommended avoidance, minimization and mitigation approaches for burrowing owls.

The Department has identified three main actions that together will facilitate a more viable, coordinated, and concerted approach to conservation and mitigation for burrowing owls in California. These include:

1. Incorporating burrowing owl comprehensive conservation strategies into landscape-based planning efforts such as Natural Community Conservation Plans (NCCPs) and multi-species Habitat Conservation Plans (HCPs) that specifically address burrowing owls.
2. Developing and implementing a statewide conservation strategy (Burkett and Johnson, 2007) and local or regional conservation strategies for burrowing owls, including the development and implementation of a statewide burrowing owl survey and monitoring plan.
3. Developing more rigorous burrowing owl survey methods, working to improve the adequacy of impacts assessments; developing clear and effective avoidance and minimization measures; and developing mitigation measures to ensure impacts to the species are effectively addressed at the project, local, and/or regional level (the focus of this document).

This Report sets forth the Department's recommendations for implementing the third approach identified above by revising the 1995 Staff Report, drawing from the most relevant and current knowledge and expertise, and incorporating the best scientific information

available pertaining to the species. It is designed to provide a compilation of the best available science for Department staff, biologists, planners, land managers, California Environmental Quality Act (CEQA) lead agencies, and the public to consider when assessing impacts of projects or other activities on burrowing owls.

This revised Staff Report takes into account the California Burrowing Owl Consortium's Survey Protocol and Mitigation Guidelines (CBOC 1993, 1997) and supersedes the survey, avoidance, minimization and mitigation recommendations in the 1995 Staff Report. Based on experiences gained from implementing the 1995 Staff Report, the Department believes revising that report is warranted. This document also includes general conservation goals and principles for developing mitigation measures for burrowing owls.

DEPARTMENT ROLE AND LEGAL AUTHORITIES

The mission of the Department is to manage California's diverse fish, wildlife and plant resources, and the habitats upon which they depend, for their ecological values and for their use and enjoyment by the public. The Department has jurisdiction over the conservation, protection, and management of fish, wildlife, native plants, and habitats necessary to maintain biologically sustainable populations of those species (Fish and Game Code (FGC) §1802). The Department, as trustee agency pursuant to CEQA (See CEQA Guidelines, §15386), has jurisdiction by law over natural resources, including fish and wildlife, affected by a project, as that term is defined in Section 21065 of the Public Resources Code. The Department exercises this authority by reviewing and commenting on environmental documents and making recommendations to avoid, minimize, and mitigate potential negative impacts to those resources held in trust for the people of California.

Field surveys designed to detect the presence of a particular species, habitat element, or natural community are one of the tools that can assist biologists in determining whether a species or habitat may be significantly impacted by land use changes or disturbance. The Department reviews field survey data as well as site-specific and regional information to evaluate whether a project's impacts may be significant. This document compiles the best available science for conducting habitat assessments and surveys, and includes considerations for developing measures to avoid impacts or mitigate unavoidable impacts.

CEQA

CEQA requires public agencies in California to analyze and disclose potential environmental impacts associated with a project that the agency will carry out, fund, or approve. Any potentially significant impact must be mitigated to the extent feasible. Project-specific CEQA mitigation is important for burrowing owls because most populations exist on privately owned parcels that, when proposed for development or other types of modification, may be subject to the environmental review requirements of CEQA.

Take

Take of individual burrowing owls and their nests is defined by FGC section 86, and prohibited by sections 3503, 3503.5 and 3513. Take is defined in FGC Section 86 as "hunt, pursue, catch, capture or kill, or attempt to hunt, pursue, catch, capture or kill."

Migratory Bird Treaty Act

The Migratory Bird Treaty Act (MBTA) implements various treaties and conventions between the United States and Canada, Japan, Mexico, and Russia for the protection of migratory birds, including the burrowing owl (50 C.F.R. § 10). The MBTA protects migratory bird nests from possession, sale, purchase, barter, transport, import and export, and collection. The other prohibitions of the MBTA - capture, pursue, hunt, and kill - are inapplicable to nests. The regulatory definition of take, as defined in Title 50 C.F.R. part 10.12, means to pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to hunt, shoot, wound, kill, trap, capture, or collect. Only the verb "collect" applies to nests. It is illegal to collect, possess, and by any means transfer possession of any migratory bird nest. The MBTA prohibits the destruction of a nest when it contains birds or eggs, and no possession shall occur during the destruction (see Fish and Wildlife Service, Migratory Bird Permit Memorandum, April 15, 2003). Certain exceptions to this prohibition are included in 50 C.F.R. section 21. Pursuant to Fish & Game Code section 3513, the Department enforces the Migratory Bird Treaty Act consistent with rules and regulations adopted by the Secretary of the Interior under provisions of the Migratory Treaty Act.

Regional Conservation Plans

Regional multiple species conservation plans offer long-term assurances for conservation of covered species at a landscape scale, in exchange for biologically appropriate levels of incidental take and/or habitat loss as defined in the approved plan. California's NCCP Act (FGC §2800 et seq.) governs such plans at the state level, and was designed to conserve species, natural communities, ecosystems, and ecological processes across a jurisdiction or a collection of jurisdictions. Complementary federal HCPs are governed by the Endangered Species Act (7 U.S.C. § 136, 16 U.S.C.§ 1531 et seq.) (ESA). Regional conservation plans (and certain other landscape-level conservation and management plans), may provide conservation for unlisted as well as listed species. Because the geographic scope of NCCPs and HCPs may span many hundreds of thousands of acres, these planning tools have the potential to play a significant role in conservation of burrowing owls, and grasslands and other habitats.

Fish and Game Commission Policies

There are a number of Fish and Game Commission policies (see FGC §2008) that can be applied to burrowing owl conservation. These include policies on: Raptors, Cooperation, Endangered and Threatened Species, Land Use Planning, Management and Utilization of Fish and Wildlife on Federal Lands, Management and Utilization of Fish and Wildlife on Private Lands, and Research.

GUIDING PRINCIPLES FOR CONSERVATION

Unless otherwise provided in a statewide, local, or regional conservation strategy, surveying and evaluating impacts to burrowing owls, as well as developing and implementing avoidance, minimization, and mitigation and conservation measures incorporate the following principles. These principles are a summary of Department staff expert opinion and were used to guide the preparation of this document.

1. Use the Precautionary Principle (Noss et al.1997), by which the alternative of increased conservation is deliberately chosen in order to buffer against incomplete knowledge of burrowing owl ecology and uncertainty about the consequences to burrowing owls of potential impacts, including those that are cumulative.
2. Employ basic conservation biology tenets and population-level approaches when determining what constitutes appropriate avoidance, minimization, and mitigation for impacts. Include mitigation effectiveness monitoring and reporting, and use an adaptive management loop to modify measures based on results.
3. Protect and conserve owls in wild, semi-natural, and agricultural habitats (conserve is defined at FGC §1802).
4. Protect and conserve natural nest burrows (or burrow surrogates) previously used by burrowing owls and sufficient foraging habitat and protect auxiliary "satellite" burrows that contribute to burrowing owl survivorship and natural behavior of owls.

CONSERVATION GOALS FOR THE BURROWING OWL IN CALIFORNIA

It is Department staff expert opinion that the following goals guide and contribute to the short and long-term conservation of burrowing owls in California:

1. Maintain size and distribution of extant burrowing owl populations (allowing for natural population fluctuations).
2. Increase geographic distribution of burrowing owls into formerly occupied historical range where burrowing owl habitat still exists, or where it can be created or enhanced, and where the reason for its local disappearance is no longer of concern.
3. Increase size of existing populations where possible and appropriate (for example, considering basic ecological principles such as carrying capacity, predator-prey relationships, and inter-specific relationships with other species at risk).
4. Protect and restore self-sustaining ecosystems or natural communities which can support burrowing owls at a landscape scale, and which will require minimal long-term management.
5. Minimize or prevent unnatural causes of burrowing owl population declines (e.g., nest burrow destruction, chemical control of rodent hosts and prey).
6. Augment/restore natural dynamics of burrowing owl populations including movement and genetic exchange among populations, such that the species does not require future listing and protection under the California Endangered Species Act (CESA) and/or the federal Endangered Species Act (ESA).
7. Engage stakeholders, including ranchers; farmers; military; tribes; local, state, and federal agencies; non-governmental organizations; and scientific research and education communities involved in burrowing owl protection and habitat management.

ACTIVITIES WITH THE POTENTIAL TO TAKE OR IMPACT BURROWING OWLS

The following activities are examples of activities that have the potential to take burrowing owls, their nests or eggs, or destroy or degrade burrowing owl habitat: grading, disking, cultivation, earthmoving, burrow blockage, heavy equipment compacting and crushing burrow tunnels, levee maintenance, flooding, burning and mowing (if burrows are impacted), and operating wind turbine collisions (collectively hereafter referred to as "projects" or "activities"

whether carried out pursuant to CEQA or not). In addition, the following activities may have impacts to burrowing owl populations: eradication of host burrowers; changes in vegetation management (i.e. grazing); use of pesticides and rodenticides; destruction, conversion or degradation of nesting, foraging, over-wintering or other habitats; destruction of natural burrows and burrow surrogates; and disturbance which may result in harassment of owls at occupied burrows.

PROJECT IMPACT EVALUATIONS

The following three progressive steps are effective in evaluating whether projects will result in impacts to burrowing owls. The information gained from these steps will inform any subsequent avoidance, minimization and mitigation measures. The steps for project impact evaluations are: 1) habitat assessment, 2) surveys, and 3) impact assessment. Habitat assessments are conducted to evaluate the likelihood that a site supports burrowing owl. Burrowing owl surveys provide information needed to determine the potential effects of proposed projects and activities on burrowing owls, and to avoid take in accordance with FGC sections 86, 3503, and 3503.5. Impact assessments evaluate the extent to which burrowing owls and their habitat may be impacted, directly or indirectly, on and within a reasonable distance of a proposed CEQA project activity or non-CEQA project. These three site evaluation steps are discussed in detail below.

Biologist Qualifications

The current scientific literature indicates that only individuals meeting the following minimum qualifications should perform burrowing owl habitat assessments, surveys, and impact assessments:

1. Familiarity with the species and its local ecology;
2. Experience conducting habitat assessments and non-breeding and breeding season surveys, or experience with these surveys conducted under the direction of an experienced surveyor;
3. Familiarity with the appropriate state and federal statutes related to burrowing owls, scientific research, and conservation;
4. Experience with analyzing impacts of development on burrowing owls and their habitat.

Habitat Assessment Data Collection and Reporting

A habitat assessment is the first step in the evaluation process and will assist investigators in determining whether or not occupancy surveys are needed. Refer to Appendix B for a definition of burrowing owl habitat. Compile the detailed information described in Appendix C when conducting project scoping, conducting a habitat assessment site visit and preparing a habitat assessment report.

Surveys

Burrowing owl surveys are the second step of the evaluation process and the best available scientific literature recommends that they be conducted whenever burrowing owl habitat or sign (see Appendix B) is encountered on or adjacent to (within 150 meters) a project site

(Thomsen 1971, Martin 1973). Occupancy of burrowing owl habitat is confirmed at a site when at least one burrowing owl, or its sign at or near a burrow entrance, is observed within the last three years (Rich 1984). Burrowing owls are more detectable during the breeding season with detection probabilities being highest during the nestling stage (Conway et al. 2008). In California, the burrowing owl breeding season extends from 1 February to 31 August (Haug et al. 1993, Thompsen 1971) with some variances by geographic location and climatic conditions. Several researchers suggest three or more survey visits during daylight hours (Haug and Diduik 1993, CBOC 1997, Conway and Simon 2003) and recommend each visit occur at least three weeks apart during the peak of the breeding season, commonly accepted in California as between 15 April and 15 July (CBOC 1997). Conway and Simon (2003) and Conway et al. (2008) recommended conducting surveys during the day when most burrowing owls in a local area are in the laying and incubation period (so as not to miss early breeding attempts), during the nesting period, and in the late nestling period when most owls are spending time above ground.

Non-breeding season (1 September to 31 January) surveys may provide information on burrowing owl occupancy, but do not substitute for breeding season surveys because results are typically inconclusive. Burrowing owls are more difficult to detect during the non-breeding season and their seasonal residency status is difficult to ascertain. Burrowing owls detected during non-breeding season surveys may be year-round residents, young from the previous breeding season, pre-breeding territorial adults, winter residents, dispersing juveniles, migrants, transients or new colonizers. In addition, the numbers of owls and their pattern of distribution may differ during winter and breeding seasons. However, on rare occasions, non-breeding season surveys may be warranted (i.e., if the site is believed to be a wintering site only based on negative breeding season results). Refer to Appendix D for information on breeding season and non-breeding season survey methodologies.

Survey Reports

Adequate information about burrowing owls present in and adjacent to an area that will be disturbed by a project or activity will enable the Department, reviewing agencies and the public to effectively assess potential impacts and will guide the development of avoidance, minimization, and mitigation measures. The survey report includes but is not limited to a description of the proposed project or proposed activity, including the proposed project start and end dates, as well as a description of disturbances or other activities occurring on-site or nearby. Refer to Appendix D for details included in a survey report.

Impact Assessment

The third step in the evaluation process is the impact assessment. When surveys confirm occupied burrowing owl habitat in or adjoining the project area, there are a number of ways to assess a project's potential significant impacts to burrowing owls and their habitat. Richardson and Miller (1997) recommended monitoring raptor behavior prior to developing management recommendations and buffers to determine the extent to which individuals have been sensitized to human disturbance. Monitoring results will also provide detail necessary for developing site-specific measures. Postovit and Postovit (1987) recommended an analytical approach to mitigation planning: define the problem (impact), set goals (to guide mitigation development), evaluate and select mitigation methods, and monitor the results.

Define the problem. The impact assessment evaluates all factors that could affect burrowing owls. Postovit and Postovit (1987) recommend evaluating the following in assessing impacts to raptors and planning mitigation: type and extent of disturbance, duration and timing of disturbance, visibility of disturbance, sensitivity and ability to habituate, and influence of environmental factors. They suggest identifying and addressing all potential direct and indirect impacts to burrowing owls, regardless of whether or not the impacts will occur during the breeding season. Several examples are given for each impact category below; however, examples are not intended to be used exclusively.

Type and extent of the disturbance. The impact assessment describes the nature (source) and extent (scale) of potential project impacts on occupied, satellite and unoccupied burrows including acreage to be lost (temporary or permanent), fragmentation/edge being created, increased distance to other nesting and foraging habitat, and habitat degradation. Discuss any project activities that impact either breeding and/or non-breeding habitat which could affect owl home range size and spatial configuration, negatively affect onsite and offsite burrowing owl presence, increase energetic costs, lower reproductive success, increase vulnerability to predation, and/or decrease the chance of procuring a mate.

Duration and timing of the impact. The impact assessment describes the amount of time the burrowing owl habitat will be unavailable to burrowing owls (temporary or permanent) on the site and the effect of that loss on essential behaviors or life history requirements of burrowing owls, the overlap of project activities with breeding and/or non-breeding seasons (timing of nesting and/or non-breeding activities may vary with latitude and climatic conditions, which should be considered with the timeline of the project or activity), and any variance of the project activities in intensity, scale and proximity relative to burrowing owl occurrences.

Visibility and sensitivity. Some individual burrowing owls or pairs are more sensitive than others to specific stimuli and may habituate to ongoing visual or audible disturbance. Site-specific monitoring may provide clues to the burrowing owl's sensitivities. This type of assessment addresses the sensitivity of burrowing owls within their nesting area to humans on foot, and vehicular traffic. Other variables are whether the site is primarily in a rural versus urban setting, and whether any prior disturbance (e.g., human development or recreation) is known at the site.

Environmental factors. The impact assessment discusses any environmental factors that could be influenced or changed by the proposed activities including nest site availability, predators, prey availability, burrowing mammal presence and abundance, and threats from other extrinsic factors such as human disturbance, urban interface, feral animals, invasive species, disease or pesticides.

Significance of impacts. The impact assessment evaluates the potential loss of nesting burrows, satellite burrows, foraging habitat, dispersal and migration habitat, wintering habitat, and habitat linkages, including habitat supporting prey and host burrowers and other essential habitat attributes. This assessment determines if impacts to the species will result in significant impacts to the species locally, regionally and range-wide per CEQA Guidelines §15382 and Appendix G. The significance of the impact to habitat depends on the extent of habitat disturbed and length of time the habitat is unavailable (for example: minor – several days, medium – several weeks to months, high - breeding season affecting juvenile survival,

or over winter affecting adult survival).

Cumulative effects. The cumulative effects assessment evaluates two consequences: 1) the project's proportional share of reasonably foreseeable impacts on burrowing owls and habitat caused by the project or in combination with other projects and local influences having impacts on burrowing owls and habitat, and 2) the effects on the regional owl population resulting from the project's impacts to burrowing owls and habitat.

Mitigation goals. Establishing goals will assist in planning mitigation and selecting measures that function at a desired level. Goals also provide a standard by which to measure mitigation success. Unless specifically provided for through other FGC Sections or through specific regulations, take, possession or destruction of individual burrowing owls, their nests and eggs is prohibited under FGC sections 3503, 3503.5 and 3513. Therefore, a required goal for all project activities is to avoid take of burrowing owls. Under CEQA, goals would consist of measures that would avoid, minimize and mitigate impacts to a less than significant level. For individual projects, mitigation must be roughly proportional to the level of impacts, including cumulative impacts, in accordance with the provisions of CEQA (CEQA Guidelines, §§ 15126.4(a)(4)(B), 15064, 15065, and 16355). In order for mitigation measures to be effective, they must be specific, enforceable, and feasible actions that will improve environmental conditions. As set forth in more detail in Appendix A, the current scientific literature supports the conclusion that mitigation for permanent habitat loss necessitates replacement with an equivalent or greater habitat area for breeding, foraging, wintering, dispersal, presence of burrows, burrow surrogates, presence of fossorial mammal dens, well drained soils, and abundant and available prey within close proximity to the burrow.

MITIGATION METHODS

The current scientific literature indicates that any site-specific avoidance or mitigation measures developed should incorporate the best practices presented below or other practices confirmed by experts and the Department. The Department is available to assist in the development of site-specific avoidance and mitigation measures.

Avoiding. A primary goal is to design and implement projects to seasonally and spatially avoid negative impacts and disturbances that could result in take of burrowing owls, nests, or eggs. Other avoidance measures may include but not be limited to:

- Avoid disturbing occupied burrows during the nesting period, from 1 February through 31 August.
- Avoid impacting burrows occupied during the non-breeding season by migratory or non-migratory resident burrowing owls.
- Avoid direct destruction of burrows through chaining (dragging a heavy chain over an area to remove shrubs), disking, cultivation, and urban, industrial, or agricultural development.
- Develop and implement a worker awareness program to increase the on-site worker's recognition of and commitment to burrowing owl protection.
- Place visible markers near burrows to ensure that farm equipment and other machinery does not collapse burrows.
- Do not fumigate, use treated bait or other means of poisoning nuisance animals in areas where burrowing owls are known or suspected to occur (e.g., sites observed with nesting

owls, designated use areas).

- Restrict the use of treated grain to poison mammals to the months of January and February.

Take avoidance (pre-construction) surveys. Take avoidance surveys are intended to detect the presence of burrowing owls on a project site at a fixed period in time and inform necessary take avoidance actions. Take avoidance surveys may detect changes in owl presence such as colonizing owls that have recently moved onto the site, migrating owls, resident burrowing owls changing burrow use, or young of the year that are still present and have not dispersed. Refer to Appendix D for take avoidance survey methodology.

Site surveillance. Burrowing owls may attempt to colonize or re-colonize an area that will be impacted; thus, the current scientific literature indicates a need for ongoing surveillance at the project site during project activities is recommended. The surveillance frequency/effort should be sufficient to detect burrowing owls if they return. Subsequent to their new occupancy or return to the site, take avoidance measures should assure with a high degree of certainty that take of owls will not occur.

Minimizing. If burrowing owls and their habitat can be protected in place on or adjacent to a project site, the use of buffer zones, visual screens or other measures while project activities are occurring can minimize disturbance impacts. Conduct site-specific monitoring to inform development of buffers (see Visibility and sensitivity above). The following general guidelines for implementing buffers should be adjusted to address site-specific conditions using the impact assessment approach described above. The CEQA lead agency and/or project proponent is encouraged to consult with the Department and other burrowing owl experts for assistance in developing site-specific buffer zones and visual screens.

Buffers. Holroyd et al. (2001) identified a need to standardize management and disturbance mitigation guidelines. For instance, guidelines for mitigating impacts by petroleum industries on burrowing owls and other prairie species (Scobie and Faminow, 2000) may be used as a template for future mitigation guidelines (Holroyd et al. 2001). Scobie and Faminow (2000) developed guidelines for activities around occupied burrowing owl nests recommending buffers around low, medium, and high disturbance activities, respectively (see below).

Recommended restricted activity dates and setback distances by level of disturbance for burrowing owls (Scobie and Faminow 2000).

Location	Time of Year	Level of Disturbance		
		Low	Med	High
Nesting sites	April 1-Aug 15	200 m*	500 m	500 m
Nesting sites	Aug 16-Oct 15	200 m	200 m	500 m
Nesting sites	Oct 16-Mar 31	50 m	100 m	500 m

* meters (m)

Based on existing vegetation, human development, and land uses in an area, resource managers may decide to allow human development or resource extraction closer to these area/sites than recommended above. However, if it is decided to allow activities closer than

the setback distances recommended, a broad-scale, long-term, scientifically-rigorous monitoring program ensures that burrowing owls are not detrimentally affected by alternative approaches.

Other minimization measures include eliminating actions that reduce burrowing owl forage and burrowing surrogates (e.g. ground squirrel), or introduce/facilitate burrowing owl predators. Actions that could influence these factors include reducing livestock grazing rates and/or changing the timing or duration of grazing or vegetation management that could result in less suitable habitat.

Burrow exclusion and closure. Burrow exclusion is a technique of installing one-way doors in burrow openings during the non-breeding season to temporarily exclude burrowing owls, or permanently exclude burrowing owls and close burrows after verifying burrows are empty by site monitoring and scoping. Exclusion in and of itself is not a take avoidance, minimization or mitigation method. Eviction of burrowing owls is a potentially significant impact under CEQA.

The long-term demographic consequences of these techniques have not been thoroughly evaluated, and the fate of evicted or excluded burrowing owls has not been systematically studied. Because burrowing owls are dependent on burrows at all times of the year for survival and/or reproduction, evicting them from nesting, roosting, and satellite burrows may lead to indirect impacts or take. Temporary or permanent closure of burrows may result in significant loss of burrows and habitat for reproduction and other life history requirements. Depending on the proximity and availability of alternate habitat, loss of access to burrows will likely result in varying levels of increased stress on burrowing owls and could depress reproduction, increase predation, increase energetic costs, and introduce risks posed by having to find and compete for available burrows. Therefore, exclusion and burrow closure are not recommended where they can be avoided. The current scientific literature indicates consideration of all possible avoidance and minimization measures before temporary or permanent exclusion and closure of burrows is implemented, in order to avoid take.

The results of a study by Trulio (1995) in California showed that burrowing owls passively displaced from their burrows were quickly attracted to adjacent artificial burrows at five of six passive relocation sites. The successful sites were all within 75 meters (m) of the destroyed burrow, a distance generally within a pair's territory. This researcher discouraged using passive relocation to artificial burrows as a mitigation measure for lost burrows without protection of adjacent foraging habitat. The study results indicated artificial burrows were used by evicted burrowing owls when they were approximately 50-100 m from the natural burrow (Thomsen 1971, Haug and Oliphant 1990). Locating artificial or natural burrows more than 100 m from the eviction burrow may greatly reduce the chances that new burrows will be used. Ideally, exclusion and burrow closure is employed only where there are adjacent natural burrows and non-impacted, sufficient habitat for burrowing owls to occupy with permanent protection mechanisms in place. Any new burrowing owl colonizing the project site after the CEQA document has been adopted may constitute changed circumstances that should be addressed in a re-circulated CEQA document.

The current scientific literature indicates that burrow exclusion should only be conducted by qualified biologists (meeting the Biologist's Qualifications above) during the non-breeding

season, before breeding behavior is exhibited and after the burrow is confirmed empty by site surveillance and/or scoping. The literature also indicates that when temporary or permanent burrow exclusion and/or burrow closure is implemented, burrowing owls should not be excluded from burrows unless or until:

- A Burrowing Owl Exclusion Plan (see Appendix E) is developed and approved by the applicable local DFG office;
- Permanent loss of occupied burrow(s) and habitat is mitigated in accordance with the Mitigating Impacts sections below. Temporary exclusion is mitigated in accordance with the item #1 under Mitigating Impacts below.
- Site monitoring is conducted prior to, during, and after exclusion of burrowing owls from their burrows sufficient to ensure take is avoided. Conduct daily monitoring for one week to confirm young of the year have fledged if the exclusion will occur immediately after the end of the breeding season.
- Excluded burrowing owls are documented using artificial or natural burrows on an adjoining mitigation site (if able to confirm by band re-sight).

Translocation (Active relocation offsite >100 meters). At this time, there is little published information regarding the efficacy of translocating burrowing owls, and additional research is needed to determine subsequent survival and breeding success (Klute et al. 2003, Holroyd et al. 2001). Study results for translocation in Florida implied that hatching success may be decreased for populations of burrowing owls that undergo translocation (Nixon 2006). At this time, the Department is unable to authorize the capture and relocation of burrowing owls except within the context of scientific research (FGC §1002) or a NCCP conservation strategy.

Mitigating impacts. Habitat loss and degradation from rapid urbanization of farmland in the core areas of the Central and Imperial valleys is the greatest of many threats to burrowing owls in California (Shuford and Gardali, 2008). At a minimum, if burrowing owls have been documented to occupy burrows (see Definitions, Appendix B) at the project site in recent years, the current scientific literature supports the conclusion that the site should be considered occupied and mitigation should be required by the CEQA lead agency to address project-specific significant and cumulative impacts. Other site-specific and regionally significant and cumulative impacts may warrant mitigation. The current scientific literature indicates the following to be best practices. If these best practices cannot be implemented, the lead agency or lead investigator may consult with the Department to develop effective mitigation alternatives. The Department is also available to assist in the identification of suitable mitigation lands.

1. Where habitat will be temporarily disturbed, restore the disturbed area to pre-project condition including decompacting soil and revegetating. Permanent habitat protection may be warranted if there is the potential that the temporary impacts may render a nesting site (nesting burrow and satellite burrows) unsustainable or unavailable depending on the time frame, resulting in reduced survival or abandonment. For the latter potential impact, see the permanent impact measures below.
2. Mitigate for permanent impacts to nesting, occupied and satellite burrows and/or burrowing owl habitat such that the habitat acreage, number of burrows and burrowing owls impacted are replaced based on the information provided in Appendix A. Note: A

minimum habitat replacement recommendation is not provided here as it has been shown to serve as a default, replacing any site-specific analysis and discounting the wide variation in natal area, home range, foraging area, and other factors influencing burrowing owls and burrowing owl population persistence in a particular area.

3. Mitigate for permanent impacts to nesting, occupied and satellite burrows and burrowing owl habitat with (a) permanent conservation of similar vegetation communities (grassland, scrublands, desert, urban, and agriculture) to provide for burrowing owl nesting, foraging, wintering, and dispersal (i.e., during breeding and non-breeding seasons) comparable to or better than that of the impact area, and (b) sufficiently large acreage, and presence of fossorial mammals. The mitigation lands may require habitat enhancements including enhancement or expansion of burrows for breeding, shelter and dispersal opportunity, and removal or control of population stressors. If the mitigation lands are located adjacent to the impacted burrow site, ensure the nearest neighbor artificial or natural burrow clusters are at least within 210 meters (Fisher et al. 2007).
4. Permanently protect mitigation land through a conservation easement deeded to a non-profit conservation organization or public agency with a conservation mission, for the purpose of conserving burrowing owl habitat and prohibiting activities incompatible with burrowing owl use. If the project is located within the service area of a Department-approved burrowing owl conservation bank, the project proponent may purchase available burrowing owl conservation bank credits.
5. Develop and implement a mitigation land management plan to address long-term ecological sustainability and maintenance of the site for burrowing owls (see Management Plan and Artificial Burrow sections below, if applicable).
6. Fund the maintenance and management of mitigation land through the establishment of a long-term funding mechanism such as an endowment.
7. Habitat should not be altered or destroyed, and burrowing owls should not be excluded from burrows, until mitigation lands have been legally secured, are managed for the benefit of burrowing owls according to Department-approved management, monitoring and reporting plans, and the endowment or other long-term funding mechanism is in place or security is provided until these measures are completed.
8. Mitigation lands should be on, adjacent or proximate to the impact site where possible and where habitat is sufficient to support burrowing owls present.
9. Where there is insufficient habitat on, adjacent to, or near project sites where burrowing owls will be excluded, acquire mitigation lands with burrowing owl habitat away from the project site. The selection of mitigation lands should then focus on consolidating and enlarging conservation areas located outside of urban and planned growth areas, within foraging distance of other conserved lands. If mitigation lands are not available adjacent to other conserved lands, increase the mitigation land acreage requirement to ensure a selected site is of sufficient size. Offsite mitigation may not adequately offset the biological and habitat values impacted on a one to one basis. Consult with the Department when determining offsite mitigation acreages.
10. Evaluate and select suitable mitigation lands based on a comparison of the habitat attributes of the impacted and conserved lands, including but not limited to: type and structure of habitat being impacted or conserved; density of burrowing owls in impacted and conserved habitat; and significance of impacted or conserved habitat to the species range-wide. Mitigate for the highest quality burrowing owl habitat impacted first and foremost when identifying mitigation lands, even if a mitigation site is located outside of

a lead agency's jurisdictional boundary, particularly if the lead agency is a city or special district.

11. Select mitigation lands taking into account the potential human and wildlife conflicts or incompatibility, including but not limited to, human foot and vehicle traffic, and predation by cats, loose dogs and urban-adapted wildlife, and incompatible species management (i.e., snowy plover).
12. Where a burrowing owl population appears to be highly adapted to heavily altered habitats such as golf courses, airports, athletic fields, and business complexes, permanently protecting the land, augmenting the site with artificial burrows, and enhancing and maintaining those areas may enhance sustainability of the burrowing owl population onsite. Maintenance includes keeping lands grazed or mowed with weed-eaters or push mowers, free from trees and shrubs, and preventing excessive human and human-related disturbance (e.g., walking, jogging, off-road activity, dog-walking) and loose and feral pets (chasing and, presumably, preying upon owls) that make the environment uninhabitable for burrowing owls (Wesemann and Rowe 1985, Millsap and Bear 2000, Lincer and Bloom 2007). Items 4, 5 and 6 also still apply to this mitigation approach.
13. If there are no other feasible mitigation options available and a lead agency is willing to establish and oversee a Burrowing Owl Mitigation and Conservation Fund that funds on a competitive basis acquisition and permanent habitat conservation, the project proponent may participate in the lead agency's program.

Artificial burrows. Artificial burrows have been used to replace natural burrows either temporarily or long-term and their long-term success is unclear. Artificial burrows may be an effective addition to in-perpetuity habitat mitigation if they are augmenting natural burrows, the burrows are regularly maintained (i.e., no less than annual, with biennial maintenance recommended), and surrounding habitat patches are carefully maintained. There may be some circumstances, for example at airports, where squirrels will not be allowed to persist and create a dynamic burrow system, where artificial burrows may provide some support to an owl population.

Many variables may contribute to the successful use of artificial burrows by burrowing owls, including pre-existence of burrowing owls in the area, availability of food, predators, surrounding vegetation and proximity, number of natural burrows in proximity, type of materials used to build the burrow, size of the burrow and entrance, direction in which the burrow entrance is facing, slope of the entrance, number of burrow entrances per burrow, depth of the burrow, type and height of perches, and annual maintenance needs (Belthoff and King 2002, Smith et al. 2005, Barclay et al. 2011). Refer to Barclay (2008) and (2011) and to Johnson et al. 2010 (unpublished report) for guidance on installing artificial burrows including recommendations for placement, installation and maintenance.

Any long-term reliance on artificial burrows as natural burrow replacements must include semi-annual to annual cleaning and maintenance and/or replacement (Barclay et al. 2011, Smith and Conway 2005, Alexander et al. 2005) as an ongoing management practice. Alexander et al. (2005), in a study of the use of artificial burrows found that all of 20 artificial burrows needed some annual cleaning and maintenance. Burrows were either excavated by predators, blocked by soil or vegetation, or experienced substrate erosion forming a space beneath the tubing that prevented nestlings from re-entering the burrow.

Mitigation lands management plan. Develop a Mitigation Lands Management Plan for projects that require off-site or on-site mitigation habitat protection to ensure compliance with and effectiveness of identified management actions for the mitigation lands. A suggested outline and related vegetation management goals and monitoring success criteria can be found in Appendix E.

Mitigation Monitoring and Reporting

Verify the compliance with required mitigation measures, the accuracy of predictions, and ensure the effectiveness of all mitigation measures for burrowing owls by conducting follow-up monitoring, and implementing midcourse corrections, if necessary, to protect burrowing owls. Refer to CEQA Guidelines Section 15097 and the CEQA Guidelines for additional guidance on mitigation, monitoring and reporting. Monitoring is qualitatively different from site surveillance; monitoring normally has a specific purpose and its outputs and outcomes will usually allow a comparison with some baseline condition of the site before the mitigation (including avoidance and minimization) was undertaken. Ideally, monitoring should be based on the Before-After Control-Impact (BACI) principle (McDonald et al. 2000) that requires knowledge of the pre-mitigation state to provide a reference point for the state and change in state after the project and mitigation have been implemented.

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Appendix A. Burrowing Owl Natural History and Threats

Diet

Burrowing owl diet includes arthropods, small rodents, birds, amphibians, reptiles, and carrion (Haug et al. 1993).

Breeding

In California, the breeding season for the burrowing owl typically occurs between 1 February and 31 August although breeding in December has been documented (Thompson 1971, Gervais et al. 2008); breeding behavior includes nest site selection by the male, pair formation, copulation, egg laying, hatching, fledging, and post-fledging care of young by the parents. The peak of the breeding season occurs between 15 April and 15 July and is the period when most burrowing owls have active nests (eggs or young). The incubation period lasts 29 days (Coulombe 1971) and young fledge after 44 days (Haug et al. 1993). Note that the timing of nesting activities may vary with latitude and climatic conditions. Burrowing owls may change burrows several times during the breeding season, starting when nestlings are about three weeks old (Haug et al. 1993).

Dispersal

The following discussion is an excerpt from Gervais et al (2008):

> "The burrowing owl is often considered a sedentary species (e.g., Thomsen 1971). A large proportion of adults show strong fidelity to their nest site from year to year, especially where resident, as in Florida (74% for females, 83% for males; Millsap and Bear 1997). In California, nest-site fidelity rates were 32%–50% in a large grassland and 57% in an agricultural environment (Ronan 2002, Catlin 2004, Catlin et al. 2005). Differences in these rates among sites may reflect differences in nest predation rates (Catlin 2004, Catlin et al. 2005). Despite the high nest fidelity rates, dispersal distances may be considerable for both juveniles (natal dispersal) and adults (postbreeding dispersal), but this also varied with location (Catlin 2004, Rosier et al. 2006). Distances of 53 km to roughly 150 km have been observed in California for adult and natal dispersal, respectively (D. K. Rosenberg and J. A. Gervais, unpublished data), despite the difficulty in detecting movements beyond the immediate study area (Koenig et al. 1996)."

Habitat

The burrowing owl is a small, long-legged, ground-dwelling bird species, well-adapted to open, relatively flat expanses. In California, preferred habitat is generally typified by short, sparse vegetation with few shrubs, level to gentle topography and well-drained soils (Haug et al. 1993). Grassland, shrub steppe, and desert are naturally occurring habitat types used by the species. In addition, burrowing owls may occur in some agricultural areas, ruderal grassy fields, vacant lots and pastures if the vegetation structure is suitable and there are useable burrows and foraging habitat in proximity (Gervais et al 2008). Unique amongst North

American raptors, the burrowing owl requires underground burrows or other cavities for nesting during the breeding season and for roosting and cover, year round. Burrows used by the owls are usually dug by other species termed host burrowers. In California, California ground squirrel (*Spermophilus beecheyi*) and round-tailed ground squirrel (*Citellus tereticaudus*) burrows are frequently used by burrowing owls but they may use dens or holes dug by other fossorial species including badger (*Taxidea taxus*), coyote (*Canis latrans*), and fox (e.g., San Joaquin kit fox, *Vulpes macrotis mutica*; Ronan 2002). In some instances, owls have been known to excavate their own burrows (Thompson 1971, Barclay 2007). Natural rock cavities, debris piles, culverts, and pipes also are used for nesting and roosting (Rosenberg et al. 1998). Burrowing owls have been documented using artificial burrows for nesting and cover (Smith and Belthoff, 2003).

Foraging habitat. Foraging habitat is essential to burrowing owls. The following discussion is an excerpt from Gervais et al. (2008):

> "Useful as a rough guide to evaluating project impacts and appropriate mitigation for burrowing owls, adult male burrowing owls home ranges have been documented (calculated by minimum convex polygon) to comprise anywhere from 280 acres in intensively irrigated agroecosystems in Imperial Valley (Rosenberg and Haley 2004) to 450 acres in mixed agricultural lands at Lemoore Naval Air Station, CA (Gervais et al. 2003), to 600 acres in pasture in Saskatchewan, Canada (Haug and Oliphant 1990). But owl home ranges may be much larger, perhaps by an order of magnitude, in non-irrigated grasslands such as at Carrizo Plain, California (Gervais et al. 2008), based on telemetry studies and distribution of nests. Foraging occurs primarily within 600 m of their nests (within approximately 300 acres, based on a circle with a 600 m radius) during the breeding season."

Importance of burrows and adjacent habitat. Burrows and the associated surrounding habitat are essential ecological requisites for burrowing owls throughout the year and especially during the breeding season. During the non-breeding season, burrowing owls remain closely associated with burrows, as they continue to use them as refuge from predators, shelter from weather and roost sites. Resident populations will remain near the previous season's nest burrow at least some of the time (Coulombe 1971, Thomsen 1971, Botelho 1996, LaFever et al. 2008).

In a study by Lutz and Plumpton (1999) adult males and females nested in formerly used sites at similar rates (75% and 63%, respectively) (Lutz and Plumpton 1999). Burrow fidelity has been reported in some areas; however, more frequently, burrowing owls reuse traditional nesting areas without necessarily using the same burrow (Haug et al. 1993, Dechant et al. 1999). Burrow and nest sites are re-used at a higher rate if the burrowing owl has reproduced successfully during the previous year (Haug et al. 1993) and if the number of burrows isn't limiting nesting opportunity.

Burrowing owls may use "satellite" or non-nesting burrows, moving young at 10-14 days, presumably to reduce risk of predation (Desmond and Savidge 1998) and possibly to avoid nest parasites (Dechant et al. 1999). Successful nests in Nebraska had more active satellite burrows within 75 m of the nest burrow than unsuccessful nests (Desmond and Savidge

1999). Several studies have documented the number of satellite burrows used by young and adult burrowing owls during the breeding season as between one and 11 burrows with an average use of approximately five burrows (Thompsen 1984, Haug 1985, Haug and Oliphant 1990). Supporting the notion of selecting for nest sites near potential satellite burrows, Ronan (2002) found burrowing owl families would move away from a nest site if their satellite burrows were experimentally removed through blocking their entrance.

Habitat adjacent to burrows has been documented to be important to burrowing owls. Gervais et al. (2003) found that home range sizes of male burrowing owls during the nesting season were highly variable within but not between years. Their results also suggested that owls concentrate foraging efforts within 600 meters of the nest burrow, as was observed in Canada (Haug and Oliphant 1990) and southern California (Rosenberg and Haley 2004). James et al. (1997), reported habitat modification factors causing local burrowing owl declines included habitat fragmentation and loss of connectivity.

In conclusion, the best available science indicates that essential habitat for the burrowing owl in California must include suitable year-round habitat, primarily for breeding, foraging, wintering and dispersal habitat consisting of short or sparse vegetation (at least at some time of year), presence of burrows, burrow surrogates or presence of fossorial mammal dens, well-drained soils, and abundant and available prey within close proximity to the burrow.

Threats to Burrowing Owls in California

Habitat loss. Habitat loss, degradation, and fragmentation are the greatest threats to burrowing owls in California. According to DeSante et al. (2007), “the vast majority of burrowing owls [now] occur in the wide, flat lowland valleys and basins of the Imperial Valley and Great Central Valley [where] for the most part,...the highest rates of residential and commercial development in California are occurring.” Habitat loss from the State’s long history of urbanization in coastal counties has already resulted in either extirpation or drastic reduction of burrowing owl populations there (Gervais et al. 2008). Further, loss of agricultural and other open lands (such as grazed landscapes) also negatively affect owl populations. Because of their need for open habitat with low vegetation, burrowing owls are unlikely to persist in agricultural lands dominated by vineyards and orchards (Gervais et al. 2008).

Control of burrowing rodents. According to Klute et al. (2003), the elimination of burrowing rodents through control programs is a primary factor in the recent and historical decline of burrowing owl populations nationwide. In California, ground squirrel burrows are most often used by burrowing owls for nesting and cover; thus, ground squirrel control programs may affect owl numbers in local areas by eliminating a necessary resource.

Direct mortality. Burrowing owls suffer direct losses from a number of sources. Vehicle collisions are a significant source of mortality especially in the urban interface and where owls nest alongside roads (Haug et al. 1993, Gervais et al. 2008). Road and ditch maintenance, modification of water conveyance structures (Imperial Valley) and discing to control weeds in fallow fields may destroy burrows (Rosenberg and Haley 2004, Catlin and Rosenberg 2006) which may trap or crush owls. Wind turbines at Altamont Pass Wind Resource Area are known to cause direct burrowing owl mortality (Thelander et al. 2003). Exposure to

pesticides may pose a threat to the species but is poorly understood (Klute et al. 2003, Gervais et al. 2008).

Appendix B. Definitions

Some key terms that appear in this document are defined below.

Adjacent habitat means burrowing owl habitat that abuts the area where habitat and burrows will be impacted and rendered non-suitable for occupancy.

Breeding (nesting) season begins as early as 1 February and continues through 31 August (Thomsen 1971, Zarn 1974). The timing of breeding activities may vary with latitude and climatic conditions. The breeding season includes pairing, egg-laying and incubation, and nestling and fledging stages.

Burrow exclusion is a technique of installing one-way doors in burrow openings during the non-breeding season to temporarily exclude burrowing owls or permanently exclude burrowing owls and excavate and close burrows after confirming burrows are empty.

Burrowing owl habitat generally includes, but is not limited to, short or sparse vegetation (at least at some time of year), presence of burrows, burrow surrogates or presence of fossorial mammal dens, well-drained soils, and abundant and available prey.

Burrow surrogates include culverts, piles of concrete rubble, piles of soil, burrows created along soft banks of ditches and canals, pipes, and similar structures.

Civil twilight - Morning civil twilight begins when the geometric center of the sun is 6 degrees below the horizon (civil dawn) and ends at sunrise. Evening civil twilight begins at sunset and ends when the geometric center of the sun reaches 6 degrees below the horizon (civil dusk). During this period there is enough light from the sun that artificial sources of light may not be needed to carry on outdoor activities. This concept is sometimes enshrined in laws, for example, when drivers of automobiles must turn on their headlights (called lighting-up time in the UK); when pilots may exercise the rights to fly aircraft. Civil twilight can also be described as the limit at which twilight illumination is sufficient, under clear weather conditions, for terrestrial objects to be clearly distinguished; at the beginning of morning civil twilight, or end of evening civil twilight, the horizon is clearly defined and the brightest stars are visible under clear atmospheric conditions.

Conservation for burrowing owls may include but may not be limited to protecting remaining breeding pairs or providing for population expansion, protecting and enhancing breeding and essential habitat, and amending or augmenting land use plans to stabilize populations and other specific actions to avoid the need to list the species pursuant to California or federal Endangered Species Acts.

Contiguous means connected together so as to form an uninterrupted expanse in space.

Essential habitat includes nesting, foraging, wintering, and dispersal habitat.

Foraging habitat is habitat within the estimated home range of an occupied burrow, supports suitable prey base, and allows for effective hunting.

Host burrowers include ground squirrels, badgers, foxes, coyotes, gophers etc.

Locally significant species is a species that is not rare from a statewide perspective but is rare or uncommon in a local context such as within a county or region (CEQA §15125 (c)) or is so designated in local or regional plans, policies, or ordinances (CEQA Guidelines, Appendix G). Examples include a species at the outer limits of its known range or occurring in a unique habitat type.

Non-breeding season is the period of time when nesting activity is not occurring, generally September 1 through January 31, but may vary with latitude and climatic conditions.

Occupied site or occupancy means a site that is assumed occupied if at least one burrowing owl has been observed occupying a burrow within the last three years (Rich 1984). Occupancy of suitable burrowing owl habitat may also be indicated by owl sign including its molted feathers, cast pellets, prey remains, eggshell fragments, or excrement at or near a burrow entrance or perch site.

Other impacting activities may include but may not be limited to agricultural practices, vegetation management and fire control, pest management, conversion of habitat from rangeland or natural lands to more intensive agricultural uses that could result in “take”. These impacting activities may not meet the definition of a project under CEQA.

Passive relocation is a technique of installing one-way doors in burrow openings to temporarily or permanently evict burrowing owls and prevent burrow re-occupation.

Peak of the breeding season is between 15 April and 15 July.

Sign includes its tracks, molted feathers, cast pellets (defined as 1-2” long brown to black regurgitated pellets consisting of non-digestible portions of the owls’ diet, such as fur, bones, claws, beetle elytra, or feathers), prey remains, egg shell fragments, owl white wash, nest burrow decoration materials (e.g., paper, foil, plastic items, livestock or other animal manure, etc.), possible owl perches, or other items.

Appendix C. Habitat Assessment and Reporting Details

Habitat Assessment Data Collection and Reporting

Current scientific literature indicates that it would be most effective to gather the data in the manner described below when conducting project scoping, conducting a habitat assessment site visit and preparing a habitat assessment report:

1. Conduct at least one visit covering the entire potential project/activity area including areas that will be directly or indirectly impacted by the project. Survey adjoining areas within 150 m (Thomsen 1971, Martin 1973), or more where direct or indirect effects could potentially extend offsite. If lawful access cannot be achieved to adjacent areas, surveys can be performed with a spotting scope or other methods.
2. Prior to the site visit, compile relevant biological information for the site and surrounding area to provide a local and regional context.
3. Check all available sources for burrowing owl occurrence information regionally prior to a field inspection. The CNDDB and BIOS (see References cited) may be consulted for known occurrences of burrowing owls. Other sources of information include, but are not limited to, the Proceedings of the California Burrowing Owl Symposium (Barclay et al. 2007), county bird atlas projects, Breeding Bird Survey records, eBIRD (http://ebird.org), Gervais et al. (2008), local reports or experts, museum records, and other site-specific relevant information.
4. Identify vegetation and habitat types potentially supporting burrowing owls in the project area and vicinity.
5. Record and report on the following information:
   a. A full description of the proposed project, including but not limited to, expected work periods, daily work schedules, equipment used, activities performed (such as drilling, construction, excavation, etc.) and whether the expected activities will vary in location or intensity over the project's timeline;
   b. A regional setting map, showing the general project location relative to major roads and other recognizable features;
   c. A detailed map (preferably a USGS topo 7.5' quad base map) of the site and proposed project, including the footprint of proposed land and/or vegetation-altering activities, base map source, identifying topography, landscape features, a north arrow, bar scale, and legend;
   d. A written description of the biological setting, including location (Section, Township, Range, baseline and meridian), acreage, topography, soils, geographic and hydrologic characteristics, land use and management history on and adjoining the site (i.e., whether it is urban, semi-urban or rural; whether there is any evidence of past or current livestock grazing, mowing, disking, or other vegetation management activities);
   e. An analysis of any relevant, historical information concerning burrowing owl use or occupancy (breeding, foraging, over-wintering) on site or in the assessment area;
   f. Vegetation type and structure (using Sawyer et al. 2009), vegetation height, habitat types and features in the surrounding area plus a reasonably sized (as supported with logical justification) assessment area; (Note: use caution in discounting habitat based on grass height as it can be a temporary condition variable by season and conditions (such as current grazing regime) or may be distributed as a mosaic).

g. The presence of burrowing owl individuals or pairs or sign (see Appendix B);
h. The presence of suitable burrows and/or burrow surrogates (>11 cm in diameter (height and width) and >150 cm in depth) (Johnson et al. 2010), regardless of a lack of any burrowing owl sign and/or burrow surrogates; and burrowing owls and/or their sign that have recently or historically (within the last 3 years) been identified on or adjacent to the site.

Appendix D. Breeding and Non-breeding Season Surveys and Reports

Current scientific literature indicates that it is most effective to conduct breeding and non-breeding season surveys and report in the manner that follows:

Breeding Season Surveys

Number of visits and timing. Conduct 4 survey visits: 1) at least one site visit between 15 February and 15 April, and 2) a minimum of three survey visits, at least three weeks apart, between 15 April and 15 July, with at least one visit after 15 June. Note: many burrowing owl migrants are still present in southwestern California during mid-March, therefore, exercise caution in assuming breeding occupancy early in the breeding season.

Survey method. Rosenberg et al. (2007) confirmed walking line transects were most effective in smaller habitat patches. Conduct surveys in all portions of the project site that were identified in the Habitat Assessment and fit the description of habitat in Appendix A. Conduct surveys by walking straight-line transects spaced 7 m to 20 m apart, adjusting for vegetation height and density (Rosenberg et al. 2007). At the start of each transect and, at least, every 100 m, scan the entire visible project area for burrowing owls using binoculars. During walking surveys, record all potential burrows used by burrowing owls as determined by the presence of one or more burrowing owls, pellets, prey remains, whitewash, or decoration. Some burrowing owls may be detected by their calls, so observers should also listen for burrowing owls while conducting the survey.

Care should be taken to minimize disturbance near occupied burrows during all seasons and not to “flush” burrowing owls especially if predators are present to reduce any potential for needless energy expenditure or burrowing owl mortality. Burrowing owls may flush if approached by pedestrians within 50 m (Conway et al. 2003). If raptors or other predators are present that may suppress burrowing owl activity, return at another time or later date for a follow-up survey.

Check all burrowing owls detected for bands and/or color bands and report band combinations to the Bird Banding Laboratory (BBL). Some site-specific variations to survey methods discussed below may be developed in coordination with species experts and Department staff.

Weather conditions. Poor weather may affect the surveyor’s ability to detect burrowing owls, therefore, avoid conducting surveys when wind speed is >20 km/hr, and there is precipitation or dense fog. Surveys have greater detection probability if conducted when ambient temperatures are >20º C, <12 km/hr winds, and cloud cover is <75% (Conway et al. 2008).

Time of day. Daily timing of surveys varies according to the literature, latitude, and survey method. However, surveys between morning civil twilight and 10:00 AM and two hours before sunset until evening civil twilight provide the highest detection probabilities (Barclay pers. comm. 2012, Conway et al. 2008).

Alternate methods. If the project site is large enough to warrant an alternate method, consult current literature for generally accepted survey methods and consult with the Department on the proposed survey approach.

Additional breeding season site visits. Additional breeding season site visits may be necessary, especially if non-breeding season exclusion methods are contemplated. Detailed information, such as approximate home ranges of each individual or of family units, as well as foraging areas as related to the proposed project, will be important to document for evaluating impacts, planning avoidance measure implementation and for mitigation measure performance monitoring.

Adverse conditions may prevent investigators from determining presence or occupancy. Disease, predation, drought, high rainfall or site disturbance may preclude presence of burrowing owls in any given year. Any such conditions should be identified and discussed in the survey report. Visits to the site in more than one year may increase the likelihood of detection. Also, visits to adjacent known occupied habitat may help determine appropriate survey timing.

Given the high site fidelity shown by burrowing owls (see Appendix A, Importance of burrows), conducting surveys over several years may be necessary when project activities are ongoing, occur annually, or start and stop seasonally. (See Negative surveys).

Non-breeding Season Surveys

If conducting non-breeding season surveys, follow the methods described above for breeding season surveys, but conduct at least four (4) visits, spread evenly, throughout the non-breeding season. Burrowing owl experts and local Department staff are available to assist with interpreting results.

Negative Surveys

Adverse conditions may prevent investigators from documenting presence or occupancy. Disease, predation, drought, high rainfall or site disturbance may preclude presence of burrowing owl in any given year. Discuss such conditions in the Survey Report. Visits to the site in more than one year increase the likelihood of detection and failure to locate burrowing owls during one field season does not constitute evidence that the site is no longer occupied, particularly if adverse conditions influenced the survey results. Visits to other nearby known occupied sites can affirm whether the survey timing is appropriate.

Take Avoidance Surveys

Field experience from 1995 to present supports the conclusion that it would be effective to complete an initial take avoidance survey no less than 14 days prior to initiating ground disturbance activities using the recommended methods described in the Detection Surveys section above. Implementation of avoidance and minimization measures would be triggered by positive owl presence on the site where project activities will occur. The development of avoidance and minimization approaches would be informed by monitoring the burrowing owls.

Burrowing owls may re-colonize a site after only a few days. Time lapses between project activities trigger subsequent take avoidance surveys including but not limited to a final survey conducted within 24 hours prior to ground disturbance.

Survey Reports

Report on the survey methods used and results including the information described in the Summary Report and include the reports within the CEQA documentation:

1. Date, start and end time of surveys including weather conditions (ambient temperature, wind speed, percent cloud cover, precipitation and visibility);
2. Name(s) of surveyor(s) and qualifications;
3. A discussion of how the timing of the survey affected the comprehensiveness and detection probability;
4. A description of survey methods used including transect spacing, point count dispersal and duration, and any calls used;
5. A description and justification of the area surveyed relative to the project area;
6. A description that includes: number of owls or nesting pairs at each location (by nestlings, juveniles, adults, and those of an unknown age), number of burrows being used by owls, and burrowing owl sign at burrows. Include a description of individual markers, such as bands (numbers and colors), transmitters, or unique natural identifying features. If any owls are banded, request documentation from the BBL and bander to report on the details regarding the known history of the banded burrowing owl(s) (age, sex, origins, whether it was previously relocated) and provide with the report if available;
7. A description of the behavior of burrowing owls during the surveys, including feeding, resting, courtship, alarm, territorial defense, and those indicative of parents or juveniles;
8. A list of possible burrowing owl predators present and documentation of any evidence of predation of owls;
9. A detailed map (1:24,000 or closer to show details) showing locations of all burrowing owls, potential burrows, occupied burrows, areas of concentrated burrows, and burrowing owl sign. Locations documented by use of global positioning system (GPS) coordinates must include the datum in which they were collected. The map should include a title, north arrow, bar scale and legend;
10. Signed field forms, photos, etc., as appendices to the field survey report;
11. Recent color photographs of the proposed project or activity site; and
12. Original CNDDB Field Survey Forms should be sent directly to the Department's CNDDB office, and copies should be included in the environmental document as an appendix. (http://www.dfg.ca.gov/bdb/html/cnddb.html).

Appendix E. Example Components for Burrowing Owl Artificial Burrow and Exclusion Plans

Whereas the Department does not recommend exclusion and burrow closure, current scientific literature and experience from 1995 to present, indicate that the following example components for burrowing owl artificial burrow and exclusion plans, combined with consultation with the Department to further develop these plans, would be effective.

Artificial Burrow Location

If a burrow is confirmed occupied on-site, artificial burrow locations should be appropriately located and their use should be documented taking into consideration:

1. A brief description of the project and project site pre-construction;
2. The mitigation measures that will be implemented;
3. Potential conflicting site uses or encumbrances;
4. A comparison of the occupied burrow site(s) and the artificial burrow site(s) (e.g., vegetation, habitat types, fossorial species use in the area, and other features);
5. Artificial burrow(s) proximity to the project activities, roads and drainages;
6. Artificial burrow(s) proximity to other burrows and entrance exposure;
7. Photographs of the site of the occupied burrow(s) and the artificial burrows;
8. Map of the project area that identifies the burrow(s) to be excluded as well as the proposed sites for the artificial burrows;
9. A brief description of the artificial burrow design;
10. Description of the monitoring that will take place during and after project implementation including information that will be provided in a monitoring report.
11. A description of the frequency and type of burrow maintenance.

Exclusion Plan

An Exclusion Plan addresses the following including but not limited to:

1. Confirm by site surveillance that the burrow(s) is empty of burrowing owls and other species preceding burrow scoping;
2. Type of scope and appropriate timing of scoping to avoid impacts;
3. Occupancy factors to look for and what will guide determination of vacancy and excavation timing (one-way doors should be left in place 48 hours to ensure burrowing owls have left the burrow before excavation, visited twice daily and monitored for evidence that owls are inside and can't escape i.e., look for sign immediately inside the door).
4. How the burrow(s) will be excavated. Excavation using hand tools with refilling to prevent reoccupation is preferable whenever possible (may include using piping to stabilize the burrow to prevent collapsing until the entire burrow has been excavated and it can be determined that no owls reside inside the burrow);
5. Removal of other potential owl burrow surrogates or refugia on site;
6. Photographing the excavation and closure of the burrow to demonstrate success and sufficiency;

7. Monitoring of the site to evaluate success and, if needed, to implement remedial measures to prevent subsequent owl use to avoid take;
8. How the impacted site will continually be made inhospitable to burrowing owls and fossorial mammals (e.g., by allowing vegetation to grow tall, heavy disking, or immediate and continuous grading) until development is complete.

Appendix F. Mitigation Management Plan and Vegetation Management Goals

Mitigation Management Plan

A mitigation site management plan will help ensure the appropriate implementation and maintenance for the mitigation site and persistence of the burrowing owls on the site. For an example to review, refer to Rosenberg et al. (2009). The current scientific literature and field experience from 1995 to present indicate that an effective management plan includes the following:

1. Mitigation objectives;
2. Site selection factors (including a comparison of the attributes of the impacted and conserved lands) and baseline assessment;
3. Enhancement of the conserved lands (enhancement of reproductive capacity, enhancement of breeding areas and dispersal opportunities, and removal or control of population stressors);
4. Site protection method and prohibited uses;
5. Site manager roles and responsibilities;
6. Habitat management goals and objectives:
    a. Vegetation management goals,
        i. Vegetation management tools:
            1. Grazing
            2. Mowing
            3. Burning
            4. Other
    b. Management of ground squirrels and other fossorial mammals,
    c. Semi-annual and annual artificial burrow cleaning and maintenance,
    d. Non-natives control – weeds and wildlife,
    e. Trash removal;
7. Financial assurances:
    a. Property analysis record or other financial analysis to determine long-term management funding,
    b. Funding schedule;
8. Performance standards and success criteria;
9. Monitoring, surveys and adaptive management;
10. Maps;
11. Annual reports.

Vegetation Management Goals

- Manage vegetation height and density (especially in immediate proximity to burrows). Suitable vegetation structure varies across sites and vegetation types, but should generally be at the average effective vegetation height of 4.7 cm (Green and Anthony 1989) and <13 cm average effective vegetation height (MacCracken et al. 1985*a)*.
- Employ experimental prescribed fires (controlled, at a small scale) to manage vegetation structure;

- Vegetation reduction or ground disturbance timing, extent, and configuration should avoid take. While local ordinances may require fire prevention through vegetation management, activities like disking, mowing, and grading during the breeding season can result in take of burrowing owls and collapse of burrows, causing nest destruction. Consult the take avoidance surveys section above for pre-management avoidance survey recommendations;
- Promote natural prey distribution and abundance, especially in proximity to occupied burrows; and
- Promote self-sustaining populations of host burrowers by limiting or prohibiting lethal rodent control measures and by ensuring food availability for host burrowers through vegetation management.

Refer to Rosenberg et al. (2009) for a good discussion of managing grasslands for burrowing owls.

Mitigation Site Success Criteria

In order to evaluate the success of mitigation and management strategies for burrowing owls, monitoring is required that is specific to the burrowing owl management plan. Given limited resources, Barclay et al. (2011) suggests managers focus on accurately estimating annual adult owl populations rather than devoting time to estimating reproduction, which shows high annual variation and is difficult to accurately estimate. Therefore, the key objective will be to determine accurately the number of adult burrowing owls and pairs, and if the numbers are maintained. A frequency of 5-10 years for surveys to estimate population size may suffice if there are no changes in the management of the nesting and foraging habitat of the owls.

Effective monitoring and evaluation of off-site and on-site mitigation management success for burrowing owls includes (Barclay, pers. comm.):

- Site tenacity;
- Number of adult owls present and reproducing;
- Colonization by burrowing owls from elsewhere (by band re-sight);
- Evidence and causes of mortality;
- Changes in distribution; and
- Trends in stressors.

APPENDIX B

USERS GUIDE TO INSTALLATION OF ARTIFICIAL BURROWS FOR BURROWING OWLS

USERS GUIDE TO INSTALLATION OF ARTIFICIAL BURROWS FOR BURROWING OWLS

David H. Johnson, Donald C. Gillis, Michael A. Gregg, James L. Rebholz, Jeffrey L. Lincer, and James R. Belthoff

19 August 2010

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Burrowing Owl Conservation Society of British Columbia

EXECUTIVE SUMMARY

Western Burrowing Owl (*Athene cunicularia hypugea*) populations have been declining across nearly all portions of their North American range (Klute *et al.* 2003). Range contraction and fragmentation is a significant concern for this owl. Artificial Burrow Systems (ABS) have been in use since the 1970's, and this management tool has been thoughtfully studied and refined since its inception. In this Users Guide, we provide a synthesis of material relevant to the use of ABS for Burrowing Owls, insights into the placement of ABS, design specifications and installation techniques, and fundamental anti-predator strategies.

ABS should not be designed to simply maintain the species (with the exception of the Imperial Valley of California, the species is not maintaining itself now over most of its range), but rather should meaningfully contribute to slowing the rate of population decline, and directly help in the recovery and conservation of the species. Additionally, burrow systems need to be simple in design, very low-cost, easy to install and maintain, durable, and very efficient. We recognize that this is a lot to ask of artificial burrows. Further, the fundamental underlying issue here is the loss of habitat as well as the persecution and loss of the mammal species (e.g., badger, prairie dog, ground squirrels) which have historically provided the burrows that the owls use. Thus, while ABS are genuinely helpful, they address only part of the real conservation issue occurring in our open grassland, sagebrush and arid-land communities. The use of artificial nest structures is not new to wildlife conservation nor to owls, specifically, as a number of cavity-nesting forest owl species are supported largely by wooden nest boxes in Finland (Saurola 2009). This does not mean that boxes are preferred as a management method over natural sites (they are not), but given other ecosystem management systems, the only operational choice is the use of nest boxes as a conservation safety net for the owls.

In this document we first examine the dimensions of burrows made by the main fossorial mammal species, i.e., American Badger (*Taxidea taxus*), Black-tailed Prairie Dog (*Cynomys ludovicianus*), and various species of large ground squirrels (*Spermophilus* spp.), that provide the burrows used by burrowing owls. We then offer a review of other ABS designs, and follow that with details on an ABS design that reflects the combination of features from other ABS systems, and integrate elements that we have found successful in our work.

We suggest two artificial burrow system (ABS designs): one design employs the use of half of a 208 l (55-gallon) barrel for the nest chamber (i.e., 50 cm, 20 in., in diameter, 1960 cm^2 interior floor space) and two stacked 9.5 l (2.5 gal.) buckets on top for access. The main tunnel is a 2.4 m (10-ft) section of 15 cm (6 in.) diameter corrugated flex drain pipe with a 7.5 cm (3 in.) slot cut out of the bottom to provide a dirt walkway for the owls), and an anti-predator patio. The occupancy rate of this design through the 2010 nesting season (with 59 units in place) on a northeastern Oregon study site has been 86%. Our second design is this same basic concept, except that we use a 10 cm (4-in.) diameter flex pipe main tunnel without a walkway slot, rather than the 15 cm diameter version. As owls have shown a clear preference with sites that have many burrows, a minimum of two (or three) burrow units should be placed at a given site (about 5-10 m apart). We also make recommendations as to selection criteria for placement of the ABS system, and specifics on short perches (i.e., $\leq$60 cm, 24 in.) and related anti-predator aspects.

INTRODUCTION

In general, western burrowing owls (*Athene cunicularia hypugea*) nest in areas of short grasses or other sparse vegetation, but their most basic habitat requirement is a burrow. In an environment with few refuges, nesting in a burrow provides owls protection from many grassland predators, a relatively constant microclimate for nesting and thermoregulation, protection from hazardous or inclement weather such as heavy rain, extreme heat, snow, hail or strong winds, and an area in which to cache prey items. Juvenile burrowing owls depend on burrows during the post-fledging, pre-migratory period, roosting almost exclusively in association with burrows. Even during migration and on the wintering grounds, burrowing owls are found roosting in association with burrows. Any understanding of habitat associations or actions to manage habitat for the benefit of this species must include burrows as a key component (Poulin *et al.* 2005).

The main species that make the burrows for burrowing owls are the badger, prairie dog, and large ground squirrels. The California ground squirrel (*Otospermophilus beecheyi*), is the most common (widespread) burrow provider in California and the round-tailed ground squirrel (*Xerospermophilus tereticaudus*), supplemented by Botta's pocket gopher (*Thomomys bottae*) is the one that provides almost all the burrows for owls in the Imperial Valley, which houses over 70% of California's burrowing owls. The obligate association of burrowing owls with the fossorial (i.e., digging) animals who make the burrows they use, leaves them susceptible to changes in the populations of distributions of these animals. Prairie Dogs have been extirpated from 90% of their former range. Badgers have been persecuted in farmland sites, and their numbers have dropped substantially. Also, in areas where coyote-control programs were instituted, badgers became "by-catch" and the inadvertent impact nearly always resulted in the death of the badgers. Construction in large open areas, has eliminated substantial areas of ground squirrel habitat. The widespread practice of poisoning "vermin" has substantially impacted

ground squirrel populations throughout their range. As a consequence of the loss of habitat and burrow-making mammals, the range of the owl is subsequently declining (Fig. 1).

Artificial burrow systems (ABS) for Burrowing Owls have been used since the 1970s (Collins & Landry 1977) to help provide nesting and over-wintering sites, mitigate construction impacts or habitat loss, help to support reintroduction and relocation programs, and as a key research tool to more efficiently monitor population trends and demography. Artificial burrows for burrowing owls are often used as a stop-gap measure, to either provide nest burrows in areas without them, or strategically augment some landscape areas to stabilize and increase the numbers of owl pairs.

For this Users Guide, we examined studies from British Columbia, Alberta, Saskatchewan, Idaho, Oregon, Arizona, California, Oklahoma and Texas involving specific design and placement aspects of artificial burrow systems (ABS) for burrowing owls. The framework for our work was driven by: 1) our desire to highlight the most successful features from existing ABS designs, 2) incorporate a synthesis of results from studies that have tested design aspects of ABS, 3) incorporate the most successful aspects of our own ABS work, 4) compare these design elements against features within natural burrows, and 5) offer a burrow design that builds on all of these components.

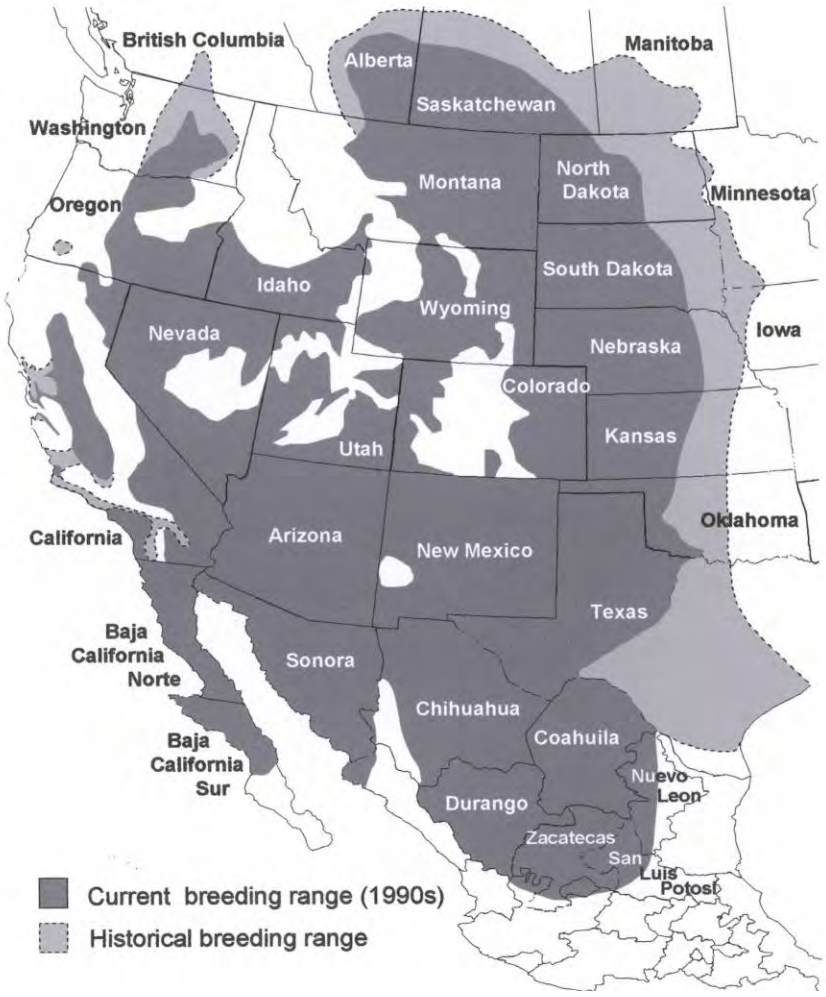


Figure 1. Map of burrowing owl range, and range contraction (after Klute *et al.* 2003).

GOALS FOR THE USE OF ARTIFICIAL BURROW SYSTEMS

The use of ABS is growing, and significant effort will be invested in installing and maintaining them. From a management perspective, it is relevant to have objective and measureable goals against which we can measure/track our ABS investments and successes. ABSs have been used since the 1970's to manage populations of the Western Burrowing Owl (*A.c. hypugaea*), study their breeding biology, and prevent construction impacts or mitigate habitat loss. While the initial goal of ABS for burrowing owls was to minimize construction impacts, we recognize that the goals have broadened given the shift to a more multi-national conservation- and recovery-minded perspective. We offer the following revised ABS goals:

1) as a strategic, broad-scale, conservation tool to slow the rate of population decline,
2) support local and regional reintroduction and augmentation efforts,
3) provide a basis for scientific studies and the efficient monitoring of population trends and demography,
4) use in specific relocation efforts related to construction activities, and
5) use as a practical educational and engagement tool.

BURROW DIMENSIONS FROM THE NATURAL BURROW MAKERS

Figure 2. The main mammal species that create the burrows used by Burrowing Owls. Clockwise from upper left: Black-tailed Prairie Dog (*Cynomys ludovicianus*), a number of ground squirrel species (Richardson's Ground Squirrel *Spermophilus richardsonii* shown here), and American Badger).

Burrowing owls typically live in loose colonies, using burrows excavated by other animal species for cover. When selecting a burrow, the owls prefer burrows with low, open cover that

provide good horizontal visibility. Burrowing owls are commonly found in plant communities in early stages of succession because cover is low. Long-abandoned burrows are usually not used because the burrow entrance has become overgrown. Burrows adjacent to burrows occupied by other burrowing owls are preferred, although burrowing owl pairs have nested alone if other burrowing owls were not in the area.

We have examined seven papers that offer specific dimensions on the height, width, and/or length of burrow tunnels used by burrowing owls (Table 1). The seven natural burrows (apparently old badger burrows) used by nesting owls we have examined in northeastern Oregon were from 2.4-5.0 m in length (D.H. Johnson unpubl. data). A good summary statement about the size of burrow tunnels used for nesting by the owls in Saskatchewan was found in Poulin *et al.* (2005): *Burrowing owls preferentially select nest sites in grassland pastures and avoid nesting in crop fields. They choose to nest in burrows surrounded by a high density of other burrows and that tend to resemble badger burrows, having larger soil mounds and taller entrances than random or Richardson's Ground Squirrel (*Spermophilus richardsonii*) burrows. Owls chose nest burrows with an entrance height of 15-16 cm, an entrance smaller than the average badger burrow (18-19 cm) but larger than the average ground squirrel burrow (9-10 cm).* Similar results have been found in other parts of the U.S (Table 1).

Table 1. Dimensions of natural burrows used by burrowing owls for nesting. Except for the Butts & Lewis (1982) reference, all dimensions are the averages stated in the papers and are given in cm.

Study location	**species**	**n**	**dia.**	**ht**	**width**	**length**	**source**
New Mexico	Rock Squirrel (*Spermophilus variegates*)	15 owl nests		11 cm	20 cm		Martin 1973
Imperial Valley, CA		104 owl nests	20 cm				Coulombe 1971
South Dakota	Prairie Dog	180 owl nests	13 cm				MacCracken *et al.* 1985
Idaho		32 owl nests		14.8 cm	20.2 cm		Belthoff & King 2002
Saskatchewan		22 owl nests		15.4 cm			Poulin *et al.* 2005
Oklahoma	Prairie Dog	11 owl nests		11-13 cm	14-15 cm	150 cm	Butts & Lewis 1982
Oklahoma	Badger	2 owl nests		15cm & 19 cm	18 cm & 22 cm	165 cm & 216 cm	Butts & Lewis 1982
Saskatchewan	Badger			13 cm			Haug 1985

Jenny Barnett

Figure 3. A former badger burrow, now occupied by burrowing owls (note the many tracks).

REVIEW OF ARTIFICIAL BURROW DESIGNS

In this section, we highlight examples of artificial burrow designs, with the intent of showing the various combinations of components. While all of these designs work, we recognize that the owls may use some designs more than others. All designs and field testing efforts have helped to advance the primary aspects of artificial burrow systems. The differences in specific components have implications for durability and longevity, tunnel slope, issues of access and maintenance, internal space, and potential flooding. In turn, these burrow features have implications for owl use and productivity. A commonality shared by burrow designs is that there is a bend in the tunnel proper; the main intent here is to not allow sunlight to shine, or a predator to look, directly into the nest chamber. In an important comparison study using three chamber sizes and two tunnel sizes, Smith and Belthoff (2001) found that chamber size and tunnel dimensions strongly influenced nest-site use, with owls using the largest nest chambers (plastic tubs of 50 x 35 x 40 cm, 1,750 cm^2) and the smallest (10 cm. diameter) tunnels. They stated that this combination reduced the negative effects of overcrowding, gained the most favorable microclimate for developing juveniles, and helped to deter larger ground-dwelling predators.

1) *First design by Collins and Landry (1977), California.* The nest chamber was made of warp-resistant plywood and measured 30 x 30 x 20 cm (12" x 12" x 8") deep (Fig 4). The tunnel connecting the chamber to the burrow entrance was 10 x 10 cm (4" x 4") and approximately 1.8 m (6') long with one right-angle turn about 10 cm from the entrance. The sides and top of the nest chamber and tunnel were of wood with a natural dirt floor. The actual dimensions were not felt to be critical, but at least one turn in the tunnel seemed necessary to maintain the nest

chamber in darkness. The whole artificial burrow was buried to a depth of 15 cm to provide thermal stability in the nest chamber. Some flooding and silting in of unoccupied burrows was caused by winter rains; thus most burrows had to be renovated prior to each breeding season. Subsequent to this paper, field test have found that burrow/chamber dimensions are indeed critical, and that the generally poor durability of a wooden structure is also a consideration.

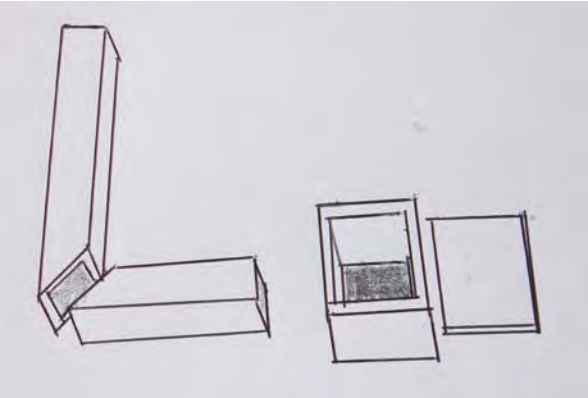


Figure 4. Nest burrow design of Collins and Landry (1977).

2) *Design by Poulin et al. (2001), as used in Canada.* The design by Poulin *et al.* (2001) (Fig. 5) follows the aspects of natural burrows used by owls in Canada: Natural nest burrows have an elevated soil mound at the entrance, and have about a 15-cm diameter tunnel entrance. The tunnel normally extends between 2-3 m and descends to about 1.0 to 1.5 m depth before meeting with a larger 'domed' chamber. The tunnel usually takes at least one sharp turn and often has one rise in elevation before meeting the nesting chamber (this likely prevents flooding). The nesting chamber is 25 to 30 cm tall and at least as wide on all sides.

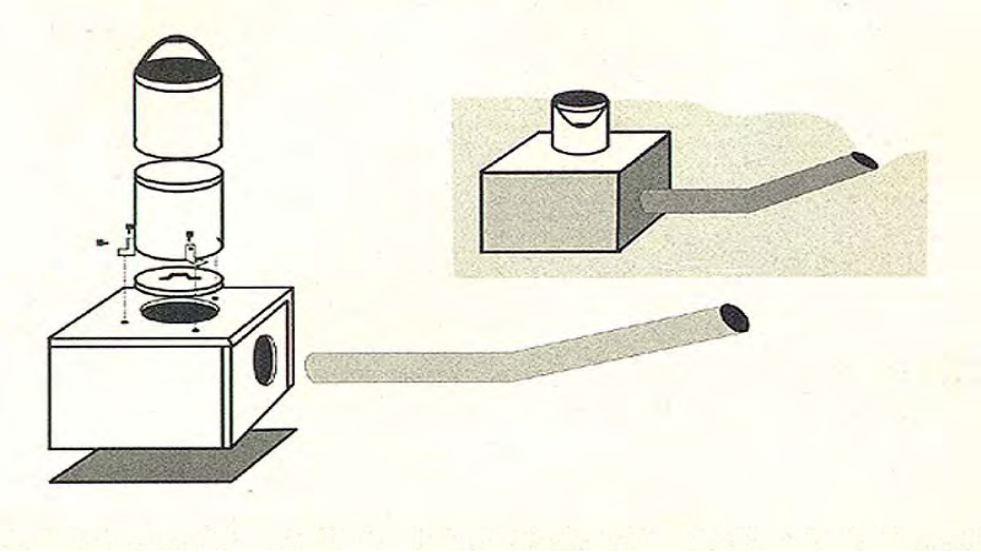


Figure 5. ABS design by Poulin *et al.* (2001) as used in Canada.

3) *Design by Barclay (2008) in California.* The design by Jack H. Barclay (2008) (Fig. 6) conforms to Smith and Belthoff's (2001) findings, using inexpensive, commercially available materials that require minimum modification to assemble into a functional AB. This design also

includes a provision to protect the AB entrance so that when properly installed, the entrance (a hollow concrete end block) is resistant to damage from agricultural machinery and livestock (Smith and Belthoff 2001). Previous AB designs using wooden nest boxes are subject to rotting and collapse and can be time-consuming to construct. Plastic buckets or pails installed as nest boxes are subject to collapse from settling and shifting soil and do not provide the larger nest chamber that Burrowing Owls in Idaho selected (Smith and Belthoff 2001). The plastic irrigation valve box used for the nest chamber in this design provides 1,680 cm^2 of floor space. Bucket collapse can be mitigated, somewhat, by carefully-supervised installation (J. Lincer, pers. comm.).

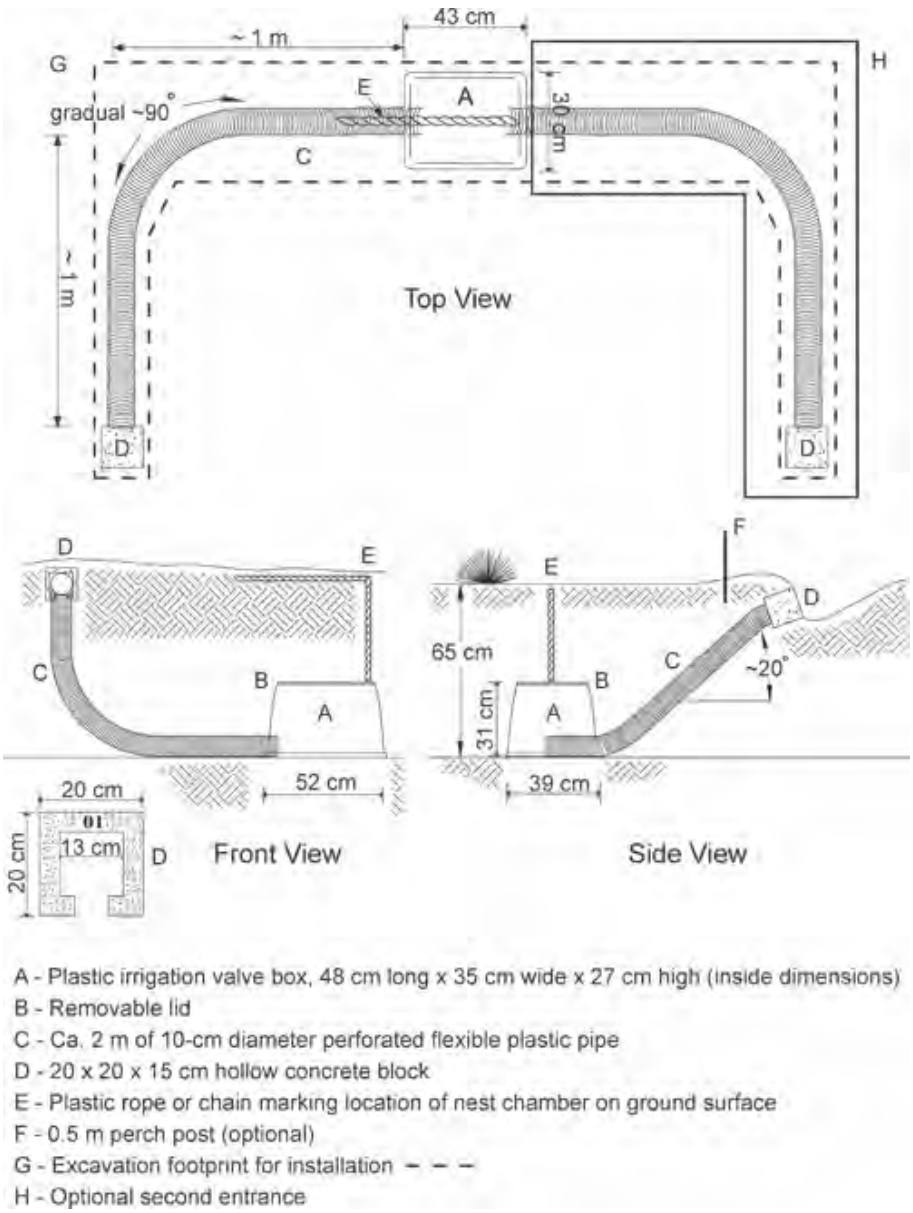


Figure 6. Artificial burrow system design by Barclay (2008).

4) *Design used and updated by Wildlife Resources Institute (California).* Below are design drawings for the burrow system being used by the Wildlife Resources Institute (California) (Fig. 7). Materials: for each burrow, two five-gallon heavy duty plastic buckets with lids (Home Depot), two 8 ft foot lengths of 4" slotted plastic drainage pipe, two 6" to 4" reducers, two one foot lengths of 6" slotted plastic drainage pipe, two hexagonal concrete surround pieces, duct tape, 60 in. wooden post (2" in diameter), and one cement stepping stone at least 1' square.

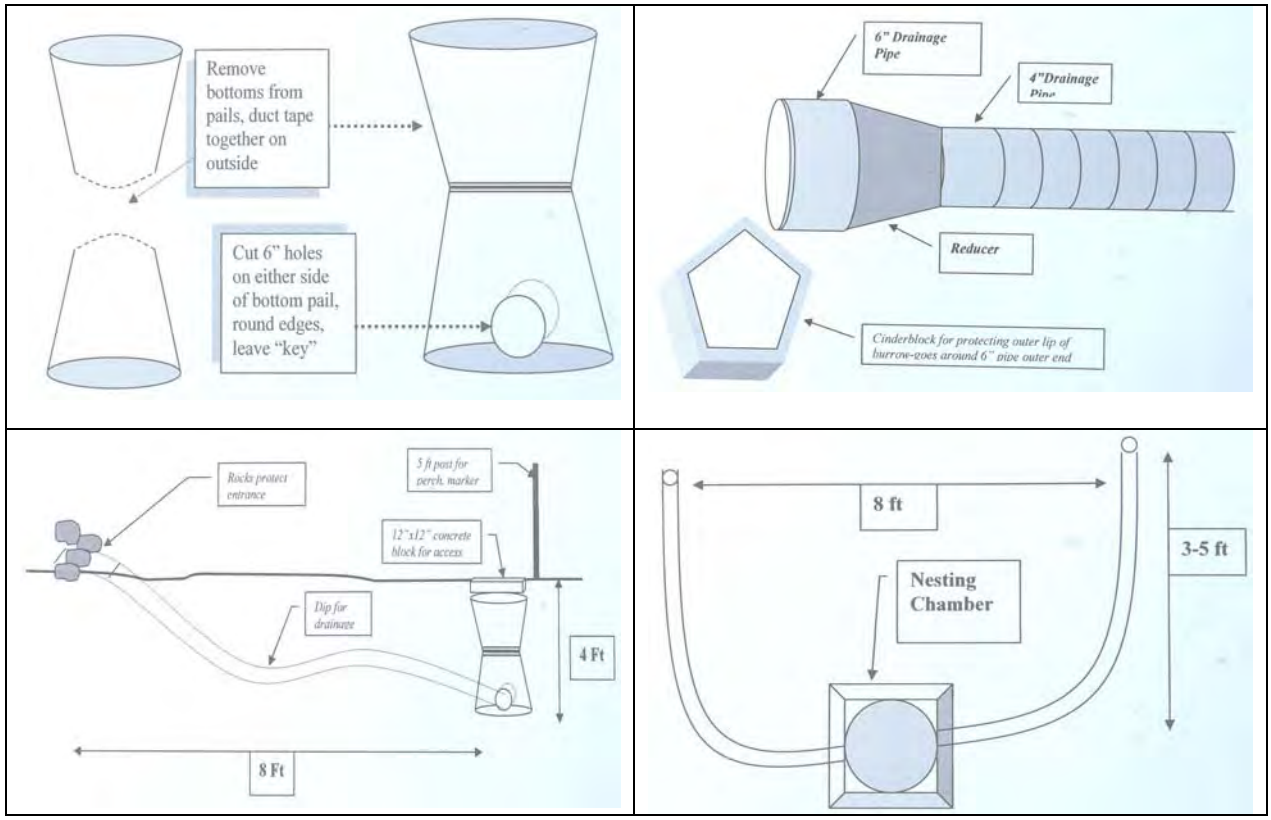


Figure 7. Design drawings for the burrow system being used by the Wildlife Resources Institute (California).

5) *Design from Arizona Partners in Flight Habitat Substitution Project* (Greg Clark 2001, http://www.mirror-pole.com/burr_owl/bur_owl1.htm) (Fig. 8). An underground burrow is built using a 5-gallon plastic bucket for the burrow chamber and 12'of 4" flexible irrigation hose for the tunnel. For protection from dogs, a rigid PVC pipe must be used to protect the burrow entrance (slipped over the 4 in. line). Holes must be provided in the bucket and hose to allow water to escape into the ground, the flexible hose can be purchased with perforations. In addition, the hose must make a double turn between the burrow and the surface to simulate natural burrows. The diagram only shows the tube bending toward the surface, but it also needs to bend horizontally 90 degrees. The section from the burrow chamber to the bend should be at a 4-foot depth. There must be at least two feet of dirt on top of the over-turned bucket. The photo shows the bucket and hose before being buried. Four of these burrow units are installed at a given site (within 5-10 m of each other). Concerns of this design are that the nest chamber is small, and it does not allow for easy inspection or maintenance.

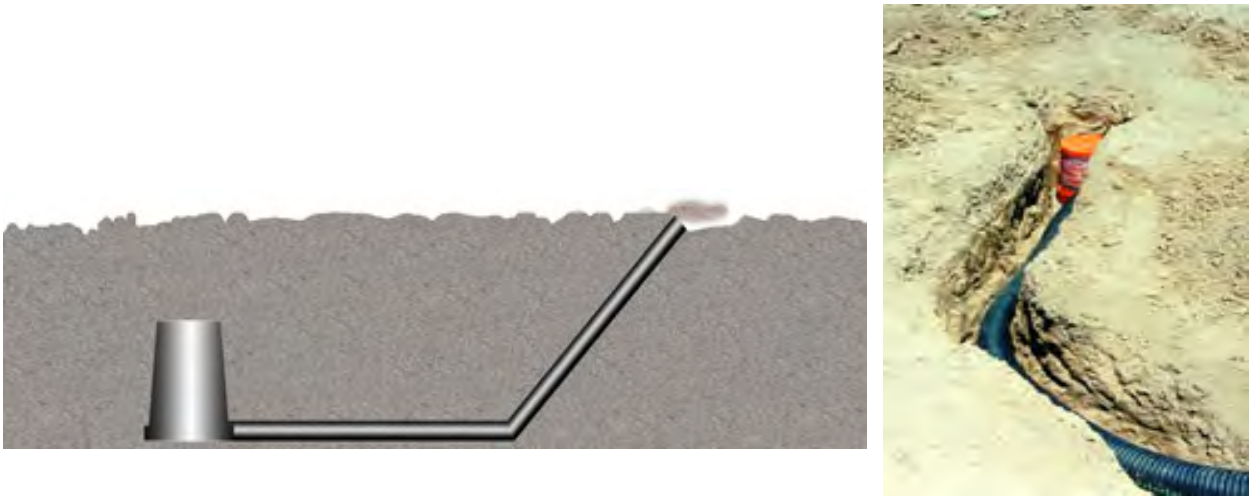


Figure 8. Artificial burrow design from Arizona Partners in Flight Habitat Substitution Project (Greg Clark 2001, http://www.mirror-pole.com/burr_owl/bur_owl1.htm).

6) *Design description as per Belthoff and Smith (2001).* Studies using artificial burrows (Smith and Belthoff 2001, Belthoff and Smith 2003) have documented that burrowing owls prefer artificial burrows with large (68-Liter) chambers and small-diameter (10 cm, 4") tunnels. They placed three artificial burrows in a cluster at previously used natural burrows, and tested for chamber size preferences (Fig. 9). Within the clusters of three, each artificial burrow consisted of a 15 cm diameter tunnel made of flexible, perforated plastic pipe and a plastic nest chamber. Each cluster had chambers of three sizes: a 30 cm x 30 cm x 20 cm (17-L, 4.5 gal, 900 cm^2 floor space) plastic container, a 19 L (5 gal) bucket with a 30 cm diameter (706 cm^2 floor space), and a 50 cm x 35 cm x 40 cm (68 L, 18 gal, 1,750 cm^2 floor space) plastic tub. All ABS tunnels were 2 m long with a 90 degree turn between the entrance and the ABS chamber. Each tunnel sloped downward (20-30 degrees) towards the chamber, within the range typical of nest burrows in their Idaho study areas (Belthoff and King 2002). The tunnel inserted into the chamber on a level plane. The top of each ABS chamber was at least 30 cm underground. To increase the probability of ABS use, a wooden perch was placed in the center of the cluster as in King (1996). From 1997-2001, Belthoff and Smith (2003) monitored 80 ABS clusters (2 or 3 ABS per cluster) and found an annual occupancy rate of 55%, with 33% of the clusters used in four or more years. Their results indicated that artificial burrows provided long-term nest sites for owls.

James R. Belthoff

Figure 9. Clusters of artificial nest burrows used in field comparison studies, Idaho.

OUR SUGGESTED DESIGNS

We suggest two ABS designs, and with the exception of the tunnel size, the units are essentially the same. The designs employ the use of half of a 208 l (55-gallon) barrel for the nest chamber, i.e., 50 cm (20 in.) in diameter (1,960 cm^2 interior floor space) and two stacked 9.5 l (2.5 gal.) buckets on top for access (see Fig. 10 through Fig. 26). We suggest using black- or blue-colored plastic barrels. The floor of the main chamber is located 91 cm (36 in.) below ground level. The main tunnel is a 3.0 m (10-ft) section of 15 cm (6 in.) diameter corrugated flex drain pipe with a 7.5 cm (3 in.) slot cut out of the bottom to provide a dirt walkway for the owls). The occupancy rate of this design through the 2010 nesting season (with 59 units in place) on a northeastern Oregon study site has been 86%. Liquid Nails (or similar adhesive) is used to seal the bottomless bucket to the main chamber, as well as attaching (for the 15 cm design) a tunnel collar to the main chamber. Our second design is this same concept, except that we suggest a 10 cm (4-in.) diameter flex pipe main tunnel without a walkway slot cut out of it.

As owls have shown a clear preference for sites that have many burrows (e.g., Poulin *et al.* 2005), a minimum of two (or three) burrow units should be placed at a given site (5-10 m apart) to make a burrow cluster. One burrow is for nesting and the other as prey cache for male, or refuge for the young; dispersing young use satellite burrows in the vicinity of their natal burrows for about two months after hatching before departing the natal area (King and Belthoff 2001). Burrow clusters are typically placed a minimum of 110 m (Green and Anthony 1989) to 300 m apart, to minimize territorial conflicts and nest abandonment by neighboring owl pairs. The tunnel inserts into the chamber on a level plane. About midway along its length, the tunnel has a 60º arc in it. This provides darkness in the nest chamber, but still allows researchers to readily secure adult and young owls for banding. Further in this Users Guide, we make recommendations as to selection criteria for placement of the ABS system, specifics on placement of short perches (i.e., ≤60 cm, 24 in.), and related anti-predator aspects.

Slope of the burrow tunnel entrance: The slope of the burrow entrance is the deviation from horizontal, i.e., the larger the angle, the steeper the entrance tunnel. The slopes of natural burrows in Idaho used by nesting owls was 27º (Smith and Belthoff 2001) and the odds of

burrow use decreased 17% with each 1° increase in slope (Belthoff and King 2002). The slope of the burrow entrance was 15º to 25º in Oklahoma; while steeper-sloped tunnels were available, they were not used by owls nesting in a prairie dog town (Butts and Lewis 1982). Tunnel slope was 15º in owl nests located in California (Coulombe 1971). We suggest that tunnels be gently sloped downward (15-20º) towards the nest chamber.

CONSTRUCTION TECHNIQUE

Materials for our main burrow design:

One-half of a 55 gallon plastic barrel
Two – 2.5 gallon buckets
16” section of 6” unperforated drain line
10’ section of 6” unperforated drain line
About ½ tube of Liquid Nails
Jigsaw, skillsaw, drill with ½” bit.
Anti-predator Patio (see this document for design).

Materials for our second burrow design:

One-half of a 55 gallon plastic barrel
Two – 2.5 gallon buckets
10’ section of 4” unperforated drain line
About ½ tube of Liquid Nails
Jigsaw, skillsaw, drill with ½” bit.
Anti-predator Patio (see this document for design).

Figure 10. Eighteen artificial burrows ready for placement into the field. Typically, 2-3 burrows are placed 5-10 m (15-30 ft) apart to form a cluster. In turn, each cluster will support one pair of owls and young.

Figure 11. 55-gallon plastic juice barrel with masking tape to mark centerline. One barrel will yield two nest burrows.

Figure 12. Cutting barrel in half with skillsaw.

Figure 13. Trace outline of 2.5 gallon pail bottom onto top of barrel section.

Figure 14. Use jigsaw to cut hole for pail to just slip about 1 in. into barrel.

Figure 15. Use jigsaw to cut bottom out of one 2.5 gallon pail.

Figure 16. Bottomless pail fits into barrel top.

Figure 17. Use caulking gun to apply ample Liquid Nails (or similar adhesive) to solidly affix pail to barrel.

Figure 18. Scribe a 5.75 in. hole onto bottom edge of barrel for the 6 in. drain line collar section. Note: a smaller hole is cut for the 4 in. drain line design.

Figure 19. Cutting the 5.75 in. hole with jigsaw.

Figure 20. Cutting a 3-in. "walkway" in the 15 cm flex pipe with jigsaw (note: a jigsaw works best for this task).

Figure 21. Insert the 6 x 16 in. drain line collar section 2-3 rings into barrel; affix firmly with adhesive, inside and outside of barrel. This needs to be solid.

Figure 22. 10-foot tunnel section of 6-in. flexible drain line. A 3 in. wide "walkway" has been cut out. This will be placed face-down, so the owls can walk on natural dirt. A jigsaw is used to cut the walkway out of the flex pipe.

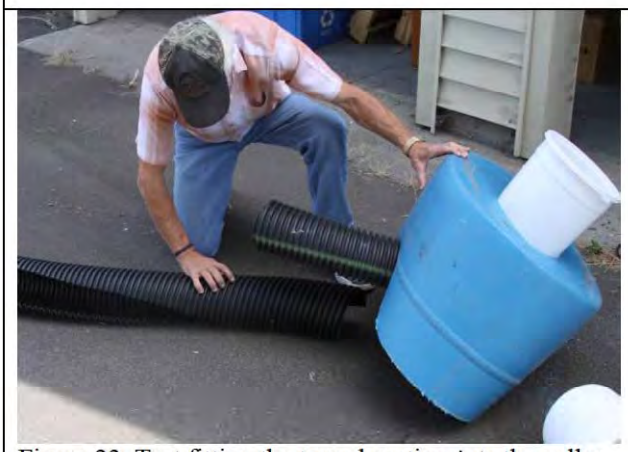


Figure 23. Test fitting the tunnel section *into* the collar. The final attachment of the tunnel to the collar and nest chamber is done in the field, after the hole has been dug and the nest chamber has been placed into it.

Figure 24. Test fitting (continued). It is important that the main tunnel be placed on the *inside* of the collar, to aid in future operations of the burrow system. Main tunnel should fit 2-3 rings inside the main barrel chamber. No caulking is used to attach main tunnel section to collar/nest chamber.

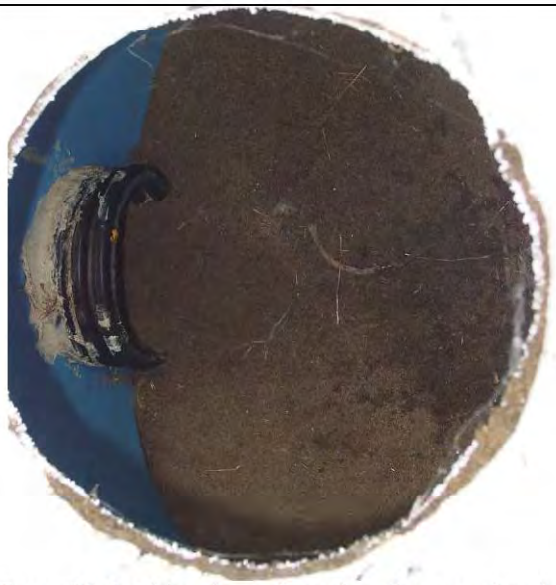


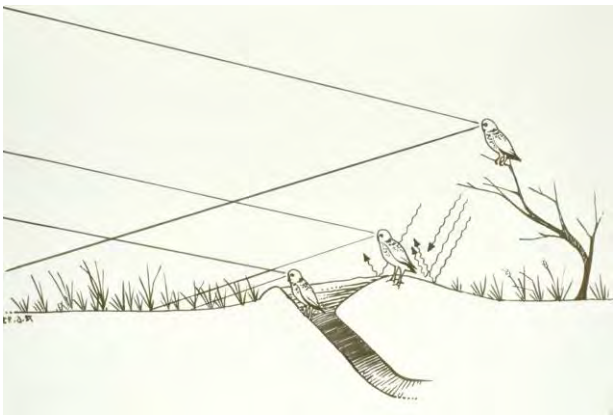
Figure 25. Looking down through pail at tunnel and collar into an installed burrow. Note the amount of adhesive placed around collar fitting; it is important that the collar stay firmly attached to the barrel chamber to prevent water and sand/dirt infiltration.

Figure 26. Finished burrow chamber, top buckets, and collar. Unit is being installed.

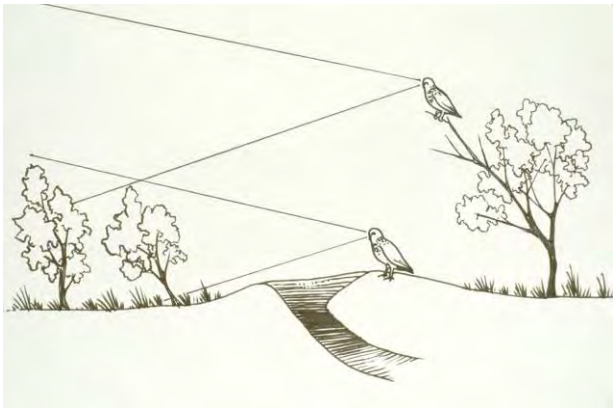
Choosing the Site for Your Artificial Burrow System

In this section we focus on characterizing burrow site selection at the nest site and landscape levels.

Gregory A. Green



Jadine Cook



Gregory A. Green

Figure 27. Conceptual diagrams (left column) of the open visual sightline characteristics of critical importance for successful burrowing owl nest sites (G.A. Green pers. comm.). These sightline characteristics allow the owls to detect potential predators and are required for positive owl use of ABS.

The owl's selection of open habitat, lacking dense vegetation and cover, provides the owl high visibility, both for specific foraging needs and predator detection; favored nest burrow sites are those in areas with low vegetation around the burrows (to facilitate the owl's view and hunting success) (Fig. 27). In addition to burrows, the owls also require perching locations and

frequently use the top of low mounds (e.g., 17-20 cm; Belthoff and King 2002, Poulin *et al.* 2005) or short perches (≤60 cm) outside (in front of) the burrow.

Gregory A. Green

Figure 28. Good burrowing owl habitat in northeastern Oregon.

Burrowing owl populations have declined in much of the western U.S. and Canada. For example, in San Diego County, California the burrowing owl population decreased approximately 90% between the late 1970s and 2003 (Lincer and Bloom 2003). In order to hypothesize as to what caused the burrowing owl crash and be in a position to intelligently manage this species, one must understand what the important site characteristics are (Lincer and Steenhof 1997, Lincer 2005). Based on our experience, that of others, and a review of the literature, we offer some components considered critical if a site is to support burrowing owls.

1. **Short Grass/Open Space.** *We can't emphasize the importance of this parameter enough.* In order for these ground-dwelling owls to be successful at spotting and catching prey and seeing predators before they become prey themselves, their habitat must contain substantial short grass areas and/or open space, especially close to the burrow(s) (Bloom 1980, Green and Anthony 1989, Poulin *et al.* 2005). This need is emphasized by the fact that burrowing owls commonly leave an area once grazing pressure has been removed and the grass grows taller (J. Lincer and P. Bloom, pers. observ.). The loss of short grass prairie and other habitats with suitable open space is exacerbated through habitat fragmentation (James *et al.* 1997) and the placement of utility poles or trees, in an otherwise flat, open habitat, making owls more easily preyed upon by aerial predators.

2. **Burrows.** Burrows are equally key components of burrowing owl habitat (Henny and Blus 1981). These can be in the form of the classic burrows created by fossorial mammals, artificial burrows, culverts or piles of concrete or other debris that provide

spaces for nesting. Owls use modified environments such as capped landfills, airports, golf courses, etc. For "urban owls," these may be useful sites for relocation, etc. However, in order that a burrowing owl population be truly self-sustaining, a healthy fossorial mammal population is helpful, if not critical, over the long term. This being the case, the type of soil can be critical, since these small mammals can only dig where there's an adequate soil structure to prevent cave-ins but not so much clay or rock that they can't dig into it. Burrowing owls have demonstrated their preference for nesting in places that have a higher-than-average supply of nest burrows (e.g., Poulin *et al.* 2005).

3. **Prey.** An adequate supply of prey, with enough diversity to meet the food needs of the owls throughout its life cycle, is clearly critical. This usually means a healthy mix of arthropods, small mammals**,** birds, and reptiles. For owls to over-winter on or near the breeding grounds, the prey base needs to be adequate *throughout the year*. As an example, the colony on North Island (San Diego County), which consistently had high nesting success, experienced very poor reproduction in 1999, when winter rains (and, presumably prey) were very limited. Specifically, 60-70% of the burrowing owl pairs failed to produce any young that year (C. Winchell, U.S. Fish and Wildlife Service, pers. comm.). In northeastern Oregon, small mammals are the main prey during incubation to fledging. However, about the time of fledging, the small mammals begin estivation, requiring the owls to switch to grasshoppers and other insect prey.

4. **Conflicts with Listed Species Management.** In some areas of the owls' range, conflicts between the management of two (or more) species, both in need of intense action, is not uncommon. Interactions between peregrine falcons and least terns are a classic example. So it is with burrowing owls and least terns, and perhaps western snowy plovers, in coastal San Diego, California. Management decisions as to which species gets "managed" are based on the level of legal protection. Since the burrowing owl is listed differently across the U.S. portion of its range, and is not listed as Endangered or Threatened in the U.S., the owl is a species that has been managed against by the responsible agencies in these conflict situations, with the net result being the effective removal (either temporarily or permanently) of those owls from the breeding population. Clearly, the owl is a tri-national conservation issue, with effective conservation efforts needing to take place at the local and regional levels.

5. **Minimal Disturbance.** Burrowing Owls often occupy disturbed environments, most colonies appear to have a finite threshold for human or pet-related disturbance, beyond which colony size reduction and/or abandonment occurs (Wesemann and Rowe 1985, Millsap and Bear 2000). During three years of observing owls that were translocated to artificial burrows in four different land uses, Grandmaison (2007) observed lower site occupancy at artificial burrows located in residential areas and urban parks, compared to those in agricultural and industrial sites in Arizona. Grandmaison also found that if burrowing owls at translocation sites are free from major disturbances (harassment by feral dogs, vandalism, vehicular traffic, changes in vegetation structure), both nest success and reproductive output remain relatively constant regardless of land use. In other situations, some burrowing owl populations seem to be able to tolerate a moderate level of human disturbance. This characteristic may provide a management opportunity in certain situations. The timing and frequency of disturbance is an important management issue. For instance, human activity, including recreation, disking, scraping,

or mowing adjacent to an active burrow may drive the pair away prior to or during egg-laying or incubation but, once they've produced eggs and incubated for a while, they are less likely to leave (because of their parental investment). For this reason, some military bases and public conservation areas with large grassy habitats could provide desirable locations for burrowing owl relocation and other management efforts.

6. **A "Normal" Predator Population.** Natural habitats have been greatly modified since the arrival of Europeans in North America. Burrowing owls have co-existed with their predators for 6.5 million years (Haug *et al.* 1993) to their mutual advantage. However, when a food chain is simplified, internal checks are lost. In coastal southern California, which has lost many of its mountain lions and other top predators, the populations of meso-predators tend to increase without historical controls. In areas that are close to human habitation, pet and feral dogs and cats are added to the list of meso-predators, although they don't seem to be a problem for all areas (e.g., Imperial Valley, D. Rosenberg, pers. comm.). These predators, however, are the very ones that are capable of effectively impacting the burrowing owl, especially through predation of the young.

7. **Predation "Facilitation."** Field observations and the literature indicate that many other raptors are very effective predators of this owl. Habitat changes, such as placement of utility poles or trees in an otherwise flat environment, markedly increases the effectiveness of these aerial predators, making otherwise supportive and surrounding habitat unproductive because of intensive and successful predation on these owls.

8. **Minimum Population Size.** The burrowing owls, themselves, are part of the environment that they create. They are, at least, semi-colonial, if not colonial, nesters. In addition to providing desirable genetic diversity and increased awareness of both predators and prey, having several nesting pairs nearby should also increase success by attracting and keeping pairs around in an otherwise unoccupied area. Long-term burrowing owl colonies are often characterized by a large number of pairs but this may, simply, be a reflection of burrow availability. However, there is some evidence that the owls have behavioral traits to select for this (Ronan 2002). Satellite burrows are clearly a feature of the owls' natural history and they show a strong selection for this trait as a "habitat feature" (Rosenberg, pers. comm.). In our opinion, satellite burrows aren't just peripheral to the needs of burrowing owls; they are important escape routes. If an owl has no place to go *other than its nest burrow*, it is doomed to predation, particularly by avian predators. This, in fact, may be is one of the reasons so many relocation attempts have failed. It is possible that once a population decreases below a certain number, other key benefits of colonial breeding are also lost (e.g., increased predator and prey awareness, maximizing gene pool variability, mutual assistance in the raising of young, etc. (J. Lincer, pers. observation; C. Winchell, pers. comm.). Although this factor is not a causative force in the initial decline of the burrowing owl population, and certainly colonies experience a normal fluctuation in size, a colony may not be as likely to recover once it falls below some critical size, especially if there is no other local colony from which to recruit new individuals (WRI 2003).

Jeffrey L.Lincer

Figure 29. General landscape view of burrowing owl habitat in southern California. The artificial burrow is placed in the rise in lower right-hand edge of the photo.

Jenny Barnett

Figure 30. Flagging marks the sites for installation of two burrows. Notice that the location is on a topographic rise, with a very open, and dominant, view of the surroundings.

Mike Gregg

Figure 31. Completed burrow installation. Note that this site is located on a gentle topographic rise, with the burrow facing to the right. The bitterbrush root wad was brought in for the perch

Burrowing Owl Conservation Society of British Columbia.

Figure 32. Burrow complex at Nikola lake area, British Columbia. Prime residence.

Installation Technique

1) Burrows are installed in groups of two or three, with 15-30 feet between each burrow entrance.

2) Dig the hole for the intended burrow, either by hand or with the help of a backhoe or trencher. . Place dug out dirt close, for easy access to cover hole back up (you will be backfilling by hand). Remove the sod pieces carefully and place them to the side.

3) The pipe should extend inside the nest chamber only 2-3 ribs of pipe. Double check just before final fill-in to ensure pipe has not moved further into the nest chamber.

4) Place dirt in tunnel and/or Insure that the "walkway" notch of the pipe is facing downwards, and backfill gently to hold it in place. Pipe for tunnel is 10 feet long.

5) Place the bucket system deep enough so that the top bucket is at ground level. Put dirt in the top bucket (with handle) with soil.

7) Do NOT use backhoe to backfill as the backhoe moves too much dirt at once, and can easily affect the chamber position, or crush/alter the tunnel. Back fill by hand and tamp soil firmly over pipe and around nest chamber. This will prevent the soil from settling and leaving a divot. Replace the removed sod pieces on the disturbed soil areas after the burrow system is installed.

8) If available, place rocks around the entrance to prevent coyotes and dogs from digging. Support each side of the pipe entrance with rocks. This will prevent damage to the pipe by large top rocks. If rocks are not available, place dirt and sod in a small mound (e.g., 10-12 in.es tall) on top of entrance, to hold burrow tunnel in place, and give the owls a place to perch (and view their surroundings). To minimize cattle trampling, place rocks around burrow entrance and nest chamber bucket.

9) Record, date and GPS the new burrow's location. Write out full GPS coordinates (lat/long in decimal degrees).

10) Tunnels are inserted into nest chambers on a level plane, and the bottom of the nesting chamber is placed 91 cm (36 in.) below the surface of the ground. This depth will insure that the top of the top bucket will be flush with ground level. The top of each nesting chamber is 35 cm (14 in.) underground.

The next series of 12 images show the installation and backfilling process. All backfilling is done by hand. Figure 33 shows a completed burrow installation.

Backhoe digging main hole for burrow chamber; the bottom of the burrow chamber will be 36 in.es below ground level.

Trench for the burrow tunnel is done with a sweeping motion of the backhoe bucket. In this image it is a left-swinging and upward motion. This gives the trench an appropriate arc for the main tunnel. Some hand digging may be necessary (to get the trench deep enough) right where the main tunnel meets the collar/burrow chamber.

David H. Johnson

Figure 33. Newly installed burrow in northeastern Oregon. Note the sod clumps placed on top of the tunnel entrance to make sight mound, the top bucket just protruding out of soil, and natural perches.

PREDATOR-PROOFING YOUR ARTIFICIAL BURROW SYSTEM

We see five main aspects to making artificial burrows more predator resistant:

1) size of burrow entrance
2) the addition of an anti-predator 'patio' at the mouth of the burrow entrance
3) putting rocks around the burrow entrance area to frustrate digging mammals, such as coyotes or feral dogs
4) perch placement
5) attaching a screen mesh to the bottom side of the nest chamber, to frustrate the under-and-up digging of badgers

Size of Burrow Entrance. Burrowing Owls have demonstrated preferential use of artificial burrows with entrance hole diameters of 10 cm. (Smith and Belthoff 2001). Many artificial burrow users have utilized either a 10 cm or a 15 cm tunnel size. In this paper, we recommend the use of a 15 cm tunnel (with a dirt floor), but with a 10 cm passageway (anti-predator patio) added to the burrow entrance (Fig. 34). We also recommend a 10 cm tunnel (especially in areas where owls have historically used ground-squirrel burrows), with a anti-predator patio attached (Fig. 35).

Keppers *et al*. (2008) reported on the use of artificial burrows by Western Burrowing Owls and other vertebrates during winter in southern Texas. They monitored 72 burrows that consisted of equal numbers of 15, 20, or 25 cm diameter, 2.4 m-long perforated polyethylene drainage pipe. Of their 58 owl detections, 46 (79%) occurred in the 15 cm dia. pipes. Wintering owls were usually observed roosting at the entrance (not the interior) of the burrows, supporting the hypothesis that owls selected 15 cm-diameter artificial burrows primarily because they deter large mammal predators. Also, in the 15 cm dia. pipes, they recorded one sighting of a Virginia Opossum (*Didelphis virginiana*), and four sightings of the Striped Skunk (*Mephitis mephitis*). Both of these two mammal species are potential nest predators of burrowing owls, noteworthy here is that they were able to gain access through the 15 cm dia. pipes.

Anti-Predator Patio. Wellicome *et al.* (1997) put predator-excluder "collars" (also called 'donuts') inside the burrow tunnels, about 30 cm (12 in.) in from the entrance. For the three years of their study, predator-proof burrows significantly reduced the frequency of nest predation.

After analyzing burrow opening sizes, actual tunnel dimensions of the fossorial burrow makers, and observations of burrowing owls as they dash into burrows to avoid danger, we felt it justifiable to design an addition onto the ABS tunnels. The anti-predator patio is designed to allow several owls (say a family group of young) to quickly move inside a covered area (and then go single-file into the main tunnel), but still provide a limited (i.e., 10 cm.) portal that will exclude many mammalian predators. We offer two designs for this (Fig. 34 and Fig. 35) with one design for 15 cm tunnels, and the other for 10 cm tunnels. If we were to only use a 10 cm tunnel (with no patio), the young will 'bunch up' at the entrance, and it is probable that any avian (and some mammalian) predators will capture an unlucky 'not-quite the last in' owl. Also, the entrance of a 15 cm diameter tunnel has been observed as a safe roost, the size most frequently used by wintering owls (Keppers *et al.* 2008).

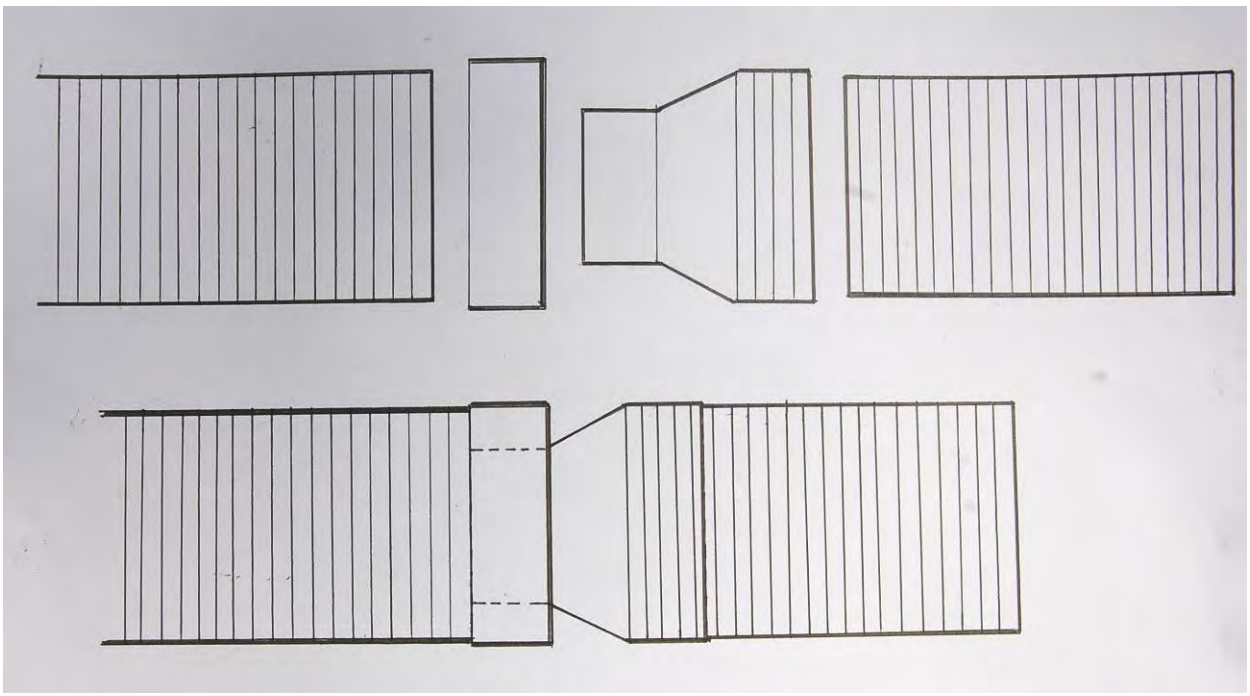


Figure 34. *Anti-predator patio for 15 cm(6 in.) tunnel*. Top drawing shows the four components for the anti-predator patio (L to R): 6 in. dia. main tunnel, a 6 in. cap (with 4 in. dia. hole cut out of it), a 4-to-6 in. connector, and a 6 in. dia. x 12 in. patio section. Liquid Nails (or similar adhesive) is used to connect the cap, connector, and patio section together so they become a solid unit. Bottom image shows the completed patio unit. Entrance is from the right. About 1 in. of dirt is placed inside the patio unit and tunnel to level the walkway for the owls. The exact dimensions of these components may vary based on the materials available in your location.

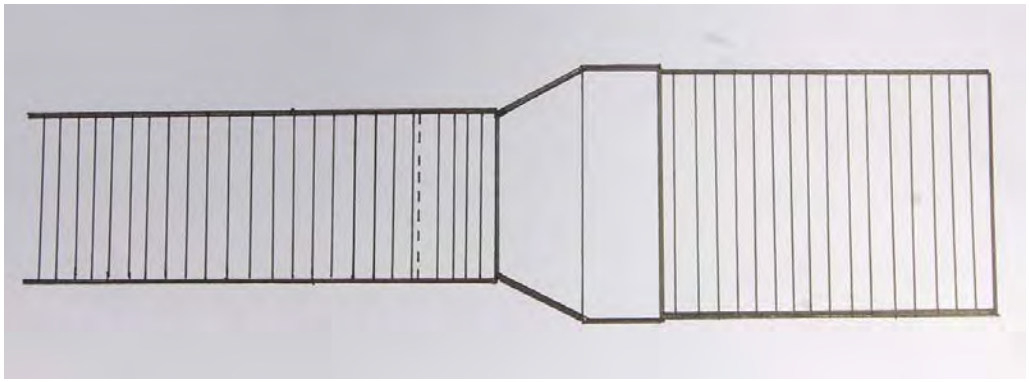


Figure 35. *Anti-predator patio for 10 cm (4 in.) tunnel***.** Drawing of completed anti-predator patio unit with the 3 components: 4 in. main tunnel, a 4-6 in. connector, and a 6 in. diam. x 12 in. long patio section. About 1 in. of dirt is placed inside the patio unit (and a lesser amount in the tunnel) to level the walkway for the owls. Entrance is from the right.

Perches for the Owls. Perches, and mounds, are substantially used by owls for roosting, preening, observing, and hunting. Perches are also used during the very hottest of weather, to help the owls stay cool. Perches should be relatively short in height, e.g., $\leq$ 60 cm (24 in.es).

We found that, in certain situations, a 90-120 cm (3-4 foot) high pole perch we provided was too attractive to ravens but, if we shortened it to 60 cm or less, it *seemed* to reduce its attraction for ravens but the owls still used it. As we don't want the perches to be used to the advantage of avian predators, we urge the placement of the perch *in front of* (not behind) the burrows (Fig. 36). That way, when an owl comes to the entrance (from the inside), it can see if a potential predator is sitting on its hunting perch. If the perch is behind the entrance, the advantage is with the predator. We offer six images of natural and artificial perches below.

Jeffrey L.Lincer

Figure 36. Perch placement in front of artificial burrow.

Mike Gregg

Jeffrey L.Lincer

Gregory A. Green

Courtney Conway

Jeffrey L.Lincer

Rock around burrow entrances. The digging of coyotes and dogs is often concentrated along the burrow entrances. Armoring the entrance areas with rocks, a piece of concrete (Fig. 37) or placing a slightly larger solid piece of PVC tubing over the first meter or so of the tunnel have been used.

Jeffrey L.Lincer

Figure 37. A well-fortified burrow entrance, to ward off digging by coyotes and domestic dogs.

Wire grate under burrow chamber. Badgers have been reported digging down alongside the burrow chamber, and then under it, to get at the owls within. Thus far, to our knowledge, this type of predation has been reported only from Canada. A remedy for this is the attachment of a wire grate to the bottom of the burrow chamber before it is placed into the site and backfilled (Wellicome *et al.* 1997).

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APPENDIX L-5
Draft Habitat Compensation Plan

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Draft Habitat Compensation Plan

Soda Mountain Solar Project

San Bernardino County, CA
BLM Case Number CACA 49584

July 2013

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ENVIRONMENTAL, INC.

Draft Habitat Compensation Plan

Soda Mountain Solar Project

San Bernardino County, CA
BLM Case Number CACA 49584

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1 INTRODUCTION

1.1 OVERVIEW

Soda Mountain Solar, LLC (SMS), has applied to the U.S. Department of the Interior, Bureau of Land Management (BLM), for a right-of-way (ROW) grant that would authorize construction, operation, maintenance, and decommissioning of the proposed Soda Mountain Solar project (project). The project would consist of an industrial solar electric power-generating facility and substation on approximately 4,179 acres of undeveloped BLM-managed lands in unincorporated San Bernardino County, California. The project is located approximately 6 miles southwest of the community of Baker, along Interstate 15 (I-15) (Figure 1.1-1). Panorama Environmental, Inc. (Panorama), has prepared this Habitat Compensation Plan (Plan) for the project on behalf of SMS. This plan was developed in consultation with Kiva Biological Consulting and C.S. Ecological Surveys and Assessments.

1.2 PURPOSE OF PLAN

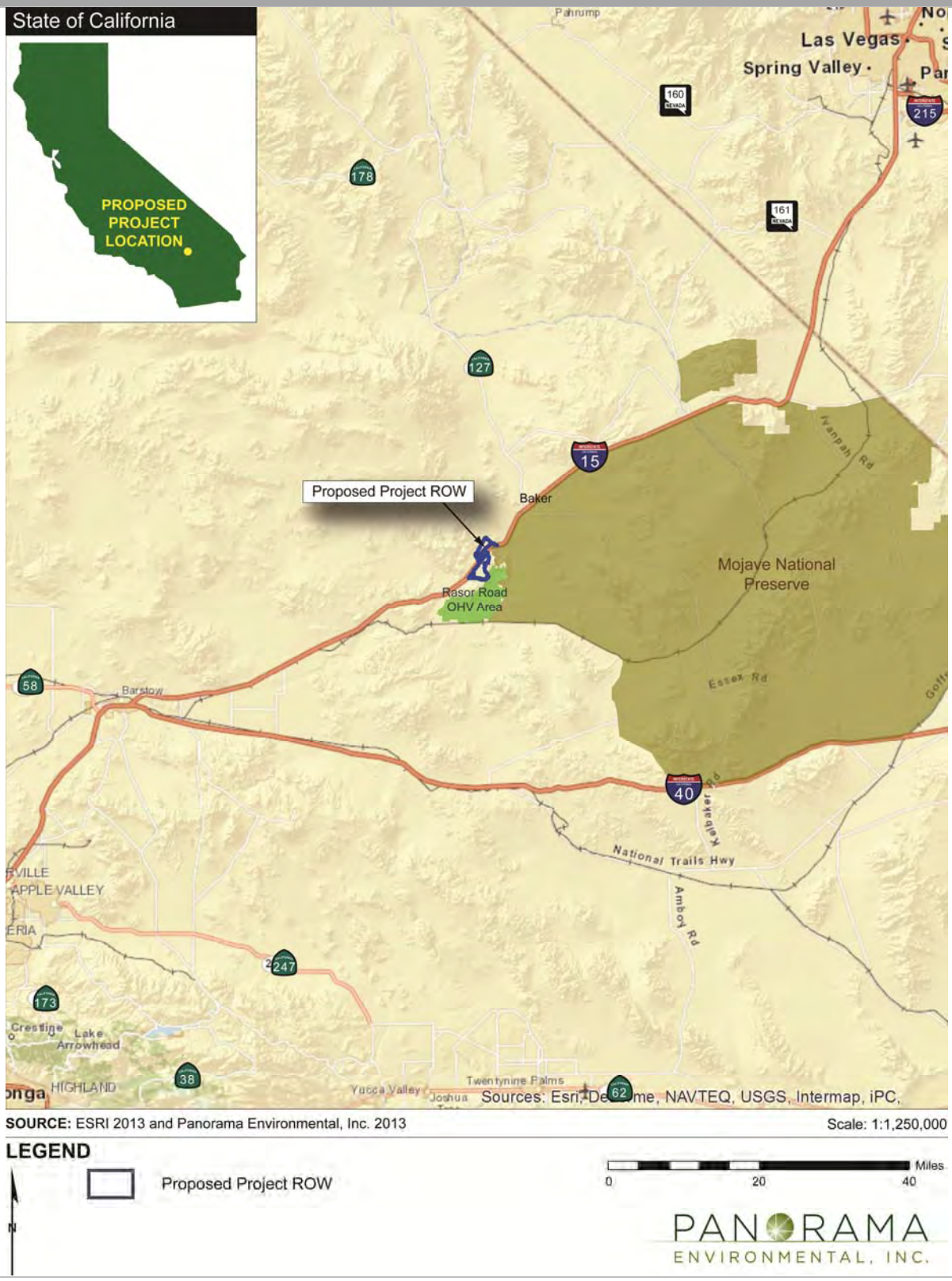
The Plan was prepared in accordance with regulatory agency guidance to provide details of proposed compensatory mitigation for potential impacts to wildlife and Waters of the State. The special-status species addressed in the Plan are listed in Table 1.2-1.

Table 1.2-1: Species Addressed in the Habitat Compensation Plan

Potentially Affected Species	Special Status
Desert tortoise (*Gopherus agassizii*)	FED: Threatened CA: Threatened (CDFW)
Burrowing owl (*Athene cunicularia*)	FED: Bird of Conservation Concern CA: Species of Special Concern (CDFW) BLM: Sensitive
Mojave fringe-toed lizard (*Uma scoparia*)	BLM: Sensitive CA: Species of Special Concern (CDFW)
Nelson's bighorn sheep (*Ovis canadensis nelsoni*)	BLM: Sensitive CA: Fully Protected (CFGC)

BLM = Bureau of Land Management
CA = California
CDFW = California Department of Fish and Wildlife
CFGC = California Fish and Game Code
FED = Endangered Species Act

Figure 1.1-1: Project Location



SOURCE: ESRI 2013 and Panorama Environmental, Inc. 2013

Scale: 1:1,250,000

LEGEND

Proposed Project ROW

N

Miles
0 20 40

PANORAMA ENVIRONMENTAL, INC.

The Plan includes:

1. Ratios for mitigation of impacts to biological resources
2. Calculation of the number of acres that will be required for in-kind mitigation for implementation of the project
3. Calculation of fees for compensatory mitigation

1.3 PROJECT DESCRIPTION

The proposed project consists of a 350-megawatt photovoltaic solar generating facility located within an approximately 4,179-acre ROW on federal land administered by BLM. Solar array fields would cover approximately 52 percent of the ROW. The remaining area would be used for stormwater control, access roads, ancillary buildings, and desert tortoise and/or cactus translocation.

1.3.1 Construction

Project construction would include the following main elements and activities:

- Clearing, preparation, and grading of temporary laydown areas, switchyard area, and substation area
- Surveying, clearing, and grading of internal road corridors to transport construction equipment, materials, and crews within the site
- Improvement of Rasor Road to the main entrance of the solar facility
- Rerouting of the portion of Rasor Road that is located in the proposed array fields to the southern perimeter of the array fields
- Construction of earthen berms
- Construction of water well(s) and reverse osmosis facilities including brine ponds
- Construction of buildings
- Construction of foundations and mounts for panel arrays, inverters, trackers, and medium-voltage transformers
- Installation of the electrical collection system, including low-voltage circuits
- Assembly and erection of solar panels
- Construction and installation of the substation and switchyard
- Solar panel commissioning and energizing
- Final grading and drainage
- Restoration activities

1.3.2 Operation and Maintenance

Operational activities at the site would include monitoring and optimizing the power generated by the solar arrays and interconnection with the transmission lines, operating the solar array tracking system, and performing panel washing activities once or twice each year.

Project maintenance activities would generally include:

- Road maintenance
- Vegetation restoration and management
- Scheduled maintenance of inverters, transformers, and other electrical equipment
- Occasional replacement of faulty modules or other site electrical equipment
- Panel washing
- Regular inspection of access roads, with repairs completed as needed
- Maintenance of hydraulic structures twice per year and following any major storm event
- Regular maintenance of the interconnect transmission line

The majority of planned maintenance activities would be performed before sunup, with repairs made at sundown. Miscellaneous damage repair due to failure of conductor splices, lightning strikes, wildfires, high winds, or vandalism may also be conducted as needed. All activities would occur within the project fence, or within defined routes of travel.

It is anticipated that project operation would require a workforce in the range of approximately 25 to 40 workers, which would include a mix of professional staff, maintenance workers, and security personnel.

1.3.3 Acreage Calculation

Estimated total permanent disturbance acreages for the various project components described above are presented in Table 1.3-1 and were used to calculate the mitigation acreages presented in Section 2.

1.3.4 Decommissioning

SMS has prepared a Decommissioning and Site Reclamation Plan that outlines the procedures for decommissioning the project at the end of its commercial life. The plan may be revisited by BLM at the time of decommissioning to require use of state-of-the-art procedures. SMS would comply with the terms and conditions of the ROW grant.

Aboveground structures would be dismantled and removed from the site upon decommissioning. Concrete pads or foundations would be demolished where required, and rubble would be transported to an off-site disposal facility authorized to accept the waste. Belowground facilities may be disconnected at the surface and left in place in conformance with guidance from BLM.

Table 1.3-1: Estimated Surface Disturbance		
Component	**Permanent Area of Disturbance (acres)**	**Surface Disturbance Calculation Methodology**
Solar Arrays	2,165	Area within security fenceline for solar arrays
Substation, Switchyard, and Interconnection	15	Area within substation/switchyard fenceline
Operations and Maintenance Buildings, Warehouses, and Water Tank	1	Area around building footprints and water tank
Project Wells (3)	0	Well pad and access area (included in permanent impact area for solar arrays)
Reverse Osmosis Facility	1	Area around building footprint
Brine Ponds	4	Area around brine ponds
Rasor Road Realignment	13	19-foot-wide buffer from centerline for a 38-foot-wide road
Access Roads	20	8-foot-wide buffer from centerline for 16-foot-wide roads (excludes areas that overlap permanent disturbance areas of project components)
Berms	25	15-foot-wide buffer from centerline for approximately 30-foot-wide berms
Collector Routes	0	Collector routes will be reclaimed after construction
Laydown Area	0	Laydown areas will be reclaimed after construction
Temporary Desert Tortoise Exclusion Fence	0	Temporary desert tortoise exclusion fence will be removed after construction and temporary disturbance areas will be reclaimed
Total	**2,244**	

SOURCE: SMS 2013

2 CALCULATION OF MITIGATION REQUIREMENTS

2.1 MITIGATION BACKGROUND

The mitigation outlined in this document will compensate for impacts to wildlife. The mitigation ratios, mitigation fees, and conservation banking requirements were determined through review of BLM, U.S. Fish and Wildlife Service (USFWS), and California Department of Fish and Wildlife (CDFW) guidance documents, among others. This section provides calculations of ratios and mitigation requirements for such mitigation. Guidance documents used in the analysis are listed in Table 2.1-1.

Table 2.1-2 presents the ratios that were used to calculate mitigation acreages for the project site. If more than one resource is present at the same location, the higher ratio is used for mitigation calculations.

Table 2.1-1: Guidance Documents Summary

Mitigation Type	Document Name	Document Author and Year
Desert tortoise mitigation ratio	Final Environmental Impact Report and Statement for the West Mojave Plan, A Habitat Conservation Plan and California Desert Conservation Area Plan Amendment	BLM 2005
	Compensation for the Desert Tortoise: A Report Prepared for the Desert Tortoise Management Oversight Group by the Desert Tortoise Compensation Team	BLM and USFWS 1991
	Desert Tortoise Habitat Management on the Public Lands: A Rangewide Plan	BLM 1988
Burrowing owl mitigation ratio	Burrowing Owl Survey Protocol and Mitigation Guidelines	California Burrowing Owl Consortium (CBOC) 1993
Mitigation fees	The Renewable Energy Action Team Mitigation Account Memorandum of Agreement between the Renewable Energy Action Team Agencies and the National Fish and Wildlife Foundation	Renewable Energy Action Team (REAT) and National Fish and Wildlife Federation (NFWF) 2010
Off-site mitigation	Off-site Mitigation	BLM 2008
Conservation banking	Guidance for the Establishment, Use, and Operation of Conservation Banks	USFWS 2003
Raven mitigation fees	Common Raven Predation on the Desert Tortoise	USFWS 2010

Table 2.1-2: Mitigation Ratios

Ratio	Type of Impact Area	Source
3:1	CDFW jurisdictional drainage areas	CDFW
1:1	Desert tortoise habitat[1]	BLM 2005 BLM and USFWS 1991
1.5:1	Ratio applies to 6.5 acres per pair of burrowing owls or single bird[2]	CBOC 1993
1:1	Mojave fringe-toed lizard (MFTL) habitat (wash containing aeolian deposits)	NA
1:1	Nelson's bighorn sheep mountain habitat	NA
1:1	Nelson's bighorn sheep foraging habitat (project disturbance within 0.25 mile of 10 percent slope topographic contour)	NA

Notes:

[1] Desert tortoise habitat compensation ratio of 1:1 is assigned to habitat outside of an Area of Critical Environmental Concern (ACEC) (BLM 2005), and to Category III habitat area (BLM and USFWS 1991).

[2] Replacement of occupied habitat with occupied habitat: 1.5 x 6.5 = 9.75 acres per pair or single bird (CBOC 1993).

NA = No guidance has been developed for mitigation of these habitat types

2.2 MITIGATION REQUIREMENTS

Mitigation acreages were calculated using geographic information system (GIS) data to overlay project features on surveyed habitat areas. The number of acres of each habitat type within the ROW and the area of project impact are identified in Table 2.2-1. Mitigation ratios were calculated based on information included in the following reports:

- *Biological Resources Technical Report, Soda Mountain Solar, San Bernardino County, California* (Panorama 2013a)
- *2009 Desert Tortoise Survey Report* (URS 2009a)
- *Final 2009 Desert Tortoise Survey Report* (CSM 2010a)
- *Protocol Desert Tortoise Survey For Soda Mountain Solar Project, Fall 2012* (Kiva 2012a)
- *Protocol Desert Tortoise Survey for Soda Mountain Solar Project Geotechnical Work* (Kiva 2012b)
- *Protocol Desert Tortoise Survey for Soda Mountain Solar Project, Spring 2013* (Kiva 2013)
- *2009 Mojave Fringe-toed Lizard Survey Report* (URS 2009b)
- *Final 2009 Mojave Fringe-toed Lizard Survey Report* (CSM 2010b)
- *Focused Fall Special-status Plant Survey, Soda Mountain Solar Project, October-November 2012* (CSESA 2012)
- *Bighorn Sheep Survey Results and Analysis, Soda Mountain Solar Project, San Bernardino County, California* (Panorama 2013b)

Table 2.2-1: Habitat within the ROW and Areas of Potential Impact

Habitat Type	Within ROW (acres)	Impacted (acres)
CDFW Jurisdictional Waters	1,038	Up to 457[1]
Desert Tortoise Habitat	4,179	2,244[2]
Burrowing Owl Habitat[3]	Up to 88	Up to 88
Mojave Fringe-toed Lizard Habitat	5.29	4.50
Nelson's Bighorn Sheep Mountain Habitat	116	6
Nelson's Bighorn Sheep Foraging Habitat	845	399

Notes:

[1] Impacts to CDFW jurisdictional waters are preliminary. The impacts were estimated based on the acreage of CDFW waters within the areas of project facilities. Only a portion of these waters would be subject to impacts from either grading or placement of piles. The estimate will be updated and revised in the Streambed Alteration Agreement after more detailed engineering is completed.

[2] Desert tortoise habitat impacts include all areas of permanent impacts.

[3] Burrowing owl habitat calculated as 9.75 acres per individual or pair, per CBOC (1993). Nine owls were identified on site in fall 2012.

Final areas of impact will be calculated based on the footprint and acreage of the components of the final project, following completion of construction. Pre- and post-aerial photography or ground-based surveys may be used to determine actual areas of project impacts, as appropriate.

2.2.1 CDFW Jurisdictional Waters

CDFW jurisdictional waters include the beds, banks, and channels of rivers, lakes, and streams to the landward edge of riparian vegetation. CDFW jurisdictional waters within the ROW were mapped following guidance of Vyverberg (2010), who defines the watercourse boundary by the larger flow zone bounding the channel network where channel relocations are likely to occur. The watercourse boundary is defined primarily by changes in sediment types and vegetation conditions. A total of 1,038 acres of Waters of the State were mapped within the ROW (Panorama 2013a). Waters of the State are shown on Figure 2.2-1.

2.2.2 Desert Tortoise

USFWS protocol-level desert tortoise surveys were conducted over approximately 4,000 acres of the project area in May 2009 (URS 2009a) and over the entire project area in April and May 2013 (Kiva 2013b). A supplemental desert tortoise survey and a survey of 17 geotechnical locations were conducted in fall 2012 (Kiva 2012a; Kiva 2012b). One tortoise was observed during the 2013 survey (Kiva 2013b). No live tortoises were found during surveys in 2009 and 2012. Desert tortoise sign (including tortoise burrows, carcasses, and scat) has been observed during surveys within the project area and in the zone of influence (AMEC 2001; URS 2009a; CSESA 2012; Kiva 2012a; Kiva 2013b). Survey results are shown on Figure 2.2-2. There is also a report of an

Figure 2.2-1: Waters of the State

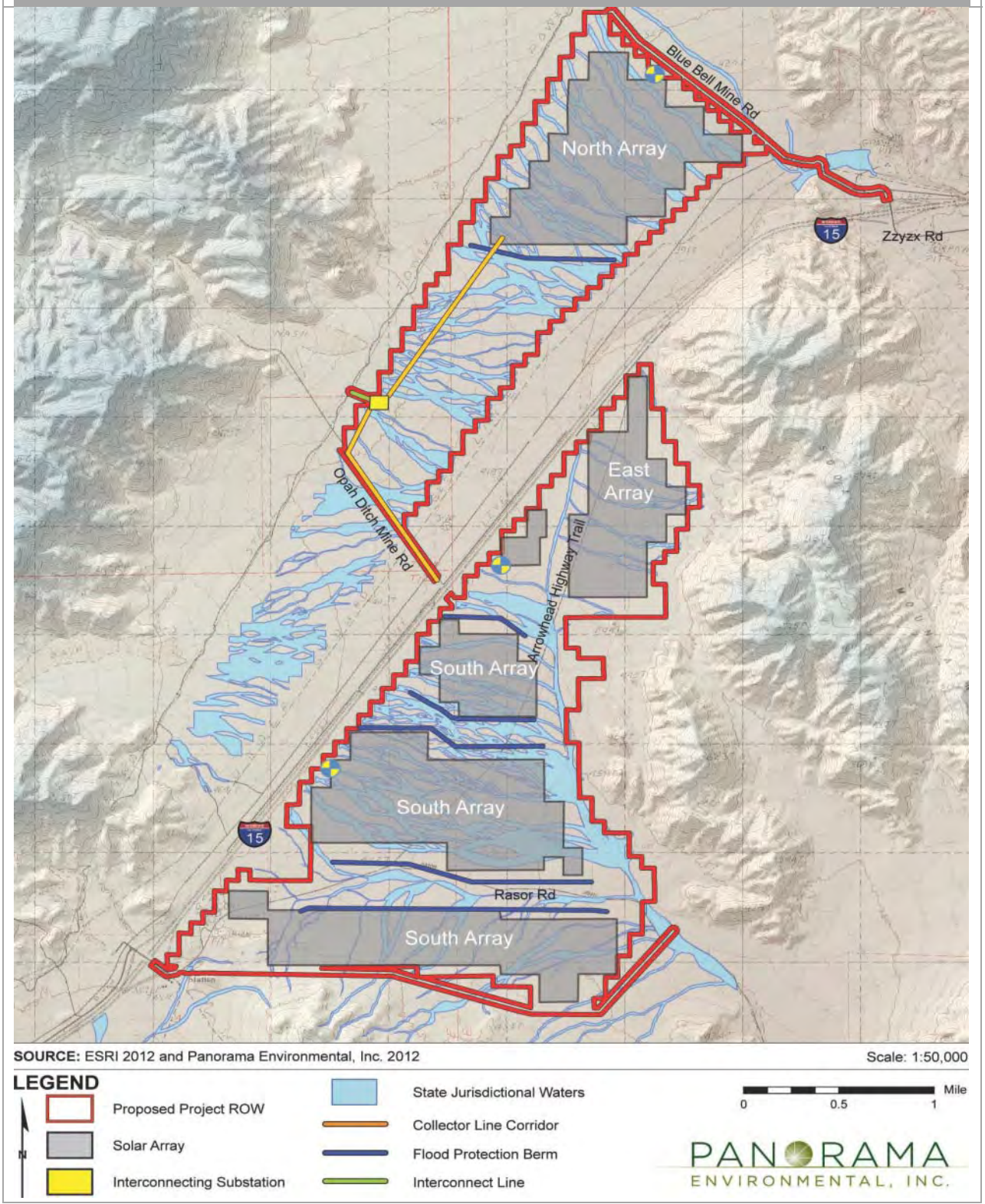
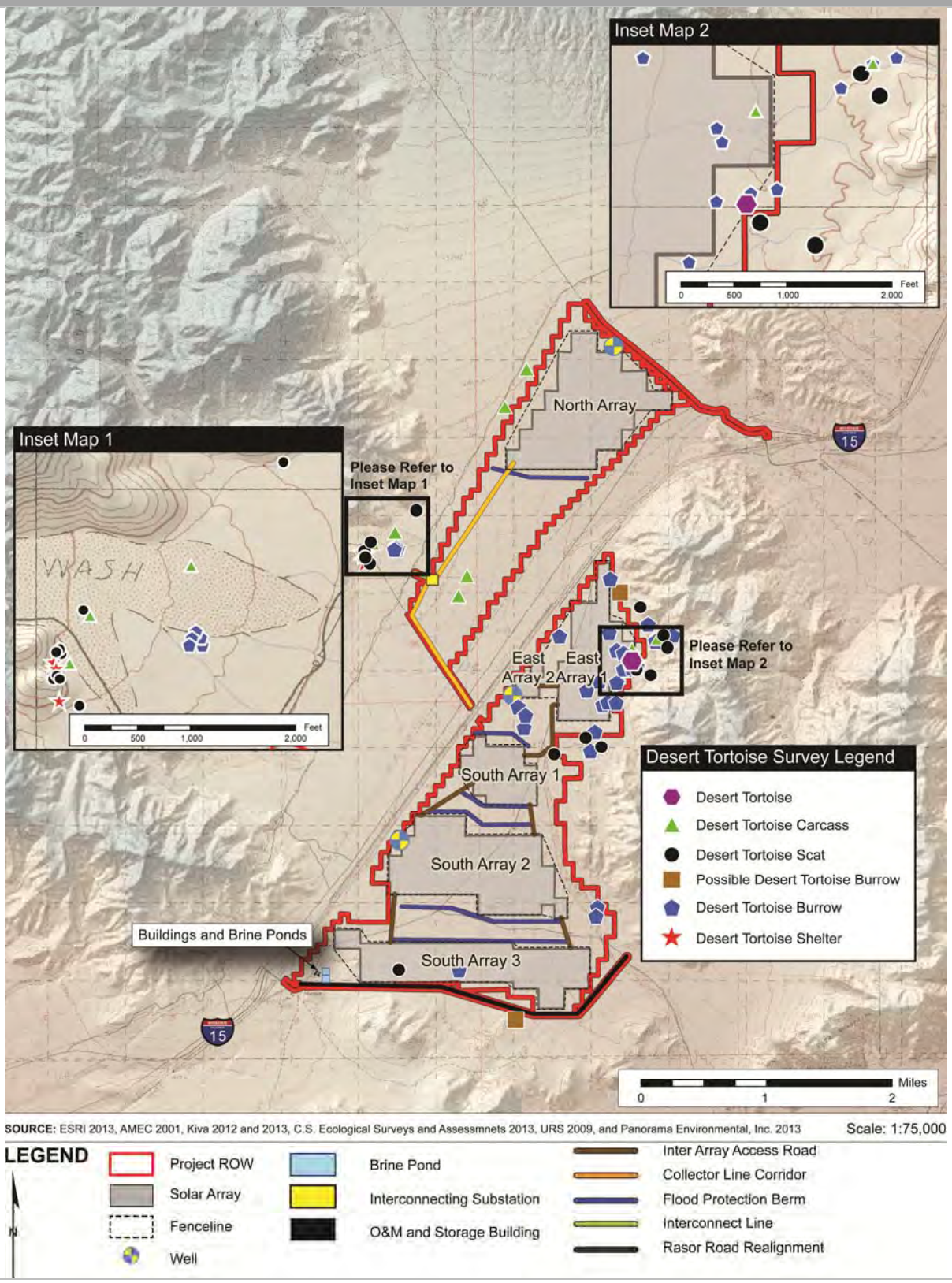


Figure 2.2-2: Desert Tortoise Survey Results



incidental sighting of a desert tortoise in 2001 along Opah Ditch Road, within the northern portion of the ROW.

The project area is within the range of desert tortoise habitat (USFWS 2010). There is generally suitable habitat for tortoise in the project area and tortoises are known to occur on the project site (Kiva 2013b). Human disturbance and I-15, which interferes with tortoise movement through the Soda Mountain Valley, may reduce the potential for tortoise to occur in the project area. The project area likely supports a low-density population of desert tortoise (Kiva 2012a). Additional information on habitat suitability and connectivity for desert tortoise was provided in the Biological Resources Technical Report prepared for the project (Panorama 2013a).

Desert tortoise habitat mitigation ratios are based on the habitat categories defined in *Compensation for the Desert Tortoise: A Report Prepared for the Desert Tortoise Management Oversight Group by the Desert Tortoise Compensation Team* (BLM and USFWS 1991) and *Desert Tortoise Habitat Management on the Public Lands: A Rangewide Plan* (BLM 1988). Habitat categories are defined in Table 2.2-2.

Table 2.2-2: Desert Tortoise Habitat Categories

Criteria	Category I Habitat Areas	Category II Habitat Areas	Category III Habitat Areas
Criterion 1: Maintenance of Viable Populations	Habitat area essential to maintenance of large viable populations	Habitat area may be essential to maintenance of viable populations	Habitat area not essential to maintenance of viable populations
Criterion 2: Resolvable Conflicts	Conflicts resolvable	Most conflicts resolvable	Most conflicts not resolvable
Criterion 3: Population Density	Medium- to high-density or low-density contiguous with medium- or high-density	Medium- to high-density or low-density contiguous with medium- or high-density	Low- to medium-density, not contiguous with medium- or high-density
Criterion 4: Population Stability	Increasing, stable, or decreasing population	Stable or decreasing population	Stable or decreasing population

SOURCE: BLM and USFWS 1991

Habitat Conditions of Project Site

Criterion 1: Maintenance of Viable Populations

Criterion 1 requires consideration of the ability to maintain viable desert tortoise populations under existing conditions. Focused desert tortoise surveys conducted in 2009, 2012, and 2013 recorded one desert tortoise in the Soda Mountain Valley (URS 2009a; Kiva 2012a; Kiva 2012b; Kiva 2013b). The project area is not essential to maintenance of viable populations because i) there is not a large population of desert tortoise in the area; ii) habitat within the project area has been fragmented by I-15; and iii) the presence of Baker Sink and Soda Lake to the south and east of the project further reduces the likelihood that desert tortoise will enter or move through the

project area because the Baker Sink is a known barrier to desert tortoise movement (USFWS 2011; Hagerty et al. 2010). The project area is located on the eastern edge of the West Mojave Recovery Unit (USFWS 2011). Genetic studies of desert tortoise populations indicate that tortoise populations are not crossing the Baker Sink and are not connecting the West Mojave Recovery Unit and the East Mojave Recovery Unit (Hagerty et al. 2010; USFWS 2011). The project is located in Category III Habitat under Criterion 1.

Criterion 2: Resolvable Conflicts
Criterion 2 requires consideration of the potential to remove the existing conflicts with desert tortoise habitat. The primary conflict with desert tortoise habitat in the project area is I-15, the presence of rocky soil, low elevation, presence of surrounding mountains and Baker sink to the east of the project site. It is possible to prevent access to I-15 by erecting fencing; however, the presence of I-15 is not a resolvable conflict and it is unlikely that the habitat conditions could be changed to provide higher quality habitat. Most conflicts are not resolvable; therefore, the project is located in Category III Habitat under Criterion 2.

Criterion 3: Population Density
The project ROW and adjacent areas of the Soda Mountain Valley have a low density of desert tortoise based on survey results (URS 2009a; Kiva 2012a; Kiva 2012b; Kiva 2013b). The 2009 desert tortoise survey covered 6,700 acres, which is an area much larger than the current 4,179-acre ROW. No live tortoise were found in the survey of the much larger area. There is no medium- or high-density desert tortoise habitat that is contiguous with the project area. The project is located in Category III Habitat under Criterion 3.

Criterion 4: Population Stability
The population dynamics for the project area have not been determined. The surveys in 2013 were consistent with the survey in 2009, indicating the population may be stable. Based on the low numbers in the area and the long generational time span for desert tortoise, it is unlikely that the population could increase substantially without the introduction of additional tortoise. The project is located in Category II or III Habitat under Criterion 4.

Habitat Assessment Results
Habitat within the project area meets the definition of a Category III habitat area based on the four criteria described above. The compensation ratio for Category III habitat is 1:1 (BLM and USFWS 1991). This ratio was adopted by BLM as part of the West Mojave Plan (BLM 2005) for desert tortoise habitat outside of ACECs, which applies to the project site.

2.2.3 Burrowing Owl
The project area provides suitable nesting, foraging, and wintering habitat for burrowing owls. Burrowing owls and burrowing owl sign, including burrows, pellets, feathers, and whitewash, were observed at multiple locations within the project ROW during fall botanical surveys and desert tortoise surveys in 2012 (CSESA 2012; Kiva 2012a). Twelve burrowing owls were observed within the ROW during the fall 2012 surveys; of these, nine of the owl observations

were located in the project footprint. Twenty-four burrows with recent sign of use by burrowing owls were mapped during the botanical surveys (CSESA 2012). No live owls were observed during the burrowing owl Phase III survey conducted during the 2013 breeding season (April 15 to June 15) by Kiva (2013a). Below-average precipitation was recorded during the 2012-2013 winter rainy season in the Mojave Desert, which is likely related to the decrease in numbers of grasshoppers observed in the region. Grasshoppers are a major food source for burrowing owls. The reduction in food source may be the reason that no live owls were observed during the 2013 breeding season. There was above-average rainfall during the 2012 summer monsoon season and the number of burrowing owls observed on site in fall 2012 provides a reasonable estimate for project planning purposes.

For each burrowing owl individual or burrowing owl pair identified within the project footprint, off-site habitat creation is required using one of the following calculations (CBOC 1993):

1. Replacement of occupied habitat with occupied habitat at 1.5 x 6.5 = 9.75 acres per pair or single bird
2. Replacement of occupied habitat with habitat contiguous to currently occupied habitat at 2 x 6.5 = 13.0 acres per pair or single bird
3. Replacement of occupied habitat with suitable unoccupied habitat at 3 x 6.5 =19.5 acres per pair or single bird

Nine burrowing owls were identified incidentally within the project footprint during fall (non-breeding season) botanical surveys in 2012. This number is used for planning purposes because it is greater than the number observed during the focused 2013 breeding season surveys (no birds were observed) and provides a conservative estimate. The actual number of owls observed during preconstruction clearance surveys will be used to modify the required mitigation acreage, as appropriate. A map of observed burrowing owl sightings and burrowing owl burrows is presented as Figure 2.2-3.

2.2.4 Mojave Fringe-toed Lizard

Twenty-six Mojave fringe-toed lizards were observed south and southwest of the project area during surveys conducted in 2009 and 2012 (URS 2009b; Kiva 2012a). No lizards were observed within the project ROW. A sand transport corridor that provides suitable habitat for Mojave fringe-toed lizard was mapped through the southwest corner of the ROW (Figure 2.2-4); there is no other suitable habitat in the project area. The closest observance of a Mojave fringe-toed lizard was approximately 1,000 feet southwest and uphill of the project ROW boundary.

Figure 2.2-3: Burrowing Owl Locations

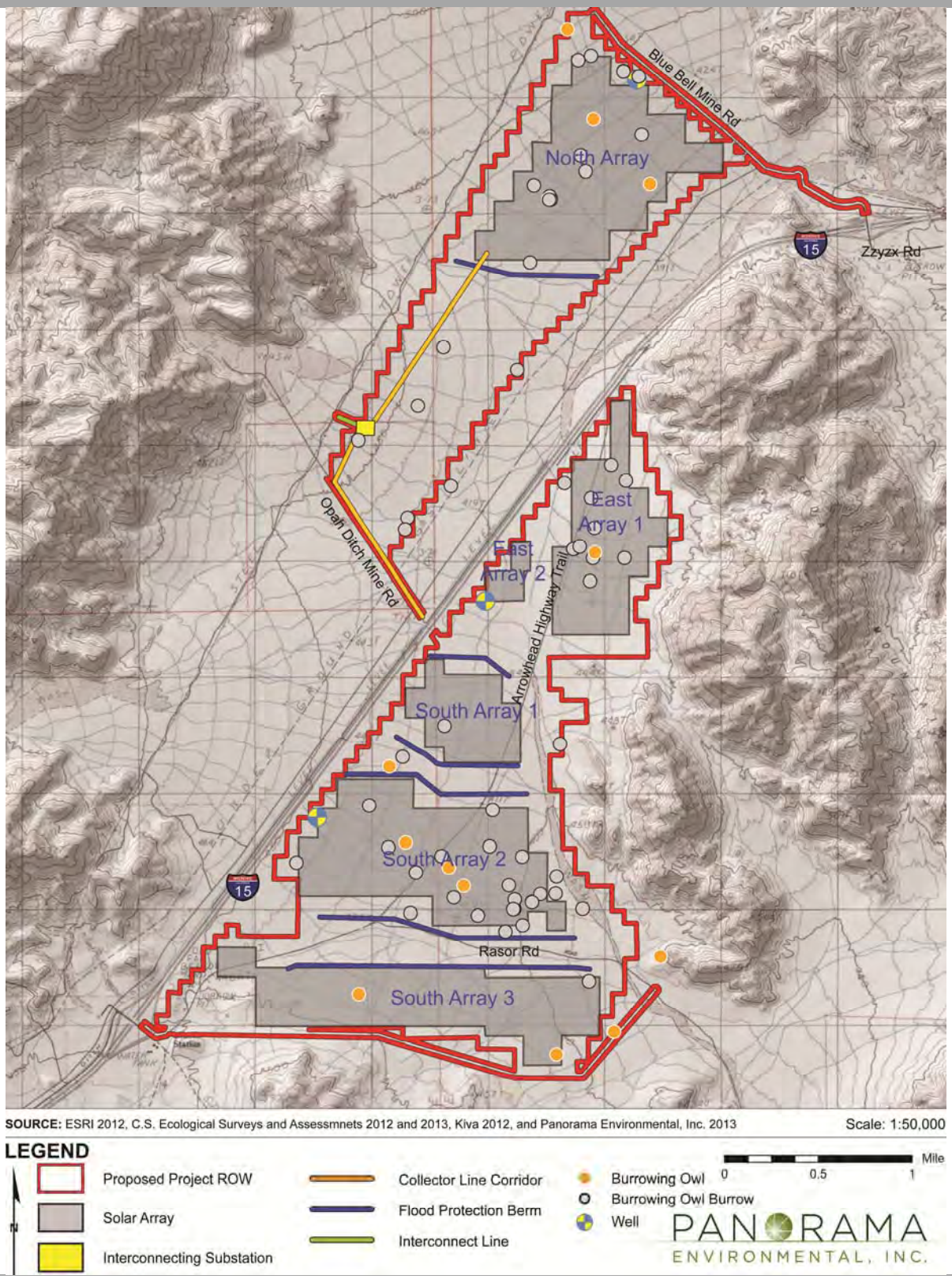
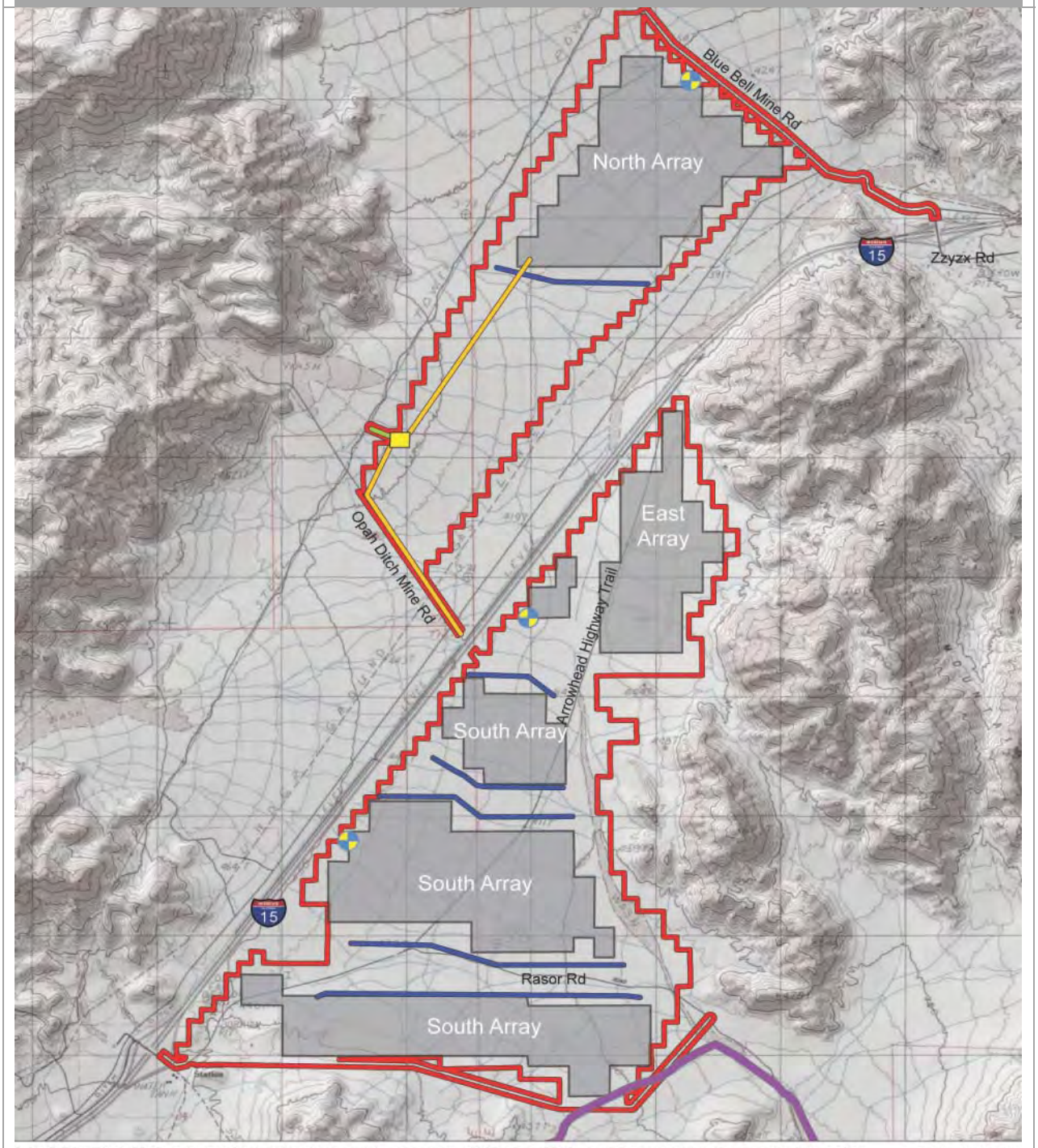


Figure 2.2-4: Mojave Fringe-toed Lizard Habitat



SOURCE: ESRI 2012, C.S. Ecological Surveys and Assessmnets 2012, Kiva 2012, and Panorama Environmental, Inc. 2012 Scale: 1:50,000

LEGEND

- Proposed Project ROW
- Solar Array
- Interconnecting Substation
- Mojave Fringe-toed Lizard Habitat
- Collector Line Corridor
- Flood Protection Berm
- Interconnect Line

N

0 0.5 1 Mile

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2.2.5 Nelson's Bighorn Sheep

Two bighorn sheep were located in the Cave Mountains approximately 8 miles southwest of the project area in March 2011 (BRC 2011). Forty-seven bighorn sheep in seven groups were observed in the south Soda Mountains during 2012 surveys (CDFW 2012). Five bighorn sheep and bedding locations were observed on the west side of the south Soda Mountains during desert tortoise surveys (Kiva 2012a). Locations of bighorn sheep observations are presented on Figure 2.2-5.

Foraging Habitat

Portions of the project area occur on alluvial fans within 0.25 mile of 10 percent slope (Figure 2.2-5) likely provide foraging habitat for bighorn sheep during the late winter, spring, and early summer (CDFW 2013). Bighorn sheep were observed foraging on the alluvial fans located at the north end of the East Array area in February 2013 (Davenport 2013). The project would impact approximately 399 acres of suitable foraging habitat on alluvial fans within 0.25 mile of the mountain base.

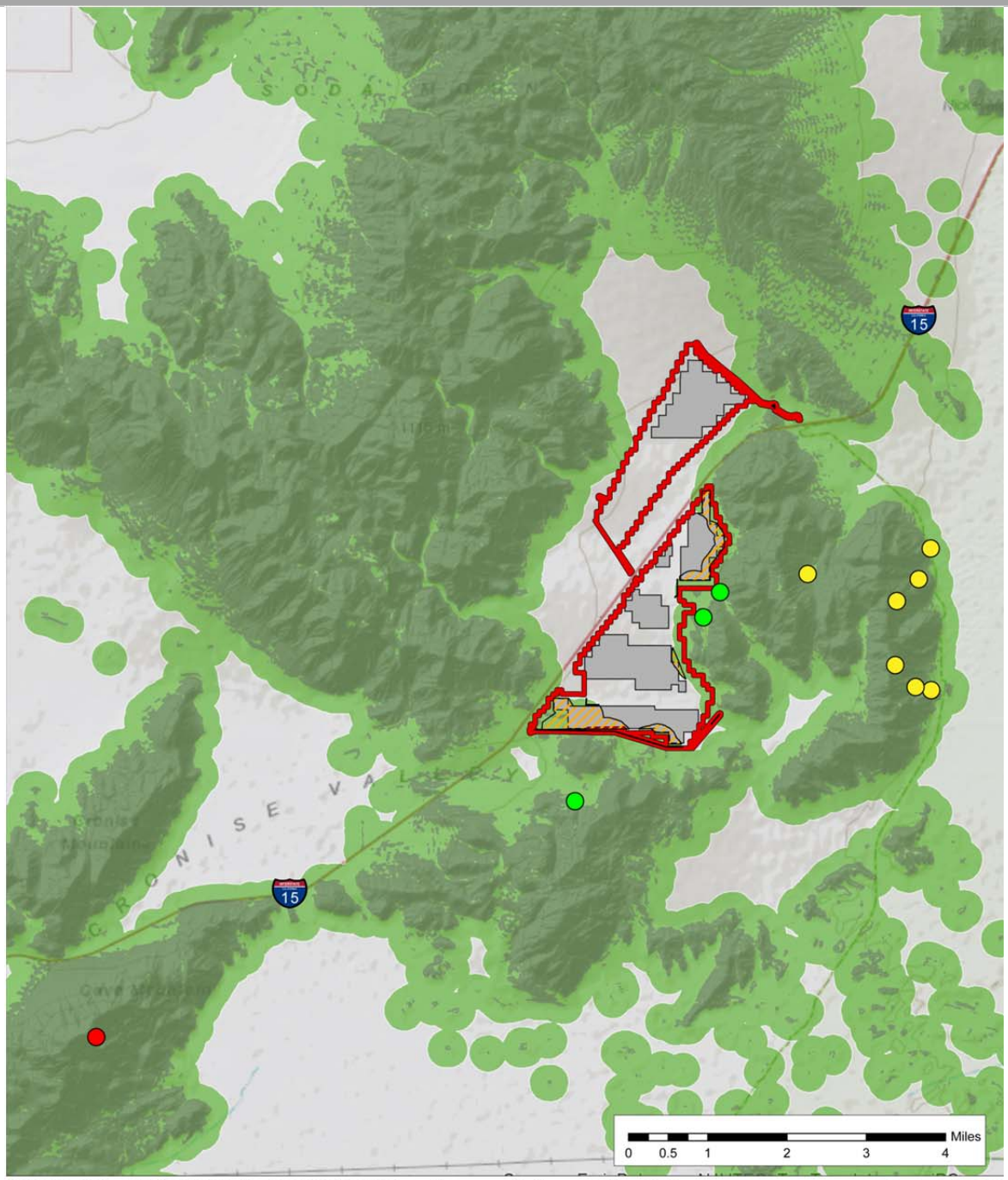
Mountain Habitat

Approximately 116 acres of the ROW near the Rasor Road service station contains suitable mountain habitat (Panorama 2013b). Construction of the operation and maintenance buildings and reverse osmosis facility would result in the loss of up to 6 acres of mountain habitat near the Rasor Road service station. An additional 6 acres of mountain habitat may be disturbed during construction to accommodate vehicle and equipment access. The remaining 104 acres of mountain habitat would be avoided by the project.

2.3 MITIGATION ACREAGE

Mitigation acreage was calculated based on the areas of potential impact for the project (Table 2.2-1). The project ROW is 4,179 acres. Areas where permanent facilities will be located cover 2,244 acres (see Table 1.3-1). Final compensation acreage will be calculated after project construction is complete and will be based on the footprint and acreage of the components of the final project that are installed. The total estimated acreage for mitigation is 3,626.5 acres, based on the acres of potential impact and the mitigation ratios for each impact, and accounting for redundancies. More acres will be needed for compensation than are disturbed by the project because each species has specific habitat requirements. Fewer acres of compensation lands may be required if the compensation lands include multiple types of habitat. The mitigation acreages are summarized in Table 2.3-1.

Figure 2.2-5: Nelson's Bighorn Sheep Foraging Habitat



SOURCE: ESRI 2013, BRC 2011, Kiva 2012, CDFW 2013, and Panorama Environmental, Inc. 2013

Scale: 1:140,000

LEGEND

- Proposed Project ROW
- Solar Array
- Slope 10% or Greater
- Bighorn Sheep Foraging Habitat
- Bighorn Sheep Foraging Area Intersect - Project
- BRC Bighorn Sheep Sighting Location
- CDFW Bighorn Sheep Sighting Location
- Kiva Bighorn Sheep Sighting Location

Table 2.3-1: Mitigation Areas			
Resource	**Impact (acres)**	**Ratio**	**Area of Mitigation (acres)**
CDFW jurisdictional drainage areas	457	3:1	1,371
Desert tortoise habitat outside of ACEC	2,244	1:1	2,244
Habitat for nine burrowing owls	6.5 per owl	1.5:1	88
MFTL habitat (wash containing aeolian deposits)	4.5	1:1	4.5
Nelson's bighorn sheep mountain habitat	6	1:1	6
Nelson's bighorn sheep foraging habitat	399	1:1	399
		Subtotal	4,112.5
Subtract Burrowing Owl and Bighorn Sheep Foraging Habitat Nested with Desert Tortoise and CDFW Jurisdictional Drainage Habitat			487
Total Proposed Mitigation Requirement with Redundant Habitat Subtracted			3,625.5

The total mitigation acreage for CDFW jurisdictional drainages and sensitive species habitat is 4,112.5 acres. A concept of nested compensatory mitigation was applied to calculate the total compensatory mitigation requirements. The nested mitigation concept allows all or any portion of acquired compensation lands to fulfill the mitigation obligation for more than one mitigated resource to the extent that the acquired land meets the habitat occupancy or suitability requirements for multiple mitigated resources. The Memorandum of Understanding between BLM and CDFW dated November 27, 2012, states the following with respect to nesting of compensatory mitigation:

> To the maximum extent possible consistent with federal and state law, the BLM and CDFG will seek to avoid duplicative mitigation and may each credit compensatory mitigation measures required by the other agency as part of the compensatory mitigation required under its own laws.

The burrowing owl habitat and bighorn sheep foraging habitat requirements are generally the same as desert tortoise habitat requirements. Compensation lands for burrowing owl habitat and bighorn sheep foraging habitat can be nested within the desert tortoise habitat compensation area. To calculate the total estimated mitigation acreage and account for the overlap in habitat requirements, the acreages for burrowing owl habitat and bighorn sheep foraging habitat were subtracted from the total mitigation acreage in accordance with the nested compensation concept. The remaining acreage consists of the CDFW jurisdictional drainage area (1,371 acres), desert tortoise habitat (2,244 acres), MFTL habitat (4.5 acres), and bighorn sheep mountain habitat (6 acres). There may be further overlap between desert tortoise habitat and CDFW jurisdictional drainage areas or other habitats. The overlap would be

considered during final calculation of compensation acreage and acquisition of compensatory habitat.

In addition to these requirements, 2,244 acres will be used to calculate raven management fees. This calculation is based on the number of acres that will be impacted by the project consistent with the guidance *Common Raven Predation on the Desert Tortoise* (USFWS 2010).

3 MITIGATION AND COMPENSATION

SMS will implement all mitigation measures identified in the upcoming EIS/EIR and Biological Assessment. Where avoidance and minimization of impacts is not feasible or will not adequately mitigate impacts, off-site mitigation will be used.

3.1 MITIGATION AND COMPENSATION

Off-site mitigation and/or habitat compensation will be accomplished by acquisition of private mitigation land and/or enhancement of public lands. The goal will be to focus on lands close to the areas disturbed by the project.

3.1.1 Land Acquisition

SMS will acquire mitigation land or conservation easements and enable the transfer of the land or easements to a third-party land manager approved by BLM, USFWS, and CDFW (e.g., NFWF). SMS will evaluate land parcels in the region to determine habitat comparability with habitats present at the project site and to evaluate other factors important to USFWS and CDFW for suitable mitigation land. Table 3.1-1 provides estimated costs associated with implementing off-site biological mitigation/compensation. For the purpose of calculations presented in Table 3.1-1, the total mitigation acreage of 3,625.5 acres is equivalent to ninety-one (91) 40-acre parcels.

The cost calculations presented in Table 3.1-1 were developed based on a Memorandum of Agreement (MOA) for the Renewable Energy Action Team (REAT) Mitigation Account that was entered into by CDFW, USFWS, the California Energy Commission, BLM, and NFWF (REAT 2010).

Table 3.1-1 consists of two parts. The first part, which includes line items 1 through 7, consists of costs and fees associated with compensation lands acquisition, costs for initial site work required as part of the compensation lands acquisition process, and long-term costs for maintaining these lands. Line items 1 through 7 are generalized costs that are not specifically related to the REAT MOA and are used to provide an estimate of costs for the acquisition of compensation lands in the project region. The second part includes line items 8 through 13 and is listed under "REAT-NFWF MOA Mitigation Account Additions," and is only applicable if the REAT Mitigation Account is used for all or a portion of the mitigation. The REAT Mitigation Account is a specific account managed by REAT, based on the MOA, for the collection of funds for the acquisition and long-term maintenance of habitat compensation lands. The costs included for line items 8 through 13 would apply if SMS uses the REAT Mitigation Account for habitat compensation. It is possible that SMS could use a different entity to manage its mitigation account for the project; however, it is likely that a different entity would have a similar fee structure.

Table 3.1-1: Biological Resource Compensation/Mitigation Cost Estimate Breakdown[1]			
Item	**Task**	**Cost**	**Calculated Cost**
1	Land acquisition[1]	$1,000/acre[2]	$3,625,500.00
2	Phase I Environmental Site Assessment	$3,000/parcel[3]	$273,000.00
3	Appraisal	$5,000/parcel[3]	$455,000.00
4	Initial site work: cleanup, enhancement, and restoration	$250/acre	$906,375.00
5	Closing and escrow costs: two transactions at $2,500 each; landowner to 3rd party and 3rd party to agency[4]	$5,000 for two transactions	$5,000.00
6	Agency costs to review and determine accepting land donation: includes two physical inspections, review and approval of the Level 1 ESA assessment, review of all title documents, drafting deed and deed restrictions, issuance of escrow instructions, and mapping the parcels	15 percent of land acquisition costs (item #1) x 1.17 (17 percent of the 15 percent for overhead)[5]	$636,275.25
		SUBTOTAL for Acquisition and Initial Site Work for Permittee-directed and REAT-NFWF MOA Options	**$5,901,150.25**
7	LTMM: includes land management, enforcement and defense of easement or title [short- and long-term], region-wide raven management, and monitoring	$1,450/acre[6]	$5,256,975.00
REAT-NFWF MOA Mitigation Account Additions *[only applicable if the REAT Mitigation Account is used for all or a portion of the mitigation]*			
8	Biological survey for determining mitigation value of land (habitat-based with species-specific augmentation)	$5,000/parcel[3]	$455,000.00
9	3rd-party administrative costs: includes staff time to work with agencies and landowners, develop management plan, oversee land transaction, conduct organizational reporting and due diligence, review acquisition documents, and assemble acreage to acquire	10 percent of land acquisition cost (item #1)	$362,550.00
10	Establish project-specific subaccount[7]	$12,000	$12,000.00
11	Pre-proposal Modified RFP or RFP processing[8]	$30,000	$30,000.00
12	NFWF management fee for acquisition and initial site work	3 percent of SUBTOTAL and items #8 and #9	$201,561.01
13	NFWF management fee for LTMM	1 percent of LTMM	$52,569.75
TOTAL for Deposit into the REAT-NFWF MOA Project-specific Mitigation Subaccount			**$12,271,806.01**

Table 3.1-1: Biological Resource Compensation/Mitigation Cost Estimate Breakdown[1]			
Item	**Task**	**Cost**	**Calculated Cost**

Notes:

[1] All costs are best estimates as of summer 2010, per information provided by REAT. Actual costs will be determined at the time of the transactions and may change the level of funding needed to implement the required mitigation obligation. Regardless of the estimates, the developer is responsible for providing adequate funding to implement the required mitigation (MOA V.I).

[2] The cost per acre is a generalized estimate taking into consideration a likely jump in land costs due to demand, and an 18- to 24-month window to acquire the land after agency decisions are made. If the agencies, developer, or third party has better, credible information on land costs in the specific area where project-specific mitigation lands are likely to be purchased, those data override this general estimate. Regardless of the estimates, the developer is responsible for providing adequate funding to implement the required mitigation.

[3] Parcel sizes may range from 1 acre to over 640 acres. The 40-acre estimate is used for illustration purposes only. The general location of the land acquisition(s) will determine the generalized parcel size for determining project specific estimates. Ninety-one 40-acre parcels are assumed.

[4] Two transactions at $2,500 each: landowner to third party and third party to agency. The transactions will likely be separated in time. State agencies may or may not require this funding.

[5] Reimbursing the agency for the cost to evaluate the land is always required for federal agency donations. State agencies may or may not require cost reimbursement to accept donations.

[6] Estimate for purposes of calculating general costs. The general location and parcel size(s) of the land acquisition may also factor into the estimate. The actual LTTM costs will be determined using a PAR or a PAR-like assessment tailored to the specific acquisition.

[7] Each renewable energy project will be a separate subaccount within the REAT-NFWF account, regardless of the number of required mitigation actions per project. If a project and its mitigation are phased, this fee is only applied when the project-specific account is established and not charged again when additional funds are deposited with subsequent phases.

[8] If determined necessary by the REAT agencies if multiple third parties have expressed interest; for transparency and objective selection of 3rd party to carry out acquisition.

Abbreviations:

ESA = environmental site assessment

LTMM = long-term management and maintenance

MOA = Memorandum of Agreement

NFWF = National Fish and Wildlife Foundation

PAR = property analysis record

REAT = Renewable Energy Action Team

RFP = Request for Proposals

Source: REAT 2010

3.1.2 Enhancement of Public Lands

As an alternative to or in addition to acquisition of conservation lands, SMS may elect to enhance public lands. Under the Federal Land Policy and Management Act (FLPMA), BLM may authorize compensatory mitigation actions on BLM lands. Public land enhancement strategies to compensate for project-related impacts may include, but are not limited to, the following actions:

- Restoring habitat and habitat corridors
- Fencing highways, freeways, and primary county roads to reduce wildlife mortality
- Improving habitat connectivity by increasing the size of existing culverts, increasing the number of culverts, or constructing alternative means of crossing
- Removing, restoring, or rehabilitating closed roads
- Removing grazing from desert lands and retiring grazing allotments
- Removing or controlling invasive or exotic plant infestations
- Implementing predator control actions
- Removing illegal dumps
- Increasing law enforcement patrols
- Creating artificial nests or burrows
- Installing fencing between grazing lands and wildlife habitat
- Developing water sources for bighorn sheep
- Increasing educational outreach (e.g., kiosks, signage, handouts, and interpreters)

3.1.3 Raven Mitigation

Raven mitigation is required by *Common Raven Predation on the Desert Tortoise* (USFWS 2010). The fee is $105 per acre for projects with 30-year leases. This translates to $235,620 for the 2,244-acre project area.

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APPENDIX L-6
Draft Bird and Bat Conservation Strategy

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Bird and Bat Conservation Strategy

Soda Mountain Solar Project

San Bernardino County, CA
BLM Case Number CACA 49584

September 2014

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Bird and Bat Conservation Strategy

Soda Mountain Solar Project

San Bernardino, California
BLM Case Number CACA 49584

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Appendix A: Avian Species—Potential to Occur, and Documented Presence in the Project Area

Appendix B: Common Bat Species—Potential to Occur and Documented Presence in the Project Area

1 INTRODUCTION

1.1 PROPOSED PROJECT

Soda Mountain Solar, LLC has requested a right-of-way (ROW) for the construction, operation, and decommissioning of a 350-megawatt photovoltaic solar electric power generating facility on federal land managed by the Bureau of Land Management (BLM). The requested ROW is located approximately 6 miles southwest of Baker, California, as shown in Figure 1.1-1.

The project includes approximately 1,838 acres of solar panel arrays. The requested BLM ROW is approximately 4,179 acres. The project includes an interconnection to the Los Angeles Department of Water and Power (LADWP) Marketplace to Adelanto 500-kilovolt (kV) transmission line adjacent to the proposed ROW. The project layout is shown in Figure 1.1-2.

1.2 PLAN PURPOSE

This Bird and Bat Conservation Strategy (BBCS) outlines strategies to avoid, minimize, and mitigate impacts to birds and bats during construction, operation, and decommissioning of the proposed project. The BBCS also has a monitoring component that would ensure success of the strategy and would allow for adaptive management.

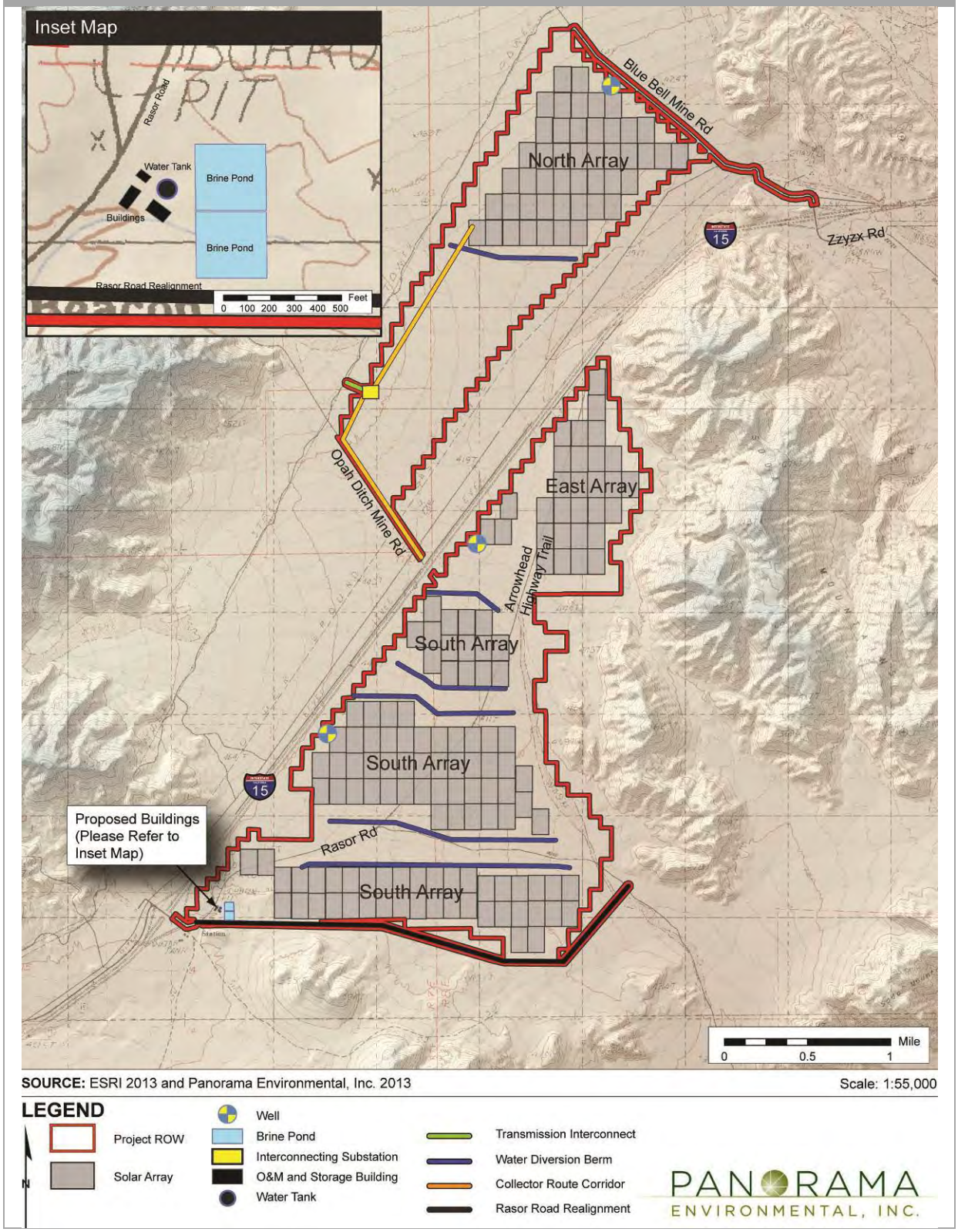
This BBCS has been prepared using guidance in the following documents:

- *Region 8 Interim Guidelines for the Development of a Project-Specific Avian and Bat Protection Plan for Solar Energy Plants and Related Transmission Facilities (Interim Guidelines)* (USFWS 2010)
- *U.S. Fish and Wildlife Service Land-Based Wind Energy Guidelines (WEG)* (USFWS 2012)
- *U.S. Fish and Wildlife Service Eagle Conservation Plan Guidance: Module 1—Land-based Wind Energy, Version 2* (ECPG) (USFWS 2013)

The USFWS is developing guidance specific for solar projects and recommends following the USFWS Wind Energy Guidelines in the interim (Rempel pers. comm. 2013). BLM recommended using the USFWS Region 8 *Interim Guidelines* (LaPré pers. comm. 2013). The *Interim Guidelines*, *WEG* and *ECPG* are voluntary, not mandatory (USFWS 2012, USFWS 2013, USFWS 2010). This BBCS conforms to the *WEG* and *ECPG* to the extent practicable; not all of the material in the *WEG* and *ECPG* can be followed because both documents are designed for wind energy facilities, not solar facilities. In addition, the new above-ground transmission facilities proposed for this project are limited to approximately 100 feet of above-ground line to connect the substation to an existing transmission line, which further limits application of the *WEG* and *ECPG*.

Figure 1.1-1: Project Location

Figure 1.1-2: Project Layout



1.3 PLAN CONTENTS

The original BBCS was submitted to BLM, CDFW, and USFWS on June 14, 2013. The BBCS was revised to address BLM and CDFW comments and submitted to all three agencies on January 12, 2014. USFWS and CDFW provided comments on the January 12, 2014 revised plan. The BBCS was subsequently revised to USFWS and CDFW comments.

The BBCS includes the following sections:

- ***Baseline Conditions: Site Characterization and Field Studies***—Description of the environmental setting as it pertains to birds and bats. This includes a description of the habitat at the project site, potential that certain avian and bat species may occur on site, and survey methodology and results.
- ***Risk Assessment***—Evaluation of potential impacts of the project on birds and bats, including habitat loss and direct mortality.
- ***Avoidance and Minimization of Risk/Conservation Measures***—Description of how project siting, facility design, and applicant proposed measures would avoid or minimize impacts to avian and bat species, including construction monitoring and reporting.
- ***Post-construction Monitoring and Studies***—Outline of a monitoring and reporting program that would allow for verification that measures are implemented and successful and for implementation of adaptive management if needed.

1.4 REGULATORY SETTING

1.4.1 Federal

Migratory Bird Treaty Act

The Migratory Bird Treaty Act (MBTA) declares it:

> unlawful at any time, by any means or in any manner, to pursue, hunt, take, capture, kill, attempt to take, capture, or kill, possess, . . . ship, export, import, cause to be shipped, exported, or imported, deliver for transportation, transport or cause to be transported, carry or cause to be carried . . . any migratory bird, any part, nest, or egg of any such bird . . . (16 U.S.C. § 703).

The definition of "take" is:

> to pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to pursue, hunt, shoot, wound, kill, trap, capture, or collect (50 C.F.R. § 10.2).

The MBTA protects more than one-thousand species of migratory birds, such as eagles and other raptor species, passerines, and waterfowl (USFWS 2012). The MBTA does not protect introduced avian species (USFWS 2012).

Bald and Golden Eagle Protection Act

The Bald and Golden Eagle Protection act (BGEPA) provides fines for those who:

> take, possess, . . . transport, export or import, at any time or in any manner any bald eagle commonly known as the American eagle or any golden eagle, alive or dead, or any part, nest, or egg thereof of the foregoing eagles, or whoever violates any permit or regulation issued pursuant to this subchapter . . . (16 U.S.C. § 668).

The definition of "take" is to:

> pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, destroy, molest, or disturb (50 C.F.R. § 22.3).

The definition of "disturb" is:

> agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, (1) injury to an eagle, (2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or (3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior (50 C.F.R. § 22.3).

Incidental take of eagles and eagle nests is allowed under particular conditions and with a permit (USFWS 2012, referencing 50 C.F.R. § 22.26, 22.27). The U.S. Fish and Wildlife Service (USFWS) issued the ECPG to provide "specific in-depth guidance for conserving bald and golden eagles in the course of siting, constructing, and operating wind energy facilities." No specific guidance exists for conserving eagles at solar facilities. The USFWS currently recommends the ECPG be adapted for solar projects. The ECPG is used in this BBCS as guidance for collecting information that assist in developing conservation strategies. The ECPG contains recommended actions to avoid, minimize, and mitigate should an eagle be identified as at risk of take (USFWS 2012).

Endangered Species Act

The federal Endangered Species Act (ESA) mandates that the USFWS identify species that are in danger of extinction and that it provide protection for listed species and their critical habitat.

Section 9 of the ESA prohibits take of endangered species. 16 USC § 1538(a)(1)(B). The statute defines "take" as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." 16 USC § 1538(19). "Harm" means to carry out:

> an act which actually kills or injures wildlife. Such act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering (50 C.F.R. § 17.3).

Incidental take authorization can be issued under section 7 of the ESA if a federal agency, federal funds, or a federal permit are involved (USFWS 2012). Section 10 allows for issuance of a take permit in other situations after preparation of a habitat conservation plan (USFWS 2012).

1.4.2 California

California Endangered Species Act

The California Endangered Species Act (CESA) prohibits take of threatened and endangered species. Cal. Fish & Game Code § 2080. Take is defined as "hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill." Cal. Fish & Game Code § 86. CESA may issue a take permit for take that occurs incidental to otherwise lawful activities after minimization and full mitigation of projected impacts. Cal. Fish & Game Code § 2080.1.

Birds (California Fish and Game Code sections 3503, 3503.5, and 3513)

California Fish and Game Code section 3503 prohibits:

> take, possess[ion], or needless destruction of the nest or eggs of any bird, except as otherwise provided by [the] code or any regulation made pursuant thereto.

Section 3503.5 deems it:

> unlawful to take, possess, or destroy any birds in the orders Falconiformes or Strigiformes (birds-of-prey) or to take, possess, or destroy the nest or eggs of any such bird except as otherwise provided by [the] code or any regulation adopted pursuant thereto.

Section 3513 provides for the adoption of the MBTA's provisions (above).

Fully Protected Species CDFG Code section 3511

Several avian species, including golden eagle, are designated by statute as fully protected species. These birds cannot be taken or possessed (Cal. Fish & Game Code § 3511). Avian species that are designated by statute as fully protected species cannot be taken or possessed (Cal Fish and Game Code 3511), except under 2835 after approval of a Natural Community Conservation Plan, 2081(a) or 2081.7. Section 2835 does not apply to the proposed project because none of the conditions that allow take are applicable to the Project.

1.5 AGENCY COORDINATION

Panorama (and URS for the 2009 surveys) consulted with BLM and CDFW regarding survey methods and requirements. Table 1.5-1 identifies the individuals who were consulted for each avian and bat survey conducted.

Table 1.5-1: Agency Consultation

Survey	Survey Date	Individuals Contacted, Affiliation
Bighorn Sheep and Golden Eagle Survey	March 2011 and May 2012	Regina Abella, CDFW Andy Pauli, CDFW
Bat Survey	August and September 2012	Chris Otahal, BLM Wendy Campbell, CDFW
Avian Point Counts	Spring and Fall 2009	Chris Otahal, BLM

This plan was reviewed by the BLM and CDFW; the respective comments are incorporated.

2 BASELINE CONDITIONS: SITE CHARACTERIZATION AND FIELD STUDIES

2.1 OBJECTIVES

The baseline conditions of the project site are described here to define the key factors necessary for understanding impacts to birds and bats and for planning appropriate avoidance and minimization measures. The key factors are:

- Avian and bat species that may occur at the project site
- Times at which certain avian and bat species may occur at the project site (e.g., during nesting, foraging, and migration)
- Nesting golden eagles near the project site
- Other nesting raptors near the project site

2.2 METHODS

2.2.1 Habitat Assessment

Literature Review and Database Queries

Literature was reviewed and databases were queried to identify recorded and potential occurrences of bird and bat species in and near the project area. Queries and reviews included:

- USFWS Critical Habitat Portal to determine if critical habitat for federally listed species is present in the project vicinity
- Geographic information system review of the California Natural Diversity Database (CNDDB) (occurrences within 5 miles of project area for birds and bats)
- Geographic information system review of the Biogeographic Information and Observation System (BIOS) maintained by the CDFW (occurrences within 10 miles of project area)
- Desert Studies Center bird observation list
- Previous bat surveys and 35 years of research at the Desert Studies Center conducted by Dr. Patricia Brown

2.2.2 Surveys

Avian point count, golden eagle, burrowing owl and bat surveys were conducted for the proposed project. Surveys were also conducted to characterize the vegetation communities and habitat on the project site.

Avian Point Counts

Avian point counts were conducted in the spring (April 23 through May 14) and fall (September 30 through October 29) of 2009 by URS (URS 2010). Field survey methods were derived and adapted from the BLM Solar Facility Point Count Protocol (2009) and Managing and Monitoring Birds Using Point Counts (Ralph et al. 1995). Survey methods were approved by the Barstow BLM Field Office (Otahal 2009) prior to initiation of field surveys.

Each point was surveyed by a qualified biologist over four consecutive weeks during the spring (breeding season) and the fall (wintering season). These studies occurred during the migration period for the majority of migratory avian species that are likely to occur in the area (refer to Appendix A). Eighty point count locations were established for the fall and spring surveys (Figure 2.2-1). Point count locations were identified to provide representative spacing throughout the project area (one point count transect per square mile with eight point counts per transect). Point count locations were marked and numbered in the field. Each point count survey started at sunrise and continued during the morning hours. During the survey, every point was visited for a 10-minute observation period and data were collected on all avian species observed within a 100-meter radius. The presence of avian species was based on elements such as direct observation, vocalization, or avian sign (e.g., nests, pellets, and whitewash). Avian taxonomy followed The Sibley Guide to Birds (Sibley 2000).

Golden Eagle Surveys

Soda Mountain Solar

BRC conducted aerial surveys for golden eagle on March 21 and 22, 2011, and May 9, 2011, and ground surveys between March 23 and 25, 2011 (BRC 2011). Golden eagle surveys were conducted in conformance with guidelines provided in the Interim Golden Eagle Inventory and Monitoring Protocols; and other Recommendations (Pagel et al. 2010). Aerial surveys included two to four passes performed at slow speeds at cliffs that had large nests, copious whitewash, or that were suspected of having nests. Multiple passes were made to allow closer observation.

Nest conditions including presence of nestlings and adult birds were documented where golden eagles were observed (BRC 2011). Survey routes are shown on Figure 2.2-2.

BLM

BLM conducted a desert-wide survey for golden eagles via helicopter in 2012 to cover the area within a 10-mile radius of the project area. The survey results were provided by BLM (LaPre 2013).

Burrowing Owl

Incidental burrowing owl sightings were recorded during fall botanical surveys and desert tortoise surveys in 2012 (CSESA 2012; Kiva Biological 2012). Burrowing owl surveys are being conducted by Kiva Biological Consulting. Survey methods followed the Consortium Guidelines (BOC 1993) and biologist qualifications were submitted to and approved by CDFW prior to conducting surveys.

Figure 2.2-1: Avian Point Count Locations

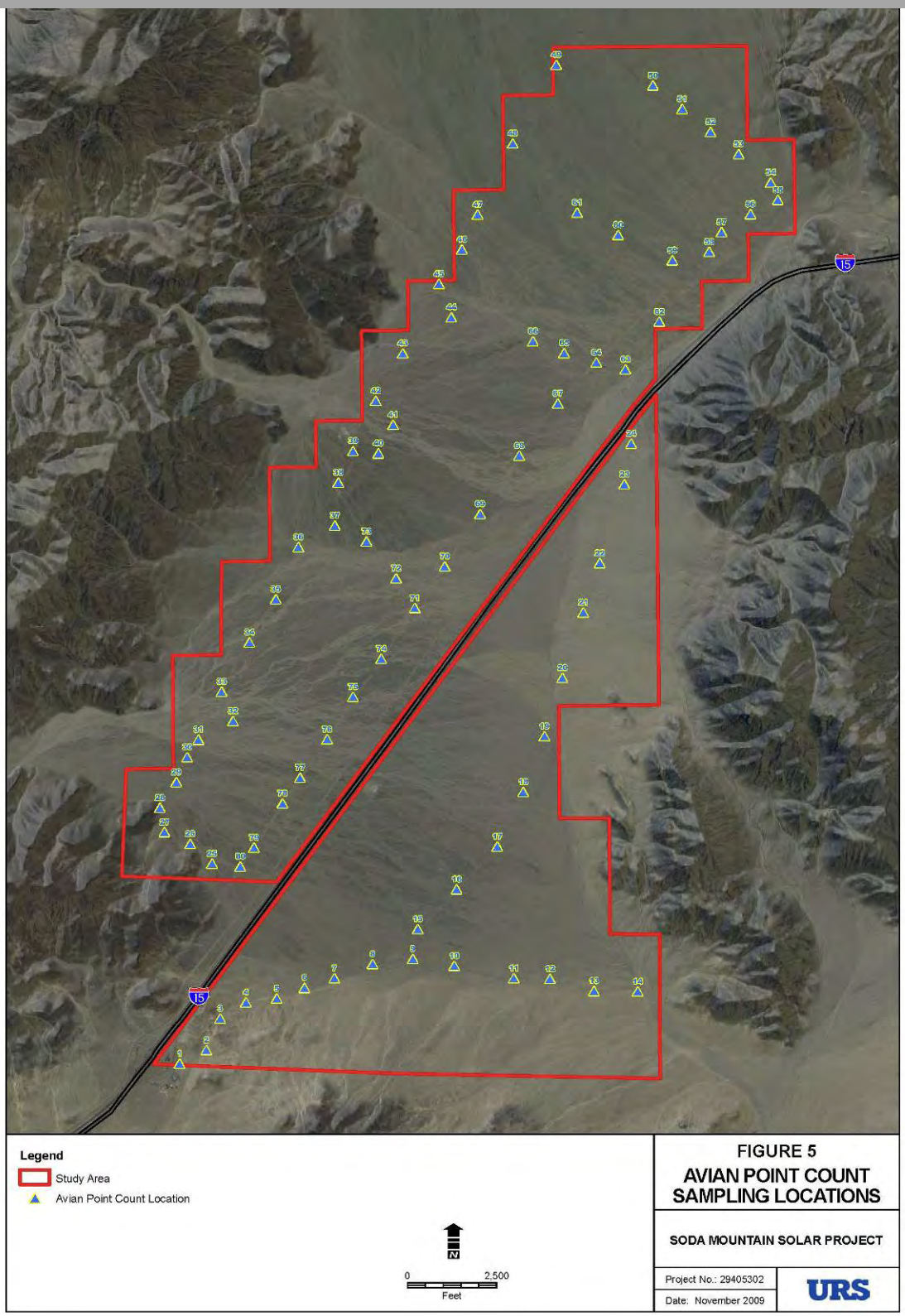
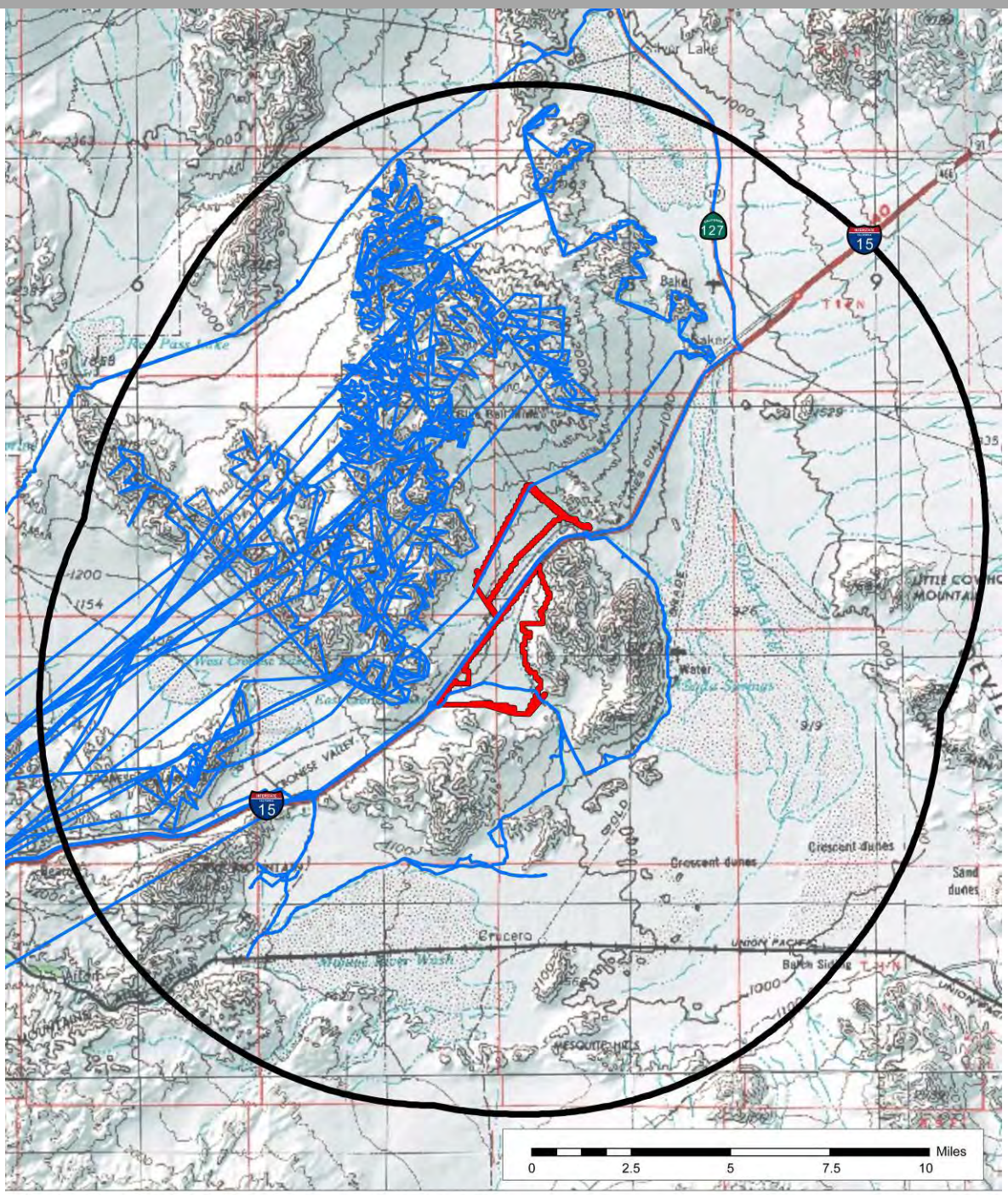


Figure 2.2-2: Golden Eagle Survey Route



SOURCE: ESRI 2013, BRC 2011, and Panorama Environmental, Inc. 2013

Scale: 1:250,000

LEGEND

Proposed Project ROW

BRC Survey Routes

10 Mile Buffer

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Kiva Biological Consulting conducted a Phase II burrowing owl survey of the project site in spring 2013. Burrowing owl surveys were conducted by walking over the entire project site and within a buffer of 150 meters (approximately 500 feet) of the project ROW in accordance with the CBOC survey protocols for Phase II surveys. Phase II surveys were conducted between April 8 and May 11, 2013. During the pre-work meetings of the spring 2013 surveys, Peter Woodman stressed the importance of searching each burrow for signs of burrowing owl use.

With concurrence from California Department of Fish and Wildlife (CDFW) the Phase II burrowing owl burrow surveys were conducted in conjunction with protocol desert tortoise surveys. Transects were walked at 10 meter (33 feet) intervals throughout the entire project area (the CBOC recommends 30 meter (100 feet) transects for Phase II surveys). A 150-meter (500 feet) wide buffer was surveyed around the entire right-of-way except the west edge of the South Project Area, which was adjacent to Interstate 15 (Figure 2). All desert tortoise, canid, and badger burrows as well as all burrowing owl sign (whitewash, pellets, feathers, dead or live burrowing owls) were marked and recorded using Garmin GPS units.

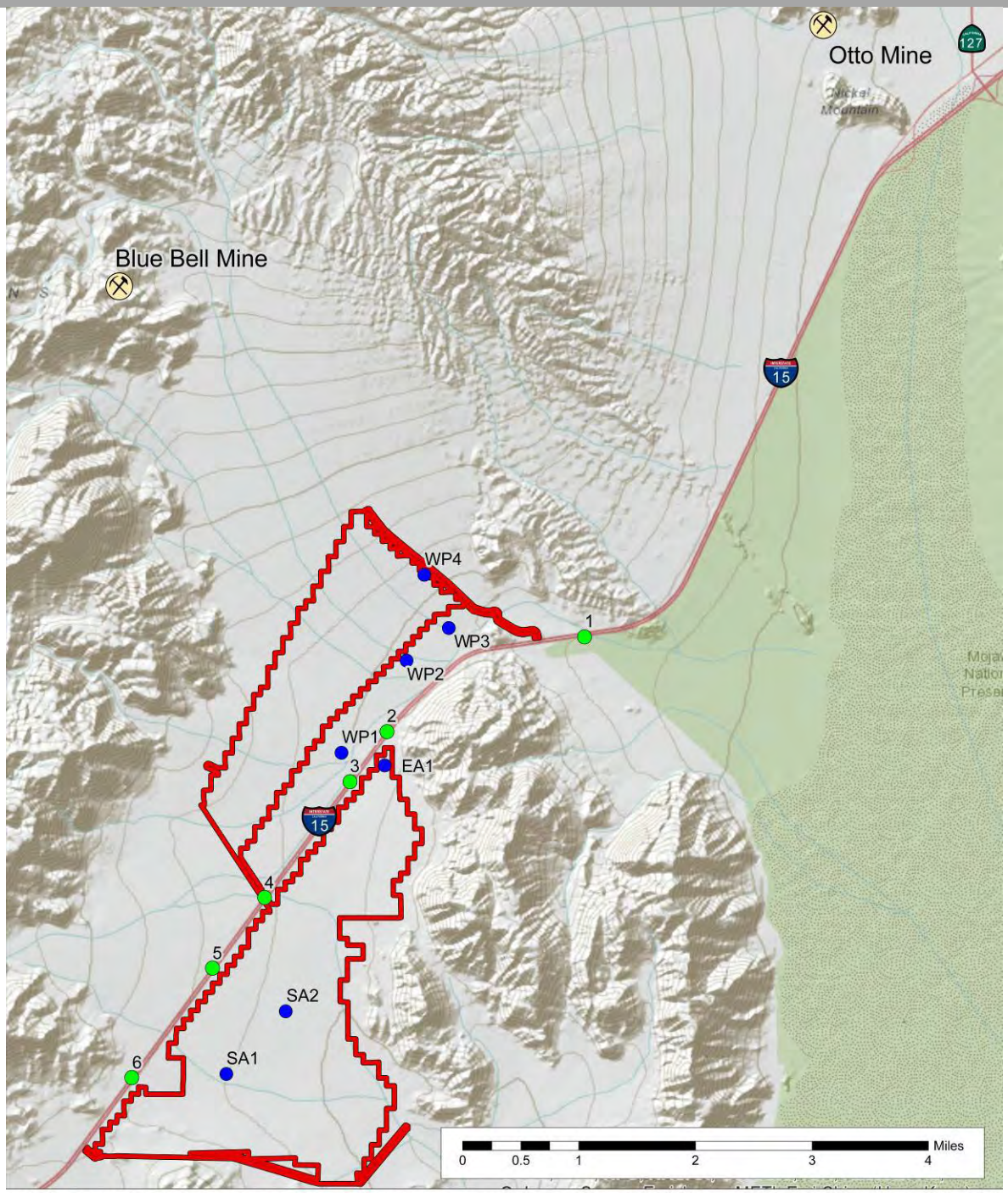
The Phase III surveys conducted by Kiva consisted of four site visits that were during the peak of the breeding season (between April 15 and July 15). Phase III surveys were conducted on April 28/29, May 21/22, June 12/13, and June 25/26, 2013. Nine to 12 hours were spent during each survey period checking all of the burrows located with burrowing owl sign during the 100% coverage protocol desert tortoise/burrowing owl as well as 30 to 40 additional tortoise, canid, or badger burrows, and walking throughout the site. Surveys were conducted between one hour before and two hours after sunrise and two hours before and one hour after sunset. A minimum of three hours was spent during the nights of the last three site visits. No tapes were played but the observer listened for calling owls for a minimum of one to two hours in each of the North and South Project Areas. Observations were conducted from multiple fixed points to provide visual coverage of the site using spotting scopes and binoculars. Surveys were conducted during weather that was conducive to observing owls outside their burrows. There was no heavy rain, high winds (> 20 mph), or dense fog during surveys.

This methodology for the survey protocol was approved by Wendy Campbell in an email to Peter Woodman dated June 3, 2013. The approach was approved based on the qualifications of the surveyors, the 10 m survey interval (instead of the 30 m protocol required), and other factors.

Bat Surveys

Bat surveys were conducted in 2012 by Brown-Berry Biological Consulting using acoustic monitoring and roost surveys (Brown-Berry Biological Consulting 2012). Survey methods and biologist qualifications were submitted to and approved by BLM and CDFW prior to conducting surveys. Acoustic monitoring was conducted to identify bat species using the project area and sample seasonal bat activity levels. Acoustic surveys included monitoring at up to seven locations between August 31 and September 4, 2012 (Figure 2.2-3). Six locations (three in the western portion of the project area and three in the eastern portion of the project area) were monitored acoustically for 3 or 4 nights. A seventh location, WP3, was monitored for the first night and then relocated to WP4 (Figure 2.2-3).

Figure 2.2-3: Avian Point Count Locations



SOURCE: ESRI 2013, Dr. Patricia Brown 2012, USGS 2012, and Panorama Environmental, Inc. 2013

Scale: 1:85,000

LEGEND

Proposed Project ROW

SA2 Bat Detector

5 Culvert

Mine

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Roost surveys were conducted at the Blue Bell Mine complex (approximately 3 miles north of the project site) and at culverts, overpasses, and bridges along I-15 between Rasor Road and Zzyzx Road. Roost surveys were conducted during the day and at night. Occupied mines were monitored at dusk to obtain exit counts (Brown-Berry Biological Consulting 2012).

General Vegetation
Vegetation communities were mapped by CSESA in fall 2012 (CSESA 2012) at the alliance level using the keys and descriptions provided in A Manual of California Vegetation (Sawyer et al. 2009). Vegetation communities were remapped in spring 2013 (CSESA 2013) to include all areas within the proposed ROW. Survey methods and biologist qualifications were submitted to and approved by BLM and CDFW prior to conducting surveys.

Incidental Observations
Incidental observations of bird and bat species were recorded during protocol-level surveys for other species. Burrowing owl sightings were recorded during fall botanical surveys and desert tortoise surveys in 2012 (CSESA 2012; Kiva Biological 2012).

2.2.3 Habitat Suitability Criteria

The following criteria were used to determine the potential for bird and bat species to occur within the project area:

- ***Present:*** The species was observed in the project area, either anecdotally or during field surveys.
- ***High Potential:*** High habitat quality combined with local CNDDB occurrences or other records indicate the species is likely to occur on the project site. Individuals were not observed in the project area during field surveys; however, the species would likely occur in the project area.
- ***Moderate Potential:*** CNDDB occurrences or surveys have recorded the species within 10 miles of the project area and suitable habitat is present. The species could be present.
- ***Low Potential:*** Marginally suitable habitat may occur in the project area, but individuals were not observed during surveys and are not anticipated to be present.
- ***Absent:*** Species, sign, or suitable habitat were not observed on the site during protocol surveys and suitable habitat is not present.

2.3 RESULTS

2.3.1 Habitat

No special land use or habitat designations were found during the queries for critical habitat. There are no Areas of Critical Environmental Concern in the project area (Figure 1.1-1).

Vegetation alliances within the project area include:

- Creosote bush-white bursage scrub

- Cheesebush scrub
- Creosote bush
- White bursage scrub

Two cover types (disturbed and developed ground) were also observed within the SMS survey area in 2012 (CSESA 2012).

2.3.2 Birds

Appendix A contains the results of the literature review and survey results for common bird species with a determination of their potential to occur in the project area and the type of habitat may exist in the project area for each species. Birds observed in the project area are representative of the Mojave Desert. Please refer to the project's Biological Resources Technical Report (Panorama 2013) for a full discussion of habitat by species.

2.3.3 Special Status Bird Species

Eleven special-status bird species were evaluated for their potential to occur in the area (Table 2.3-1). Three of these species, golden eagle, burrowing owl, and loggerhead shrike, were observed during project surveys; golden eagle was identified 7.75 miles south of the project area. These special-status species are discussed in further detail below.

Golden Eagle

Habitat Requirements

Golden eagles nest in large sturdy trees and on cliffs and forage widely over grasslands and scrublands for rodents and other prey. They build large nests of sticks, and nest from early mid- January to mid-September (USFWS undated). The project is located within an open valley and there is no suitable nesting habitat for golden eagles within the project area. The project area provides suitable foraging habitat and could be used by golden eagles nesting outside of the project area, as the home range of the species in southern California is estimated to be approximately 36 square miles.

Survey Results

No golden eagles have been sighted in the project area during project surveys. Biologists identified two golden eagle nests approximately 7.75 miles southwest of the project area in the Cave Mountains during March 2011 helicopter and ground surveys (BRC 2011; Figure 2.3-1). One nest was active, with a pair of eagles taking turns incubating an unknown number of eggs. A second, alternate nest was located in a larger cave with an overhanging roof, directly below the active nest. Biologists observed an additional sub-adult golden eagle interacting with the adult male, perching and soaring around the summit of Cave Mountain. During the May 10, 2011, follow-up survey, biologists determined that two golden eagle nestlings were in the active nest, and aged them to be approximately 3 weeks old.

There is anecdotal evidence of a possible golden eagle nest within the Mojave National Preserve approximately 4 miles from the project site. The nest is thought to be located upslope from the Desert Studies Center. The BLM has no record of this nest (BLM 2012).

Table 2.3-1: Special-Status Avian Species—Potential to Occur, and Documented Presence in the Project Area

Species	Status	Habitat	Potential to Occur/Habitat Presence[1]	Activity Season/ Seasonal Restrictions
Special-Status Avian Species				
Golden eagle (*Aquila chrysaetos*)	FED: BGEPA CA: FP	Hunts in open terrain mostly for lagomorphs and rodents; nests on inaccessible cliffs and in tall trees	**Nesting:** Not present in project area; suitable habitat in mountains north and south of project area **Foraging:** Moderate	Nesting: January to August Resident: Year-round
Long-eared owl (*Asio otus*)	CDFW: SSC	Nests in dense vegetation in open desert woodlands; forages over grasslands, sagebrush scrub, and desert scrub.	**Nesting:** Not present in project area; suitable nesting habitat approximately 2 miles southeast of project area **Foraging:** Low	N/A
Burrowing owl (*Athene cunicularia*)	FED: BCC CDFW: SSC BLM: S	Annual and perennial grasslands, deserts, and scrublands with low-growing vegetation (Zarn 1974); use fossorial mammal burrows and manmade structures (CBOC 1993).	**Nesting:** High. Owls observed in the project area in fall. No nesting observed during 2013 breeding season. **Foraging:** Observed	Nesting: February 1 through August 31 Migration: Winter
Yellow-breasted chat (*Icteria virens*)	CDFW: SSC	Nest in riparian habitats that have a well- developed, dense layer of shrub, typically directly adjacent to water. Forage in low and dense thicket. Chats feed on insects, spiders, wild fruits, and berries.	**Nesting:** Not present **Foraging:** Not present	N/A
Least bittern (*Ixobrychus exilis*)	CDFW: SSC	Nests in emergent wetlands. Diet consists mainly of aquatic animals. Also feeds on amphibians, small mammals, and miscellaneous invertebrates.	**Nesting:** Not present **Foraging:** Not present	N/A
Loggerhead shrike (Lanius ludovivianus)	CDFW: SSC	Establishes breeding territories in open habitats with relatively short vegetation; can be found in grasslands and scrub habitats (Yosef 1996). It eats mostly large insects, but also takes small birds, mammals, amphibians, reptiles, fish, carrion, and various other invertebrates.	**Nesting: High** **Foraging: Observed**	Nesting: February to July Resident: Year-round

Table 2.3-1 (*Continued*): Special-Status Avian Species—Potential to Occur, and Documented Presence in the Project Area

Species	Status	Habitat	Potential to Occur/Habitat Presence[1]	Activity Season/ Seasonal Restrictions
Special-Status Avian Species				
Lucy's warbler (*Oreothlypis luciae*)	CDFW: SSC	Habitat is always close to water. Nests close to water, in cavities in trees or cactus in riparian mesquite woodlands. Forages in the top of mesquite trees and at branch ends.	**Nesting:** Not present **Forage:** Low	N/A
Summer tanager (*Piranga rubra*)	CDFW: SSC	Breeds mostly in mature riparian woodland. Forage on insects as they move through the tree canopy.	**Nesting:** Not present **Forage:** Not present	N/A
Vermilion flycatcher (*Pyrocephal-us rubinus*)	CDFW: SSC	Prefers open habitat of arid scrub, savanna, and riparian woodland; typically requires surface water. Nests in native and nonnative trees.	**Nesting:** Not present **Forage:** Not present	N/A
Yellow warbler (*Setophagapete chial*)	CDFW: SSC	Typically inhabits and nests in riparian vegetation located near streams and wet meadows. Forages on insects that it gleans from foliage of trees or bushes or on short flights.	**Nesting:** Not present **Forage:** Low	Resident: Late March to early October Migration: Mid-Summer and Spring
Yellow-headed blackbird (*Xantho- cephalus xanthoceph- alus*)	CDFW: SSC	Breeds in marshes with tall riparian vegetation. Usually nests over shallow water. Foraging takes place in the breeding territory unless there is a low abundance of food, in which case it will forage in uplands.	**Nesting:** Not present **Forage:** Not present	N/A

[1] See Section 2.2.3 (above) for definitions of habitat suitability criteria

Federal: U.S. Fish and Wildlife Service (USFWS) Status (ESA)

FE: Federally listed as Endangered FT: Federally listed as Threatened BCC: Bird of Conservation Concern

Federal: Bureau of Land Management (BLM) Status

S: Sensitive

Federal: Bald and Golden Eagle Protection Act (BGEPA)State: California Department of Fish and Wildlife (CDFW) Status (CESA)

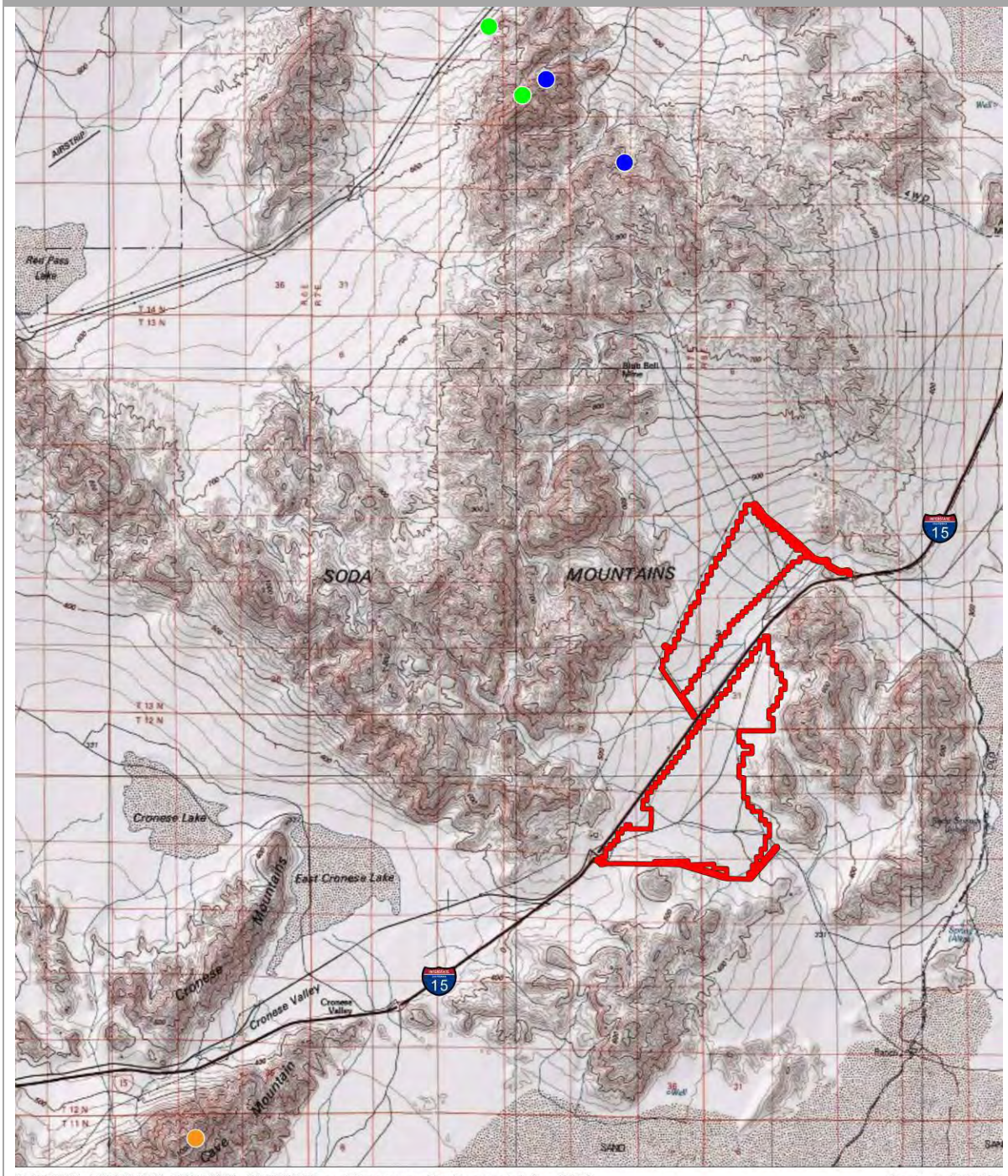
SE: State listed as endangered ST: State listed as threatened

SSC: Species of Special Concern

State: California Fish and Game Code

FP: Fully Protected

Figure 2.3-1: Golden Eagle Survey Results



SOURCE: ESRI 2012, BRC 2011, BLM 2012, and Panorama Environmental, Inc. 2012

Scale: 1:150,000

LEGEND

- Proposed Project ROW
- Active Golden Eagle Nest
- Inactive Golden Eagle Nest
- Historic Golden Eagle Nest

N

0 1 2 3 4 Miles

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Two inactive nests were also identified in the north Soda Mountains during BLM surveys in 2012. The results of the BLM survey are shown on Figure 2.3-1. The inactive nests included a large nest on a north-northwest facing slope and a dilapidated nest located in a cave. Two previously observed golden eagle nests in the north Soda Mountains were not relocated during the 2012 survey and are characterized as historical on Figure 2.3-1.

The project area provides suitable foraging habitat for golden eagle. Golden eagles in California have a home range of approximately 36 square miles. Golden eagles may forage 10 miles or more from a nest in xeric habitat. Golden eagles nesting outside the project area may therefore forage in the project area. Golden eagles may hunt jackrabbits, squirrels, woodrats, or other small animals that occur within the project area (Panorama 2013). They may also scavenge for carrion along I-15.

Burrowing Owl

Burrowing owls are listed by CDFW as a species of special concern and by BLM as a sensitive species. The burrowing owl inhabits burrows in a variety of habitats, including deserts and scrublands characterized by low-growing vegetation. Burrowing owls exhibit high site fidelity, reusing burrows year after year (CBOC 1993).

Habitat Requirements

Burrowing owl habitat can be found in annual and perennial grasslands, deserts, and scrublands characterized by low-growing vegetation (Zarn 1974). Suitable owl habitat may also include trees and shrubs if the canopy covers less than 30 percent of the ground surface.

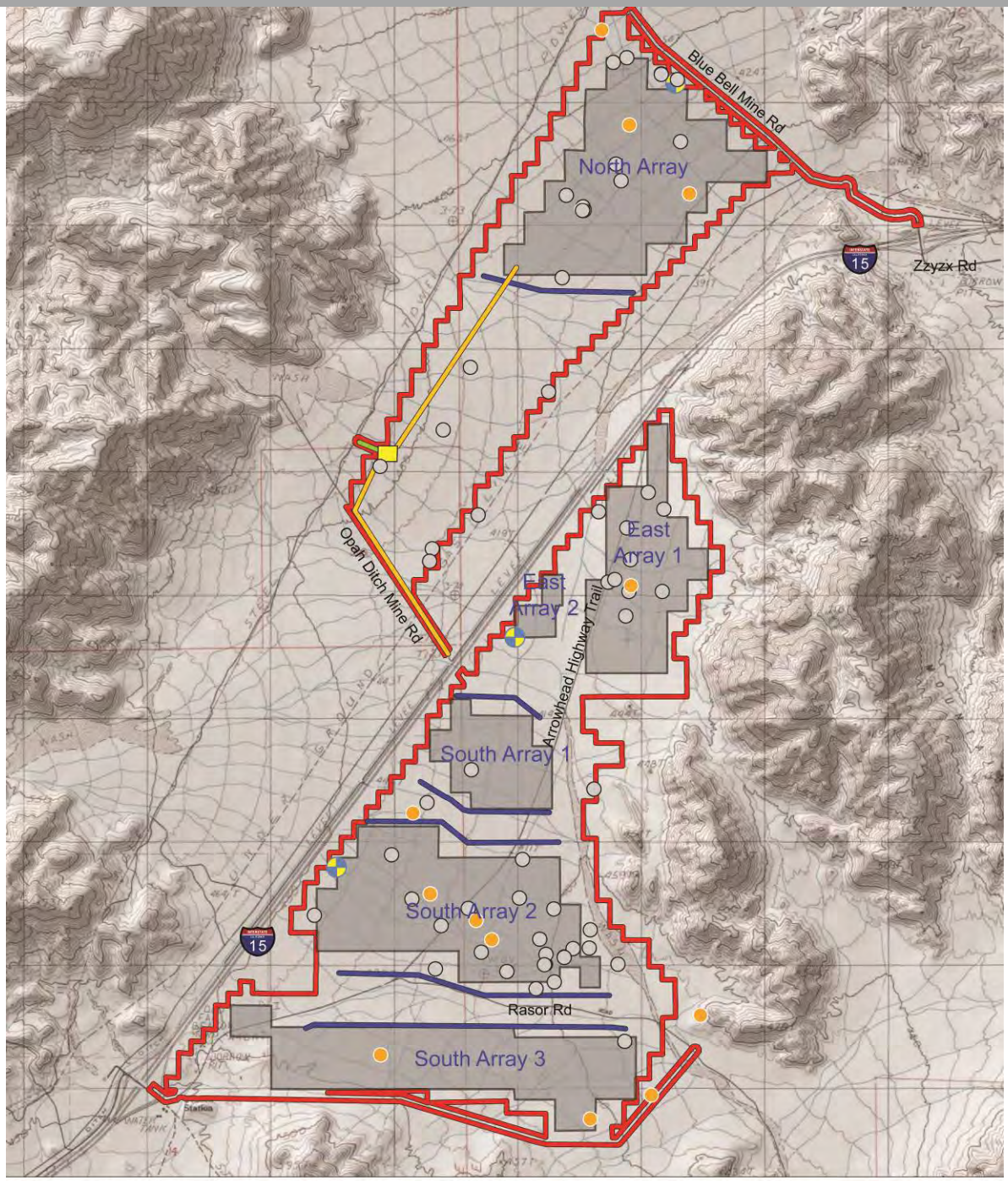
Burrows are the essential component of burrowing owl habitat: both natural and artificial burrows provide protection, shelter, and nests for burrowing owls (Henny and Blus 1981).

Burrowing owls typically use burrows made by fossorial mammals, such as ground squirrels or badgers, but also may use manmade structures, such as cement culverts; cement, asphalt, or wood debris piles; or openings beneath cement or asphalt pavement (CBOC 1993).

Survey Results

The project area provides suitable nesting, foraging, and wintering habitat for burrowing owls. Burrowing owls and burrowing owl sign, including burrows, pellets, feathers, and whitewash, were observed in multiple locations within the project ROW during fall botanical surveys and desert tortoise surveys in 2012 (Figure 2.3-2). Burrows were also mapped during Phase II burrowing owl surveys in spring 2013. Thirteen burrowing owls were observed during surveys in fall 2012(late October to early November). Twenty-four burrows with recent sign of use by burrowing owls were mapped during the botanical surveys (Panorama 2013, Figure 2.3-9). Owls were observed using 8 of the 24 active burrows; 1 additional owl was also observed in the project ROW. Many of the burrowing owls were observed foraging on grasshoppers, which were abundant during fall 2012 surveys (Schnurrenberger 2012). Burrowing owls observed during fall migration may move on to other over-wintering or nesting habitat (Schnurrenberger 2012). It is likely that a number of the burrowing owls observed in the fall were using the project area for forage during migration.

Figure 2.3-2: Fall Burrowing Owl Survey Results



SOURCE: ESRI 2012, C.S. Ecological Surveys and Assessmnets 2012 and 2013, Kiva 2012, and Panorama Environmental, Inc. 2013

Scale: 1:50,000

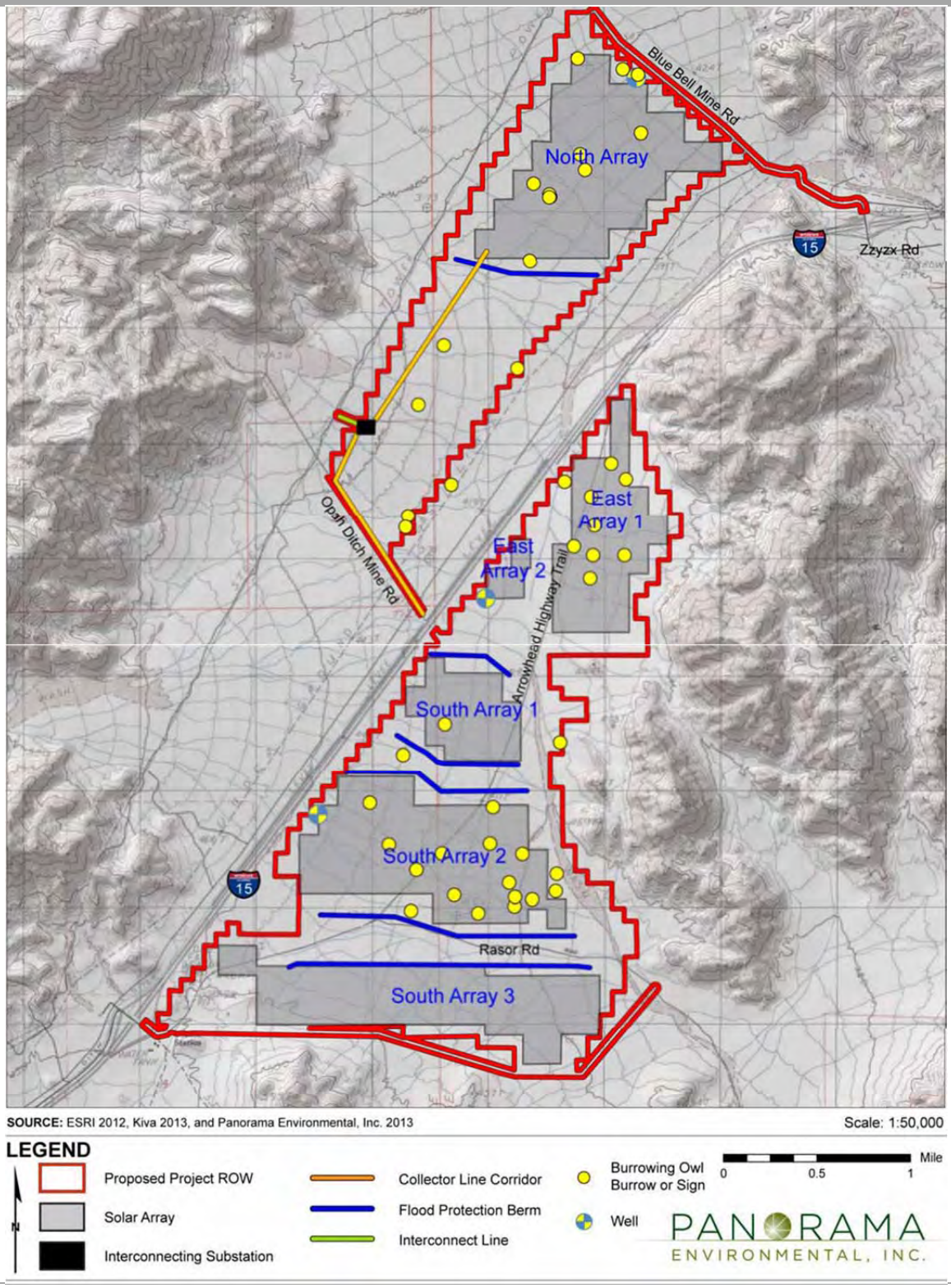
LEGEND

- Proposed Project ROW
- Solar Array
- Interconnecting Substation
- Collector Line Corridor
- Flood Protection Berm
- Interconnect Line
- Burrowing Owl
- Burrowing Owl Burrow
- Well

Mile 0 0.5 1

PANORAMA ENVIRONMENTAL, INC.

Figure 2.3-3: Spring Burrowing Owl Survey Results



Only a portion of the owls observed on the site would be expected to over-winter in the area; other owls were likely migrating (Schnurrenberger 2012).

237 burrows were recorded during the Phase II surveys in spring of 2013. Fifty burrows were observed with some type of associated owl sign. The observed sign showed some degradation; none appeared to be from spring 2013. No owl tracks were observed at any burrow. Results of the phase III 2013 breeding season surveys indicate that there were no burrowing owls on the site in spring of 2013 (Kiva 2013). Phase III surveys were conducted between mid-April and late June 2013. It is assumed, however, that burrowing owls use the site for nesting due to the presence of burrows, owls using the site in the fall, and suitable adjacent foraging habitat.

Loggerhead Shrike

Habitat Requirements

The loggerhead shrike is listed by USFWS as a bird of conservation concern and by CDFW as a species of special concern. The loggerhead shrike is distributed throughout much of California, except in higher-elevation and heavily-forested areas (Humple 2008). Loggerhead shrikes establish breeding territories in open habitats with relatively short vegetation that allows for visibility of prey; they can be found in grasslands, scrub habitats, riparian areas, other open woodlands, ruderal habitats, and developed areas including golf courses and agricultural fields (Yosef 1996). They often use structures for impaling their prey; the structures most often take the form of thorny or sharp-stemmed shrubs, or barbed wire (Humple 2008). Shrikes nest earlier than most other passerines, especially in the west where populations are resident. The breeding season can begin as early as late February and lasts through July (Yosef 1996). Nests are typically established in shrubs and low trees, such as sagebrush (Artemisia spp.), willow (Salix spp.), and mesquite.

Survey Results

Suitable nesting and foraging habitat for loggerhead shrike exists on and adjacent to the project area. Seven loggerhead shrikes were observed during spring and fall avian surveys in 2009 (URS 2010), indicating that loggerhead shrike may use the project area year-round. A wing of a logger-head shrike was identified in the project area during fall 2012 rare plant surveys, but no live birds were observed (CSESA 2012). There were no observations of loggerhead shrike during rare plant or desert tortoise surveys in spring 2013.

2.3.4 Bats

Appendix B contains the results of the literature review and focused surveys for common bats with a determination on their potential to occur in the project area.

2.3.5 Special Status Bats

Eleven special-status bat species were evaluated for their potential to occur in the area (Table 2.3- 2). None of the species have been recorded in the project area, but two of those species have been recorded nearby.

Table 2.3-2: Special Status Bat Species, Habitat Suitability, and Detection During Site Surveys

Species	Status	Habitat Suitability/Detection within Study Area
Special Status Bat Species		
Pallid bat *(Antrozous pallidus)*	BLM: S CDFW: SSC	**Roosting:** Individual roosting habitat present; maternal roosting habitat not present **Foraging:** High **Detection:** Sign recorded in Otto Mountain Mine north of Baker
Townsend's big-eared bat *(Corynorhinus townsendii)*	BLM: S CDFW: SSC	**Roosting:** Habitat not present **Foraging:** High **Detection:** Observed exiting from several mine portals outside of the project site; one observed in an adit (mine entrance) during the day.
Western mastiff bat (*Eumops perotis)*	CDFW: SSC USFWS: SC	**Roosting:** Habitat not present **Foraging:** Low **Detection:** Not detected during surveys
Pocketed free- tailed bat (*Nyctinomops femorosaccus*)	CDFW: SSC	**Roosting:** Habitat not present **Foraging:** Low **Detection:** Not detected during surveys
Spotted bat (*Euderma maculatum*)	CDFW: SSC USFWS:SC	**Roosting:** Habitat not present **Foraging:** Moderate **Detection:** Not detected during surveys
Red bat (*Lasiurus blossevillii*)	CDFW: SSC	**Roosting:** Habitat not present **Foraging:** Moderate **Detection:** Not detected during surveys
Small-footed myotis (*Myotis ciliolabrum)*	USFWS: SC	**Roosting:** Low possibility present for individuals; no maternal roosting habitat **Foraging:** Moderate **Detection:** Not detected during surveys
Long-eared myotis (*Myotis evotis*)	USFWS: SC	**Roosting:** Habitat not present **Foraging:** Moderate **Detection:** Not detected during surveys
Fringed myotis (*Myotis thysanodes*)	USFWS: SC	**Roosting:** Habitat not present **Foraging:** Moderate **Detection:** Not detected during surveys
Long-legged myotis (*Myotis volans)*	USFWS: SC	**Roosting:** Habitat not present **Foraging:** Moderate **Detection:** Not detected during surveys

Table 2.3-2 (*Continued*): Special Status Bat Species, Habitat Suitability, and Detection During Site Surveys

Species	Status	Habitat Suitability/Detection within Study Area
Special Status Bat Species		
Yuma myotis (*Myotis yumaensis*)	USFWS: SC	**Roosting:** Habitat not present **Foraging:** Moderate **Detection:** Not detected during surveys
Notes: BLM:S = BLM Sensitive CDFW:SSC = CDFW Species of Special Concern USFWS:SC = USFWS Species of Concern		

Source: Brown-Berry Consulting 2012; Keller 2000

Pallid Bat

Habitat Requirements

Pallid bats select roosts on the basis of temperature and proximity to foraging habitat. Pallid bats roost in crevices in granite boulders, between rocks in loosely cemented conglomerate, mud solution tubes, historic buildings, mines, and burrows (Brown-Berry Biological Consulting 2012). The bats often spend the day in rock crevices and congregate for socialization at night (Lewis 1994), often in boulder caves and mines. Pallid bats have been documented traveling up to 5 miles for forage (Brown pers. comm. 2012).

Survey Results

Suitable roosting habitat occurs 3 miles outside of the project area at Blue Bell Mine and in rock crevices in nearby mountains. Individual pallid bats may also be able to use burrows within the creosote scrub habitat for roosting in the project area. Pallid bat guano and insect prey remains were discovered in three tunnels of the Otto Mountain Mine (or Aga Prospect Mine) north of Baker, within 10 miles of the project area (Brown-Berry Biological Consulting 2012). No acoustic signals of pallid bats were detected during surveys of the project area in 2012 (Brown-Berry Biological Consulting 2012). It is difficult to estimate the relative abundance of this species in the project area vicinity by acoustic methods (Brown-Berry Biological Consulting 2012). It is therefore assumed that pallid bats observed at Otto Mountain Mine may use the project area for foraging because:

- The project area provides suitable foraging habitat for pallid bat
- Pallid bats have been documented traveling up to 5 miles for forage (Brown pers. comm. 2012)
- The area is 6 miles from Otto Mountain Mine, which is just beyond the documented travel distance for forage

Townsend's Big-eared Bat

Habitat Requirements

Population concentrations occur in areas with substantial surface exposures of cavity-forming rock (e.g., limestone, sandstone, gypsum, or volcanic rock) and in old mining districts (Genter 1986;

Graham 1966; Perkins et al. 1994; Perkins and Levesque 1987). Townsend's big-eared bats have been documented traveling up to 5 miles for forage (Brown pers. comm. 2012).

Survey Results

Townsend's big-eared bats were not detected during acoustic surveys of the project area.

Townsend's big-eared bats and/or their guano were observed approximately 3 miles northwest of the project area in several of the Blue Bell Mine features and 6 miles northeast of the project area in the Otto Mountain Mine in 2012 (Brown-Berry Biological Consulting 2012). Acoustic studies are not a good method to determine the presence of this species because the bats often emit faint calls, usually detectable only within 10 feet. While no bats were observed, it is assumed that bats roosting in the Blue Bell Mine could forage over the project area because:

1. The project area provides suitable foraging habitat for Townsend's big-eared bat
2. Townsend's big-eared bats are known to travel up to 5 miles for forage (Brown-Berry Biological Consulting 2012)
3. The area is within the foraging range of bats at Blue Bell Mine and Otto Mountain Mine

Suitable roosting habitat is not present within the project area, as there is no cave-like roosting habitat.

3 RISK ASSESSMENT

3.1 OVERVIEW

Potential impacts to bird and bat species could occur without the implementation of avoidance and minimization measures incorporated into the project. Based on the results of the site- specific surveys, combined with additional regional surveys and information, the project has the potential to cause the impacts identified in Table 3.1-1.

Impacts to birds and bats are summarized in this plan and are described in the Environmental Impact Statement/Environmental Impact Report (EIR/EIS) prepared for the proposed project by the BLM and San Bernardino County.

Table 3.1-1: Overview of Potential Impacts to Bird and Bat Species

Impact	Species
Birds	
Loss of foraging habitat (up to 2,557 acres) for nesting, resident, and migrant species	Common species, golden eagle, burrowing owl, loggerhead shrike
Injury and mortality	Common species, loggerhead shrike, burrowing owl
Loss of nesting habitat, nest disturbance	Burrowing owl and common species
Habitat fragmentation	Common resident species
Displacement and behavioral changes	Common species, burrowing owl, loggerhead shrike
Bats	
Loss of foraging habitat (up to 2,557 acres)	Common species, Townsend's big-eared bat, pallid bat
Mortality	Common species, Townsend's big-eared bat, pallid bat
Loss of individual roosting habitat	Canyon bat, pallid bat

3.2 AVIAN SPECIES

3.2.1 Construction

Injury and Mortality

General Avian Species and Loggerhead Shrike

Most adult birds using the project site for foraging (including migrating species) and nesting would be displaced from the area during initial vegetation clearance and grading activities. Birds displaced from the site could face an increased risk of predation. Birds can also become trapped in open pipes and cavities of construction materials and equipment.

Bird nests, including eggs or nestling birds, could be destroyed during ground excavation, grading, and vegetation clearing.

It is likely that some birds would nest in the project area during construction, even after initial grading and vegetation clearing. Bird species most likely to nest in the project area during construction are common ravens, house finches, and mourning doves, all of which are protected by the MBTA and Fish and Game Code Sections 3503 and 3513.

The potential use of evaporation ponds during construction (if treatment of groundwater is required) could result in adverse impacts to avian species. It is unknown what constituents are contained in the groundwater and what their concentrations are. Substances are likely to include chloride, sodium, sulfate, potassium, selenium, and phosphates. As water evaporates, the concentration of these constituents would increase in the evaporation pond until the accumulated sludge is removed. Birds would be able to access these evaporation ponds, even though the ponds would be fenced. Ingestion of water with selenium can lead to bioaccumulation of selenium. Selenium can result in birth defects. Ingestion of high amounts of sodium can result in salt toxicosis and feather encrustation. Adverse effects of salt toxicosis and feather encrustation include organ failure, drowning, hypothermia, and neurological damage (BLM 2011).

Burrowing Owl

Burrowing owls are unlikely to flee the site during construction due to their characteristic behavior of taking cover in burrows. Potential impacts to burrowing owls would be similar tothose described for nesting birds, but construction activities could destroy occupied burrows, cause entombment, or cause the owls to abandon burrows during any season. Construction during the breeding season could cause nest abandonment or the incidental loss of fertile eggs or nestlings.

Burrowing owls may also be adversely affected by ingesting brine, as discussed for general avian species and loggerhead shrike.

The measures specified in Section 4 are intended to avoid these impacts. Performance of pre-construction surveys to evaluate the presence of owls at all times of year would be recommended. Pre-construction surveys would follow the Burrowing Owl Consortium Guidelines (CBOC 1993). Passive relocation may be used for active burrows present in work areas outside of the breeding season. Passive relocation would be conducted according to the Burrowing Owl Consortium Guidelines (CBOC 1993).

Habitat Loss

Nesting Habitat

Construction activities would result in the loss of nesting habitat for a limited number of species that could nest in the project area (e.g., burrowing owl, horned lark) due to earth-moving activities, vegetation removal, and disturbance from human activity. Displaced birds could experience increased competition with other populations for nesting habitat elsewhere.

Foraging Habitat

Vegetation removal and general disturbance during construction would result in the loss of foraging habitat for some nesting, resident, and migrating avian species, including special status species (e.g.,

golden eagle and burrowing owl), and many common avian species.

Habitat Fragmentation
Construction activities may disrupt dispersal and localized movements of resident, non-migratory species. Resident, non-migratory species usually travel relatively short-distances. Some populations may rely on the project area as well as the adjacent land for foraging. Depending on their behavior or anatomy, local movements may be on the ground or via short flights between shrubs in contiguous habitat. The loss of vegetation cover as a result of the project may not present an absolute barrier to movement, but it would likely alter movement patterns throughout the area for resident shrubland species, especially those species that favor contiguous shrub cover. These species would likely disperse around, but not across, the project site.

Construction activities would likely have less of an effect on wide-ranging bird species, as avian species could merely bypass the project area during migration. Examples of these birds include raptors, common raven, and long-distance migratory passerines.

Displacement and Behavioral Changes
Species other than Golden Eagle
Noise from heavy construction equipment could cause birds to abandon nests and seek food or cover in new, unfamiliar areas. Resources be may found within a territory of the same or similar species, resulting in competition for resources. Construction noise could also interfere with mating calls during the breeding season and may lead to a decrease in reproduction.

Golden Eagle
A golden eagle nest was observed 7.75 miles from the project site during project surveys. There is an anecdotal report of a possible golden eagle nest within the Mojave National Preserve approximately 4 miles from the project site (Fulton 2012), although this nest was not identified in the 2012 BLM golden eagle survey. Noise, night lighting, and visual impacts during project construction would not impact golden eagle nesting behavior due to the distance between the project and the nests and because the nests would not have a direct line of site to the project area.

The entire project area provides suitable foraging habitat for golden eagles. Reduced foraging habitat availability could trigger eagles to span a larger area in search of prey. Additionally, construction activities may reduce prey availability.

3.2.2 Operation

Injury and Mortality
Much of the project area will be covered by PV panels during operation. Birds may collide with the panels due to reflected light and images which can result in birds mistaking panels for water or open skies. Birds may collide with other aboveground infrastructure, such as the substation or the short line connecting the substation to the transmission line, resulting in electrocution. SMS will construct all project infrastructure according to the most recent APLIC guidelines, as feasible and applicable, to minimize the risk of avian collision. There would be no gen-tie line associated with the project. All distribution lines will be underground.

The use of evaporation ponds during operation could result in the same impacts to birds as discussed for construction.

Habitat Loss and Degradation
Following construction, the remaining vegetation and habitat within the project area would be unsuitable for many special-status species due to their highly specific habitat requirements. Post-construction habitat conditions may be suitable for foraging (including during migration) and nesting by common species, such as house finches and the common raven. The habitat loss would last throughout project operation and maintenance.

Habitat Fragmentation
Impacts related to habitat fragmentation would be similar to those during construction.

3.2.3 Decommissioning

Decommissioning of the facility would require equipment similar to that needed for construction. Birds may abandon nests built within facility structures. Impacts to birds are expected to be similar to those experienced during construction.

3.3 BAT SPECIES

3.3.1 Construction

Roosting Habitat
Project construction would remove potential roosting habitat for pallid bats, small-footed myotis, and canyon bats, as these bats could roost in burrows within creosote bush scrub. Construction-related dust, noise, or vibrations could disturb bats and drive them from underground roosts. Project construction would not disturb bat species roosting in crevices, mine shafts, or man-made structures because no such structures exist in, or in close proximity to, the project area.

Foraging Habitat
Construction would result in destruction of some foraging habitat because of the removal and trimming of vegetation. This would reduce the availability of insects in the project area and thereby reduce the forage quality for bats. Disturbance from construction activities may also deter bats from the project area at night when foraging. This impact would likely be limited because construction activities at night would be infrequent.

Direct Mortality
Ground excavation and soil removal has the potential to displace or kill bats roosting in burrows clustered around creosote bush roots. Night lighting, if used during construction, could attract insects to the project site and thus attract bats toward construction, which may subject bats to injury or mortality.

Bats may ingest water from brine ponds, as discussed above for birds. The effects of selenium ingestion on bats are not known, but there is potential that it can bioaccumulate (BLM 2011).

3.3.2 Operation and Maintenance

Roosting Habitat

Vegetation would be trimmed occasionally and would not be removed. This maintenance would not affect bats that roost underground (canyon bat, pallid bat). Pallid bat, Mexican free- tailed bat, and California myotis may use project structures such as the operation and maintenance building as roosting habitat during the operation phase of the project.

Foraging Habitat

Foraging habitat would experience no additional impacts beyond those occurring during construction, as additional vegetation would not be removed during operation and maintenance. The brine ponds may attract nocturnal insects, which could result in more forage for bats. Night lighting from the buildings and from infrequent night maintenance operations may also attract insects and could present increased forage in the project area.

Direct Mortality

Direct bat mortality during operation and maintenance as a result of active operations is unlikely because of the low intensity of activities that would occur during operation and maintenance. Bats are attracted to relatively flat surfaces that have the same reflectivity of sonar signals as water (Greif and Siemers 2010). Bats could possibly attempt to "dip" on solar panels, mistaking them for reflective water surfaces, and may injure themselves in the process. Bats may also collide with the substation interconnect line. There would be no gen-tie line associated with the project.

Bats may ingest water from brine ponds, as discussed above for birds, resulting in the same impacts to bats as discussed for construction.

3.3.3 Decommissioning

Roosting Habitat

Decommissioning of the project would affect areas that were disturbed during project construction. Some bat species could establish roosts in solar panel racks, operations buildings, or other facilities. The roosts would be displaced during decommissioning. Land around the project site may be disturbed by dust, noise, or vibrations and impacts would be similar to those during construction, including removal of burrows around creosote bushes that may be used for roosting habitat by the canyon bat or pallid bat. Roosts in mines and other crevices would not be disturbed because they are too far from the project site.

Foraging Habitat

Removal of night lighting might cause a decrease in forage compared to operation and maintenance lighting levels. However, forage would overall increase, as removal of the solar panels would increase the area of forage accessible to bat species.

Direct Mortality

Direct mortality of bats roosting underground (pallid bats, canyon bats) may result from

recontouring the ground to resemble the original site topography. Night lighting, if used during decommissioning, could attract insects to the project site and thus attract bats toward decommissioning activities, which may subject bats to injury or mortality.

3.4 CUMULATIVE IMPACTS

3.4.1 Birds

Common Avian Species and Loggerhead Shrike

Some common avian species migrate across long distances, while others are residents in the project vicinity. Loggerhead shrikes use the area for foraging. The project would contribute cumulatively to impacts on populations of common avian species and loggerhead shrike. The project would contribute an incremental amount (approximately 2,300 acres) to cumulative foraging (including foraging during migration) and nesting habitat loss and habitat fragmentation because current habitat areas would be occupied by project components. The project could also incrementally contribute to avian species mortality.

Golden Eagle

The proposed project would contribute to the overall reduction in available foraging habitat for golden eagle (approximately 2,300 acres), but it would not contribute to a cumulative impact on available nesting habitat.

Burrowing Owl

The proposed project would contribute to the cumulative loss of foraging, potential overwintering habitat, and potential nesting habitat for burrowing owl of approximately 2,300 acres. Only foraging has been confirmed on-site, but nesting and overwintering may occur.

Protocol-level surveys are ongoing, the results will be used to update this BBCS as necessary.

3.4.2 Bats

Common Bats

The project would contribute to an incremental loss of approximately 2,300 acres of foraging habitat for several common species of bats. It would also result in the cumulative loss of individual foraging habitat for canyon bat a common bat species.

Special-Status Bats

The project would contribute to an incremental loss of approximately 2,300 acres of foraging habitat for the pallid bat and Townsend's big-eared bat. It would also result in the cumulative loss of individual roosting habitat for the pallid bat and small footed myotis.

4 AVOIDANCE AND MINIMIZATION OF RISK

4.1 INTRODUCTION

Section 4 describes avoidance and minimization measures that would be implemented to reduce these potential threats to bird and bat species. With the incorporation of avoidance and minimization measures, the project is not expected to cause prohibited take of any species protected by the BGEPA or MBTA. Measures described in this BBCS may be amended and/or supplemented based on information contained in the EIS/EIR regarding bird and bat species impacts and mitigation measures.

4.2 PROJECT SITING

The Soda Mountain Solar project site location is well situated to avoid and minimize impacts to bird and bat species according to the characteristics considered in Tier 1 and 2 analyses under the WEG. The project design also takes into account siting considerations outlined in the *Interim Guidelines*. Table 4.2-1 outlines project site characteristics that allow for avoidance or minimization of risks to birds and bats as defined in the WEG and *Interim Guidelines*.

4.3 FACILITY DESIGN

The *Interim Guidelines* recommends incorporating several measures into project design to reduce impacts to birds from solar projects. The design recommendations of the *Interim Guidelines* are compared to the project design features in Table 4.3-1.

4.4 BEST MANAGEMENT PRACTICES AND ADVANCED CONSERVATION PRACTICES

Several Best Management Practices (BMPs) from *the WEG and Eagle Conservation Plan Guidance* would be implemented on the project. Some BMPs have been modified to fit the project. Those measures pertaining only to wind projects or that are otherwise not applicable are not included in this Plan. The following conservation methods will be implemented prior to construction, during construction, during operation and maintenance of the facility, and during decommissioning of the project, to reduce potentially significant and adverse impacts to birds and bats. Conservation measures may be superseded by mitigation requirements once the Final EIS is adopted.

Table 4.2-1: Project Site Characteristics for Risk Avoidance

Risk Characteristic	Site Risk Avoidance Description
Macrositing	
Locations with federally or state listed, or otherwise designated sensitive species, and areas managed for the conservation of listed species (such as designated critical habitat)	The project area is not located in any of the following areas managed for conservation of listed species or protection of birds: • Critical habitat unit • Area of Critical Environmental Concern • Important Bird Area • Western Hemisphere Shorebird Reserve Network • Convention on Wetlands of International Importance designated area The number of sensitive avian and bat species that could occur on the project site is low, as discussed in Sections 2.3.2 and 2.3.3. Three special status bird species have moderate or high potential to occur on the project site; two of these species were observed during avian point count surveys and the Fall Botanical Survey in 2012. Two special status bat species were detected in the vicinity of the project site during surveys, but were not detected on site. The site therefore has a low concentration of listed or otherwise sensitive avian and bat species.
Areas frequently used for daily bird and bat movements (i.e., areas between roosting and feeding sites)	The project area was sited to avoid wash vegetation communities, wetlands, and areas with higher feeding or roosting potential. Areas that provide higher quality foraging habitat for birds and bats would be avoided by project components. Upper alluvial fan areas outside of the project site support greater vegetative diversity and would not contain project components. The survey results indicate that the area is not used by a large number of birds and bats for daily movements.
Breeding and wintering eagle use areas	The project is not located in a breeding or wintering eagle use area. Valley floor areas where the project would be located do not provide wintering or breeding habitat for eagles but may provide foraging habitat for golden eagles and other raptor species.
Known migration flyways for birds and bats	The project area is in the Pacific Flyway. No local migration pathways are suspected to occur in the project area because of low avian species diversity and abundance in the area during spring and fall migration periods. Avian species abundance is higher in the spring than in the fall (629 birds documented in the spring and 210 documented in the fall); however this seasonal variation is common throughout the Mojave Desert. There are currently no features that would attract birds to the project area, such as water bodies or riparian habitat. Nesting of common bird species and burrowing by burrowing owls takes place in the project area.

Table 4.2-1 (*Continued*): Project Site Characteristics for Risk Avoidance

Risk Characteristic	Site Risk Avoidance Description
Micrositing	
Areas near known bat hibernacula, breeding, and maternity/nursery colonies	There are no hibernacula, breeding, or maternity colonies in the project area. Bats are known to roost in the Blue Bell Mine and Otto Mountain Mine. However, these mines are approximately 3 miles northwest and 6 miles northeast, respectively, from the project site and the project activities would not affect roosting.
Fragmentation of large, contiguous tracts of wildlife habitat (see Canadian Wildlife Service 2006a and 2006b)	The solar array fence plan leaves open corridors for wildlife to move between the arrays. The arrays would not take up the entire valley and the habitat of the region would not be fragmented as a result of the project. The project may contribute incrementally to cumulative habitat fragmentation as a result of renewable energy projects within the desert.
Avoid features that attract raptors (areas supporting tall perching structures including trees, utility poles, etc.)	The project would be located near existing utility poles, and would generally avoid removal or changes to those structures. One transmission line tower would be removed and the tower would be replaced with two turning structures to facilitate interconnection to the LADWP 500kV transmission line. The project would install 34.5-kV conductor underground and does not include the use of overhead lines.
Avoid features that attract migrant birds (e.g., water sources, riparian vegetation). Minimize the potential for enhancing habitats suitable for raptor prey species such as rodents that would likely attract raptors to the project site.	There are no riparian areas, wetlands, or water sources in the project area. The project would avoid a large wash containing marsh woodland vegetation. The project would use water for panel washing during operation. Brine ponds are proposed in the event that well water is not adequate for panel washing. If constructed, the brine ponds could attract migrant birds to the project site. The brine ponds would be monitored for potential fatalities and BMPs approved by BLM, CDFW, or USFWS would be applied to deter birds and bats at the direction of the Designated Biologist. Two water sources will be installed near the project to encourage bighorn sheep migration to the north of I-15 (APM 75). Water sources include a 2400-gallon covered water storage tank with a ground-level, tortoise -proof opening where the water supply is available to sheep. The Designated Biologist would monitor the water sources for potential inadvertent wildlife effects. Project construction would not create additional habitat for rodents and Best Management Practices include actively managing trash to avoid attracting rodents or ravens, installing anti-nesting on structures (as appropriate), and other measures specified in the Raven Management Plan.

Table 4.3-1: Facility Design Measures to Avoid Effects to Birds

Interim Guidelines Design Measure	Project Proposal
Tower Design: Avoid using lattice-type structures, placing external ladders and platforms on towers to minimize perching and nesting.	The project connects to an existing transmission line. The interconnect will require construction of two new transmission towers and the removal of one tower. The interconnect location will be determined in consultation with BLM. The tower would follow the most recent Avian Power Line Interaction Committee (APLIC 1994, 2006) guidelines to reduce impacts. The tower design will ultimately be determined through coordination with LADWP. Monopole design will be implemented if feasible.
Noise: Implement measures to reduce or buffer adverse noise effects associated with operation of the facility on surrounding wildlife habitat. Noise impacts to birds (Rheindt 2003, Brumm 2004, Parris and Schneider 2009) and bats (Schaub et al. 2008) have generally been found to be negative; therefore, facility design should take this fact into consideration when selecting the type of solar technology (such as photovoltaic panels vs. parabolic dish engines) to be used and the placement of the solar power plant within bird and bat habitats.	The Project utilizes photovoltaic panel technology that does not cause noise. Noise impacts during construction would include noise generated from the operation of construction equipment and construction vehicles. The O&M phase of the Project would have limited or no noise from the solar array fields.
Guy Wires for Meteorological Towers: Avoid the use of guy wires for all meteorological towers and do not light them unless the Federal Aviation Administration (FAA) requires them to be lit, which is generally >60 meters (>199 ft) AGL in height. Any necessary guy wires should be marked with recommended bird deterrent devices (APLIC 1994, USFWS 2000).	The project does not involve the use of meteorological towers or guy wires.
Aviation Lighting: If structures (>60 meters [>199 ft] AGL) require lights for aviation safety, the minimum amount of pilot warning and obstruction avoidance lighting specified by the FAA should be used (FAA 2007). All lights within the facility should illuminate synchronously. Lighting of the boundary of the facility is most important as an aviation safety warning. Unless otherwise requested by the FAA, use only the minimum number of strobed, strobe-like or blinking red incandescent lights of minimum intensity. No steady burning lights should be used on facility infrastructures (Gehring et al. 2009).	The project does not include structures taller than 60 meters.
Facility Lighting: Facility lights should be focused downward to reduce skyward illumination. Lights should be equipped with motion detectors to reduce continuous illumination.	Lights would be focused downward and equipped with motion detectors.

Table 4.3-1 (*Continued*): Facility Design Measures to Avoid Effects to Birds

Interim Guidelines Design Measure	Project Proposal
Transmission and Collector Lines: Where feasible, place electric power lines underground or on the surface as insulated, shielded wire to avoid electrocution of birds. Use recommendations of the Avian Power Line Interaction Committee (APLIC 1994, 2006) for any required above-ground lines, transformers, or conductors. When transmission lines must be above-ground, avoid placing lines within wetlands and over canyons.	The 34.5 kV collector lines will be placed underground. There will be an approximately 100-foot long length of transmission line that would run between the substation/switchyard and LADWP 500 kV transmission line. This length of power line would be constructed in accordance with APLIC recommendations. No power lines would be constructed within wetlands or over canyons.
Roads: The creation of roads leads to further loss and fragmentation of migratory bird habitat. The Service recommends that the number of roads be minimized for all phases of a project.	Roads associated with the project be within the project fence and access roads have been minimized
Evaporation: If evaporation ponds are required for the operation of the facility, placement of netting over the surface of the ponds is encouraged to prevent birds and bats from contacting the water's surface.	In the event that evaporation ponds are required, the type of netting will be determined through consultation with USFWS. The evaporation ponds will be monitored for bird
Solar Reflectors: Reducing the attractiveness of solar reflectors to polarotactic water insects (those attracted to polarized light) (Horvath et al. 2010) will help reduce the attractiveness of these facilities to birds and bats.	Solar reflectors would not be used. Poloratactic water insects would not be attracted to the project.

4.4.1 Pre-Construction and Construction

1. **Avian Nest Preconstruction Surveys, Monitoring, and Management**. Preconstruction clearance surveys to identify active bird nests will be conducted within 2 weeks of ground disturbance or vegetation removal in all active work areas during the breeding season (February 1 through August 31). The work area will need to be resurveyed following periods of inactivity of 2 weeks or more. Active nests will be avoided using non- disturbance buffer zones as described in Section 4.5.
2. **Worker Environmental Awareness Training**. SMS will implement a Worker Environmental Awareness Program (WEAP) to educate workers about the environmental issues associated with the project and the mitigation measures that will be implemented at the site, including nest awareness and non-disturbance exclusion zones.
3. **Burrowing Owl Passive Relocation.** Burrowing owls occupying burrows on site will be passively relocated according to the CDFW Burrowing Owl Staff Report (CDFW 2012) and outside the nesting season or after a qualified biologist determines that the burrow does not contain eggs or chicks and after consultation with CDFW. Prior to construction and passive relocation, artificial burrows will be installed in areas that will not be disturbed during construction at a ratio of 5:1 for each burrow that will be destroyed by project construction. Passive relocation will be conducted prior to construction and according to methods approved by CDFW. If burrowing owls are located in a burrow prior to construction, a Burrowing Owl Exclusion Plan will be drafted and submitted for approval to CDFW. The Plan will describe the location of artificial burrows and the methods of passive relocation.
4. **Active Nest and Burrow Monitoring.** A qualified biologist will monitor active bird nests or burrows that are located in or adjacent to work area during the avian breeding season until nesting activities are complete. Nest monitoring results will be recorded in a Nest Check Form. Typically a nest check will have a minimum duration of 30 minutes, but may be longer or shorter, or more frequent than one check per day, as determined by the Designated Biologist based on the type of construction activity (duration, equipment being used, potential for construction- related disturbance) and other factors related to assessment of nest disturbance (weather variations, pair behavior, nest stage, nest type, species, etc.). The Designated Biologist will record the construction activity occurring at the time of the nest check and note any work exclusion buffer in effect at the time of the nest check. Non-SMS activities in the area should also be recorded (e.g., adjacent construction sites, roads, commercial/industrial activities, recreational use, etc.). The Designated Biologist will record any sign of disturbance to the active nest, including but not limited to parental alarm calls, agitated behavior, distraction displays, nest fleeing and returning, chicks falling out of the nest or chicks or eggs being predated as a result of parental abandonment of the nest.

Should the Designated Biologist determine project activities are causing or contributing to nest disturbance that might lead to nest failure, the Designated Biologist will coordinate with the Construction Manager to limit the duration or location of work, and/or set other

limits related to use of project vehicles, and/or heavy equipment. Nest locations, project activities in the vicinity of nests, and any adjustments to buffer areas will be described and reported in regular monitoring and compliance reports.

5. **Avian Monitoring Program.** An Avian Monitoring Program shall be initiated and approved pre-construction and continue for at least one year and potentially up to three years following commercial operation (and longer if determined necessary and appropriate by the Compliance Project Manager (CPM)) that shall include, at a minimum, the following provisions:
   1. The Project owner will survey and monitor on-site avian and bat behavior to document avian and bat reactions to the project and to infer causal factors, if any, to project impacts. The Project owner will submit all data gathered onsite to the CPM as specified herein, or as requested by the CPM, and also will make consulting biologists available to answer CPM inquiries.
   2. The Project owner will implement a scientifically defensible avian and bat fatality and injury monitoring program to accurately estimate the rates of collision- caused fatalities and injuries and to enable comparisons of project impacts through time and to other projects that are also monitored for collision-caused fatalities, including:
      a) estimating levels of collision-related mortality and injury with PV panels, perimeter fences, gen-tie line poles or wires, and other project features and structures;
      b) quantifying flight patterns and behaviors via diurnal behavior surveys and nocturnal thermal imaging surveys, and comparing these patterns to collision-related mortality and injury to infer associations, if any.
   3. The Project owner will implement an adaptive management and decision-making framework for reviewing, characterizing, and responding to monitoring results.
   4. The Project owner will identify specific conservation measures and/or programs to, minimize, rectify, reduce, or offset project-caused avian injury or mortality over time and will evaluate the effectiveness of those measures. The Avian Monitoring Program shall include the following components:
      1. A description and summary of the baseline study design, survey methods, raw data, and results.
      2. Full survey methodology and field documentation, identification of appropriate onsite and offsite survey locations, control sites, and the seasonal considerations.
      3. Avian and bat mortality and injury monitoring that includes:
         a) Onsite monitoring that will periodically survey representative locations within the facility, and in combination with an integrated carcass detection trial, will produce accurate project-wide impact estimates.
         b) Low-visibility and high-wind weather event monitoring to document potential weather-related collision risks, including foggy, highly overcast, or rainy night-time weather typically associated with an advancing frontal system, and high wind events (40 miles per hour winds) that are sustained for longer than 4 hours. The monitoring report shall include study design

(including integrated detection trials), search frequency, search locations and field methods.

c) Statistical methods used to generate facility estimates of potential avian and bat impacts based on the observed number of detections during standardized searches and adjusted by integrated detection trials.

4. All post-construction monitoring studies included in the Avian Monitoring Program shall be conducted by a third party contractor for at least one year and up to three years following commercial operation and approval of the Avian Monitoring Program by the CPM. All surveys and monitoring studies included in the Avian Monitoring Program shall be conducted during construction and commercial operation. At the end of the three-year period, the CPM shall determine whether the survey program shall be continued.
5. An adaptive management program shall be developed to identify and implement reasonable and feasible measures that would reduce levels of avian or bat mortality or injury attributable to Project operations and facilities.
6. Monitor the death and injury of birds and bats from collisions with facility features. The monitoring data shall be used to inform an adaptive management program that would minimize Project-related avian and bat impacts. The study design shall be approved by the CPM in consultation with CDFW and USFWS. The Avian Monitoring Program shall include detailed specifications on data and carcass collection protocol and a rationale justifying the proposed schedule of carcass searches. The program also shall include integrated detection trial to estimate the proportion of fatalities not found during periodic searches.

6. **Preconstruction Individual Bat Roost Surveys.** Preconstruction surveys for burrows containing suitable bat roosting habitat that could be used as individual bat roosts will be conducted in all project work areas.
7. **Transmission Design.** The connection from the substation to the transmission line will be designed to meet the most recent APLIC guidelines to the extent practicable.
8. **Invasive Weeds.** SMS will implement an Integrated Weed Management Plan to control weed infestations and the spread of noxious weeds on the project site.
9. **Minimize Disturbance.** Roads, power lines, fences, and other infrastructure associated with the project will be minimized to reduce habitat loss. Fencing will use wildlife- compatible design standards to the extent practicable.
10. **Underground Collector Lines.** Collector lines will be placed underground to reduce avian collisions.
11. **Restore Roads.** Construction access roads will be closed after project construction and the restoration measures in the Vegetation Resources Management Plan will be implemented.
12. **Hazardous Materials.** Federal and state measures for handling toxic substances will be followed to minimize danger to water and wildlife resources from spills to water and wildlife resources. Facility operators shall maintain Hazardous Materials Spill Kits on site. Personnel will be trained to use the Hazardous Materials Spill Kits.
13. **Vegetation Clearing.** SMS will clear vegetation outside of the bird breeding season to the maximum extent practicable. Preconstruction avian clearance surveys will be conducted by a qualified biologist for vegetation clearing during the bird breeding season (February 1

through August 31). If a nest(s) is identified in the preconstruction avian clearance surveys, a qualified monitor will be on site during vegetation removal in order to enforce non-disturbance buffers and stop activities as necessary should construction disturb nesting activity. Depending on the length of the project, on-going vegetation management may be necessary, as determined by the monitoring biologist.

14. **Site Cleanliness.** Trash will be disposed of in covered containers and regularly removed from the site.
15. **Burrowing Owl Construction Clearance Survey.** Surveys for burrowing owl will be conducted in suitable burrowing owl habitat prior to construction and if construction is suspended for 2 weeks or more. Surveys will be conducted at every work area and within a 150-foot buffer zone of each work area. The survey protocol will follow the Burrowing Owl Consortium Guidelines (CBOC 1993). If active burrows are found they will be avoided using non-disturbance buffer zones, as described in Section 4.5. Passive relocation would be used as described above once the burrow is determined to be inactive. The results of the survey will be submitted to the BLM Authorized Officer and CDFW.
16. **Golden Eagle Clearance Survey.** A qualified biologist will conduct a golden eagle clearance survey for a 4-mile area surrounding the project. Golden eagle clearance surveys will be conducted annually for each year of construction during the golden eagle nesting season. If active nests are found in the survey area, SMS will coordinate with BLM, USFWS, and CDFW to ensure that construction does not result in disturbance of the golden eagles.
17. **Evaporation Pond Design.** Evaporation ponds would be installed only if the groundwater quality is unsuitable for panel washing. The applicant will prepare and implement an Avoidance, Hazing, and Bird Rescue Plan to the approval of BLM, CDFW, and USFWS if reverse osmosis and evaporation ponds are required for project operation. The Avoidance, Hazing, and Bird Rescue Plan would include measures for deterring bird use such as noise and visual deterrents, netting, bird balls, or other appropriate methods. Evaporation ponds would have 3:1 sloping sides to discourage wading birds from utilizing the ponds. Netting or other appropriate BMPs would be applied at the direction of the Designated Biologist and described in the Avoidance, Hazing, and Bird Rescue Plan. The evaporation pond would be monitored for bird fatalities and maintenance.
18. **Bird Deterrents.** Bird deterrents would be used during construction, operation, and decommissioning of the project. Bird deterrents have long been used near airports, military bases, and at industrial ponds to reduce avian injuries and fatalities. . Deterrents may include:
    - Visual deterrents (e.g., balloons, enhanced effigies, eagle eyes, lasers, lights)
    - Auditory deterrents (e.g., air cannons, pyrotechnics, and predator calls)
    - Active pursuit (e.g., dogs, falconry, drones)

    At a minimum, visual or noise deterrents could be used at each of the four corners of the North, South and East Array areas. The type of deterrent used, location of each deterrent, and timing of deterrents will be adjusted by the Designated Biologist following an adaptive management strategy.

4.4.2 Operation and Maintenance

During operation and maintenance of the project, conservation measures would be used to reduce the attractiveness of the facility to breeding, migrating, and wintering birds and bats and to ensure that mortality is minimized:

1. **Manage Road Kill.** The project will remove and dispose of road kill near the project to avoid attracting raptors and other scavengers to the site, and will regularly remove vegetation around larger facilities (such as the substation) to reduce raptor foraging.
2. **Minimize Lighting.** The project will minimize the use of lighting that could attract migrating birds and bats (that could feed on concentrations of insects at lights). Lighting will be kept to the minimum level necessary for safety and security. High intensity, steady burning, bright lights such as sodium vapor or spotlights will not be used on project facilities.
3. **Vehicle Speeds.** Project personnel and visitors will be instructed to drive at low speeds (<15 mph) and be alert for wildlife, especially in low-visibility conditions.
4. **Bird Kills.** The Avian Monitoring Program will be implemented for at least 1 year and up to 3 years after commercial operation begins.
5. **Permit.** A permit from the USFWS will be required for handling migratory birds.

4.4.3 Decommissioning

1. **Minimize Disturbance.** Decommissioning methods will minimize new site disturbance and removal of native vegetation.
2. **Soil Restoration.** Foundations will be removed to a minimum of 3 feet below surrounding grade during decommissioning, and covered with soil to allow adequate root penetration for native plants. Petroleum product leaks and chemical releases shall be remediated prior to completion of decommissioning.
3. **Fencing.** Fencing will be removed at the completion of decommissioning.

4.5 AVIAN AWARENESS AND NON-DISTURBANCE BUFFER ZONES

4.5.1 Baseline Buffer Zones

Table 4.5-1 lists baseline awareness or non-disturbance buffer zones for active bird nests and burrowing owl burrows. A qualified biologist may reduce buffer distances should there be sufficient evidence that nesting activity would not be impacted by project activities and that a smaller buffer would effectively prevent adverse impacts to nesting birds, as described in Section 4.5.2. Buffer distances and, if applicable, reduced buffer distances would be implemented until a designated biologist determines the nest is no longer active.

4.5.2 Buffer Zone Modification

Effective buffer distances are highly variable and based on project-specific settings, bird species, stage of nesting cycle, work type, and tolerance of a particular bird pair; therefore, effective buffer distances for nests will be determined by a CDFW-approved Avian Biologist in the field, which may result in reduction of the baseline buffers in Table 4.5-1 in individual situations, if appropriate.

SMS Avian Biologists will conduct assessments to determine the appropriate buffers for each nest. Determination of buffer widths will be site- and species-/guild-specific, data-driven, and not based on generalized assumptions. The determination will take into account the following factors:

- Nesting chronologies
- Geographic location
- Existing ambient conditions (e.g., human activity within line of sight, such as vehicles, pedestrians, and noise)
- Type and extent of disturbance (e.g., noise levels and quality)
- Visibility of disturbance
- Duration and timing of disturbance
- Influence of other environmental factors
- Species' site-specific level of habituation to the disturbance

Application of recommended buffers is expected to avoid and minimize the potential for project- related nest abandonment and failure of fledging and minimize other types of disturbance to nesting behavior. The buffer will be re-evaluated and revised or increased if deemed appropriate should the Avian Biologist determine that project activities cause or contribute to a bird being flushed from a nest or cause or contribute to other signs of disturbance of a nesting bird at a level that has potential to cause nest failure. The Avian Biologist may modify buffers so that some types of work could occur in the buffer, while other types of work could not. . For example, the Avian Biologist could modify a buffer to allow for drive-through access, but not sustained work.

4.5.3 Buffer Zone Monitoring

Once a nest buffer is established, the Avian Biologist will determine the monitoring frequency and construction restrictions for each nest based on the bird's sensitivity to disturbance from the specific work activity occurring near or, if applicable, in the buffer zone.

Table 4.5-1: Avian Awareness and Baseline Non-Disturbance Buffer Zones

Type	Starting Distance of Awareness or Non-Disturbance Exclusion Zones	Implementation Notes
Passerines	300 feet from active nest	A qualified biologist may reduce or increase the buffer distance if there is sufficient evidence based on species, habitat, and other factors, that SMS activity would not impact nesting activity, after approval from BLM, USFWS, and CDFW. Monitoring will be conducted as described in Section 4.4.1. Buffers will be maintained until a qualified biologist has determined that the nest is no longer active.
Raptors	500 feet from active nest	
Golden Eagles	1 mile and line of sight from active nest	
Burrowing Owls1	250 feet from active burrows during nesting season (February 1 through August 31)	
	160 feet from active burrows during the wintering period (September 1 through January 31)	
1 Described in CBOC 1993		

5 CONSTRUCTION AND POST-CONSTRUCTION MONITORING AND STUDIES

5.1 OBJECTIVES

Post-construction monitoring and studies are designed to ensure that the risk assessment above was accurate and that mitigation measures are effective. Adaptive management strategies would be implemented if impacts are found to be greater than expected and mitigation is not effective in reducing those impacts to a satisfactory level. Monitoring objectives include:

- Estimating bird and bat fatalities due to project-related activities
- Assessing bird use of evaporation ponds
- Assessing changes in bird and bat behavior due to all aspects of facility operation (noise, lighting, etc.)
- Assessing territorial abandonment, nest avoidance, and changes in population
- status within and adjacent to the project footprint
- Assessing whether conservation measures implemented for the project were adequate.

5.2 MONITORING DESIGN

5.2.1 Duration and Timing

Avian monitoring would occur for the duration of construction. Post-construction monitoring would occur intensively for at least 1 year and up to 3 years after operation begins. The monitoring program will be extended beyond 1 year if further study will result in an improved understanding of avian reactions to the project. The Designated Biologist will coordinate with BLM, USFWS, and CDFW at the end of the first-year operational monitoring effort to present the results of the monitoring and determine if additional monitoring is needed. Incidental monitoring will be conducted throughout the operational life of the project.

5.2.2 Components

Incidental Observations

Throughout the construction and operation phases of the project, incidental sightings of special- status bird species, raptors and bats will be recorded. During construction, sightings will be recorded by biological monitors and construction workers. The Lead Bird Biologist will be tasked with keeping records and reporting these results (as described below). Incidental observations of bird carcasses, including the carcass location and assumed cause of death, will be collected throughout the operational life of the project and reported annually to the BLM and USFWS. Incidental data would not be used in quantitative analysis; rather these data would be reviewed for evidence of general changes in species composition or fatality rates that could warrant more focused evaluation.

Bird Mortality Studies

Scavenger Removal Study

Scavenger removal studies would be conducted to determine the rate at which carcasses are removed from the site by scavengers. Three to four studies will be performed at random times during the year. The studies will not be performed seasonally because this standard trial methodology of placements once per season generates biases in the calculation of carcass persistence (Smallwood pers. comm. 2014). A designated trial administrator would place 1-2 fresh (i.e., just thawed after storage in a freezer) small and large carcasses weekly on randomized days of the week and at random locations throughout the site. Motion-activated cameras would be placed in viewing range of each carcass to record the times of carcass removal. Carcasses where scavenger activity was detected would be checked by designated investigators to be certain that the carcass was removed from the site and not just outside of the camera's field of view. Biologists, who would also perform the searcher efficiency studies, would survey the site weekly for enough time to obtain sufficient data to calculate a scavenger removal rate. A scavenger removal rate would then be determined from data to determine the average length of carcass persistence on site. A detailed methodology would be prepared and submitted to BLM and USFWS for review prior to conducting the scavenger removal study.

Searcher Efficiency Study

A searcher efficiency study would be conducted in tandem with the scavenger removal studies to determine the likelihood of a surveyor locating carcasses on the project site. Carcasses would be placed throughout the site by a designated trial administrator as described in the scavenger removal study. The administrator would not search for carcasses and would not share details about the trials with the fatality searchers. The site would be surveyed for carcasses by biologists who would also perform the scavenger removal searches. A detection rate would be calculated by determining the number of located carcasses versus the total carcasses on site. The detection rate would be used to adjust the fatality rate for the fatalities that were never found. A detailed methodology would be prepared and submitted to BLM and USFWS for review prior to conducting the searcher efficiency study.

Mortality Studies

Mortality studies will be conducted to determine any monitoring of the death or injury of birds from the proposed project during construction and operation. Mortality studies would follow the approach developed by Nicolai et al. (2011) or the most updated version. A qualified observer will walk along pre-determined transects searching for bird carcasses.

During project construction, transects would be established among active construction areas at a distance that would allow the observer to visually cover the areas within 200 feet of all areas subject to active construction since the last survey.

When a carcass is observed the following data will be collected:

- GPS location (UTM)
- Species identification
- Carcass condition

Carcasses would be removed from the site, pursuant to a Special Purpose Utility Permit, to prevent increased scavenging by ravens. Once data is collected at a carcass, the observer will return to the pre-determined transect and continue with the survey.

The mortality survey interval will be set based on the results of the scavenger removal study. The interval will be short enough that a statistically representative number of carcasses wouldpersist on site long enough to be found during the mortality surveys. Results from the searcher efficiency study would be used to adjust the results to account for any missed carcasses. An integrated detection trial will be used to estimate the proportion of fatalities not found during periodic searches. After one year, the need for these studies will be assessed as described in adaptive management, below. Data will be collected using handheld data recorders and/or paper data sheets. All data will be scanned and entered into a database and will be analyzed using *Program Distance* and *Program MARK*. *Program* Distance will be used to determine the most effective transect width to search for carcasses. *Program MARK* will be used to estimate the total number of mortalities controlling for detection rate and scavenging rate. Data will be submitted as part of the annual reporting, described below.

Avian Behavioral Surveys
Avian and raptor-specific behavioral surveys would be conducted using methods developed in consultation with USFWS and CDFW. The behavioral surveys would be conducted during each year of construction and for up to 3 years after completion of construction.

Nest Surveys
After construction, a nest survey would be conducted on site each spring for three years between February 15 and June 1.

Eagle Nest Success Study
Two eagle nest surveys shall be conducted prior to or within the first calendar year (January through December) of construction to determine nesting success. The first survey should occur early enough in the nesting season to document nest activity. The second survey should occur late enough in the nesting season to document success of nesting activities identified in the first survey. The golden eagle nesting season is generally from mid-January through mid-September. Surveys will be conducted in accordance with Interim Golden Eagle Inventory and Monitoring Protocols; and Other Recommendations (Pagel et al. 2010).

Burrowing Owl Surveys
The relocation area for burrowing owls will be monitored to determine if burrowing owls are using artificial burrows. Surveys will be conducted according to the most recent CDFW protocol, or as determined through consultation.

Bat Surveys
Acoustic stations would be installed on the periphery of the project area to monitor bat activity before, during, and after construction to assess the impacts of the project on bat foraging habitat.

5.2.3 Reporting

The results of avian point counts and survey results for nesting birds and bats will be provided to the BLM, USFWS, CDFW, and other agencies as determined through consultation. A quarterly and annual report will be prepared by the Designated Biologist that summarizes the monitoring data for the reporting period and includes recommendations for future management actions.

5.3 ADAPTIVE MANAGEMENT

An adaptive management strategy is recommended to "promote flexible decision making in the face of uncertainties as outcomes from management actions and other events become better understood" (Williams et al. 2009). Adaptive management allows data to inform the appropriate actions. This BBCS includes specific measures to mitigate impacts to birds and bats. Adaptive management is proposed here to benefit from the research and data gained from monitoring at this project and other regional solar projects. The ongoing monitoring at several new solar projects is providing data that will be useful in adjusting deterrents to reduce effects to birds. SMS will develop the Adaptive Management Plan as the project permitting is completed and prior to construction.

The adaptive management process generally includes the following steps (Williams et al. 2009):

- Assess Problem
- Design/Plan
- Implement
- Monitor
- Evaluate
- Adjust

5.3.1 Assess Problem

The objective of this adaptive management strategy is to improve measures to reduce and minimize bird and bat injuries and fatalities as a result of the project. Monitoring data from this and other solar projects can be used to inform the location, timing, and type of bird and bat deterrents that are most effective.

5.3.2 Plan

The Designated Biologist will prepare an Adaptive Management Plan that describes:

- Specific locations for the proposed bird and bat deterrents on the project site
- Duration of use
- Timing for each deterrent

The study will be randomized and will control for spatial and temporal variation in bird use, to the extent feasible. The Adaptive Management Plan will be submitted to the BLM, CDFW, and USFWS for review at least 14 days prior to implementation.

5.3.3 Implement

Bird deterrent strategies will be implemented as described in the Adaptive Management Plan.

5.3.4 Monitor

Monitoring for adaptive management is described in Section 5.2.

5.3.5 Evaluate

The Designated Biologist will review the monitoring data on a quarterly and annual basis to evaluate the effectiveness of each of the deterrents used on the site. The results of this quarterly evaluation will be documented in the quarterly and annual monitoring reports. The Designated Biologist will also review the monitoring data from other renewable energy projects. The use of other or additional bird deterrents will be evaluated and documented in the annual monitoring report.

5.3.6 Adjust

The Designated Biologist will make recommendations for future deterrents that could reduce impacts to birds and bats based on the monitoring data. Adjustments to the deterrent strategy will be made according to the Adaptive Management Plan. The Adaptive Management Plan may be updated to reflect new data and/or new technologies. Monitoring and evaluation will continue as adjustments are made to the deterrents used (e.g., deterrents moved, new deterrents deployed). The deterrent strategy for the project will be revised during project operation through this iterative monitoring, evaluation, and adjustment process.

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APPENDIX L-7
Draft Raven Monitoring and Control Plan

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Raven Monitoring and Control Plan

Soda Mountain Solar Project

BLM Case No. CACA 49584

August 2014

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Raven Monitoring and Control Plan

Soda Mountain Solar Project

BLM Case No. CACA 49584

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Bureau of Land Management
California Desert District Office
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List of Acronyms

AC	alternating current
APM	Applicant Proposed Measure
BLM	Bureau of Land Management
BO	Biological Opinion
CDFW	California Department of Fish and Wildlife
CEC	California Energy Commission
CEQA	California Environmental Quality Act
DWR	California Department of Water Resources
EIS/EIR	Environmental Impact Statement/Environmental Impact Report
I-15	Interstate 15
kV	kilovolt
MW	megawatt
NEPA	National Environmental Policy Act
NOAA	National Oceanic and Atmospheric Association
NPS	National Park Service
NRCS	National Resources Conservation Service
O&M	operation and maintenance
OHV	off-highway vehicle
PV	solar photovoltaic
RO	reverse osmosis
ROW	right-of-way
SCE	Southern California Edison
SMS	Soda Mountain Solar LLC
USFWS	US Fish and Wildlife Service
WEAP	Worker Environmental Awareness Program
WGI	Wilson Geosciences, Inc.
WRCC	Western Regional Climate Center

1 INTRODUCTION

1.1 OVERVIEW

Soda Mountain Solar, LLC (SMS) proposes to develop the Soda Mountain Solar Project (project) on 4,179 acres of public lands administered by the U.S. Department of the Interior, Bureau of Land Management (BLM), in unincorporated San Bernardino County, approximately 6 miles southwest of Baker, California (Figure 1.1-1).

The project includes a 358-megawatt (MW) solar photovoltaic energy generating facility. Major project components would generally consist of photovoltaic panels installed within three array areas (North, East, and South Arrays), operations and maintenance (O&M) buildings and structures, water supply and stormwater infrastructure, and a substation and switchyard for interconnection to the existing transmission system adjacent to the site. The project also would involve relocation of Rasor Road. Detailed descriptions of the project and alternatives can be found in the SMS Plan of Development (SMS 2011, revised 2013) and Chapter 2 of the Soda Mountain Solar Project Draft Plan Amendment/Environmental Impact Statement/ Environmental Impact Report (EIS/EIR; BLM 2013).

The project vicinity is inhabited by desert tortoise (*Gopherus agassizii*), a threatened species under the federal Endangered Species Act and the California Endangered Species Act. The area has a low density of tortoise (Kiva 2013).

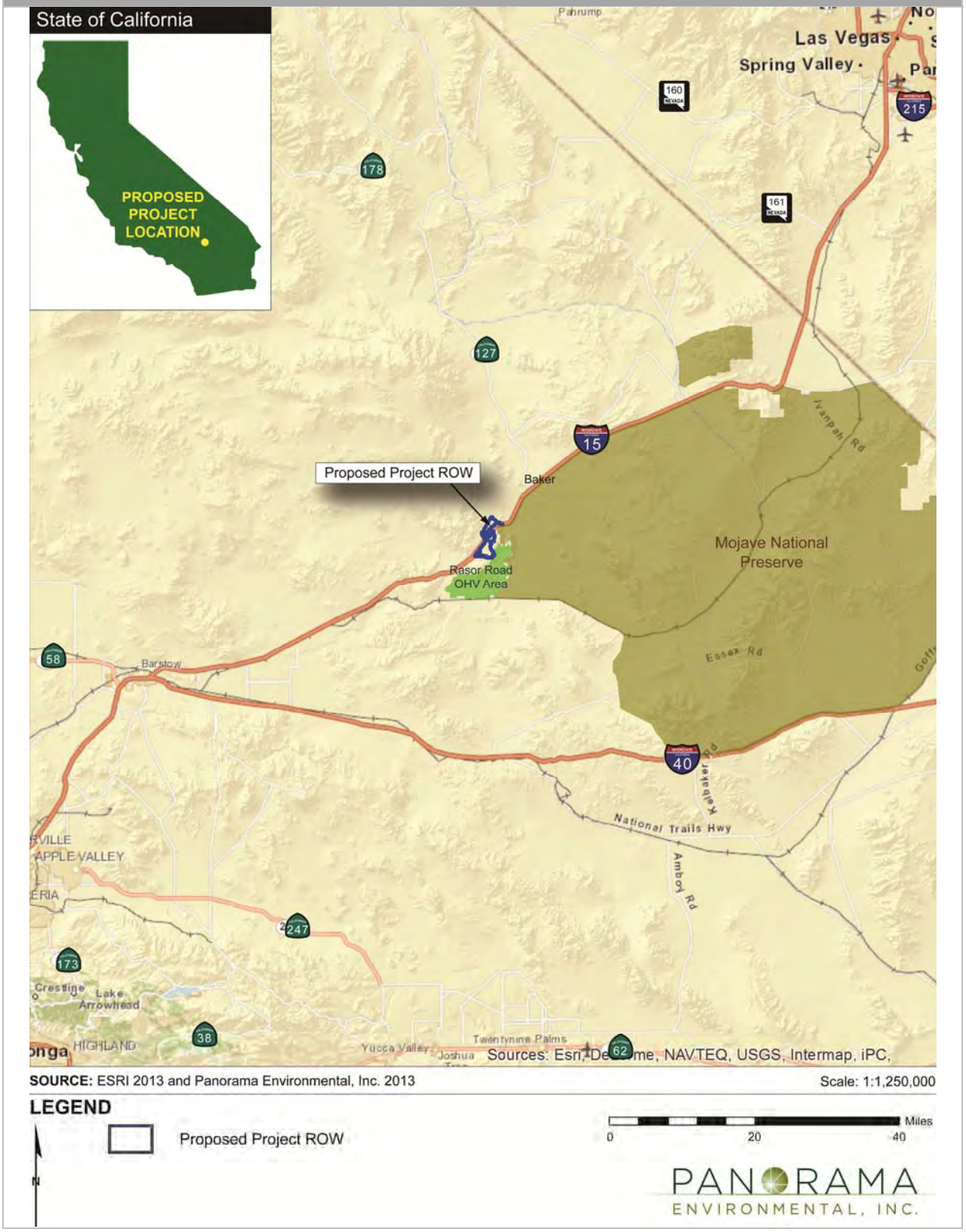
1.2 OBJECTIVE

This Raven Monitoring and Control Plan has been prepared to minimize the effects of project construction, operation, maintenance, and decommissioning on the desert tortoise by reducing the subsidies that could attract and benefit the common raven (*Corvus corax*) and result in increased probability of tortoise predation.

The SMS Raven Monitoring and Control Plan objectives are to:

1. Identify the project-specific design features and other measures that may attract ravens to the project area.
2. Define specific SMS management and control measures intended to avoid, minimize, and/or mitigate impacts and to avoid any project-related increases in raven numbers during construction, operation, and decommissioning.
3. Define procedures for monitoring raven activity to evaluate the effectiveness of these measures.
4. Specify documentation procedures to report the effectiveness of project design features and BMPs.
5. Identify triggers that will prompt implementation of adaptive management procedures.

Figure 1.1-1: Project Location



2 PROJECT LOCATION AND SITE DESCRIPTION

2.1 PROJECT LOCATION AND SETTING

The proposed SMS project is located in a rural, undeveloped area of the Mojave Desert. The project area is bisected by Interstate 15 (I-15) and is located in an intermontane desert valley composed of alluvial fan deposits and surrounded by the Soda Mountains. The project will be located entirely on BLM lands, which consist of generally undeveloped, natural open space. Portions of the project area are located within the BLM-designated utility corridor, which includes two transmission lines, a distribution line, telephone line, fiber optic line, fuel pipeline, and a cellular tower. The Rasor Road Service Station is located just south of the project area and includes several buildings.

2.2 HABITAT

Project area soils are gravelly with areas of desert pavement. The area has slopes of generally 2 percent or less and includes deeply incised washes.

Vegetation communities within the project area were mapped in 2013 at the alliance level. Four vegetation alliances and two cover types (disturbed and developed ground) were observed within the right-of-way (ROW) in 2013 (CSESA 2013a). The project area is sparsely vegetated and includes six vegetation communities/land cover types:

- Creosote bush-white bursage scrub
- Cheesebush scrub
- Creosote bush scrub
- White bursage scrub
- Developed, and
- Disturbed

Disturbed, ruderal, and non-vegetated areas provide habitat for ravens and other opportunistic wildlife species. Common ravens regularly nest, roost, or perch on human structures, including buildings, fences, and the steel lattice towers of transmission lines. The project area is characterized by sandy, gravelly, and rocky soils. Previous human disturbance near the project site provides nesting, roosting, and perching habitat for ravens including:

- Two transmission lines
- Two distribution lines
- Telephone line
- Cellular tower
- Fences near I-15 highway
- Rasor Road Service Station buildings

Ravens often feed opportunistically on animals killed on the highway or live prey, such as reptiles and small mammals in open, disturbed areas. Road-kill carcasses on I-15 and other wildlife in the area provide a food subsidy for ravens.

2.3 STRUCTURES AND FACILITIES

2.3.1 Solar Arrays and Ancillary Facilities

The proposed project is a solar photovoltaic (PV) electric generation facility with a peak capacity of 358 megawatts of alternating current (AC) renewable energy. Major components of the project include:

- PV panel arrays (North, South, and East Arrays), inverters, medium-voltage collector transformers, and ancillary equipment
- Unpaved access roads between the arrays
- 34.5-kilovolt (kV) buried collector lines to connect the panel arrays to the substation
- Substation and switchyard for interconnection to the adjacent, existing transmission line
- Water wells
- Water storage tanks
- Reverse osmosis (RO) water treatment system with brine ponds
- Control room and office building, maintenance facility, storage warehouse, and other ancillary structures
- Temporary storage area for materials and supplies required during construction
- Earthen berms

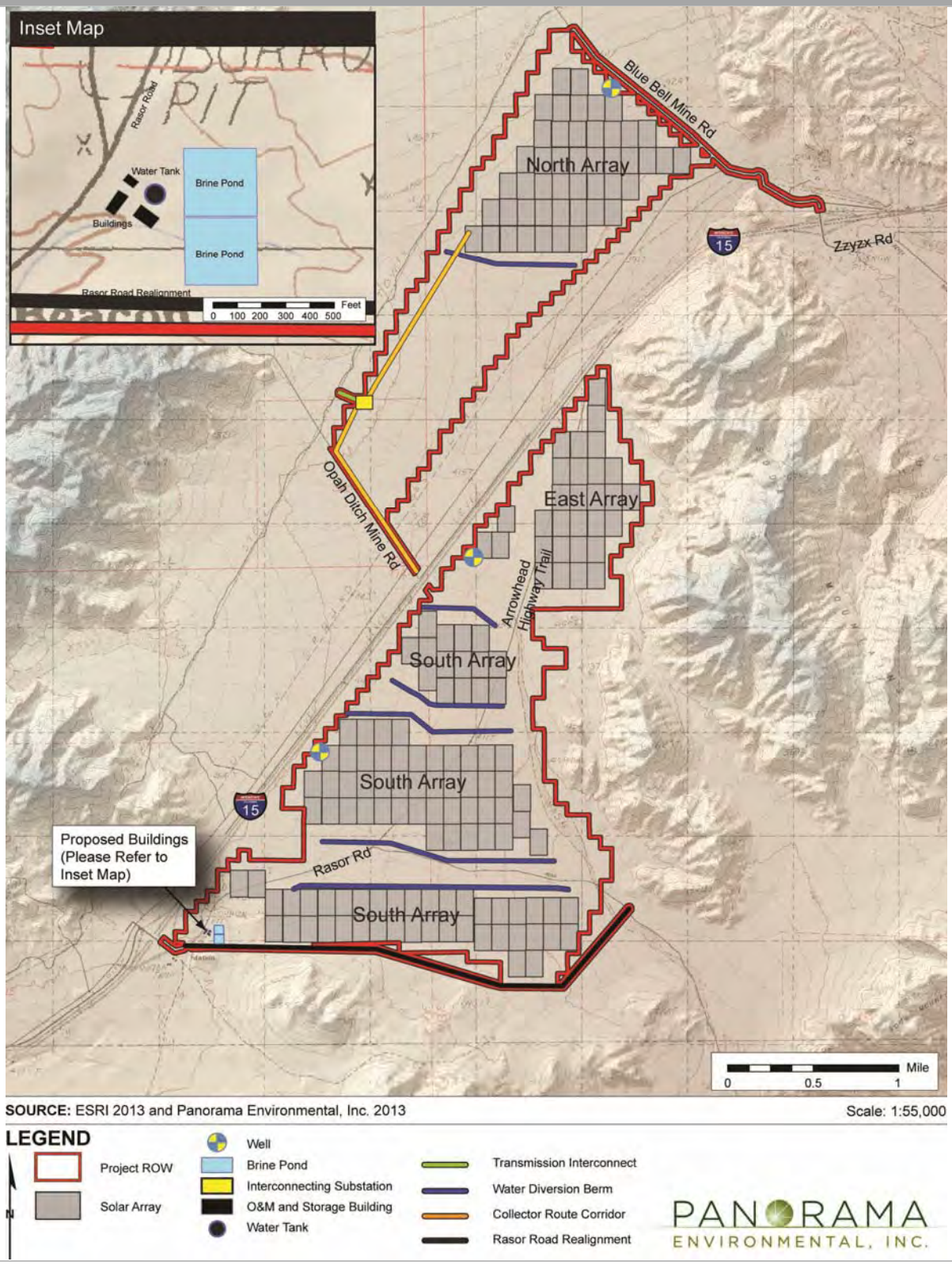
The proposed project solar array fields will cover approximately 52 percent of the defined ROW. The remaining area will be used for stormwater control, access roads, ancillary buildings, and desert tortoise and/or cactus translocation. Project components are shown on Figure 2.3-1.

2.3.2 Site Preparation

SMS proposes to use site preparation techniques that will minimize earth movement and preserve existing runoff patterns to the extent possible. Stormwater drainage will flow through the site. Isolated grading is proposed to create berms to reduce side channels from forming in the array areas. Grading is also proposed to smooth isolated bumps and dips in the array areas. No topsoil will be stripped or otherwise segregated. Construction in major drainage areas will be avoided.

SMS construction and site preparation activities may include vegetation removal or clearing, rock and boulder removal, and cut and fill. These activities have the possibility to injure or kill wildlife, which can provide a food subsidy for ravens. Installation of desert tortoise exclusion fencing is proposed to reduce the potential for animal mortality during construction.

Figure 2.3-1: Project Layout



3 BACKGROUND

3.1 REGULATORY BACKGROUND

U.S. Fish and Wildlife Service (USFWS), together with several cooperating agencies, including BLM, National Park Service, Department of Defense, and the Department of Agriculture, completed an environmental assessment (Raven EA) for the implementation of a regional plan to reduce predation of desert tortoise by the common raven in the California desert (USFWS et al. 2008). The common raven and other native birds are protected from most take under the federal Migratory Bird Treaty Act and California Fish and Game Code §3503 and §3513.

This Raven Monitoring and Control Plan is intended to meet the requirements of Applicant Proposed Measure 72 (quoted below) presented in the SMS EIS/EIR and USFWS guidance for raven management planning (USFWS 2010).

> **APM 72:** A Raven Monitoring and Control Plan shall be prepared consistent with the most current USFWS-approved raven management guidelines. The purpose of the plan is to avoid any project-related increases in raven numbers during construction, operation, and decommissioning. The Raven Monitoring and Control Plan shall be submitted to BLM and CDFW for approval at least 30 days prior to the start of construction.

This Raven Monitoring and Control Plan conforms to the requirements in the regional Raven EA, as well as the USFWS raven management guidelines (USFWS 2010).

3.2 DESERT TORTOISE

The desert tortoise is listed as a threatened species under both the Federal Endangered Species and Act and California Endangered Species Act. Surveys conducted for the project indicate tortoises are present in low numbers along the eastern edge of the project area. Surveys conducted by AMEC (2001), URS (2009), and Kiva Biological Consulting (2012 and 2013) indicate that the abundance of tortoises in the valley is low. Desert tortoise survey results are summarized in Table 3.2-1.

The project area contains creosote bush scrub habitat and is within the range of desert tortoise. One tortoise was observed in the southern portion of the project area during the 2013 Protocol Desert Tortoise Surveys (Kiva Biological Consulting 2013). Desert tortoise sign, including scat, burrows, and carcasses, were found in and near the project area. Identified sign is shown in Figure 3.2-1. The area is considered low quality habitat due to the low elevation, highway I-15 bisecting the valley, and the low density of tortoises (Kiva 2013).

Table 3.2-1: Desert Tortoise and Other Surveys Results

Survey	Survey Area	Live Tortoise	Scat	Burrows	Carcasses	Rock Shelters
2001 Desert Tortoise Survey at Opah Ditch (outside SMS)*	115-acres in Opah Ditch area	0	9	5	3	3
2009 SMS Desert Tortoise Survey (including QA/QC surveys at 10-foot [3-meter] spacing)*	6,770-acre 2009 ROW	0	1 (ZOI)	0	0	0
2012 SMS Desert Tortoise Supplemental 220-acre Survey*	220 acres and ZOI	0	20 (ZOI)	8 (SMS) 2 (ZOI)	1 (SMS) 1 (ZOI)	0
2012 Geotechnical Study Desert Tortoise Survey*	17 acres and 10-meter transects on either side of 5.3 miles of access routes	0	0	0	0	0
Fall 2012 Botanical Survey	4,075-acre potential impact area[1]	0	1	3 (SMS)	1 (ZOI)	0
Spring 2013 Desert Tortoise Survey*	4,179-acre 2013 ROW and ZOI	1	6(ZOI)	18 (SMS) 5 (ZOI)	3 (SMS) 2(ZOI)	0

Note:

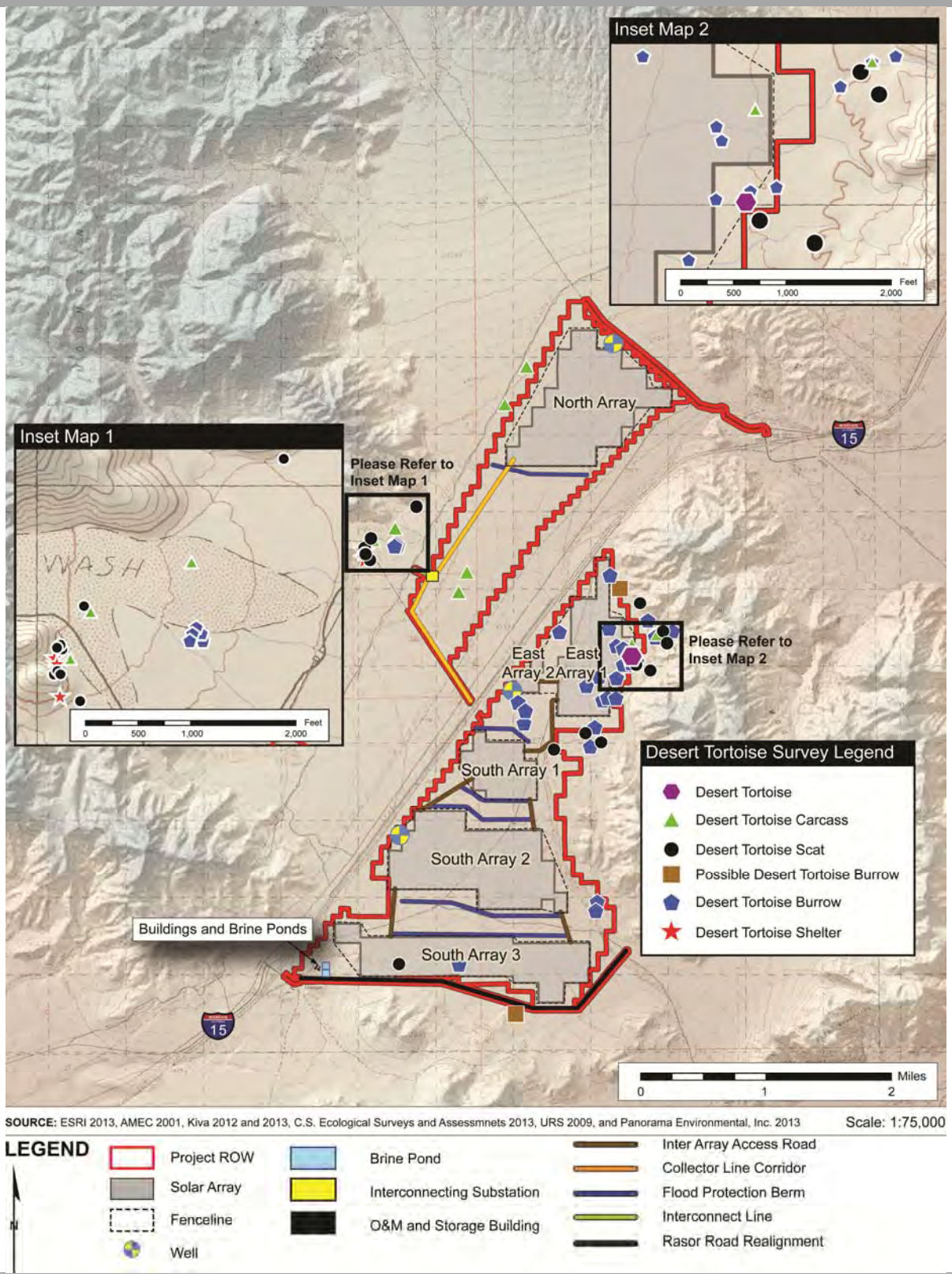
[1] The 2012 plant survey area was smaller than the fall 2012 ROW because area south of the North Array was determined to be unlikely to be subject to surface disturbance from project activities.

SMS: Soda Mountain Solar ROW Area ZOI: zone of influence

* Conducted according to USFWS desert tortoise survey protocol

Sources: AMEC 2001; URS 2009; Caithness 2010; Kiva 2012a; Kiva 2012b; Kiva 2013; CSESA 2012

Figure 3.2-1: Desert Tortoise and Sign Locations



3.3 COMMON RAVEN

Common ravens are known to occur in the project area and are believed to be a year-round resident. A total of 55 ravens were observed during the 2009 spring and fall avian point count surveys and were one of the most abundant bird species in the area (URS 2010).

3.3.1 Raven Predation of Desert Tortoise

Ravens are efficient predators of desert tortoise and thrive in areas of human activity. Carcasses found under raven nests, direct observations, and circumstantial evidence suggest that ravens prey on juvenile tortoises (Boarman 2002). Boarman (2002) found that the majority of raven predation on tortoises occurs in the spring (April and May) when tortoises are most active and ravens are feeding young. Parent ravens forage within 0.5 mile of their nest; therefore, creating a new potential nesting site could increase the probability of predation in the immediate vicinity.

Ravens may nest in native trees, large shrubs, on rock faces, or on other natural features. Anthropogenic features such as buildings, billboards, signs, utility poles, landscape trees, and other structures have introduced suitable raven nesting sites into areas where nest sites were otherwise very limited (Boarman 2002). Human-induced sources of food and water, such as road kill, landfills, dumpsters, garbage bins, and food for pets and livestock also attract ravens to an otherwise less-inhabitable area. The availability of nesting sites, food, and water in close proximity are ideal conditions for nesting ravens. Rising raven populations create increased predation of juvenile tortoises, thereby causing tortoise populations to diminish (Boarman 2002).

3.3.2 Existing and Potential Raven Subsidies

Human subsidies that attract ravens include roads, open water sources, trash, food, and structures suitable for sheltering, roosting, perching, and nesting. Construction and decommissioning activities have the potential to attract ravens by killing or unearthing food sources such as insects and rodents.

Existing Raven Subsidies

There are several subsidies that exist within the Soda Mountain Valley and within 1 mile of the project area. These subsidies are described below.

Roads

The project area is bisected by four-lane Highway I-15. Road kill and litter from the highway may attract ravens. Signage and fences along the highway could provide perches for ravens.

Transmission Lines

The Los Angeles Department of Water and Power Marketplace-Adelanto 500-kV transmission line and the Southern California Edison (SCE) 115-kV transmission line (Mountain Pass to Coolwater segment) parallel the North Array along the western edge of the valley and provide nesting, roosting, and perching sites for ravens.

Distribution Line and Telephone Line
The distribution line and telephone line south and east of the North Array provide perching sites for ravens.

Cellular Tower
There is a cellular tower southeast of the North Array. The tower may provide nesting, roosting, and perching sites for ravens.

Rasor Road Service Station
The Rasor Road service station is less than 1 mile from the South Array project area. Lighting poles, signs, buildings, and power lines at the service station provide perching and nesting sites for ravens. Litter and food waste from dumpsters and trash bins may also subsidize raven foraging.

Rasor Off-highway Vehicle Area
The off-highway vehicle (OHV) area is adjacent to the southeastern edge of the project area. Litter, food waste, and road kill at the OHV area provide a food subsidy for ravens.

I-15 Highway
The I-15 Highway is located adjacent to the South and East Array areas and approximately 0.4 mile from the North Array area. Fencing along the highway provides roosting opportunities for ravens. Litter, food waste, and road kill from vehicles on I-15 provide a food subsidy for ravens.

4 POTENTIAL PROJECT-SPECIFIC RAVEN SUBSIDIES

Potential raven subsidies may occur during project construction, operation and maintenance, or decommissioning. Potential subsidies are shown in Table 4-1. Additional information on the subsidies is provided below.

4.1 FOOD SOURCES

4.1.1 Trash and Waste Management

Food waste can become a raven subsidy if it is either left on the ground (i.e., litter) or left in accessible open containers. Food waste is a potential problem during all phases of the project.

4.1.2 Surface Disturbance (Construction, Operation & Maintenance, Decommissioning)

Grading during site preparation, operation and maintenance, and decommissioning phases can injure or kill wildlife, especially small mammals and reptiles, and can unearth burrowing animals. These animals can provide a food subsidy for ravens. Grading and other earthwork

Table 4-1: Potential Project Subsidies during Project Phases

Subsidy Type	Source of Subsidy	Construction	O&M	Decommissioning
Food sources	Human and animal food and waste	X	X	X
	Soil disturbance	X		
	Road kill	X	X	X
Ponding water	Equipment cleaning	X		X
	Watering for dust abatement	X	X	X
	Panel washing		X	
	Evaporation ponds		X	
	Cacti salvage	X		
	Bighorn sheep water sources		X	
	Leaks in water infrastructure	X	X	X
Nesting, roosting, and perching	Fences	X	X	X
	Vehicles or heavy equipment	X	X	X
	Buildings	X	X	X
	Electrical infrastructure	X	X	X

activities are primarily focused during construction and decommissioning project phases. Grading activities during operation and maintenance will be minimal, generally limited to access route maintenance or repair of buried lines.

4.1.3 Road Kill on Access Roads (Construction, Operation & Maintenance, Decommissioning)

The project will result in increased traffic along paved access routes between I-15 and the project site. The traffic may result in road kill during all phases of the project, but especially during construction and decommissioning phases due to higher vehicle traffic volume. Road-killed wildlife, including small to medium-sized mammals, reptiles, and (uncommonly) birds, all may serve as raven food subsidies.

4.2 STANDING OR PONDING WATER

Standing water on the project site could subsidize ravens. Several project-related activities could provide water subsidies, including:

- Vehicle wash stations for weed prevention (Construction, Decommissioning)
- Solar panel washing (Operation and Maintenance)
- Road watering for dust abatement (Construction, Operation and Maintenance, Decommissioning)
- Evaporation ponds (Operation and Maintenance)
- Irrigation for revegetation (Construction, Operation and Maintenance, Decommissioning)
- Water sources for bighorn sheep (Operation and Maintenance)
- Leaking pumps, water lines, and storage tanks (Construction, Operation and Maintenance, Decommissioning)

4.3 NESTING, ROOSTING, AND PERCHING SITES

4.3.1 Project Facilities and Structures (Construction, Operation and Maintenance, Decommissioning)

All above-ground project facilities, including solar panels, fences, vehicles and heavy equipment, buildings, and electrical infrastructure may provide roosting, perching, or nesting subsidies throughout the life of the project.

5 SUBSIDY CONTROL MEASURES

5.1 GOAL OF PROPOSED MEASURES

The USFWS Raven EA (2008) states the goals of raven management measures for projects in the California desert. California Department of Fish and Wildlife (CDFW) was consulted on state regulations and policies affecting the management of the common raven and the status of the common raven population in the California desert. Key points of the measures include:

1. Implementation of effectiveness monitoring will ensure that common ravens will be removed only when necessary to meet stated objectives.
2. Wildlife specialists would be used to capture and release or dispatch the common raven.
3. The impacts of the program on the common raven would be monitored annually.
4. The impacts of the program on the common raven would be monitored by considering the "cumulative take" which involves assessing the impacts of all known forms of take against the common raven population estimates and trend indicators.
5. Common ravens that are trapped would not be relocated. They would be euthanized using the most humane methods practicable and offered to museums or laboratories for research purposes.

The measures identified below are described in the Draft EIS/EIR for the project and are specific to this project. Measures may be revised in the Final EIS/EIR. The Raven Monitoring and Control Plan may be updated to include the agency-approved project mitigation measures, if necessary. To the extent the provisions of this plan conflict with the Final EIS/EIR or any additional agency-approved mitigation measures, the Final EIS/EIR and such agency measures shall control.

5.2 FOOD SOURCES AND ATTRACTANTS

Raven food subsidies and attractants generated by the project would be avoided and/or minimized by maintaining a clean construction site, reducing surface disturbance, and by minimizing road kill on project access roads.

5.2.1 Trash and Waste Management (Construction, Operation and Maintenance, Decommissioning)

APM 56 requires that trash be disposed of in covered containers and regularly removed from the site. Mitigation Measure 3.4-1b further minimizes impacts from possible trash and food-related waste by requiring the Designated Biologist to inspect the site for trash.

APM 56: Trash will be disposed of in covered containers and regularly removed from the site.

Mitigation Measure 3.4-1b: Biological Monitoring during Construction. Biological Monitor(s) shall be employed to assist the Designated Biologist in conducting pre-construction surveys and monitoring ground disturbance, grading, construction, operation and maintenance, decommissioning, and restoration activities. The Biological Monitor(s) shall have sufficient education and field experience to understand resident wildlife species biology, have experience conducting desert tortoise, burrowing owl, kit fox, and badger field monitoring, and be able to identify these species and their sign (including active burrows). The Designated Biologist shall submit a resume, at least three (3) references, and contact information for each prospective Biological Monitor to the BLM, and the Wildlife Agencies for approval. To avoid and minimize effects to biological resources, the Biological Monitor(s) will assist the Designated Biologist with the following:

1. Be present during construction activities that take place in suitable habitat for desert tortoise, burrowing owl, kit fox, badger, or other protected species to prevent or minimize harm or injury to these species.
2. Activities of the Biological Monitor(s) include, but are not limited to, ensuring compliance with all avoidance and minimization measures; monitoring for desert tortoise, burrowing owl, kit fox, badger, and other protected species; halting construction activity in the area if an individual is found; and checking the staking/flagging of all disturbance areas to be sure that they are intact and that all construction activities are being kept within the staked/flagged limits. If a desert tortoise, burrowing owl, kit fox, badger, or other protected species is found within a work area, the Biological Monitor(s) shall immediately notify the Designated Biologist, who shall determine measures to be taken to ensure that the individual is not harmed.
3. Inspect the Project area for any special-status wildlife species.
4. Ensure that potential habitats within the construction zone are not occupied by special-status species (e.g., potential burrows or nests are inspected).
5. In the event of the discovery of a non-listed, special-status ground-dwelling animal, recover and relocate the animal to adjacent suitable habitat at least 200 feet from the limits of construction activities.
6. At the end of each work day, inspect all potential wildlife pitfalls (e.g., trenches, bores, other excavations) for wildlife and remove wildlife as necessary. If the potential pitfalls will not be immediately backfilled following inspection, the Biological Monitor(s) will ensure that the construction crew slopes the ends of the excavation (3:1 slope) to provide wildlife escape ramps or will ensure that the construction crew completely and securely covers the excavation to prevent wildlife entry.

7. Inspect the site to help ensure trash and food-related waste is place in closed-lid containers and to ensure that workers do not feed wildlife. Also inspect the work area each day to ensure that no microtrash (e.g., bolts, screws, etc.) is left behind.

5.2.2 Surface Disturbance (Construction, Operation and Maintenance, Decommissioning)

APM 63 and Mitigation Measure 3.3-2 reduce surface disturbance by limiting disturbance areas during construction and decommissioning. APM 71 requires a biologist to be on site during ground-disturbing activities between March 15 and October 31 and to check construction areas for desert tortoise before construction activities begin.

APM 63: Decommissioning methods will minimize new site disturbance and removal of native vegetation.

APM 71: No construction, operations, or decommissioning activities shall occur in unfenced areas without an approved desert tortoise biologist present. These activities include the construction phase (construction, revegetation), decommissioning phase, and maintenance activities during the operations phase that require new surface disturbance. An adequate number of trained and experienced monitors must be present during all construction and decommissioning activities in unfenced areas, depending on the various construction tasks, locations, and season. A biologist shall be on site from March 15 through October 31 (active season) during ground-disturbing activities in areas outside the exclusion fencing, and shall be on-call from November 1 to March 14 (inactive season). The biologist shall check all construction areas immediately before construction activities begin. The biologist shall inspect construction pipes, culverts, or similar structures: (a) with a diameter greater than 3 inches, (b) stored for one or more nights, (c) less than 8 inches aboveground, and (d) within desert tortoise habitat (i.e., outside the permanently fenced area), before the materials are moved, buried, or capped. Alternatively, such materials may be capped before storing outside the fenced area or placing on pipe racks.

Mitigation Measure 3.3-2: Vegetation Best Management Practices. The Applicant shall undertake the following measures to manage the construction site and related facilities in a manner to avoid or minimize impacts to vegetation resources:

1. Limit Area of Disturbance. The boundaries of all areas to be disturbed (including staging areas, access roads, and sites for temporary placement of spoils) shall be delineated with stakes and flagging prior to construction activities in consultation with the Designated Biologist. Spoils and topsoil shall be stockpiled in disturbed areas lacking native vegetation and which do not provide habitat for special-status species. Parking areas, staging and disposal site locations shall similarly be located in areas without native vegetation or special-status species habitat. All disturbances, Project vehicles and equipment shall be confined to the flagged areas.
2. Minimize Road Impacts. New and existing roads that are planned for construction, widening, or other improvements shall not extend beyond the flagged impact area as

described above. All vehicles passing or turning around would do so within the planned impact area or in previously disturbed areas. Where new access is required outside of existing roads or the construction zone, the route shall be clearly marked (i.e., flagged and/or staked) prior to the onset of construction.

3. Minimize Traffic Impacts. Vehicular traffic during Project construction and operation shall be confined to existing routes of travel to and from the Project site, and cross country vehicle and equipment use outside designated work areas shall be prohibited.
4. Monitor During Construction. In areas that have not been fenced with desert tortoise exclusion fencing and cleared, a Designated Biologist shall be present at the construction site during all Project activities that have potential to disturb soil, vegetation, and wildlife. The Designated Biologist or Biological Monitor shall review areas immediately ahead of equipment during brushing and grading activities.
5. Minimize Impacts of Staging Areas. Staging areas for construction on the plant site shall be within the area that has been fenced with desert tortoise exclusion fencing. For construction activities outside of the solar plant site, access roads, pulling sites, and storage and parking areas shall be designed, utilized, and maintained with the goal of minimizing impacts to native plant communities and sensitive biological resources.
6. Avoid Use of Toxic Substances. Soil bonding and weighting agents used on unpaved surfaces shall be non-toxic to plants and wildlife.
7. Implement Erosion Control Measures. Standard erosion control measures shall be implemented for all phases of construction and operation where sediment run-off from exposed slopes threatens to enter "waters of the State". Sediment and other flow-restricting materials shall be moved to a location where they shall not be washed back into drainages. All disturbed soils and roads within the Project site shall be stabilized to reduce erosion potential, both during and following construction. Areas of disturbed soils (access and staging areas) with slopes toward a drainage shall be stabilized to reduce erosion potential. To avoid impacts associated with generation of fugitive dust, surface application of water would be employed during construction and operation and maintenance activities.
8. Monitor Ground Disturbing Activities Prior to Pre-Construction Site Mobilization. If pre-construction site mobilization requires ground-disturbing activities such as for geotechnical borings or hazardous waste evaluations, a Designated Biologist or Biological Monitor shall be present to monitor any actions that could disturb soil, vegetation, or wildlife.
9. Revegetation of Temporarily Disturbed Areas. The Applicant shall prepare and implement a Revegetation Plan to restore all areas subject to temporary disturbance to pre-Project grade and conditions. Temporarily disturbed areas within the Project site include, but are not limited to: all proposed locations for linear facilities, temporary access roads, berms, areas surrounding the drainage diffusers, construction work temporary lay-down areas not converted to part of the solar field, and construction equipment staging areas. The Revegetation Plan shall include a

description of topsoil salvage and seeding techniques and a monitoring and reporting plan, and the following performance standards by the end of monitoring year 2:

a. at least 80 percent of the species observed within the temporarily disturbed areas shall be native species that naturally occur in desert scrub habitats; and
b. relative cover and density of plant species within the temporarily disturbed areas shall equal at least 60 percent.

10. Integrated Weed Management Plan. This measure provides further detail and clarifies requirements for the Applicant's draft Integrated Weed Management Plan (IWMP) (see Appendix E-2). Prior to beginning construction on the Project, the Applicant shall prepare, circulate to the BLM for comment and approval, and then implement an IWMP that meets the approval of BLM's Authorized Officer and conforms to the CDCA Plan (Table 1) to prevent the spread of existing invasive species and the introduction of new invasive species to the Project site. The Plan shall be consistent with BLM's Vegetation Treatments Using Herbicides on BLM Lands in 17 Western States (BLM, 2007) and the National Invasive Species Management Plan (National Invasive Species Council, 2008).
The IWMP shall include, at a minimum: specific management objectives and measures for each target invasive species; baseline conditions; weed risk assessment; measures (both preventative and containment/control) to prevent/limit the introduction and spread of invasive species; monitoring and surveying methods; and reporting requirements.
The BLM-approved IWMP shall include:
    a. Preventative measures to prevent the spread of weeds into new habitats, such as equipment inspections, use of weed-free erosion control materials and soils, and a mandatory site training element that includes weed management;
    b. Weed containment and control measures such as the removal of invasive species primarily via mechanical means, with the use of herbicides restricted to BLM-policies and approved usage (e.g., BLM's Herbicide Use Standard Operating Procedures provided in Appendix B of the Record of Decision for the Final Vegetation Treatments Using Herbicides Programmatic Environmental Impact Statement (BLM, 2007);
    c. Monitoring and reporting standards annually during construction and for three years following the completion of construction to describe trend in weed distribution and direct weed management measures, and;
    d. Reporting of monitoring and management efforts in annual reports and a final monitoring report completed at the end of three years of post-construction monitoring. Copies of these reports will be provided to the BLM for review and comment. The BLM will use the results of these reports to determine if any additional monitoring or control measures are necessary. Weed control will be ongoing on the Project site for the life of the Project, but plan success will be determined by the BLM after the three years of operations monitoring through

the reporting and review process. Success criteria will be defined as having no more than 10 percent increase in a weed species or in overall weed cover in any part of the Project site.

5.2.3 Road Kill on Access Roads (Construction, Operation and Maintenance, Decommissioning)

APM 60 requires project personnel to remove road kill near the project site. APM 62 and Mitigation Measure 3.4-1d recommend limiting vehicle speeds to 15 mph on access roads to avoid collisions with wildlife.

> **APM 60:** The Project will remove and dispose of road kill near the Project site to avoid attracting raptors and other scavengers to the site, and will regularly remove vegetation around larger facilities (such as the substation) to reduce raptor foraging.
>
> **APM 62:** Project personnel and visitors will be instructed to drive at low speeds (<15 mph) and be alert for wildlife, especially in low-visibility conditions.
>
> **Mitigation Measure 3.4-1d: Speed Limits.** Speed limits along all access roads outside of permanent desert tortoise fencing shall not exceed 15 miles per hour to minimize dust during construction activities. Speed limits within permanent desert tortoise fencing shall not exceed 25 miles per hour to minimize impacts during operations and maintenance. Nighttime vehicle traffic associated with Project activities shall be kept to a minimum volume and speed to prevent mortality of nocturnal wildlife species.

5.3 STANDING OR PONDING WATER

Measures to reduce standing or ponding water that may occur as a result of project procedures such as vehicle and panel washing, dust abatement, temporary storage pond use, and revegetation are described below.

5.3.1 Vehicle and Solar Panel Washing (Operation and Maintenance)

Mud and dirt will be removed from construction vehicles at two wash stations, one on each side of I-15. The purpose of the wash stations is to reduce the introduction and spread of invasive weeds on the project site (CSESA 2013b). The wash stations will be designed to collect, filter, and re-use wash water to minimize waste and ponding. The stations will be maintained in proper operating condition throughout their use, and the filters will be changed or rinsed as needed. SMS will ensure that no ponded wash water persists at the wash station sites.

Panel washing is expected to occur 120 days per year and would require an approximate annual total of 5.4 acre-feet per year. The water will be allowed to run off the panels to the ground below where it is expected to percolate into the soil. No ponding or standing water is expected to result from panel washing. The Designated Biologist will be instructed to describe any standing water in the monitoring reports.

5.3.2 Dust Abatement (Construction)

APM 1 and Mitigation Measure 3.2-1 require SMS to apply water to all unpaved roads in order to reduce fugitive dust emissions on site. Water would only be applied to dry soils for the purpose of managing fugitive dust. The Designated Biologist will be instructed to report any leaking or standing water in regular monitoring reports.

> **APM 1:** The Applicant shall use periodic watering for short-term stabilization of disturbed areas to minimize visible fugitive dust emissions. Use of a water truck to maintain surface moisture on disturbed areas and surface application of water during visible dusting episodes shall be considered sufficient to maintain compliance.
>
> **Mitigation Measure 3.2-1:** The Applicant shall apply water twice daily to all unpaved roads and unpaved parking areas actively used during operation and maintenance, except when moisture remains in the soils such that dust is not produced when driving on unpaved roads.

5.3.3 Temporary Storage Ponds (Operation and Maintenance)

Evaporation ponds would only be constructed if groundwater is not adequate for panel washing due to dissolved solid content levels. APM 59 describes the construction requirements for on-site evaporation ponds. Ponds would be covered by wire grids incorporating visual features such as plastic colored ribbons (or other methods) or netting designed to deter birds from landing in the ponds. The evaporation ponds would be monitored for bird fatalities.

> **APM 59:** Evaporation ponds will have 3:1 sloping sides to discourage wading birds from utilizing the ponds. A wire grid with visual deterrents, such as plastic colored ribbons, will be implemented to discourage birds and bats from landing on the ponds. The evaporation pond will be monitored for bird fatalities. Netting or other appropriate BMPs will be applied at the direction of the Designated Biologist and as approved by BLM, CDFW, and USFWS (as appropriate).

5.3.4 Cacti Salvage (Construction, Decommissioning)

APM 36 and Mitigation Measure 3.3-3 require a Vegetation Resources Management Plan (VRMP). The SMS VRMP addresses watering of cacti. The VRMP requires watering to be infrequent to allow cacti to adjust to the local environment. The watering of cacti is not expected to generate standing or ponding of water.

> **APM 36: Vegetation Resources Management Plan.** The Applicant will prepare and implement a Vegetation Resources Management Plan that contains the following components:
>
> a) Vegetation Salvage plans that discuss the methods that will be used to transplant cacti present within the proposed disturbance areas following BLM's standard operating procedures, as well as methods that will be used to transplant special-status plant species that occur within proposed disturbance areas.

b) Restoration plans discussing the methods that will be used to restore any of the four native plant community types (creosote bush-white bursage scrub, cheesebush scrub, creosote bush scrub, and smoke tree woodland) present within the Project right-of-way that may be temporarily disturbed by construction activities. The Applicant would obtain BLM approval for any seed mix used for restoration.

c) Vegetation Salvage and Restoration plans that will specify success criteria and performance standards. The Applicant will be responsible for implementing the VRMP according to BLM requirements.

Mitigation Measure 3.3-3: Special-Status Plant Species and Cacti Impact Avoidance and Minimization. This measure will avoid unintended impacts to special-status plants on the Project site (i.e., Emory's crucifixion thorn) and provide for the salvage of protected cacti prior to construction. This measure includes the following requirements:

1. The Applicant shall establish Environmental Exclusion Areas (EEAs) around Emory's crucifixion thorn plants that have been identified on the Project site (Figure 3.3-3). A minimum 100-foot exclusion area shall be established around the plants, which shall be clearly identified and maintained throughout construction to ensure that avoided plants are not inadvertently harmed. EEAs shall be clearly delineated in the field with temporary construction fencing and signs prohibiting movement of the fencing or sediment controls under penalty of work stoppages or compensatory mitigation.
2. Worker Environmental Awareness Program (WEAP). The WEAP (APM 44; Mitigation Measure 3.4-1c) shall include training components specific to protection of special-status plants that occur on the Project site.
3. Herbicide and Soil Stabilizer Drift Control Measures. Special-status plant occurrences within 100 feet of the Project Disturbance Area, including Utah vine milkweed, shall be protected from herbicide and soil stabilizer drift. The IWMP (APM 50 and Mitigation Measure 3.3-2) includes measures to avoid chemical drift or residual toxicity to special-status plants consistent with guidelines such as those provided by the Nature Conservancy's The Global Invasive Species Team (Hillmer and Liedtke, 2003), the USEPA, and the Pesticide Action Network Database. *Erosion and Sediment Control Measures*. Erosion and sediment control measures shall not inadvertently impact special-status plants (e.g., by using invasive or non-Mojave Desert native plants in seed mixes, introducing pest plants through contaminated seed or straw, etc.). These measures shall be incorporated in the Comprehensive Drainage, Erosion, and Sedimentation Control Plan (Mitigation Measure 3.19-2).
4. Preconstruction Cacti Salvage. The Applicant shall develop a Vegetation Resources Management Plan that details the methods for the salvage and transplantation of target succulent species that would be affected by the Project. The Plan shall be submitted to the BLM AO for review and approval and shall include at a minimum the following elements:

a. The location of target plants on the Project site;
b. Criteria for determining which individual plants are appropriate for salvage;
c. The proposed methods for salvage, propagation, transport, and planting;
d. Procedures for identifying target species during preconstruction clearance surveys;
e. Considerations for storing salvaged plants or pre-planting requirements;
f. Suggested transplantation sites;
g. A requirement for 10 years of maintenance of the transplanted individuals, including removal of invasive species and irrigation (if necessary); and
h. A requirement for 10 years of monitoring to determine the percentage of surviving plants each year and to adjust maintenance activities using an adaptive management approach.

5.3.5 Bighorn Sheep Water Sources (Operation and Maintenance)

APM 75 specifies that SMS will establish two water sources to encourage bighorn sheep migration to the north of I-15. Mitigation Measure 3.4-3 requires three additional water sources for bighorn sheep. Water sources include a 2,300 gallon underground water storage tank with a ground-level opening where the water supply is available to sheep and other wildlife. Siting the water sources in locations where other raven attractants, such as food subsidies and nesting and perching sites, are not readily available will decrease raven use of the water sources. If monitoring data indicates an increase in raven predation around the water sources, adaptive management control measures may be implemented at the discretion of the Designated Biologist with approval from USFWS, CDFW, and BLM.

APM 75: Two water sources will be created to encourage bighorn sheep migration to the north of I-15. The water source location(s) shall be determined through coordination with CDFW and BLM. The water sources shall be maintained throughout the life of the Project.

Mitigation Measure 3.4-3: Bighorn Sheep Habitat Connectivity. In addition to APM 75, which will provide two water sources to improve bighorn sheep habitat connectivity, this measure provides additional detail and requirements for the proposed water sources. To compensate for impacts to bighorn sheep habitat connectivity, the Applicant/Owner shall support CDFW's 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 to install between three and five (total) pre-fabricated bighorn sheep water 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 1-15 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. 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.

5.3.6 Leaking Pumps, Water Lines, or Storage Tanks (Construction, Operation and Maintenance, Decommissioning)

Unplanned events including leaks in pumps, water lines, and storage tanks also have the potential to cause standing or ponding water. SMS will ensure that water tanks are sealed and free of leaks at all times, and that water trucks are not overfilled. Water sources, such as wells, will be checked for leaks regularly. Any leak causing standing surface water will be promptly repaired. The Designated Biologist, as well as all construction crew members, will be instructed to identify and report any leaking or standing water, for inclusion in regular monitoring reports.

5.4 NESTING, ROOSTING, OR PERCHING SITES

5.4.1 Project Facilities and Structures (Construction, Operation and Maintenance, Decommissioning)

The project does not include a transmission line because the ROW is adjacent to the interconnecting transmission grid. There will be two above-ground poles at the substation that could provide nesting, roosting, or perching sites. APM 49 requires the connection from the substation to the transmission line meet the most recent Avian Power Line Interaction Committee (APLIC) guidelines to the extent practicable. The project fences, buildings, panels, and inverters could be used by ravens for roosting or perching. All potential nesting, roosting, or perching sites that are created during project construction, operation, and decommissioning would be monitored by the Designated Biologist during that phase and removed when they are no longer needed.

6 MONITORING

6.1 BIOLOGIST

SMS will appoint a Designated Biologist, as required by Mitigation Measure 3.3-1. The Designated Biologist will be responsible for implementing and managing the monitoring plan as described in this Raven Monitoring and Control Plan, and providing monitoring reports for the project. Monitoring reports will be provided to SMS, BLM, CDFW, USFW, and San Bernardino County. Monitoring tasks may be completed by biological monitors, overseen by the Designated Biologist.

The Designated Biologist will develop and implement the Worker Environmental Awareness Program (WEAP) prior to project construction, as required by Mitigation Measure 3.4-1c.

> **Mitigation Measure 3.3-1: Designated Biologist.** The Applicant shall assign at least one Designated Biologist to the Project. The Applicant shall submit the resume of the proposed Designated Biologist(s), with at least three references and contact information, to the BLM Authorized Officer (AO) for approval in consultation with CDFW and USFWS.
>
> The Designated Biologist must meet the following minimum qualifications:
>
> 1. Bachelor's degree in biological sciences, zoology, botany, ecology, or a closely related field;
> 2. Three years of experience in field biology or current certification of a nationally recognized biological society, such as The Ecological Society of America or The Wildlife Society;
> 3. Have at least one year of field experience with biological resources found in or near the Project site;
> 4. Meet the current USFWS Authorized Biologist qualifications criteria (www.fws.gov/ ventura/speciesinfo/protocols_guidelines), demonstrate familiarity with protocols and guidelines for the desert tortoise, and be approved by the USFWS;
> 5. Possess a CESA Memorandum of Understanding pursuant to Section 2081(a) for desert tortoise.
>
> In lieu of the above requirements, the resume shall demonstrate to the satisfaction of the BLM AO, in consultation with CDFW and USFWS, that the proposed Designated Biologist or alternate has the appropriate training and background to effectively implement the mitigation measures.

Mitigation Measure 3.4-1c: Worker Environmental Awareness Program (WEAP). Prior to Project initiation, the Designated Biologist shall develop and implement the WEAP (APM 44), which shall be available in English and Spanish. Wallet-sized cards summarizing the information shall be provided to all construction and operation and maintenance personnel. The WEAP shall include the following:

1. An explanation of the sensitivity of the vegetation communities and special-status plant and wildlife species within and adjacent to work areas, and proper identification of these resources.
2. Biology and status of the desert tortoise, golden eagle, burrowing owl, other nesting birds, kit fox, and American badger and measures to reduce potential effects to these species.
3. Actions and reporting procedures to be used if desert tortoise, burrowing owl, other nesting birds, kit fox, or American badger are encountered.
4. An explanation of the function of flagging that designates authorized work areas.
5. Driving procedures and techniques to reduce mortality of wildlife on roads.
6. Discussion of the federal and state Endangered Species Acts, Bald and Golden Eagle Protection Act, and the Migratory Bird Treaty Act and the consequences of non-compliance with these acts.
7. The importance of avoiding the introduction of invasive weeds into the Project area and surrounding areas.
8. A discussion of general safety protocols such as hazardous substance spill prevention and containment measures and fire prevention and protection measures.
9. A review of mitigation requirements.

6.2 MONITORING TASKS

6.2.1 Daily Monitoring

The Designated Biologist, or a biological monitor overseen by the Designated Biologist, will conduct daily monitoring inspections of project activities and potential subsidies (e.g., trash containers, project access roads, water lines, water tanks, and water trucks) throughout the project area during construction of the project as required by Mitigation Measure 3.4-1b. The Designated Biologist or biological monitor will complete a daily monitoring report form to confirm inspection of items listed below. The monitor will inspect and report daily on the condition, or presence of the following:

- Trash receptacles and trash storage areas (uncovered containers; exposed or overflowing trash)
- Food waste or food-related trash on the ground or in an open vehicle (anywhere on the project site)

- Vehicle speeds that exceed 15 mph (vehicle description, license number or other ID, time and location)
- Dead or injured animal(s) (anywhere on the project site)
- Standing water (anywhere on the project site, including tanks, pumps, pipes, irrigation sites, trucks, road watering, and panel washing area)
- Raven observation(s) (record time, date, location, number of ravens, and activity for each raven observation)

Daily monitoring logs will be submitted to the site supervisor each day upon completion of the monitoring tasks. The log will identify any facility or condition in need of review or repair. The site supervisor will make completed daily logs available to the Designated Biologist and biological monitors during follow-up monitoring visits. Follow-up daily inspections will document correction(s) of the problem(s), as needed. All daily monitoring logs will be included as electronic attachments to the annual monitoring reports. All problems identified/reported will be addressed within 48 hours or one full working day after the daily monitoring report is filed.

6.2.2 Nest Monitoring

The Designated Biologist, biological monitor, or a qualified contractor will inspect the solar facility daily during the raven nesting season (March through early July) during construction to identify any courtship or nesting behavior, initiation or any stick nest construction (whether by raptors or ravens) on project equipment, and the progress and success of any stick nest on the structures. Other potential nesting sites within 0.25 mile of any project facility will also be monitored (including parallel transmission or distribution lines).

If ravens or raptors nest on any project facility or other site within 0.25 mile of the project facilities, the Designated Biologist, biological monitors, or a qualified contractor will document nesting progress including success or failure, and inspect any evidence of predation on desert tortoises, during each weekly monitoring visit throughout the nesting season. All nest monitoring data will be summarized in annual reports and the data itself will be provided electronically.

The Designated Biologist will report any active raven nest, as well as any evidence of raven predation, to SMS, BLM, CDFW, and USFWS.

6.2.3 Other Monitoring Activities

The Designated Biologist or biological monitor will be responsible for the activities listed below, in addition to daily inspections.

- During all soil-disturbing activities, attempt to relocate animals from the area prior to disturbance, and remove any dead or injured wildlife from the work area.
- Handle road killed or injured wildlife according to APM 60.

6.3 REPORTING

SMS will submit monitoring reports to BLM, CDFW, and USFWS no later than January 31 each year of construction. The annual monitoring reports will document raven management measures that have been implemented as well as track the effectiveness of the measures through the results of raven abundance. The raven management practices, such as employee education and trash containment will be implemented for the life of the solar facility.

The annual report will include:

- Summary of raven observations and behavior (from daily monitoring report forms)
- Summary of annual nesting season monitoring, including locations and species for all observed stick nests on project facilities and within 0.25 mile
- Documented raven nesting, roosting, and perching locations
- Number and locations of any stick nests removed from project facilities
- Recommendations by the Designated Biologist for improving raven management

7 ADAPTIVE MANAGEMENT

If raven monitoring data indicate a clear increase in local raven nesting activity attributed to the project, then SMS and the Designated Biologist will confer with the USFWS, CDFW, and BLM to develop and implement further raven control measures. Adaptive management measures may include additional worker education, more stringent restrictions on water use or trash disposal, nest removal, or specific measures to "haze" ravens from project facilities or subsidies.

8 EDUCATION

As required by Mitigation Measure 3.4-1c and APM 44, the Designated Biologist shall develop and implement the WEAP prior to project initiation. The WEAP will be available in English and Spanish. Wallet-sized cards summarizing the information shall be provided to all construction and operation and maintenance personnel. The WEAP shall include the following instructions specific to minimizing or preventing raven subsidies:

1. Review of raven biology, including desert tortoise predation and dependence on human subsidies
2. Specific responsibilities and consequences for all workers (e.g., maintaining speed limits below 15 mph, reporting any leaks or ponding water that could attract ravens)
3. Trash and food waste disposal and control methods
4. Reporting road-killed wildlife, water leaks, or other subsidies

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APPENDIX L-8
Desert Pavement Protection Plan

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Desert Pavement Protection Plan

Soda Mountain Solar Project

San Bernardino County, California
BLM Case No. CACA 49584

October 2014

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Desert Pavement Protection Plan

Soda Mountain Solar Project

San Bernardino County, California
BLM Case No. CACA 49584

October 2014

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1 INTRODUCTION

1.1 PROJECT OVERVIEW

The proposed Soda Mountain Solar Project (project) includes construction, operation, maintenance, and decommissioning of a 358-megawatt (MW) photovoltaic solar electric power generating facility on federal land managed by the U.S. Department of Interior, Bureau of Land Management (BLM). The project is proposed by Soda Mountain Solar, LLC (SMS), under BLM case number CACA 49584.

The project includes approximately 2,227 acres of solar panel arrays. The proposed BLM right-of-way (ROW) is approximately 4,179 acres. The project includes an interconnection to the City of Los Angeles Department of Water and Power (LADWP) Marketplace to Adelanto 500-kilovolt (kV) transmission line, which is adjacent to the proposed ROW.

1.2 ENVIRONMENTAL IMPACT STATEMENT/ENVIRONMENTAL IMPACT REPORT

BLM and the County of San Bernardino released a Draft Environmental Impact Statement/Environmental Impact Report (EIS/EIR) on November 29, 2013 (BLM 2013).The Draft EIS/EIR included a mitigation measure for Desert Pavement, provided below. This Desert Pavement Protection Plan is consistent with the requirements of Mitigation Measure 3.7-4. This measure may be subject to revision in the Final EIS/EIR or Record of Decision. The final mitigation measure language could supersede the measures provided below. This Plan would be revised if needed to address the requirements in the final mitigation measure.

> **Mitigation Measure 3.7-4: Protection of Desert Pavement**. Grading and other methods of ground disturbance in areas covered by desert pavement shall be avoided or minimized. If avoidance of these areas is not possible, the desert pavement surface shall be protected from damage or disturbance from construction vehicles by use of temporary mats on the surface. A plan for identification and avoidance or protection of sensitive desert pavement shall be prepared and submitted to the BLM for review and approval at least 60 days prior to start of construction.

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2 DESERT PAVEMENT DELINEATION

2.1 DESERT PAVEMENT DEFINITION

Desert pavement is a soil unit characterized by a surface of interlocking gravels (Wilson Geosciences 2011). Desert pavements form a hardened desert surface as a result of wind action and sheetwash, which have removed finer-grained material. The presence of desert pavement is an indication of an older, stable surface that has not been recently eroded. Alluvial units with desert pavement are less prone to erosion if undisturbed.

2.2 METHODOLOGY FOR IDENTIFICATION OF DESERT PAVEMENT AREA

Geologic mapping was conducted for the proposed project in 2010 (Wilson Geosciences 2011) to delineate various bedrock and alluvial units that would affect project designs and facility locations. The engineering suitability of each geologic unit for trafficability and foundation support was a primary concern in geologic mapping. The presence of desert pavement and/or desert varnish was one of the classifications addressed. The geologic unit descriptions follow Bedford and others (2010), which were developed based on more rigorous U.S. Geological Survey (USGS) mapping of the Amboy quadrangle (1:100,000 scale) to the southeast of the project area. The USGS researchers prepared detailed descriptions of the various units in the Amboy quadrangle. The geologic unit nomenclature was used for the project area to maintain some consistency with the USGS mapping.

In general, Amboy and Soda Mountain desert pavements are classified as:

1. Not present or none;
2. None to very weak;
3. Very weak to weak;
4. Weak to moderate; and
5. Moderate to well-developed.

The weak to moderate classification was not used for the project area because the distinction between weak to moderate and moderate to well-developed was not readily made at the level of site characterization mapping performed. The moderate to well-developed was therefore applied to areas that may have weak to moderate development of desert pavement.

Each alluvial fan geologic unit, as summarized in Table 6 of the Soda Mountain Geologic Characterization Report (WGI 2011), may contain alluvial fan surfaces with a range of desert pavement development (e.g., due to degradation and erosion of previously well developed to weakly developed desert pavement). The level of desert pavement development in each geologic map unit was estimated visually. Geologic map units were superimposed on Google

Earth imagery. Wilson Geosciences (who had performed the original SMS geologic mapping and field checking) visually inspected the aerial photographs and estimated the percentage of desert pavement development within the map unit based on color, presence of vegetation, and geomorphic character (e.g., a smooth, broad flat surface versus a narrow sinuous surface). See Appendix A for the geologic maps.

2.3 DESERT PAVEMENT AREAS IN THE PROJECT RIGHT-OF-WAY

Appendix B includes a table that identifies the geologic map units and percentage of moderate to well-developed desert pavement in each unit. The percentage of moderate to well-developed desert pavement in each geologic unit varies from 0 percent to 100 percent. An estimated 582 acres of moderate to well-developed desert pavement occurs within the project right-of-way.

3 PROJECT DESCRIPTION

3.1 LOCATION AND FACILITIES

As shown in Figure 3.1-1, the project is located approximately 6 miles southwest of the community of Baker, along Interstate 15 (I-15). The project consists of a 358-megawatt (MW) photovoltaic (PV) solar energy generating facility located on federal ROW administered by the BLM in a rural area of the Mojave Desert, east of the western Soda Mountains in unincorporated San Bernardino County. Solar array fields and project facility construction will disturb approximately 2,557 acres. The area of disturbance by project features is provided in Table 3.1-1. Figure 3.1-2 depicts the project layout.

Table 3.1-1: Area of Project Disturbance

Project Component	Area of Disturbance (acres)
Solar Arrays	2,227[1]
Substation, Switchyard, and Interconnection	40
Rasor Road Realignment	68
Access Roads	106
Berms	33
Collector Routes	24
Laydown Area	30
Temporary Desert Tortoise Exclusion Fence	29
Total	**2,557**

Notes:

[1] Solar array area of disturbance is calculated as all areas within the solar array security fence and within 30 feet outside of the solar array security fence, excluding other Project components. Project components included within the solar array security fence include the operation and maintenance buildings, warehouses, water tanks, wells, water treatment facility, and brine ponds. Impacts for these components are accounted for in the impacts for the solar arrays.

Source: BLM 2013

Figure 3.1-1: Project Location

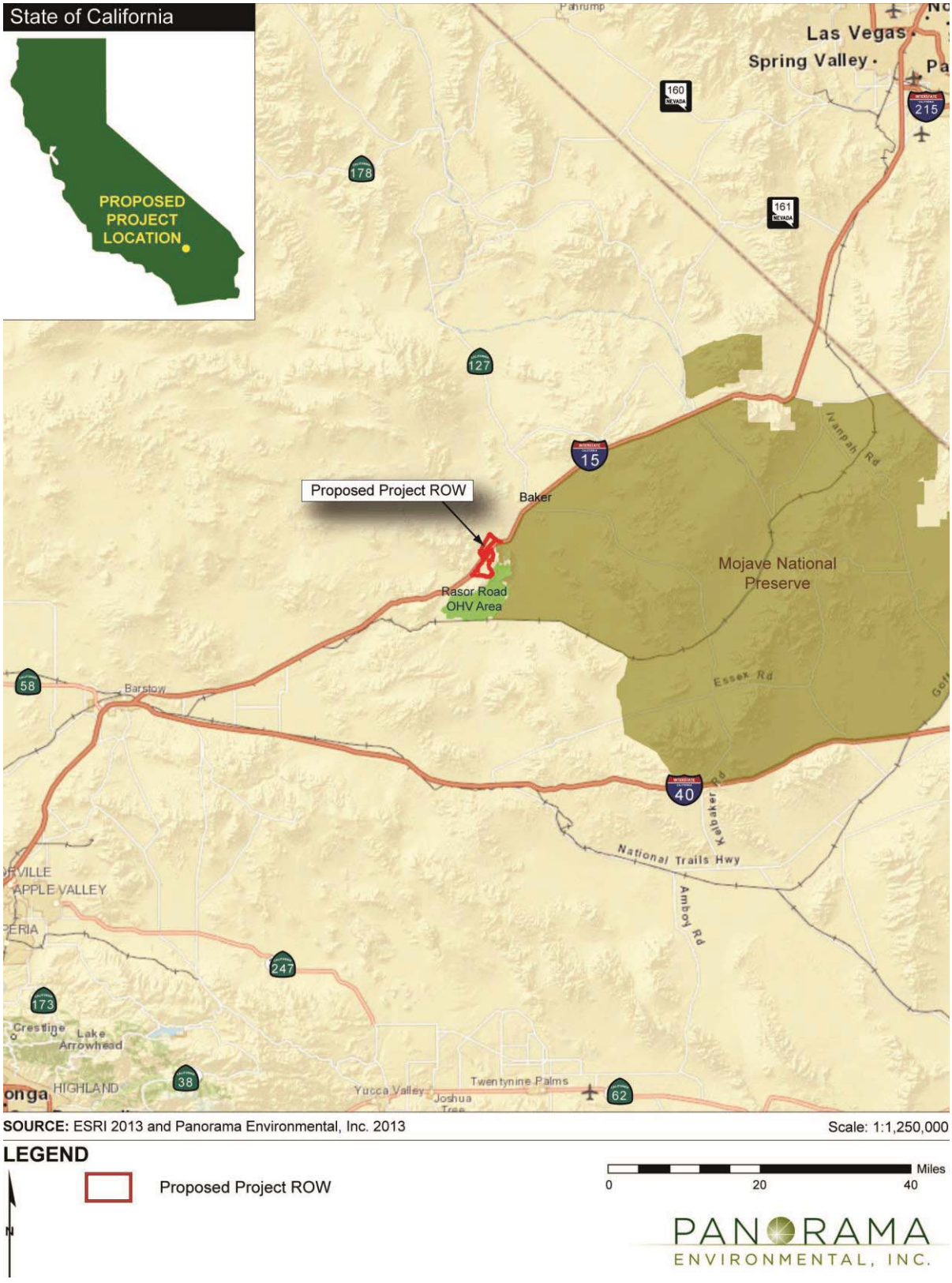
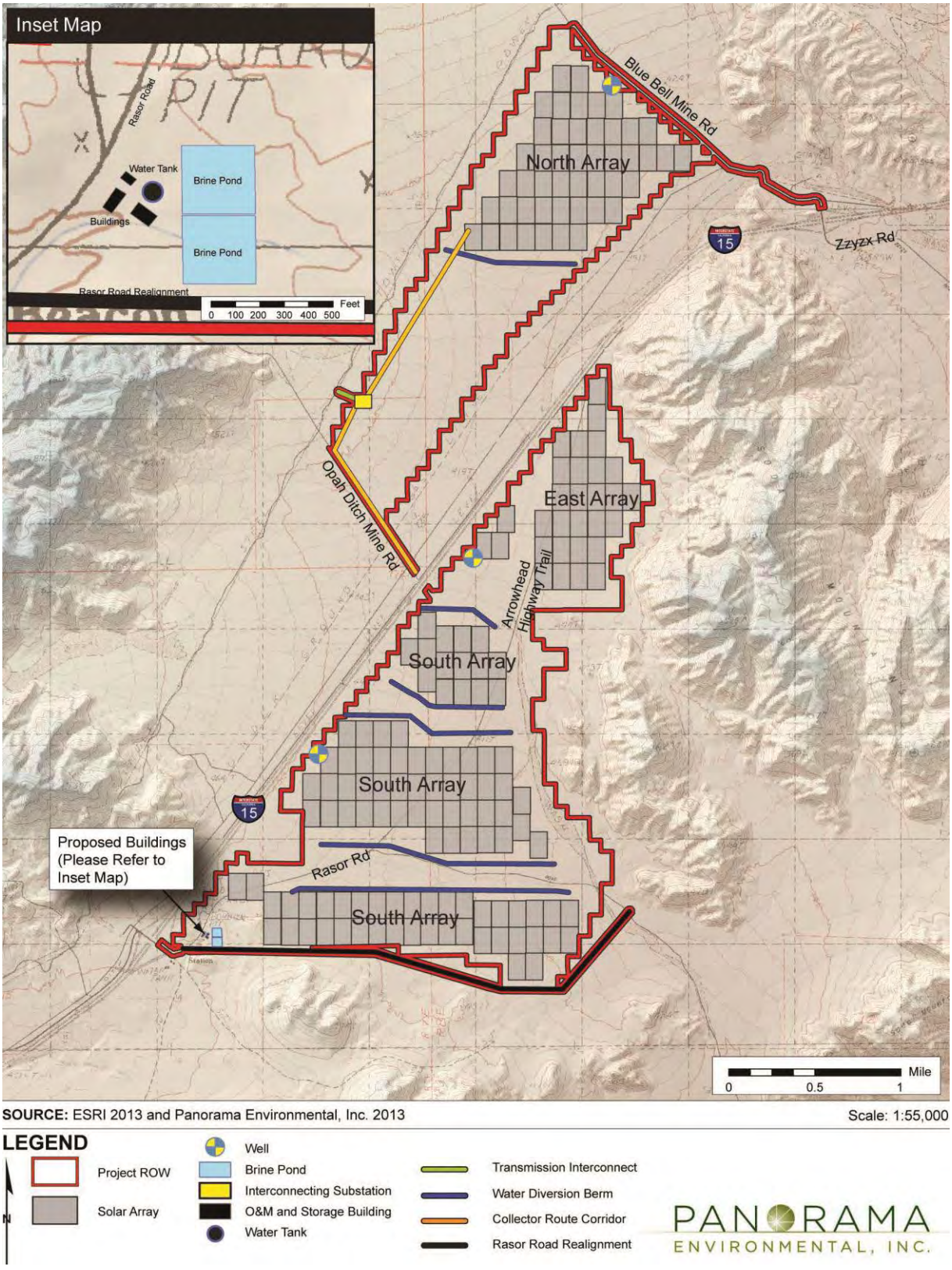


Figure 3.1-2: Proposed Project Layout



3.2 CONSTRUCTION

Construction is anticipated to occur over a 24- to 30-month period. Construction phasing will depend on the terms of the Power Purchase Agreement (PPA) with the local utility company, but is anticipated to comprise the following: 100 MW in Year 1, 125 MW in Year 2, and 125 MW in Year 3. The construction workforce would consist of an average of 175 direct labor workers, with a peak of to 250 directly employed labor workers during the height of construction. In addition to this direct labor workforce, approximately 25 to 40 additional workers at the site would engage in supervision, contract services, administration, and other non-direct labor activities.

The project would include the construction of several solar panel arrays, operation and maintenance buildings and storage areas, a substation, switchyard and appurtenant facilities, and associated roads and a short transmission intertie. Project construction would include the following main elements and activities (BLM 2013):

- Clearing, preparation, and grading of temporary laydown areas, switchyard area, and substation area;
- Surveying, clearing, and grading of internal road corridors to transport construction equipment, materials, and crews within the site;
- Improvement of Rasor Road to the main entrance of the solar facility;
- Rerouting of the portion of Rasor Road that is located in the proposed array fields to the southern perimeter of the array fields;
- Construction of earthen berms;
- Construction of water well(s);
- Construction of reverse osmosis facilities, including brine ponds (if necessary based on water quality of pumped groundwater);
- Construction of buildings;
- Construction of foundations and mounts for panel arrays, inverters, trackers, and medium-voltage transformers;
- Installation of the electrical collection system, including low-voltage circuits;
- Assembly and erection of solar panels;
- Construction and installation of the substation and switchyard;
- Solar panel commissioning and energizing;
- Final grading and drainage; and
- Restoration activities.

3.2.1 Site Clearing and Grading

Construction would commence with site clearing and grading of the laydown areas and the substation location. The construction contractor would then survey, clear, and grade road corridors to allow equipment, materials, and workers to be brought to the construction area.

Small temporary parking areas may be established adjacent to the array locations to allow direct access to work areas. Alternatively, larger central parking areas may be constructed, and vans or other vehicles would be used to bring workers, equipment, and materials to the area under construction. Materials and equipment would arrive on tractor-trailers at the staging area and would be brought directly to the installation location. After the initial solar arrays are installed and interconnected to the grid, they would begin generating power while additional PV blocks are constructed.

The solar arrays would be surveyed between 90 and 180 acres at a time. Within the surveyed area, larger vegetation would be cut or crushed as described below, and the ground would be prepared through isolated grading. The locations for the inverters, transformers, and buried electrical lines then would be surveyed.

Prior to construction, areas of the project site proposed for the location of the array blocks and other infrastructure would undergo partial removal of scrub vegetation; plants would be cut back leaving the root structure and about 6 inches of stem in place. Isolated grading would be undertaken at minor drainage washes along the alignment of the wash, and would be used to level isolated undulations. Grading would also be conducted along access roads through the array blocks. Up to 1,155 acres would be graded for the project (Panorama Environmental, Inc., 2013); additional areas would be subject to disc and roll or another type of ground treatment. The final area and limits of grading will be determined during detailed design, but will be within the footprint of disturbance analyzed in the PA/EIS/EIR. The staging area, road corridors, building and substation location, and areas for other infrastructure would be cleared and graded. Rocks or boulders removed from the array area would be used as fill within the earthen berms. The remaining fill to construct the earthen berms would be taken from areas immediately adjacent to the berms.

Trenches would be located along roadways and areas already disturbed by the installation process. Roads would be constructed at grade to maintain existing sheet/shallow flow through the site during storm events. In select locations of the site, cut-and-fill may be required. A site-specific stormwater prevention plan or best management practice plan is required and would provide a description of the erosion control methods planned for the site.

Draft grading plans would be developed by the SMS prior to the start of construction. The draft grading plans would include proposed contours, grading daylight lines, flow lines, grade breaks, potential drainage features, and spot elevations sufficient to demonstrate that streets, driveways, parking lots, and drainage grades meet minimum requirements. Final design plan sheets would be prepared at appropriate scale and would show layout and location of site grading improvements and drainage facilities. Earthwork quantities (i.e., cut, fill, and net volumes) would be shown on the plans. Design section sheets would be produced at appropriate scale and would contain site cross sections and other pertinent features for proposed grading features corresponding to those depicted on the grading plans.

3.2.2 Solar Array Assembly and Construction

Construction of the solar arrays is expected to take place at a pace of approximately 3 MW per week. Construction of the arrays is generally expected to proceed from north to south; however, construction phasing would ultimately be determined by the terms of the PPA. Array construction would begin with the installation of array support posts, which would be vibrated into the ground or bored or driven if necessary. Once the support structures are in place, solar panels would be attached to the support frame. The assembled groups of solar panels would be wired together into strings via connectors on the back of the modules. Assembled panel sections then would be connected to combiner boxes located throughout the arrays that would deliver power to the inverter. Inverters would be mounted on concrete pads or driven piles. Inverters and transformers would be brought in by tractor-trailers and delivered directly to the mounting pad sites.

Buried electrical lines for direct current (DC) array wiring and alternating current (AC) wiring between inverters and transformers would then be installed using trenching machines. The trenches would be approximately 1 to 2 feet wide and 2 to 4 feet deep. The trenched areas would be filled once the cables are buried. After this work is complete, and depending on the level of ground preparation chosen, the surveyors, vegetation cutters, graders, and trenchers would move on to the next block.

It is anticipated that the solar panels would require one washing during the construction phase prior to energizing and performance testing of the arrays in order to remove the dust that has accumulated on the panels during construction.

3.2.3 Collection Line Construction

The medium-voltage collection cables would be trenched at depths up to 4 feet using a trenching machine. The trenches would be approximately 1 to 2 feet wide. Multiple trenches may be placed adjacent to each other, depending on the number of collector circuits in a particular location. The cables would be manually placed within the trenches in layers (as necessary) followed by a backfill and compaction operation. Alternatively, a cable laybox would be used to automate the cable placement and backfill process. The main trenching operations would be for installation of DC cables from the combiner boxes to the inverter skids and installation of AC collector circuits between inverter skids and the substation. The exact locations would be determined during detailed design. The laydown areas (approximately 100 feet by 100 feet) would generally be staged close to the work fronts, distributed throughout the arrays, and within disturbance limits.

The collector circuits from the east and south arrays would be routed to the project substation by boring under I-15. The boring operation would be accomplished by constructing a boring pit on each side of I-15 to initiate and terminate the bore. The collector circuits would cross I-15 through 15 to 24 bores in a 150-foot-wide corridor at a 90-degree angle, and would be installed per Caltrans requirements. The collector cable would be installed by circuit in conduits, with each circuit contained in a single 6-inch diameter conduit (typical) spaced approximately 10 feet on center. Alternative design concepts for boring design may be considered based on project

requirements. SMS would coordinate closely with Caltrans and would secure the necessary encroachment permit for activities within Caltrans ROW. No overhead collector lines are proposed.

3.2.4 Substation and Switchyard Construction

At the same time the solar arrays are being constructed, separate crews would begin building the substation, switchyard, and the interconnection to the 500 kV transmission line. Los Angeles Department of Water and Power would be responsible for construction of the switchyard. One tower would be removed from the existing line and two turning structures would be constructed adjacent to the removed tower. The turning structures would direct the 500 kV transmission line into and out of the new switchyard. The substation and switchyard would be graded and compacted to an approximately level grade. Equipment would be staged adjacent to the site.

A substation and switchyard grounding grid would be installed as required. Multiple concrete pads and/or piers would be constructed as foundations for substation equipment and the remaining area would be graveled. Concrete piers and footings would be installed to support the transmission towers, switchyard, and substation buswork. Electrical transformers, switchgear, and related substation facilities would be designed and installed/constructed to transform the 34.5 kV power on the collection lines to the transmission line voltage. A chain-link fence would then be erected around the substation and switchyard.

3.2.5 On-site Building Construction

The on-site buildings are proposed to be pre-engineered metal buildings that would be fabricated off-site. Sections would be transported to the project site for erection and assembly. The buildings would be anchored to concrete foundations on site. The interior details and other finish work would be completed on site after anchoring.

3.2.6 Access Road Construction

Access road construction activities would include improvements to existing roads, the realignment of Rasor Road, and construction of new internal roads for panel access and site maintenance.

Existing site roads (mainly the southern entrance to the site, Blue Bell Mine Road, and the access road on the west side of the site parallel to the transmission lines) may require some reinforcement with rip-rap or crushed aggregate during construction and maintenance of the project. These additions would be limited to areas previously damaged by erosion or washed out in rain events or where sharp turns need to be widened to allow equipment deliveries. Most wash crossings would be at grade over wide channels with compacted native materials.

The relocation of Rasor Road would result in approximately 2.6 miles of newly constructed, 26 foot wide roadway. The road surface would consist of graded and compacted native material. Aggregate surface material is not proposed.

To access the interior of the site during construction and operation, approximately 14.5 miles of graded access and maintenance roadways would be constructed. Access roads would be 16 feet wide and maintenance roads would be 10 feet wide. These roads would consist of compacted native material and would be graded as necessary, but generally would follow the existing terrain. Larger boulders that could impede vehicle access would be removed. These permanent access roads would be compacted to meet load requirements for vehicle traffic over the life of the project.

3.3 OPERATION AND MAINTENANCE

Operational needs at the site include monitoring and optimizing the power generated by the solar arrays and interconnection with the transmission lines, operating the solar array tracking system, and conducting panel washing activities periodically through the year. During operation, it is anticipated that the proposed project would require a workforce in the range of approximately 25 to 40 workers, which include a mix of professional staff and maintenance and security personnel.

Maintenance activities would include inspecting, repairing, and maintaining the arrays and tracking systems and the Supervisory Control and Data Acquisition (SCADA) system; washing panels; and troubleshooting the collector lines and repairing damaged cables, which may necessitate some trenching. Additional maintenance would be required to maintain the administrative buildings, fencing and signage, roadways, and other ancillary facilities at the site. The majority of planned maintenance activities would be performed before sunrise, with repairs made at sundown. To ensure security of the facility, nighttime security and monitoring personnel would be employed.

The substation would be unmanned during operation; however, on-site personnel would visit the substation as needed to operate equipment or interface with the relaying and metering equipment. One 500-gallon diesel tank or 50-cubic-foot propane tank would be kept on site permanently for emergency power generation use in the event of an electrical outage. The emergency generator would be located adjacent to the ancillary buildings on the southwest side of the project site.

3.4 DECOMMISSIONING AND SITE RECLAMATION

When the proposed project reaches the end of its useful life, structures and equipment would be removed for reuse, or sold as scrap, and the land surface would be reclaimed. The decommissioning and site reclamation activities that would occur are anticipated to be substantially in conformance with those described in the draft Decommissioning and Closure Plan (BLM 2013). Because site conditions are likely to change over the life of the project and to assure that the Decommissioning and Closure Plan addresses all necessary conditions, the draft will be finalized and approved by the BLM before decommissioning and reclamation activities begin.

4 IMPACTS TO DESERT PAVEMENT

The proposed project has been designed to minimize grading and surface disturbance. The amount of grading is estimated at less than 50 percent of the area in each array, with additional disturbance required for roads, substation, inverters, and collector lines. Approximately 245.5 acres of moderate to well-developed desert pavement area may be disrupted by the proposed project.

4.1 METHODOLOGY

The impacts to desert pavement were analyzed using GIS. The estimate acreage of disturbance to desert pavement by each project feature is provided in Table 4.1-1.The area of desert pavement impacts was estimated using the following method:

1. Define the area of project facilities (Project Features column in Table 4.1-1)
2. Define the area of geologic units containing moderate to well-developed desert pavement within the area of project facilities (Area of Desert Pavement Geologic Unit Intersect column in Table 4.1-1)
3. Calculate the percent cover of desert pavement within the geologic units containing moderate to well- developed desert pavement
4. Calculate the project impacts to desert pavement by applying the percentage of desert pavement cover to each geologic map unit within the area of project facilities (Area of Impact to Desert Pavement in Table 4.1-1)
5. Reduce the desert pavement impacts within the array areas by 50 percent to reflect up to 50 percent grading within the array areas.

The methods to estimate desert pavement in this report were conservative and the actual area of desert pavement within the project is expected to be less than the estimated area.

4.2 PROJECT IMPACTS

Construction activities that could affect desert pavement include excavation, grading, and soil compaction. These activities are necessary to prepare the site for installation of project components such as access roads, berms, solar arrays, inverters, electrical collector lines, groundwater wells pads, laydown areas, operation and maintenance facilities, reverse osmosis facilities and brine ponds (if required), and the Rasor Road realignment. Ground-disturbing activities that impact desert pavement would have the potential to result in erosion, transport, and deposition of soil and/or surface sediments. Disturbance to desert pavement could increase wind erosion rates by exposing the underlying layer of finer-grained material.

The analysis of aerial photos and estimation of percentage of desert pavement in geologic units results in a conservative estimate of 245.5 acres of desert pavement that may be affected by project construction.

Table 4.1-1: Calculation of Potential Impacts to Moderate to Well Developed Desert Pavement in the Project Area

Project Feature[a]	Project Feature (acres)[b]	Area of Desert Pavement Geologic Unit Intersect[c] (acres)	Area of Impact to Desert Pavement[d] (acres)	Percentage of Desert Pavement Impacted by Project Element[e]
Groundwater wells	0.02	0.02	0.004	16%
Substation	40.0	39.7	37.8	95%
Laydown Area	30.0	0.0	0	0%
Fencing	25.0	15.0	5.1	20%
Collector Corridor	48.5	41.2	12.4	25%
Building/Tanks	1.3	0.0	0.01	1%
Rasor Road Realignment	8.5	0.0	0	0%
Berms	11.0	6.9	1.6	15%
Access Roads	13.0	10.0	3.3	25%
South Array 3	401.3	0.0	0	0%
South Array 2	509.8	468.8	71.9[f]	14%
South Array 1	157.3	157.1	12.6[f]	8%
East Array	336.3	0.0	0	0%
North Array	536.9	536.7	100.8[f]	19%
Total	**2,118.9**	**1,275.4**	**245.5**	

Notes:

[a] Name of project feature.

[b] Acres occupied by project feature. The project description assumes that the solar array area includes all areas within the outer fenceline; this delineation is more detailed and focuses on the areas of the solar arrays.

[c] Acres of geologic unit with moderate to well-developed (MWD) desert pavement in the area of each project feature.

[d] Acres of affect considering percentage of moderate to well-developed desert pavement and 50 percent grading within solar arrays with 100 percent grading in other project work areas.

[e] Percent of the desert pavement within the geologic units at each project element that will be impacted by the project element.

[f] Assumes 50 percent of the desert pavement within the array will be impacted; this impact reflects grading of up to 50 percent of the array.

5 AVOIDANCE AND MINIMIZATION EFFORTS

5.1 PLACEMENT OF FACILITIES AND LIMITED GRADING

The placement of the various project components will be designed to minimize overall project environmental impacts. The grading in the array areas will be limited to approximately 1,114 acres or less (50 percent of the estimated 2,227 acres of panels). Once construction is complete, the topography beneath the solar panels would generally be the same as the baseline condition, except in areas where soil has been compacted or rocks and isolated surface undulations have been removed by grading. The proposed approach to limit grading within the solar array fields would limit impacts to desert pavement by limiting disturbance to the desert pavement surface.

5.2 FLAGGING AND FENCING

Prior to construction, appropriate flagging or fencing will delineate work area boundaries. The flagging will clearly alert construction workers to boundary locations. Flagging or fencing is required by Mitigation Measure 3.3-2: Vegetation Best Management Practices, mitigation Measure 3.4.-1a: Monitoring by the Designated Biologist, and Mitigation Measure 3.4-1c: Workers Environmental Awareness Program.

> **Mitigation Measure 3.3-2:** Vegetation Best Management Practices. The Applicant shall undertake the following measures to manage the construction site and related facilities in a manner to avoid or minimize impacts to vegetation resources:
>
> 1. *Limit Area of Disturbance.* The boundaries of all areas to be disturbed (including staging areas, access roads, and sites for temporary placement of spoils) shall be delineated with stakes and flagging prior to construction activities in consultation with the Designated Biologist. Spoils and topsoil shall be stockpiled in disturbed areas lacking native vegetation and which do not provide habitat for special-status species. Parking areas, staging and disposal site locations shall similarly be located in areas without native vegetation or special-status species habitat. All disturbances, Project vehicles and equipment shall be confined to the flagged areas.
>
> 2. *Minimize Road Impacts.* New and existing roads that are planned for construction, widening, or other improvements shall not extend beyond the flagged impact area as described above. All vehicles passing or turning around would do so within the planned impact area or in previously disturbed areas. Where new access is required outside of existing roads or the construction zone, the route shall be clearly marked (i.e., flagged and/or staked) prior to the onset of construction.

3. *Minimize Traffic Impacts.* Vehicular traffic during Project construction and operation shall be confined to existing routes of travel to and from the Project site, and cross country vehicle and equipment use outside designated work areas shall be prohibited.

4. *Monitor During Construction.* In areas that have not been fenced with desert tortoise exclusion fencing and cleared, a Designated Biologist shall be present at the construction site during all Project activities that have potential to disturb soil, vegetation, and wildlife. The Designated Biologist or Biological Monitor shall review areas immediately ahead of equipment during brushing and grading activities.

5. *Minimize Impacts of Staging Areas.* Staging areas for construction on the plant site shall be within the area that has been fenced with desert tortoise exclusion fencing. For construction activities outside of the solar plant site, access roads, pulling sites, and storage and parking areas shall be designed, utilized, and maintained with the goal of minimizing impacts to native plant communities and sensitive biological resources.

6. *Avoid Use of Toxic Substances.* Soil bonding and weighting agents used on unpaved surfaces shall be non-toxic to plants and wildlife.

7. *Implement Erosion Control Measures.* Standard erosion control measures shall be implemented for all phases of construction and operation where sediment run-off from exposed slopes threatens to enter "waters of the State". Sediment and other flow-restricting materials shall be moved to a location where they shall not be washed back into drainages. All disturbed soils and roads within the Project site shall be stabilized to reduce erosion potential, both during and following construction. Areas of disturbed soils (access and staging areas) with slopes toward a drainage shall be stabilized to reduce erosion potential. To avoid impacts associated with generation of fugitive dust, surface application of water would be employed during construction and operation and maintenance activities.

8. *Monitor Ground Disturbing Activities Prior to Pre-Construction Site Mobilization.* If pre-construction site mobilization requires ground-disturbing activities such as for geotechnical borings or hazardous waste evaluations, a Designated Biologist or Biological Monitor shall be present to monitor any actions that could disturb soil, vegetation, or wildlife.

9. *Revegetation of Temporarily Disturbed Areas.* The Applicant shall prepare and implement a Revegetation Plan to restore all areas subject to temporary disturbance to pre-Project grade and conditions. Temporarily disturbed areas within the Project site include, but are not limited to: all proposed locations for linear facilities, temporary access roads, berms, areas surrounding the drainage diffusers, construction work temporary lay-down areas not converted to part of the solar field, and construction equipment staging areas. The Revegetation Plan shall include a

description of topsoil salvage and seeding techniques and a monitoring and reporting plan, and the following performance standards by the end of monitoring year 2:

a. at least 80 percent of the species observed within the temporarily disturbed areas shall be native species that naturally occur in desert scrub habitats; and

b. relative cover and density of plant species within the temporarily disturbed areas shall equal at least 60 percent.

10. *Integrated Weed Management Plan.* This measure provides further detail and clarifies requirements for the Applicant's draft Integrated Weed Management Plan (IWMP) (see Appendix E-2). Prior to beginning construction on the Project, the Applicant shall prepare, circulate to the BLM for comment and approval, and then implement an IWMP that meets the approval of BLM's Authorized Officer and conforms to the CDCA Plan (Table 1) to prevent the spread of existing invasive species and the introduction of new invasive species to the Project site. The Plan shall be consistent with BLM's Vegetation Treatments Using Herbicides on BLM Lands in 17 Western States (BLM, 2007) and the National Invasive Species Management Plan (National Invasive Species Council, 2008).

The IWMP shall include, at a minimum: specific management objectives and measures for each target invasive species; baseline conditions; weed risk assessment; measures (both preventative and containment/control) to prevent/limit the introduction and spread of invasive species; monitoring and surveying methods; and reporting requirements.

The BLM-approved IWMP shall include:

a. Preventative measures to prevent the spread of weeds into new habitats, such as equipment inspections, use of weed-free erosion control materials and soils, and a mandatory site training element that includes weed management;

b. Weed containment and control measures such as the removal of invasive species primarily via mechanical means, with the use of herbicides restricted to BLM-policies and approved usage (e.g., BLM's *Herbicide Use Standard Operating Procedures* provided in Appendix B of the Record of Decision for the *Final Vegetation Treatments Using Herbicides Programmatic Environmental Impact Statement* (BLM, 2007);

c. Monitoring and reporting standards annually during construction and for three years following the completion of construction to describe trend in weed distribution and direct weed management measures, and;

d. Reporting of monitoring and management efforts in annual reports and a final monitoring report completed at the end of three years of post-construction monitoring. Copies of these reports will be provided to the BLM for review and comment. The BLM will use the results of these reports to determine if any additional monitoring or control measures are necessary. Weed control will be ongoing on the Project site for the life of the Project, but plan success will be determined by the BLM after the three years of operations monitoring through the reporting and review process. Success criteria will be defined as having no more than 10 percent increase in a weed species or in overall weed cover in any part of the Project site.

Mitigation Measure 3.4-1a: Compliance Monitoring by the Designated Biologist. Prior to ground-disturbing activities, an individual shall be designated and approved by the BLM and Resources Agencies (USFWS and CDFW, as appropriate) as a Designated Biologist (i.e., field contact representative). Designated Biologist qualifications are presented in Mitigation Measure 3.3-1: *Designated Biologist*.

The Designated Biologist shall be employed for the period during which on-going construction and post-construction monitoring and reporting by an approved biologist is required. Each successive Designated Biologist shall be approved by the BLM's Authorized Officer. The Designated Biologist shall have the authority to ensure compliance with all measures set forth in the Biological Opinion and CESA Section 2081 take authorization and with all mitigation measures included herein, and will be the primary agency contact for the implementation of these measures. The Designated Biologist will have the authority and responsibility to halt any project activities that are in violation of the terms of the Biological Opinion, Section 2081 take authorization, or Project mitigation measures. A list of responsibilities of the Designated Biologist is summarized below.

To avoid and minimize effects to biological resources, the Designated Biologist shall:

1. Notify the BLM's Authorized Officer and USFWS at least 14 calendar days before initiation of ground-disturbing activities.

2. Immediately notify the BLM's Authorized Officer in writing if the Applicant/Owner does not comply with any of the mitigation measures or terms of the Biological Opinion and/or the Section 2081 take authorization including, but not limited to, any actual or anticipated failure to implement such measures within the periods specified.

3. Conduct compliance inspections daily during on-going construction as clearing, grubbing, and grading are completed, and submit a monthly compliance report to BLM's Authorized Officer until construction is complete.

Mitigation Measure 3.4-1c: Worker Environmental Awareness Program (WEAP). Prior to Project initiation, the Designated Biologist shall develop and implement the WEAP (APM 44), which shall be available in English and Spanish. Wallet-sized cards summarizing the information shall be provided to all construction and operation and maintenance personnel. The WEAP shall include the following:

1. An explanation of the sensitivity of the vegetation communities and special-status plant and wildlife species within and adjacent to work areas, and proper identification of these resources.

2. Biology and status of the desert tortoise, golden eagle, burrowing owl, other nesting birds, kit fox, and American badger and measures to reduce potential effects to these species.

3. Actions and reporting procedures to be used if desert tortoise, burrowing owl, other nesting birds, kit fox, or American badger are encountered.

4. An explanation of the function of flagging that designates authorized work areas.

5. Driving procedures and techniques to reduce mortality of wildlife on roads.

6. Discussion of the federal and state Endangered Species Acts, Bald and Golden Eagle Protection Act, and the Migratory Bird Treaty Act and the consequences of non-compliance with these acts.

7. The importance of avoiding the introduction of invasive weeds into the Project area and surrounding areas.

8. A discussion of general safety protocols such as hazardous substance spill prevention and containment measures and fire prevention and protection measures.

9. A review of mitigation requirements.

5.3 VERIFICATION OF DESERT PAVEMENT

The areas of moderate to well-developed desert pavement will be verified in the field by a qualified geologist. The geologist will use a methodology approved by BLM to identify desert pavement in the field prior to construction of each phase of the project. The methods to estimate desert pavement in this report were conservative and the actual area of desert pavement within the project is expected to be less than the estimated area.

5.4 AVOIDANCE OF DESERT PAVEMENT

To the extent feasible, construction activities will avoid disturbance of desert pavement. Construction crews will plan work to limit impacts to the designated work areas. Surface

disturbance is limited by the application of Mitigation Measure 3.3-2: Vegetation Best Management Practices (BMPs), which requires the application of the following BMPs:

- Limit area of disturbance
- Minimize road impacts
- Minimize traffic impacts
- Monitor during construction
- Minimize impacts of staging areas
- Implement erosion control measures
- Monitor ground disturbance activities prior to pre-construction site mobilization

5.5 MONITORS

SMS environmental monitors will assist in placement of flagging to delineate areas of disturbance. The monitors will observe, document and report the level of compliance. Monitors will document the total area of impact to desert pavement and report to BLM in an annual report.

5.6 RESTRICTED TRAVEL

All vehicular traffic and foot traffic will be restricted to the designated limits of the project and delineated routes of travel. All project vehicle movement will be restricted to existing access roads and new access roads constructed as part of the project, except when not feasible due to physical or safety constraints.

5.7 USE OF APPROPRIATELY SIZED EQUIPMENT

SMS will avoid damage to desert pavements by selecting and using construction equipment that is appropriately sized for each portion of the work. Use of larger and heavier equipment than needed would result in larger areas of damage and greater compaction and shearing disturbance of soils. This approach will also reduce effects to plants and other habitat components.

6 PROTECTION OF DESERT PAVEMENT

The SMS Draft EIS/EIR includes Mitigation Measure 3.7.4, which is designed to minimize erosion through protection of desert pavement. The mitigation measures states:

> Grading and other methods of ground disturbance in areas covered by desert pavement shall be avoided or minimized. If avoidance of these areas is not possible, the desert pavement surface shall be protected from damage or disturbance from construction vehicles by use of temporary mats on the surface. A plan for identification and avoidance or protection of sensitive desert pavement shall be prepared and submitted to the BLM for review and approval at least 60 days prior to start of construction.

6.1 PROTECTIVE MEASURES

Environmental monitors will work with the construction supervisors to identify areas of desert pavement that cannot be avoided. Desert pavement areas that cannot be avoided during construction (other than areas that must be excavated or graded) will have temporary protective mats installed prior to any activity that would result in disturbance of desert pavement.

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7 REFERENCES

Wilson Geosciences, Inc. 2011. Geologic Characterization Report for the Proposed Caithness Soda Mountain Solar Facility Project Site Near Baker, San Bernardino County, California. March 1 2011.

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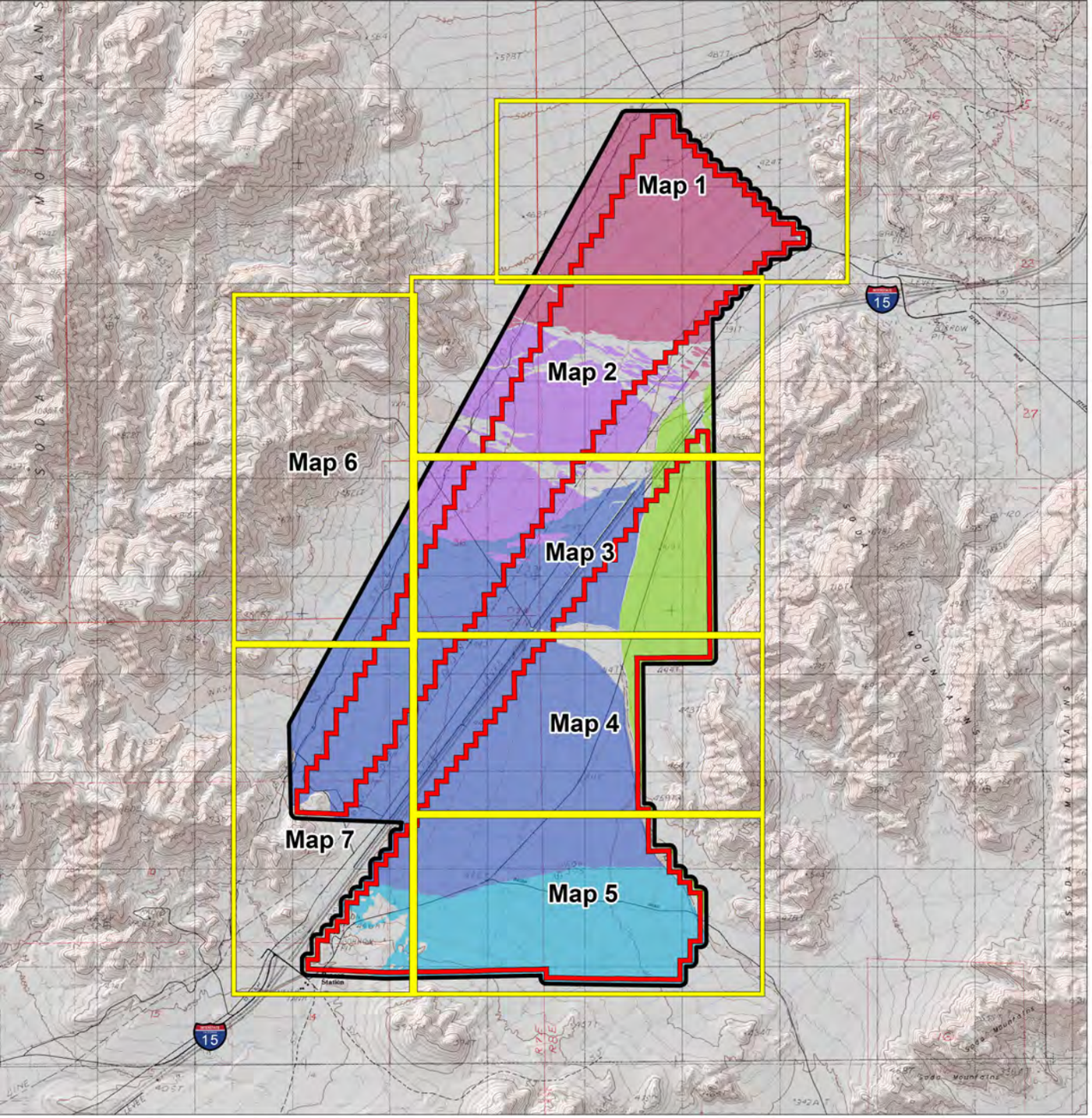
Appendix A:
Geologic Maps
(from Wilson Geosciences 2011)



GEOLOGY MAP LEGEND

- Proposed Project Boundary
- Geotechnical Survey Boundary
- North Array
- East Array
- South Array
- Substation Interconnect
- O&M Buildings, Storage Warhouses, and Rasor Road Re-alignment Area
- SCE 115 kV Transmission Line
- LADWP 500 kV Transmission Line
- Road
- Stream / Drainage
- 10 ft Contours
- 50 ft Contours

GEOLOGIC UNIT EXPLANATION

GEOLOGIC UNIT SYMBOL		TYPE OF DEPOSIT[1] (Age)
Units	**Mixed Subunits**	**ALLUVIUM**
Qaw		Active Wash Deposit (Holocene)
Qaa		Active Alluvial Fan Deposit (Holocene)
	Qaa+Qya	
	Qaw+Qyw	
Qyw		Young Wash Deposits (Holocene)
Qya		Young Alluvial Fan Deposit (Holocene and latest Pleistocene)
	Qya+Qaa	
	Qya+QiaA	
	Qya+QiaB	
	Qya+QiaC	
	Qya+QiaE	
	Qya+QiavoB	
	Qya+Tvr	
Qyea		Young Eolian Deposit (Holocene and latest Pleistocene)
	QyeaD	
	QyeaD+QieD	
Qia		Intermediate-age Alluvial Fan Deposit (late to middle Pleistocene)
	QiaA	
	QiaA+Qya	
	QiaB	
	QiaB+Qya	
	QiaC	
	QiaC+QiaoC	
	QiaC+Qya	
	QiaC+Qya+Qaa	
	QiaE+Qya	
Qie		
	QieD	
	QieD+QyeaD	
	QieaE	
Qiao		Older Intermediate-age Alluvial Fan Deposit (late to middle Pleistocene)
	QiaoB	
	QiaoB+Qya	
	QiaoC	
	QiaoE	
Qiavo		Very Old Intermediate-age Alluvial Fan Deposit (late to middle Pleistocene)
	QiavoB	
	QiavoB+Qya	
	QiavoC	
		BEDROCK
Qpv		Veneered Pediment
	Qpv+Tvr+Qyea	
Tvr		Volcanic Bedrock - Rhyolite (Tertiary)
gr		Granitic Bedrock (Mesozoic)

1. For detailed descriptions see Tables 5, 6, and 7

SOURCE: Wilson Geosiences 2010, ESRI 2010, and RMT, Inc. 2010

INDEX MAP LEGEND

- Geology Map Grid Layout and Extents
- Proposed Project Boundary
- Survey Boundary

Alluvial Fan Areas with Designated Bedrock Sources (See Table 1)

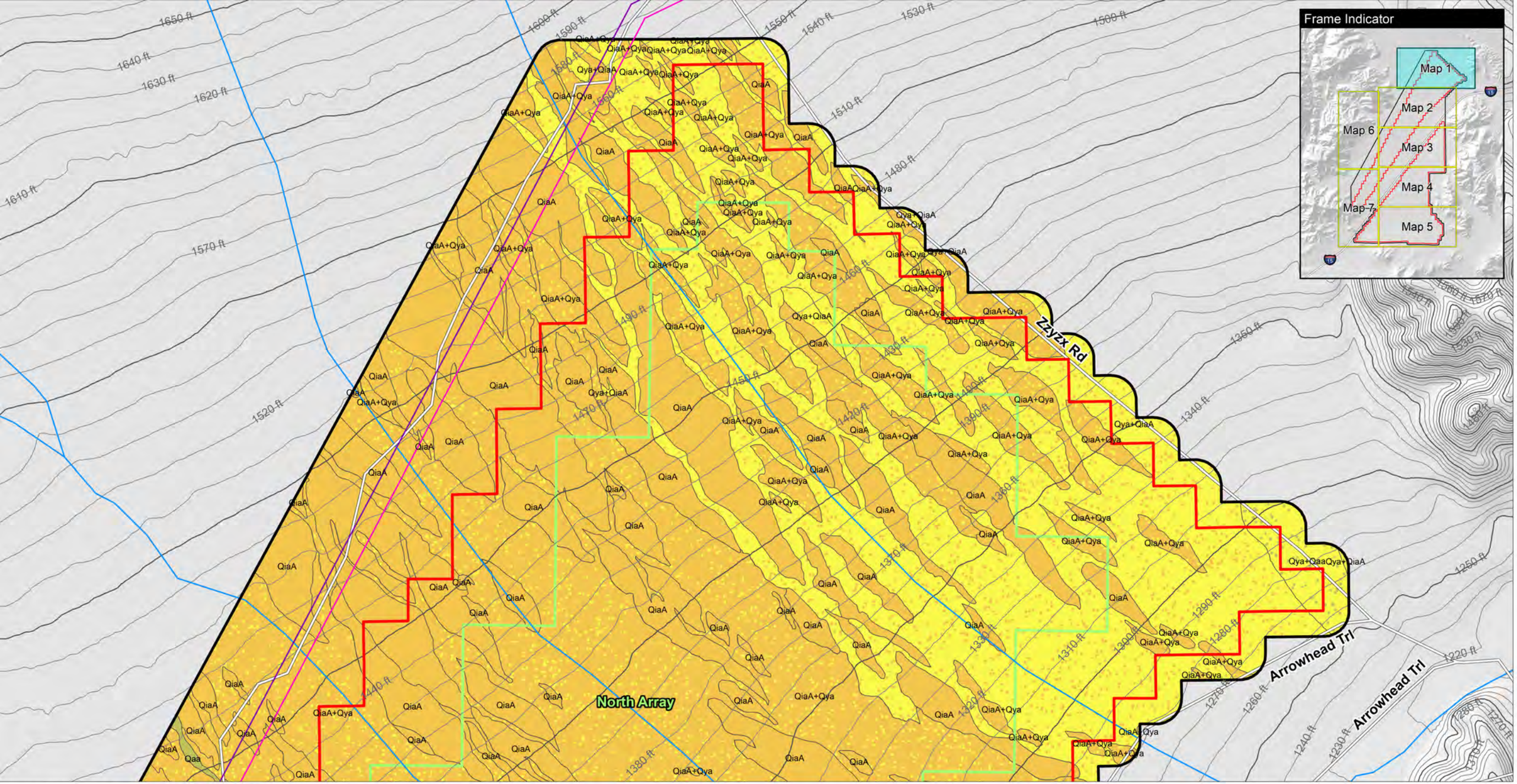
- Area A
- Area B
- Area C
- Area D
- Area E

Map Scale: 1:60,000 / 1 inch = 5,000 feet

0 0.25 .5 1 1.5 2 Miles

USGS Quads: West of Soda Lake, Soda Lake North, Soda Lake South, and Crucero Hill

RMT
ENVIRONMENT • ENERGY • ENGINEERING



SOURCE: Wilson Geosciences 2010, and RMT, Inc. 2010

Map Scale = 1:9,600 / 1 inch = 800 feet

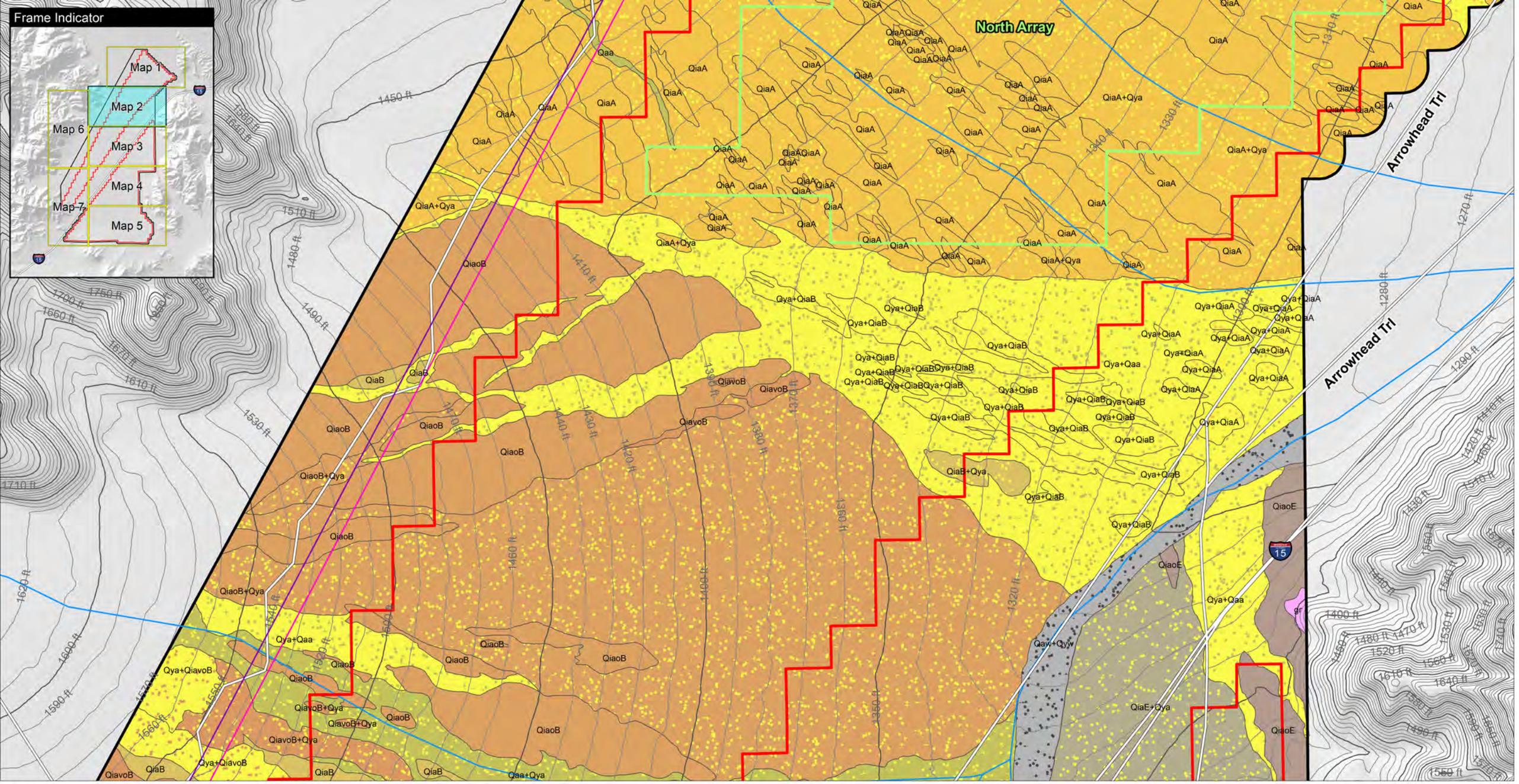
LEGEND

See Figure 5A for Legend Explanation

Note: 10ft contours are displayed for reference only
(accuracy not to engineering standards)

0 0.125 0.25 0.5 0.75 1 Mile

RMT
ENVIRONMENT • ENERGY • ENGINEERING



SOURCE: Wilson Geosciences 2010, and RMT, Inc. 2010

Map Scale = 1:9,600 / 1 inch = 800 feet

LEGEND

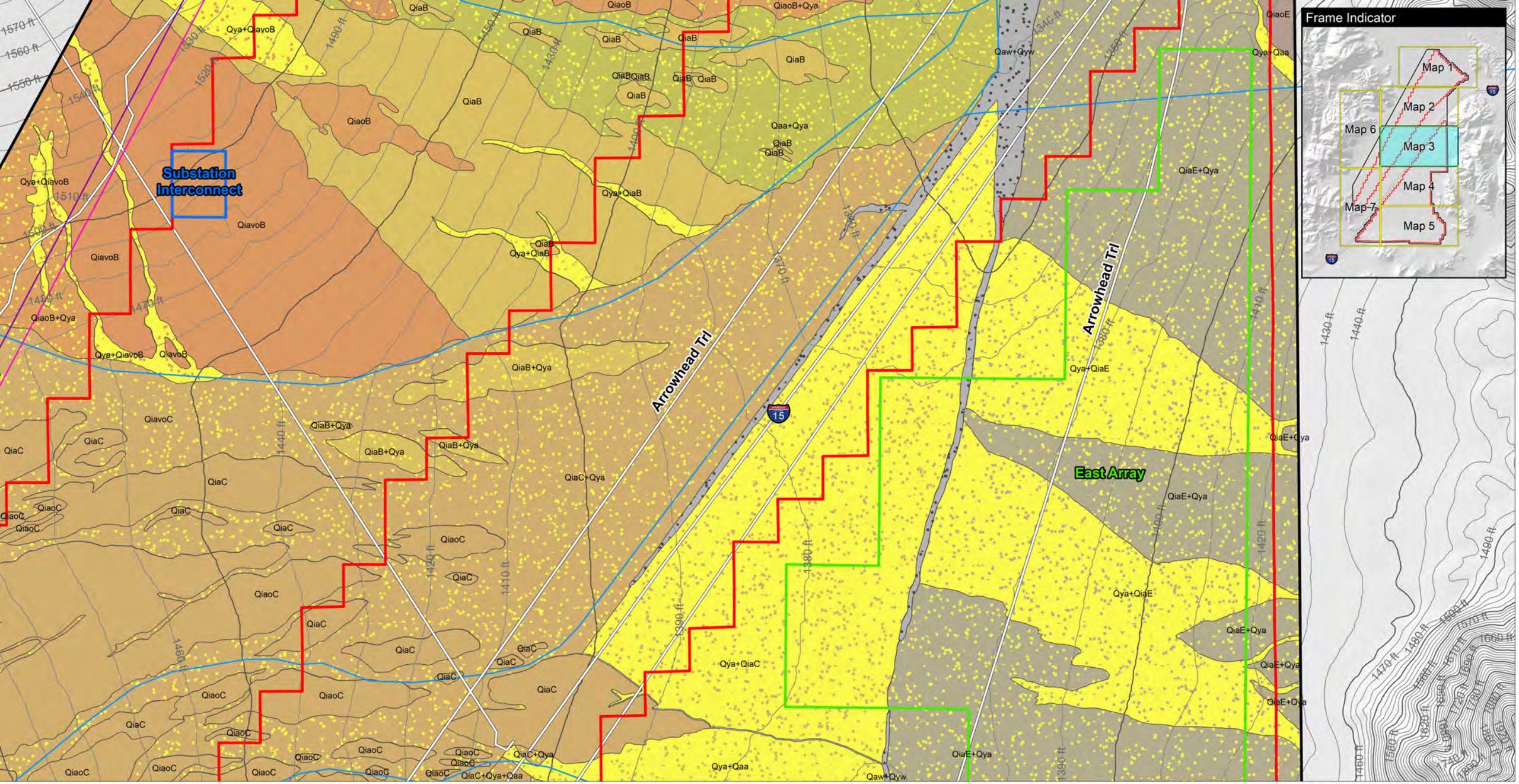
See Figure 5A for Legend Explanation

Note: 10ft contours are displayed for reference only
(accuracy not to engineering standards)

N W E S

0 0.125 0.25 0.5 0.75 1 Mile

RMT
ENVIRONMENT • ENERGY • ENGINEERING



SOURCE: Wilson Geosciences 2010, and RMT, Inc. 2010

Map Scale = 1:9,600 / 1 inch = 800 feet

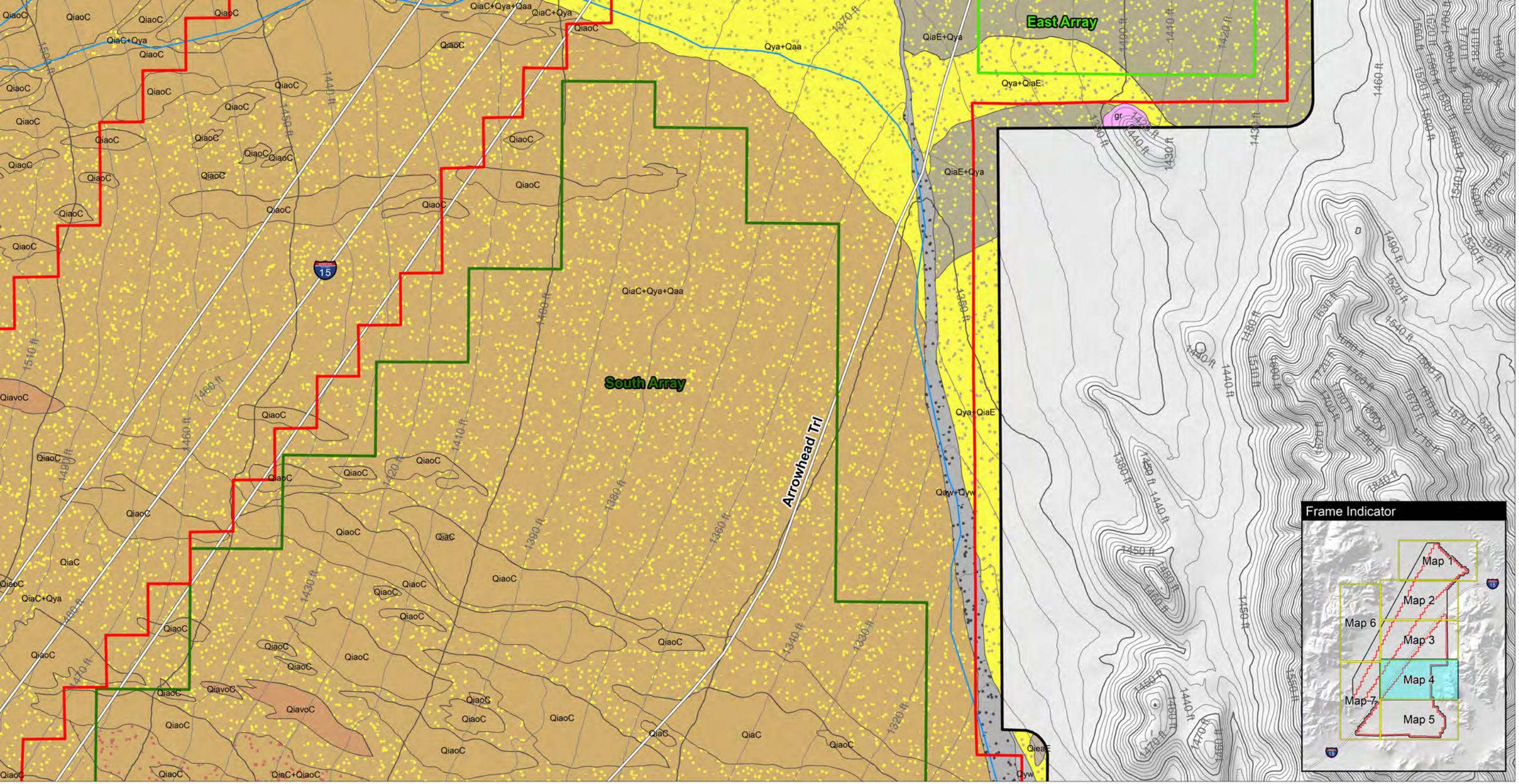
LEGEND

See Figure 5A for Legend Explanation

Note: 10ft contours are displayed for reference only (accuracy not to engineering standards)

0 0.125 0.25 0.5 0.75 1 Mile

RMT
ENVIRONMENT • ENERGY • ENGINEERING



SOURCE: Wilson Geosciences 2010, and RMT, Inc. 2010

Map Scale = 1:9,600 / 1 inch = 800 feet

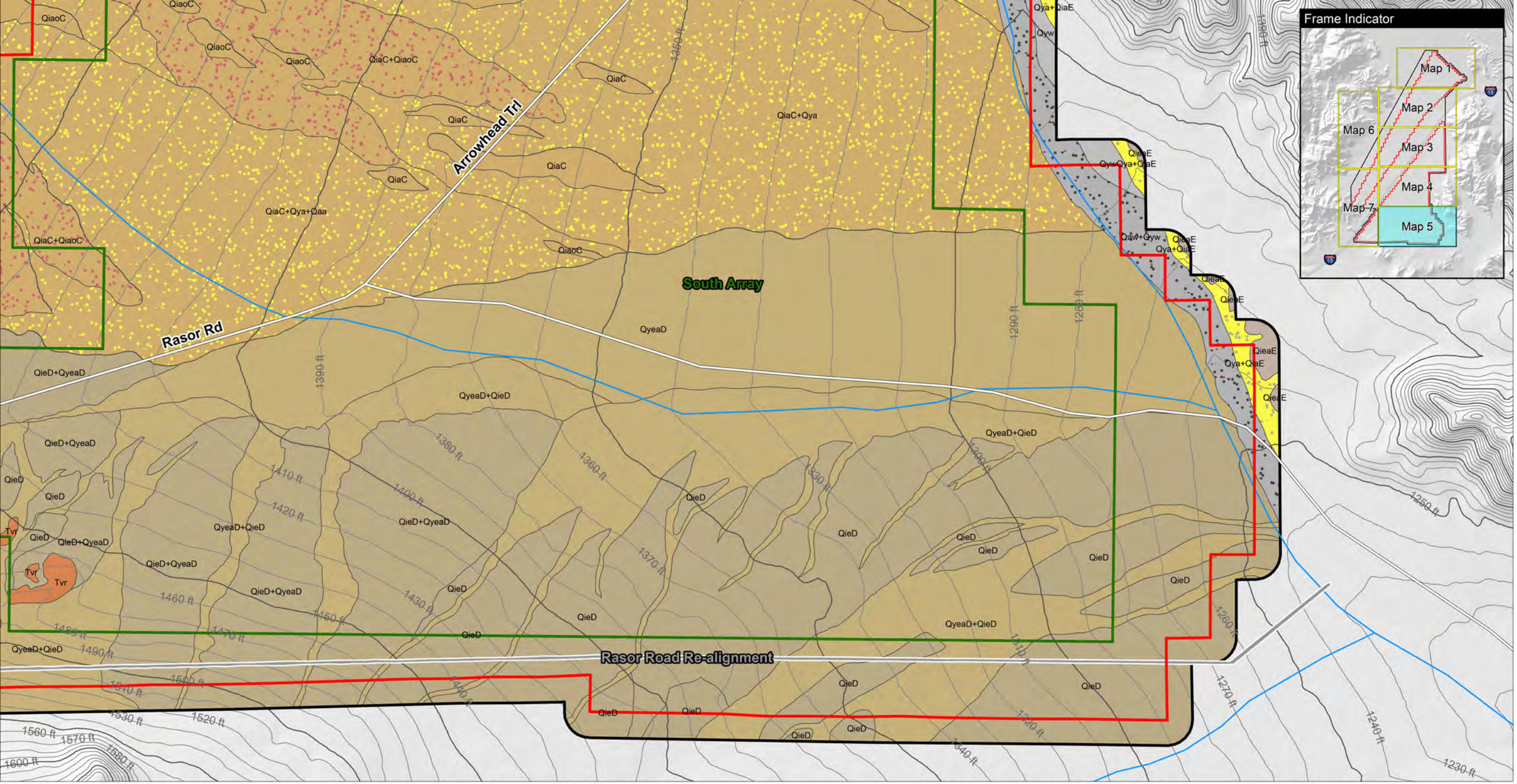
LEGEND

See Figure 5A for Legend Explanation

Note: 10ft contours are displayed for reference only (accuracy not to engineering standards)

0 0.125 0.25 0.5 0.75 1 Mile

RMT
ENVIRONMENT • ENERGY • ENGINEERING



SOURCE: Wilson Geosciences 2010, and RMT, Inc. 2010

Map Scale = 1:9,600 / 1 inch = 800 feet

LEGEND

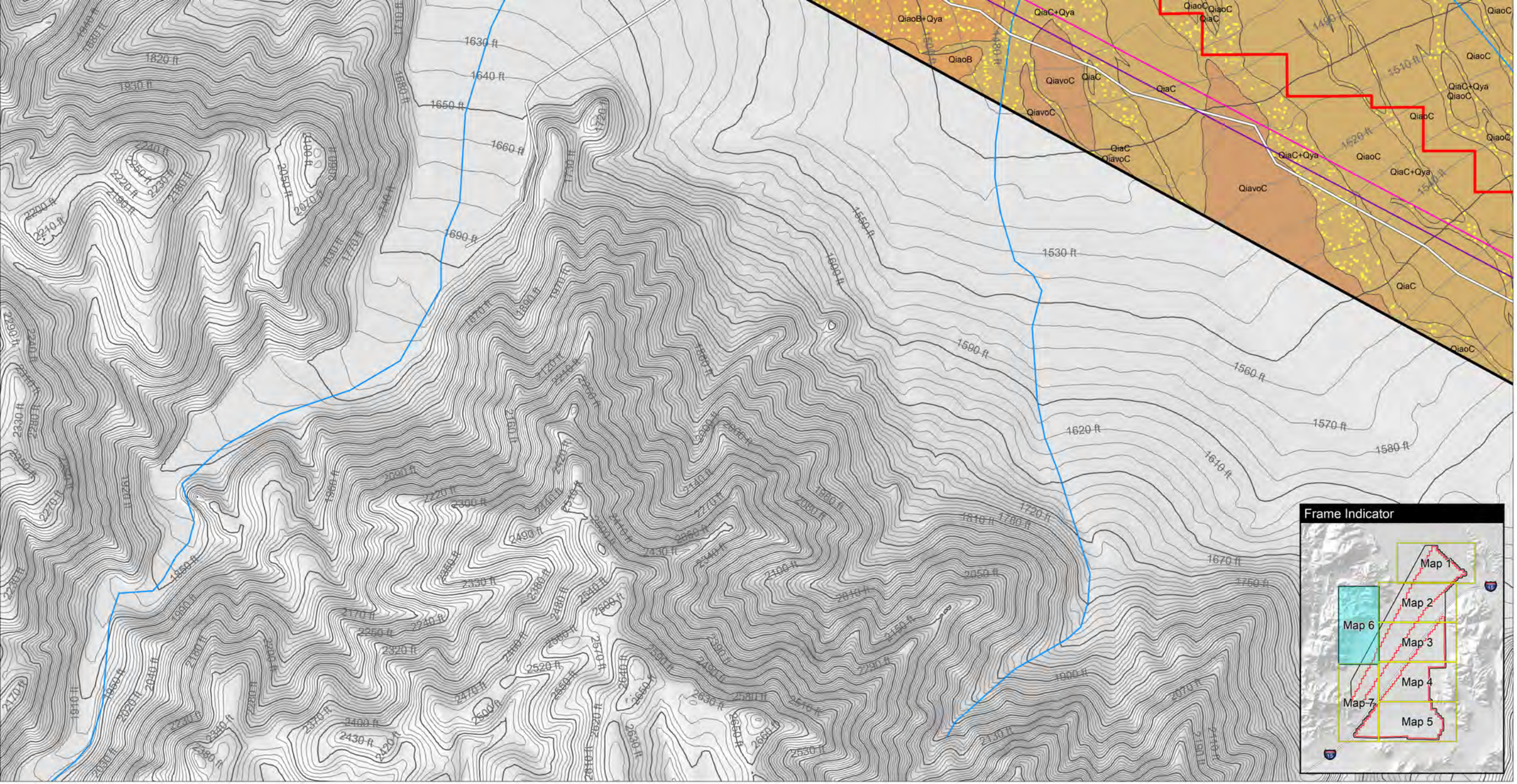
See Figure 5A for Legend Explanation

Note: 10ft contours are displayed for reference only
(accuracy not to engineering standards)

N W E S

0 0.125 0.25 0.5 0.75 1 Mile

RMT
ENVIRONMENT • ENERGY • ENGINEERING



SOURCE: Wilson Geosciences 2010, and RMT, Inc. 2010

Map Scale = 1:9,600 / 1 inch = 800 feet

LEGEND

See Figure 5A for Legend Explanation

Note: 10ft contours are displayed for reference only (accuracy not to engineering standards)

0 0.125 0.25 0.5 0.75 1 Mile

RMT
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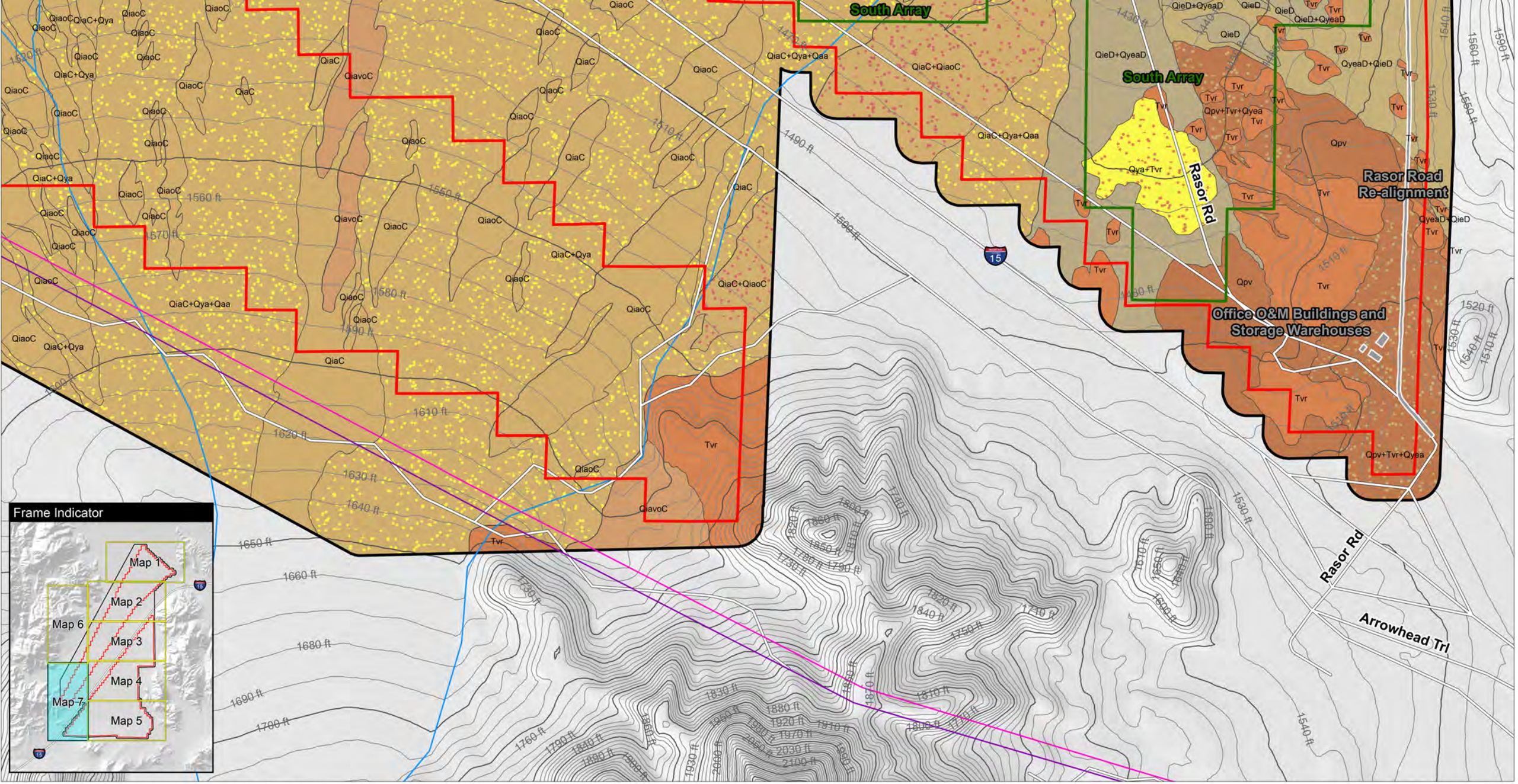

SOURCE: Wilson Geosciences 2010, and RMT, Inc. 2010

Map Scale = 1:9,600 / 1 inch = 800 feet

LEGEND

See Figure 5A for Legend Explanation

Note: 10ft contours are displayed for reference only (accuracy not to engineering standards)

0 0.125 0.25 0.5 0.75 1 Mile

RMT
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Appendix B: Desert Pavement in Geologic Map Units

Desert Pavement in Geologic Map Units

Map Unit Number	Map Unit Label	Acres	% N to VW	% VW to W	% M to WD		acres N to VW
45	QiaA+Qya	7.6	80	20	0		6.11
49	QiaA+Qya	0.2	100	0	0		0.20
50	QiaA+Qya	0.9	100	0	0		0.89
51	QiaA+Qya	2.1	80	20	0		1.71
52	QiaA+Qya	2.7	25	75	0		0.66
53	QiaA+Qya	1.5	15	85	0		0.22
54	QiaA+Qya	0.6	100	0	0		0.59
55	QiaA+Qya	3.9	20	70	10		0.78
56	QiaA+Qya	3.4	20	70	10		0.67
57	QiaA+Qya	1.5	10	80	10		0.15
58	QiaA+Qya	3.3	10	60	30		0.33
59	QiaA+Qya	0.5	50	10	40		0.25
60	QiaA+Qya	0.1	100	0	0		0.09
62	QiaA+Qya	7.0	10	80	10		0.70
63	QiaA+Qya	0.1	100	0	0		0.07
66	QiaA+Qya	0.6	0	20	80		0.00
67	QiaA+Qya	0.7	20	80	0		0.15
69	QiaA+Qya	7.5	0	50	50		0.00
75	QiaA+Qya	0.7	0	100	0		0.00
76	QiaA+Qya	1.0	0	20	80		0.00
82	QiaA+Qya	5.5	0	15	85		0.00
85	QiaA+Qya	1.6	0	25	75		0.00
86	QiaA+Qya	1.2	0	10	90		0.00
87	QiaA+Qya	5.6	0	85	15		0.00
91	QiaA+Qya	0.9	30	60	10		0.26
94	QiaA+Qya	7.9	0	50	50		0.00
95	QiaA+Qya	1.6	0	30	70		0.00
97	QiaA+Qya	4.3	0	10	90		0.00
99	QiaA+Qya	4.8	0	40	60		0.00
112	QiaA+Qya	0.5	0	10	90		0.00
114	QiaA+Qya	1.5	0	30	70		0.00
125	QiaA+Qya	0.1	0	0	100		0.00
141	QiaA+Qya	0.2	0	100	0		0.00
142	QiaA+Qya	2.5	0	0	100		0.00
143	QiaA+Qya	0.2	0	100	0		0.00
447	QiaA+Qya	361.4	25	62	18		90.35
354	QiaB+Qya	4.3	25	40	35		1.08
355	QiaB+Qya	0.5	10	50	40		0.05
390	QiaC+Qya	0.5	0	0	100		0.00
456	QiaC+Qya	1.0	40	45	15		0.39
501	QiaC+Qya	526.4	25	50	25		131.59
503	QiaC+Qya	351.2	15	55	30		52.67
382	QiaC+Qya+Qaa	1.9	40	60	0		0.77
468	QiaC+Qya+Qaa	686.4	50	35	15		343.20
506	QiaC+Qya+Qaa	173.4	25	55	20		43.35

11	QiaE+Qya	15.6	45	55	0		7.01
492	QiaE+Qya	103.5	30	70	0		31.04
493	QiaE+Qya	1.4	0	100	0		0.00
494	QiaE+Qya	2.2	25	75	0		0.56
495	QiaE+Qya	6.6	25	75	0		1.66
498	QiaE+Qya	39.1	35	65	0		13.69
499	QiaE+Qya	0.6	10	90	0		0.06
500	QiaE+Qya	161.0	35	65	0		56.34
433	QiaoB+Qya	249.4	10	55	35		24.94
519	QiavoB+Qya	11.5	5	15	80		0.57
521	QiavoB+Qya	0.4	5	20	75		0.02
88	Qya+QiaA	1.9	80	20	0		1.52
101	Qya+QiaA	0.1	10	90	0		0.01
463	Qya+QiaA	230.5	75	25	0		172.90
491	Qya+QiaC	156.8	50	50	0		78.42
12	Qya+QiaE	22.0	10	90	0		2.20
496	Qya+QiaE	72.9	70	30	0		51.04
497	Qya+QiaE	53.9	70	30	0		37.70
443	Qya+QiavoB	13.5	10	0	90		1.35
	TOTALS						**1158.29**

Notes:

See Appendix A and Geologic Map Legend for geologic unit definitions.

N to VW: none to very weak desert pavement

VW to W: very weak to weak

W to M: weak to moderate

M to WD: moderate to well developed

acres VW to W	acres M to WD
1.53	0.00
0.00	0.00
0.00	0.00
0.43	0.00
1.99	0.00
1.26	0.00
0.00	0.00
2.71	0.39
2.36	0.34
1.18	0.15
1.99	1.00
0.05	0.20
0.00	0.00
5.60	0.70
0.00	0.00
0.12	0.47
0.60	0.00
3.75	3.75
0.67	0.00
0.20	0.81
0.82	4.64
0.40	1.19
0.12	1.05
4.72	0.83
0.52	0.09
3.93	3.93
0.48	1.11
0.43	3.86
1.91	2.86
0.05	0.44
0.46	1.07
0.00	0.10
0.21	0.00
0.00	2.51
0.17	0.00
224.06	65.05
1.72	1.51
0.23	0.18
0.00	0.46
0.44	0.15
263.18	131.59
193.13	105.35
1.15	0.00
240.24	102.96
95.37	34.68

8.57	0.00
72.42	0.00
1.40	0.00
1.68	0.00
4.97	0.00
25.43	0.00
0.54	0.00
104.64	0.00
137.17	87.29
1.72	9.18
0.07	0.26
0.38	0.00
0.13	0.00
57.63	0.00
78.42	0.00
19.83	0.00
21.87	0.00
16.16	0.00
0.00	12.11
1611.20	**582.24**

APPENDIX L-9
Draft Water Quality Management Plan

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APPENDIX D:
WATER QUALITY MANAGEMENT PLAN

San Bernardino County Stormwater Program

DRAFT WATER QUALITY MANAGEMENT PLAN

DRAFT WATER QUALITY MANAGEMENT PLAN (WQMP)

For compliance with Lahontan Regional Water Quality Control Board

Order Number 2009-0009-DWQ (NPDES Permit No. CAS000002)

for

Soda Mountain Solar Project
San Bernardino County, California

BLM Case Number – CACA 49584

WQMP Preparation Date
Working Copy: December 2009
Revised Working Copy: March 2011

DRAFT WATER QUALITY MANAGEMENT PLAN (WQMP)

PROJECT SITE INFORMATION

Name of Project: Soda Mountain Solar Project

Project Location: 6 miles southwest of Baker, California, in San Bernardino County, along Interstate 15

Project Legal Description: T.12N. R.7E. – Sections 1, 2 (portion), 12; T.13N. R.7E. – Sections 25 (portion), 35 (portion),36; T.12N. R.8E. – Sections 6 (portion), 7 (portion); and T.13N. R.8E. – Sections 17 (portion), 18 (portion), 19, 20 (portion), 30, 31 (San Bernardino Base and Meridian)

Project Site Size (in acres): 4,397

SIC Codes: 4911

Erosive Site Conditions?: Disturbed soil, susceptible to erosion by wind and stormwater runoff.

Natural Slope More Than 25%?: No

DRAFT WATER QUALITY MANAGEMENT PLAN (WQMP)

Check the appropriate project category below:

Check below	**Project Categories**
	1. All significant redevelopment projects. Significant redevelopment is defined as the addition or creation of 5,000 or more square feet of impervious surface on an already developed site. This includes, but is not limited to, additional buildings and/or structures, extension of existing footprint of a building, construction of parking lots, etc. Where redevelopment results in an increase of less than 50 percent of the impervious surfaces of a previously existing development, and the existing development was not subject to SUSMPs, the design standards apply only to the addition, and not the entire development. When the redevelopment results in an increase of more than 50 percent of the impervious surfaces, then a WQMP is required for the entire development (new and existing).
	2. Home subdivisions of 10 units or more. This includes single-family residences, multi-family residences, condominiums, apartments, etc.
	3. Industrial/Commercial developments of 100,000 square feet or more. Commercial developments include nonresidential developments such as hospitals, educational institutions, recreational facilities, mini-malls, hotels, office buildings, warehouses, and light industrial facilities.
	4. Automotive repair shops (with SIC codes 5013, 5014, 5541, 7532- 7534, 7536-7539).
	5. Restaurants where the land area of development is 5,000 square feet or more.
	6. Hillside developments of 10,000 square feet or more that are located on areas with known erosive soil conditions or where the natural slope is 25 percent or more.
	7. Developments of 2,500 square feet of impervious surface or more adjacent to (within 200 feet), or discharging directly into, environmentally sensitive areas such as areas designated in the Ocean Plan as areas of special biological significance or waterbodies listed on the CWA Section 303(d) list of impaired waters.
	8. Parking lots of 5,000 square feet or more exposed to stormwater. Parking lot is defined as land area or facility for the temporary storage of motor vehicles.
√	The project does not fall into any of the categories described above. (If the project requires a precise plan of development [e.g., all commercial or industrial projects, residential projects of less than 10 dwelling units, and all other land development projects with potential for significant adverse water quality impacts] or subdivision of land, it is defined as a Non-Category Project.)

Section 1
Introduction and Project Description

1.1 Project Information

- Name of project owner: Caithness Soda Mountain, LLC
- Address of project owner: 565 Fifth Ave, 29th Floor, New York, NY 10017
- Telephone for project owner: (212) 921-9909
- Project site address: Not applicable, no street address. Project is located approximately 6 miles southwest of Baker, California, in San Bernardino County, along Interstate 15.

1.2 Permits

- State Water Resources Control Board NPDES General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities (Order No. 2009-0009-DWQ: NPDES No. CAS000002, effective July 1, 2010).

1.3 Project Description

- The project is a Non-Category Project. Caithness Soda Mountain, LLC intends to install approximately 350, one megawatt (MW) blocks, for a total of 1.5 million solar photovoltaic (PV) panels, in order to construct a 350 megawatt (MW) solar electric power generating facility. The specific technology to be used for the PV panels is polycrystalline. The right-of-way area is 4,397 acres, of which about 2,188 acres would be occupied by the Project"s solar array blocks, and approximately 6 acres would house the substation. The facility control area will consist of 13,400 square feet of building for office, maintenance and warehouse facilities, and areas for parking and assembly layout of the panels.
- A site location map identifying stormwater flow (drainage) and the receiving water is located in the Preliminary Hydrology Study Report. Best Management Plans (BMPs), details, and the site plan are included in the site PV Plant Infrastructure Construction Drawings.

1.4 Site Description

- The valley where the project area is located includes portions of two watersheds, containing approximately 28,525 acres of on-site and off-site tributary area. Additional details are included in the Preliminary Hydrology Study Report.

Section 2
Pollutants of Concern and Hydrologic Conditions of Concern

2.1 Pollutants of Concern (not required for non-category projects)

2.2 Hydrologic Conditions of Concern (not required for non-category projects)

2.3 Watershed Impact of Project

- The Project approach is to alter site grades as little as possible to accommodate the placement of the site infrastructure. Grading will be limited to constructing a grid of access roads constructed of compacted native soils (approximately 3 percent of the area of the solar field). These roads will be constructed at-grade in order to maintain existing sheet/shallow flow through the site during a storm event.
- Pollutants of Concern, such as sediment, trash, debris, oil, and grease, will be expected at the facility"s control area located at the southwestern boundary of the project.
- An evaluation of the hydrologic conditions of the project was performed, and the results of this evaluation are detailed in the Preliminary Hydrology Study Report, prepared by RMT.
- Through consultation with representatives from BLM and San Bernardino County, the approach to stormwater management is to allow water and sediment to flow through the project and continue along its natural courses downstream.
- Upstream off-site stormwater runoff will be diverted around developed areas utilizing drainage channels and diversion structures to allow for sediment to pass through to downstream receptors. Once diverted, the surface water will confluence with its natural drainage path downstream of the developed areas.

Section 3
Best Management Practice Selection Process

3.1 Site Design BMPs

For listed Site Design BMPs, indicate in the following table whether it will be used (yes/no) and describe how used, or, if not used, provide justification/alternative. Provide detailed descriptions of planned Site Design BMPs, if applicable.

1. Minimize Stormwater Runoff, Minimize Project's Impervious Footprint, and Conserve Natural Areas		
Maximize the permeable area. This can be achieved in various ways, including, but not limited to, increasing building density (number of stories above or below ground) and developing land use regulations seeking to limit impervious surfaces.		
(Yes)	No	
Describe actions taken: Solar panels are installed on small pile foundations which minimizes the amount of impervious area. About 0.23 percent of the solar array is impervious, which includes pile foundations, transformers, and inverters.		
Runoff from developed areas may be reduced by using alternative materials or surfaces with a lower Coefficient of Runoff, or "C-Factor".		
(Yes)	No	
Describe actions taken or justification/alternative: Assembly and parking areas will be either natural ground or gravel. Site access roads will be constructed of compacted native material at the existing grade.		
Conserve natural areas. This can be achieved by concentrating or clustering development on the least environmentally sensitive portions of a site while leaving the remaining land in a natural, undisturbed condition.		
(Yes)	No	
Describe actions taken or justification/alternative: Clearing and grading will be minimized where possible to conserve natural resources.		

Construct walkways, trails, patios, overflow parking lots, alleys, driveways, low-traffic streets, and other low-traffic areas with open-jointed paving materials or permeable surfaces, such as pervious concrete, porous asphalt, unit pavers, and granular materials.		
(Yes)	No	
Describe actions taken or justification/alternative: Assembly and parking areas will be constructed of compacted native material or crushed aggregate.		
Construct streets, sidewalks, and parking lot aisles to the minimum widths necessary, provided that public safety and a pedestrian-friendly environment are not compromised[1]. Incorporate landscaped buffer areas between sidewalks and streets.		
(Yes)	No	
Describe actions taken or justification/alternative: Roads will be constructed to the minimum width necessary. Clearing and grading will be minimized where possible to conserve natural resources.		
Reduce widths of street where off-street parking is available[2].		
(Yes)	No	
Describe actions taken or justification/alternative: Roads will be constructed to the minimum width necessary.		
Maximize canopy interception and water conservation by preserving existing native trees and shrubs, and planting additional native or drought-tolerant trees and large shrubs.		
(Yes)	No	
Describe actions taken or justification/alternative: Clearing and grading will be minimized where possible to conserve natural resources.		

[1] Sidewalk widths must still comply with Americans with Disabilities Act regulations and other life safety requirements.

[2] However, street widths must still comply with life safety requirements for fire and emergency vehicle access.

Other comparable site design options that are equally effective.		
Describe actions taken or justification/alternative: Straw bales and silt fence will be used to keep sediment within the project site. Check dams will be used in drainage channels to reduce velocity of the flow. Detention/Sediment basins will be used to encourage sediment to settle. Stabilized construction entrances and exits will be implemented, along with street cleaning, to keep sediment on-site. Stabilized access route(s) to the project site will be provided as soon as is feasible. Periodic watering will be used for short-term stabilization of disturbed surface areas to minimize visible fugitive dust emissions. Loaded haul vehicles will be covered while operating on publicly maintained paved surfaces. Graded site surfaces will be stabilized upon completion of grading. Non-essential earth-moving activity will be reduced under high wind conditions.		
Minimize the use of impervious surfaces, such as decorative concrete, in the landscape design.		
Yes	No	
Describe actions taken or justification/alternative: Native material or gravel will be used in the assembly and parking areas and where possible for landscaping.		
Use natural drainage systems.		
Yes	No	
Describe actions taken or justification/alternative: Project design retains the major natural drainage courses to the extent possible. Where stormwater flows are diverted around the array fields, water would be returned to the natural drainage systems downstream from the Project site. Grading will be minimized where possible to maintain natural drainage courses throughout the site.		
Where soil conditions are suitable, use perforated pipe or gravel filtration pits for low-flow infiltration[3].		
Yes	No	
Describe actions taken or justification/alternative: Perforated pipe or gravel filtration pits for low-flow infiltration pits will not be utilized at this site, because the natural soils onsite are highly permeable.		
Construct on-site ponding areas, rain gardens, or retention facilities to increase opportunities for infiltration, while being cognizant of the need to prevent the development of vector breeding areas.		
Yes	No	
Describe actions taken or justification/alternative: Retention or detention of stormwater runoff is not intended for this site. The project approach is maintain existing drainage patterns.		

[3]However, projects must still comply with hillside grading ordinances that limit or restrict infiltration of runoff. Infiltration areas may be subject to regulation as Class V injection wells and may require a report to the USEPA. Consult the Agency for more information on use of this type of facility.

2. Minimize Directly Connected Impervious Areas	
Where landscaping is proposed, drain impervious sidewalks, walkways, trails, and patios into adjacent landscaping.	
Yes (No)	
Describe actions taken or justification/alternative: Impervious sidewalks, walkways, trails, and patios are not currently planned. Landscaping will consist primarily of existing soils or gravel..	
Increase the use of vegetated drainage swales in lieu of underground piping or imperviously lined swales.	
Yes (No)	
Describe actions taken or justification/alternative: The project is located in an arid environment where it is difficult to rely on vegetation for channel stabilization. It is anticipated that channels will be lined as appropriate to reduce erosion.	

Use one or more of the following:		
Yes	**No**	**Design Feature**
X		Rural swale system: Street sheet flows to vegetated swale or gravel shoulder, curbs at street corners, culverts under driveways, and street crossings
	X	Urban curb/swale system; street slopes to curb; periodic swale inlets drain to vegetated swale/biofilter.
	X	Dual drainage system: First flush captured in street catch basins and discharged to adjacent vegetated swale or gravel shoulder; high flows connect directly to municipal storm drain systems.
	X	Other comparable design concepts that are equally effective.
Describe actions taken or justification/alternative: Project is located in a rural region and will not have curbs or connect to a municipal drain system. Drainage channels and diversion structures will divert upstream off-site surface water runoff from entering the site. As with the existing conditions, on-site stormwater runoff will occur as sheet flow through the project site.		

Use one or more of the following features for design of driveways and private residential parking areas:		
Yes	**No**	**Design Feature**
	X	Design driveways with shared access, flared (single lane at street) or wheel strips (paving only under tires), or drain into landscaping prior to discharging to the municipal storm drain system.
	X	Uncovered temporary or guest parking on private residential lots may be paved with a permeable surface, or designed to drain into landscaping prior to discharging to the municipal storm drain system.
	X	Other comparable design concepts that are equally effective.
Describe actions taken or justification/alternative: The above listed design features are not applicable to the project. Driveways/Access roads will be constructed with gravel and/or compacted fill. Project is located in a rural region and will not connect to a municipal drain system.		

3.2 Source Control BMPs

Complete the following selection table for Source Control BMPs by checking boxes that are applicable. All listed BMPs shall be implemented for the project. Where a required Source Control BMP is not applicable to the project due to project characteristics, justification and/or alternative practices for preventing pollutants must be provided. In addition to completing the following tables, provide detailed descriptions on the implementation of planned Source Control BMPs.

Use one or more of the following design concepts for the design of parking areas:		
Yes	**No**	**Design Feature**
	X	Where landscaping is proposed in parking areas, incorporate landscape areas into the drainage design.
X		Overflow parking (parking stalls provided in excess of the Agency"s minimum parking requirements) may be constructed with permeable paving.
	X	Other comparable design concepts that are equally effective.
Describe actions taken or justification/alternative: Parking areas will be constructed with natural soils or gravel.		

Justification for Source Control BMPs not incorporated into the project WQMP			
Source Control BMP	**Used in Project? (Yes/No)**	**Justification/ Alternative***	**Implementation Description**
Education of Property Owners	Yes		Operation and maintenance staff will be trained to use Best Management Practices to minimize erosion on site.
Activity Restrictions	Yes		Use of water restricted to panel cleaning (approx. twice a year) and basic necessities inside operations building.
Spill Contingency Plan	Yes		An SPCC plan will be developed for the project as applicable.
Employee Training/Education Program	Yes		Construction staff will be trained in best management practices to reduce erosion during construction. Operation and maintenance staff will be trained in best management practices to reduce erosion caused by post construction stormwater.
Street Sweeping Private Street and Parking Lots	No	Sweeping on site is not anticipated. Parking areas and access roads will be constructed of compacted native material or aggregate.	If sediment from the project is tracked onto public roads, all sediment deposited on paved roadways will be removed within 24 hours.
Common Areas Catch Basin Inspection	No	Project is located in a rural region and curb and gutters will not exist; therefore, catch basin inspection is not required.	
Landscape Planning (SD-10)	Yes		Clearing and grading will be minimized where possible. Assembly areas and parking lots will be landscaped with permeable native soil material or gravel.
Hillside Landscaping	No	Not applicable. Project area is relatively flat.	
Roof Runoff Controls (SD-11)	Yes		Rooftop runoff from the operations building will be designed to infiltrate into the natural soil, gravel areas, or channels.
Efficient Irrigation (SD-12)	No	Not applicable. Project is not anticipated to be landscaped with vegetation or irrigated given its arid location.	
Storm Drain Signage (SD-13)	No	Not applicable to project site.	
Inlet Trash Racks	No	Not applicable to project site.	

Source Control BMP	Used in Project? (Yes/No)	Justification/ Alternative*	Implementation Description
Energy Dissipaters	Yes		Energy dissipaters (check dams, riprap) will be implemented in drainage channels as applicable.
Trash Storage Areas (SD-32) and Litter Control	Yes		Covered dumpsters will be located in designated areas with signs posted forbidding the disposal of hazardous waste with solid wastes.
Fueling Areas (SD-30)	Yes		Fuel areas will be constructed to contain spilled material and prevent spillage and runoff.
Air/Water Supply Area Drainage	Yes		Water supply area will be constructed to contain spilled material.
Maintenance Bays and Docks (SD-31)	Yes		Maintenance bays will be designed to capture spilled materials.
Vehicle Washing Areas (SD-33)	No	Not applicable. Vehicle washing is not currently planned to occur on-site.	
Outdoor Material Storage Areas (SD-34)	Yes		A SPCC plan will cover the necessary containment regulations. Fuel areas will be constructed to contain spilled material and prevent spillage and runoff.
Outdoor Work Areas (SD-35)	No	The need for equipment repair/maintenance areas is not anticipated for the site, but if the need arises, containment structures will be provided to eliminate/reduce stormwater contamination.	
Outdoor Processing Areas (SD-36)	No	Not applicable. No wet material processing will occur on the project site.	
Wash Water Controls for Food Preparation Areas	No	Not applicable. No food preparation areas within project.	
Pervious Pavement (SD-20)	Yes		Native material or gravel will be used for parking and assembly areas instead of concrete.
Alternative Building Materials (SD-21)	Yes		Native material or gravel will be used for parking and assembly areas instead of concrete or asphalt.

3.3 Treatment Control BMPs (not required for non-category projects)

3.4 BMP Design Criteria

- The following Treatment Control BMPs (Flow Based or Volume Based) will be implemented for this project:

Design Basis of Treatment Control BMPs

Implemented	Treatment Control BMP	Design Basis
	Vegetated Buffer Strips	Flow Based
X	Drainage channels	
	Multiple Systems	
	Manufactured/Proprietary	
	Bioretention	Volume Based
	Wet Pond	
	Constructed Wetland	
	Detention Basin	
	Water Quality Inlet	
	Retention/Irrigation	
	Infiltration Basin	
	Infiltration Trench	
	Media Filter	
	Manufactured/Proprietary	

3.4.1 Flow-Based Design Criteria

- Design flow calculations and description are included in the attached Preliminary Hydrology Study Report.

3.4.2 Volume-Based Design Criteria

- Capture volume calculations and description are included in the attached Preliminary Hydrology Study Report as applicable.

Section 4
Operation and Maintenance

4.1 Operations and Maintenance

4.1.1 O&M Description and Schedule:

BMP	O&M Activities
Diversion Structures and Drainage Channels	Inspect drainage channels and diversion structures for washouts. Replace lost riprap, damaged linings, or soil stabilizers as applicable. Inspect channel linings, embankments, and beds for signs of erosion. Remove debris and repair linings and embankments as needed.
Check Dam	Replace missing rock, bags, bales, etc. Replace bags or bales that have degraded or have become damaged. Remove sediment when it reaches one third the dam height or as needed to maintain BMP effectiveness. Remove check dam and accumulated sediment when check dams are no longer needed.
Silt Fence	Remove sediment when it reaches one third the fence height. Check fencing for damage and repair as needed. Remove BMP after site has been permanently stabilized.
Sediment Basin	Examine basin banks for seepage and structural soundness. Check inlet and outlet structures and spillway for any damage or obstructions. Repair damage and remove obstructions as needed. Check inlet and outlet area for erosion and stabilize if required. Sediment should be removed when sediment accumulation reaches one half the designated sediment storage volume. Remove standing water from basin within 72 hours after accumulation.
Straw Bales	Straw bales degrade, especially when exposed to moisture. Replace or repair damaged bales as needed. Repair washouts or other damages as needed. Sediment should be removed when the sediment accumulation reaches one third the barrier height. Remove straw bales when no longer needed.
Wind Erosion Control	Check areas that have been protected to ensure coverage. Areas where erosion is evident shall be repaired and BMPs re-applied as necessary to maintain effectiveness. Periodic watering will be used for short-term stabilization of disturbed surface areas to minimize visible fugitive dust emissions.
Stabilized Construction Entrance	While activities associated with the BMPs are under way, inspect weekly during the rainy season and at two-week intervals in the non-rainy season to verify continued BMP implementation. Inspect local roads adjacent to the site daily. Sweep or vacuum to remove visible accumulated sediment. Remove aggregate, and separate and dispose of sediment if construction entrance/exit is clogged with sediment. Keep all temporary roadway ditches clear. Check for damage and repair as needed. Remove all sediment deposited on paved roadways within 24 hours. Remove gravel and filter fabric at completion of construction.

- BMPs should be installed before soil is disturbed and as needed on the construction site.
- O&M will be performed on all BMPs if BMP is damaged or overloaded with sediment and before and after a rainfall event, every 24 hours during extended events, and weekly during the rest of the rainy season.

- When sediment needs to be removed from a BMP, it may be incorporated into the earthwork on the site or disposed of as directed by the Resident Engineer.

4.1.2 Inspection and Monitoring Requirements:

- Water quality will be visually monitored per the general NPDES construction permit requirements through the Lahontan Regional Water Quality Control Board. The monitoring plan would include areas affected by the Project, and observations would be performed at the site of the discharge from the Project area prior to any mixing with offsite water traversing the site.
- Provide self-inspections and record keeping requirements for BMPs (review local specific requirements regarding self-inspections and/or annual reporting), including identification of responsible parties for inspection and record keeping.
- All inspection and maintenance repair activities at the project location will be performed or supervised by a Qualified SWPPP Practitioner (QSP) representing the discharger. The QSP may delegate any or all of these activities to an employee appropriately trained to do the task(s).
- Visual inspections will be performed weekly and at least once each 24-hour period during extended storm events that result in ½ inch or more of discharge (qualifying event), to identify and record BMPs that need maintenance to operate effectively, that have failed, or that could fail to operate as intended. Implementation of repairs or design changes to BMPs will be addressed within 72 hours of identification.
- Visual observations for non-stormwater discharge monitoring shall be conducted quarterly, once in each of the following periods: January to March, April to June, July to September, and October to December.
- For each inspection required, an inspection checklist will be completed. The checklists will remain on-site with the SWPPP and at a minimum, will include the following:
  - Inspection date and date the inspection report was written.
  - Weather information, including presence or absence of precipitation, estimate of beginning of qualifying storm event, duration of event, time elapsed since last storm, and approximate amount of rainfall in inches.
  - Site information, including stage of construction, activities completed, and approximate area of the site exposed.
  - A description of any BMPs evaluated and any deficiencies noted.
  - If the construction site is safely accessible during inclement weather, list the observations of all BMPs: erosion controls, sediment controls, chemical and waste controls, and non-stormwater controls. Otherwise, list the results of visual inspections at all relevant outfalls, discharge points, downstream locations, and any projected maintenance activities.
  - Report the presence of noticeable odors or of any visible sheen on the surface of any discharges.
  - Any corrective actions required, including any necessary changes to the SWPPP and the associated implementation dates.
  - Photographs taken during the inspection, if any.

  - Inspector"s name, title, and signature.

- If the event of a breach, malfunction, leakage, or spill observed during a visual inspection which could result in the discharge of pollutants to surface waters that would not be visually detectable in stormwater, water samples will be collected at discharge points and compared to a representative control sample for the presence of suspected pollutants using field analysis or through laboratory analysis (if necessary).
- Records must be kept on the construction site while construction is ongoing. Records will be retained by the owner for at least 3 years.

4.1.3 Identification of Responsible Parties:

- Caithness Soda Mountain, LLC, will be responsible for each BMP O&M.

  Thomas Grace
  Caithness Soda Mountain, LLC
  565 Fifth Avenue, 29th Floor
  New York, NY 10017
  Tel: (212) 921-9099

Section 5
Funding

5.1 Funding

- Funding source for O&M for this project will be provided by Caithness Soda Mountain, LLC.

  Mitch Garber
  Caithness Soda Mountain, LLC
  565 Fifth Avenue, 29th Floor
  New York, NY 10017
  Tel: (212) 921-9099

Section 6
WQMP Certification

6.1 Certification

- The applicant is required to sign and certify that the WQMP is in conformance with Lahontan Regional Water Quality Control Board Order Number 2009-0009-DWQ (NPDES Permit No. CAS000002, effective July 1, 2010).

- The applicant is required to sign and date the following statement „word-for-word" certifying that the provisions of the WQMP have been accepted by the applicant and that the applicant will have the plan transferred to future successors (transferability statement). The certification must be signed by the property owner, unless a written designation by the owner allows a designee to sign on the owner"s behalf.

"This Water Quality Management Plan has been prepared for Caithness Soda Mountain, LLC by RMT, Inc. It is intended to comply with the requirements of the City of San Bernardino County for Tract/Parcel Map No. _____, Condition Number(s) _____ requiring the preparation of a Water Quality Management Plan (WQMP). The undersigned is aware that Best Management Practices (BMPs) are enforceable pursuant to the City"s/County"s Water Quality Ordinance No. _____. The undersigned, while it owns the subject property, is responsible for the implementation of the provisions of this plan and will ensure that this plan is amended as appropriate to reflect up-to-date conditions on the site consistent with San Bernardino County"s Municipal Stormwater Management Program and the intent of the NPDES Permit for San Bernardino County and the incorporated cities of San Bernardino County within the Lahontan Region. Once the undersigned transfers its interest in the property, its successors in interest and the city/county shall be notified of the transfer. The new owner will be informed of its responsibility under this WQMP. A copy of the approved WQMP shall be available on the subject site in perpetuity. "

"I certify under a penalty of law that the provisions (implementation, operation, maintenance, and funding) of the WQMP have been accepted and that the plan will be transferred to future successors."

_____	_____
Applicant"s Signature	Date
_____	_____
Applicant"s Name	Applicant"s Telephone Number

TO BE COMPLETED UPON SUBMITTAL TO SAN BERNARDINO COUNTY.

Attachment A-1
Maintenance Mechanisms

A-1.1 The Agency shall not accept stormwater structural BMPs as meeting the WQMP requirements standard, unless an O&M Plan is prepared (see WQMP Section 2.6) and a mechanism is in place that will ensure ongoing long-term maintenance of all structural and nonstructural BMPs. This mechanism can be provided by the Agency or by the project proponent. As part of project review, if a project proponent is required to include interim or permanent structural and nonstructural BMPs in project plans, and if the Agency does not provide a mechanism for BMP maintenance, the Agency shall require that the applicant provide verification of maintenance requirements through such means as may be appropriate, at the discretion of the Agency, including, but not limited to, covenants, legal agreements, maintenance agreements, conditional use permits and/or funding arrangements (OC 2003).

A-1.2 Maintenance Mechanisms

1. **Public entity maintenance**: The Agency may approve a public or acceptable quasi-public entity (e.g., the County Flood Control District, or annex to an existing assessment district; an existing utility district; a state or federal resource agency, or a conservation conservancy) to assume responsibility for operation, maintenance, repair, and replacement of the BMP. Unless otherwise acceptable to individual Agencies, public entity maintenance agreements shall ensure that estimated costs are front-funded or reliably guaranteed (e.g., through a trust fund, assessment district fees, bond, letter of credit, or similar means). In addition, the Permittees may seek protection from liability by appropriate releases and indemnities.

   The Agency shall have the authority to approve stormwater BMPs proposed for transfer to any other public entity within its jurisdiction before installation. The Permittee shall be involved in the negotiation of maintenance requirements with any other public entities accepting maintenance responsibilities within their respective jurisdictions; and in negotiations with the resource agencies responsible for issuing permits for the construction and/or maintenance of the facilities. The Agency must be identified as a third-party beneficiary empowered to enforce any such maintenance agreement within their respective jurisdictions.

2. **Project proponent agreement to maintain stormwater BMPs:** The Agency may enter into a contract with the project proponent obliging the project proponent to maintain, repair, and replace the stormwater BMP as necessary into perpetuity. Security or a funding mechanism with a “no sunset” clause may be required.

3. **Assessment districts:** The Agency may approve an Assessment District or other funding mechanism created by the project proponent to provide funds for stormwater BMP maintenance, repair, and replacement on an ongoing basis. Any agreement with such a District shall be subject to the Public Entity Maintenance Provisions above.

4. **Lease provisions:** In those cases where the Agency holds title to the land in question, and the land is being leased to another party for private or public use, the Agency may ensure stormwater BMP maintenance, repair, and replacement through conditions in the lease.

5. **Conditional use permits:** For discretionary projects only, the Agency may ensure maintenance of stormwater BMPs through the inclusion of maintenance conditions in the conditional use permit. Security may be required.

6. **Alternative mechanisms:** The Agency may accept alternative maintenance mechanisms if such mechanisms are as protective as those listed above.

Attachment B
Tables

Table B-1
303(d) List of Impaired Water Bodies

Waterbody	Pollutant					
	Bacteria Indicators/ Pathogens	Metals	Nutrients	Organic Enrichment	Sedimentation/Siltation	Suspended Solids
Big Bear Lake		X	X		X	
Canyon Lake (Railroad Canyon Reservoir)	X		X			
Chino Creek Reach 1	X		X			
Chino Creek Reach 2	X					
Cucamonga Creek, Valley Reach	X					
Grout Creek		X	X			
Knickerbocker Creek	X	X				
Lytle Creek	X					
Mill Creek (Prado Area)	X		X			X
Mill Creek Reach 1	X					
Mill Creek Reach 2	X					
Mountain Home Creek	X					
Mountain Home Creek, East Fork	X					
Prado Park Lake	X		X			
Rathbone (Rathbun Creek)			X		X	
Santa Ana River, Reach 3	X					
Santa Ana River, Reach 4	X					
Summit Creek			X			

NOTES:

1) Summary of the 2002 303(d) Listed Water Bodies and Associated Pollutants of Concern from RWQCB Region 8. Check for updated lists from the RWQCB.
2) Chlorides, pesticides, salinity, total dissolved solids (TDS), toxicity, and trash are listed impairments within the 303(d) table; however, they are not impairments in the above waterbodies.

Table B-2
C Values Based on Impervious/Pervious Area Ratios

% Impervious	% Pervious	C
0	100	0.15
5	95	0.19
10	90	0.23
15	85	0.26
20	80	0.30
25	75	0.34
30	70	0.38
35	65	0.41
40	60	0.45
45	55	0.49
50	50	0.53
55	45	0.56
60	40	0.60
65	35	0.64
70	30	0.68
75	25	0.71
80	20	0.75
85	15	0.79
90	10	0.83
95	5	0.86
100	0	0.90

NOTE:

1) Obtain individual runoff coefficient C-Factors from the local agency or from the local flood control district.
2) If C-Factors are not available locally, obtain factors from hydrology textbooks or estimate using this table.
3) Composite the individual C-Factors using area-weighted averages to calculate the Composite C Factor for the area draining to a treatment control BMP.
4) Do not use the C-Factors in this table for flood control design or related work.

Attachment C
Pollutants of Concern

Pollutants of Concern

- *Bacteria and Viruses* – Bacteria and viruses are ubiquitous microorganisms that thrive under certain environmental conditions. Their proliferation is typically caused by the transport of animal or human fecal wastes from the watershed. Water containing excessive bacteria and viruses can alter the aquatic habitat and create a harmful environment for humans and aquatic life. Also, the decomposition of excess organic waste causes increased growth of undesirable organisms in the water.

- *Metals* – The primary source of metal pollution in stormwater is typically commercially available metals and metal products. Metals of concern include cadmium, chromium, copper, lead, mercury, and zinc. Lead and chromium have been used as corrosion inhibitors in primer coatings and cooling tower systems. Metals are also raw material components in non-metal products such as fuels, adhesives, paints, and other coatings. At low concentrations naturally occurring in soil, metals may not be toxic. However, at higher concentrations, certain metals can be toxic to aquatic life. Humans can be impacted from contaminated groundwater resources, and bioaccumulation of metals in fish and shellfish. Environmental concerns, regarding the potential for release of metals to the environment, have already led to restricted metal usage in certain applications (OC 2003).

- *Nutrients* – Nutrients are inorganic substances, such as nitrogen and phosphorus. Excessive discharge of nutrients to water bodies and streams causes eutrophication, where aquatic plants and algae growth can lead to excessive decay of organic matter in the water body, loss of oxygen in the water, release of toxins in sediment, and the eventual death of aquatic organisms. Primary sources of nutrients in urban runoff are fertilizers and eroded soil.

- *Pesticides* – Pesticides (including herbicides) are chemical compounds commonly used to control nuisance growth or prevalence of organisms. Relatively low levels of the active component of pesticides can result in conditions of aquatic toxicity. Excessive or improper application of a pesticide may result in runoff containing toxic levels of its active ingredient (OC 2003).

- *Organic Compounds* – Organic compounds are carbon-based. Commercially available or naturally occurring organic compounds are found in pesticides, solvents, and hydrocarbons. Organic compounds can, at certain concentrations, indirectly or directly constitute a hazard to life or health. When rinsing off objects, toxic levels of solvents and cleaning compounds can be discharged to storm drains. Dirt, grease, and grime retained in the cleaning fluid or rinse water may also adsorb levels of organic compounds that are harmful or hazardous to aquatic life (OC 2003).

- *Sediments* – Sediments are solid materials that are eroded from the land surface. Sediments can increase turbidity, clog fish gills, reduce spawning habitat, lower young aquatic organisms‟ survival rates, smother bottom-dwelling organisms, and suppress aquatic vegetation growth.

- *Trash and Debris* – Trash (such as paper, plastic, polystyrene packing foam, and aluminum materials) and biodegradable organic matter (such as leaves, grass cuttings, and food waste) are general waste products on the landscape. The presence of trash and debris may have a significant impact on the recreational value of a water body and aquatic habitat. Trash impacts water quality by increasing biochemical oxygen demand.

- *Oxygen-Demanding Substances* – This category includes biodegradable organic material as well as chemicals that react with dissolved oxygen in water to form other compounds. Proteins, carbohydrates, and fats are examples of biodegradable organic compounds. Compounds such as ammonia and hydrogen sulfide are examples of oxygen-demanding compounds. The oxygen demand of a substance can lead to depletion of dissolved oxygen in a water body and possibly the development of septic conditions. A reduction of dissolved oxygen is detrimental to aquatic life and can generate hazardous compounds such as hydrogen sulfides.

- *Oil and Grease* – Oil and grease in water bodies decreases the aesthetic value of the water body, as well as the water quality. Primary sources of oil and grease are petroleum hydrocarbon products, motor products from leaking vehicles, esters, oils, fats, waxes, and high molecular-weight fatty acids.

APPENDIX L-10
Draft Groundwater Monitoring and Mitigation Plan

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Draft Groundwater Monitoring and Mitigation Plan

Soda Mountain Solar Project

San Bernardino County, California
BLM Case No. CACA 49584

August 2014

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PANORAMA
ENVIRONMENTAL, INC.

Draft Groundwater Monitoring and Mitigation Plan

Soda Mountain Solar Project

San Bernardino County, California
BLM Case No. CACA 49584

August 2014

Submitted to:

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California Desert District Office
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Appendix B Groundwater Well Permit Application
Appendix C Groundwater Well Test Plan

1 INTRODUCTION

1.1 OVERVIEW

Soda Mountain Solar, LLC (SMS), has applied to the U.S. Department of the Interior, Bureau of Land Management (BLM), for a right-of-way (ROW) grant that would authorize construction, operation, and decommissioning of the proposed Soda Mountain Solar project (project).

The project proposal includes groundwater pumping to supply water for project construction and operation and is therefore subject to the San Bernardino County Groundwater Ordinance. The ordinance requires that a permit be obtained prior to constructing or operating a new groundwater well within the desert region of San Bernardino County (County). SMS has submitted an application for a groundwater well construction permit to San Bernardino County. The application was prepared in accordance with the permit requirements provided in §33.06554 of the San Bernardino County Code of Ordinances. Although the proposed groundwater wells would be located on federal lands, they are subject to San Bernardino County jurisdiction pursuant to a December 2, 2003, inter-agency Memorandum of Understanding between the County and BLM for implementation of the Desert Groundwater Management Ordinance on public lands within the eastern Mojave Desert. This permit is a discretionary permit under the California Environmental Quality Act (CEQA). The County must prepare an Environmental Impact Report (EIR) in compliance with CEQA prior to deciding whether to issue a groundwater permit to SMS.

BLM is the federal lead agency for the project and must prepare an Environmental Impact Statement (EIS) in compliance with the National Environmental Policy Act (NEPA) prior to deciding whether to issue the ROW grant and a California Desert Conservation Plan Amendment to authorize construction, operation, and decommissioning of the project.

A Draft EIS/EIR was published for public comment on November 29, 2013 (BLM 2013). The comment period closed on March 3, 2014.

Panorama Environmental, Inc. (Panorama), has prepared this Groundwater Monitoring and Mitigation Plan (GMMP) for the project on behalf of SMS. The GMMP was developed in accordance with the *Guidelines for Preparation of a Groundwater Monitoring Plan* (County of San Bernardino 2000).

1.2 PROJECT DESCRIPTION

1.2.1 Project Summary

The proposed project consists of a 358-megawatt photovoltaic (PV) solar energy generating facility located within an approximately 4,179-acre ROW on federal land administered by BLM in unincorporated San Bernardino County, California. Solar array fields will cover approximately 53 percent of the ROW. The remaining area will be used for stormwater control, access roads, ancillary buildings, and desert tortoise and/or cactus translocation. The project is located approximately 6 miles southwest of the community of Baker, along Interstate 15 (I-15) (Figure 1.2-1). The proposed project layout is presented as Figure 1.2-2.

1.2.2 Proposed Water Use

SMS proposes to construct up to three water supply wells (production wells) in the project area to provide non-potable water for construction and operation activities. Information on well construction procedures and materials is provided in Section 4. Estimated proposed water use volumes are summarized in Table 1.2-1.

Table 1.2-1: Proposed Water Use for Project Construction and Operation

Activity	Timeframe	Water Use Estimate		
		Gallons per day	Acre-feet per year (AFY)	Total Project Use in acre-feet
Construction				
Dust Control and Soil Compaction	24-30 months	200,000[1]	192	384-480
			Total Construction Water Use	384-480
Operation[2]				
Panel Washing	120 days/year	14,663	5.4	162
Dust Control	As needed	--	26	780
Fire Protection	As needed	-- [3]	--	--
			Total Operational Water Use[3]	942
			Total Project Water Use	1,326-1,422

Notes:

[1] Average value. Maximum daily use would be up to 350,000 gallons per day at peak periods, but total construction water use would remain at or below 480 acre-feet.

[2] Operational period estimated at 30 years.

[3] Fire protection water tank would be filled periodically as needed to keep the tank at its 5,000-gallon capacity, per County requirements.

1.2.3 Water Treatment

Water containing high (i.e., greater than approximately 1,200 parts per million [ppm]) concentrations of total dissolved solids (TDS) will require treatment prior to use for PV panel washing. Groundwater samples will be collected and analyzed for TDS during the aquifer testing program (Panorama 2014), which will precede the activities described in the GMMP. Additional groundwater samples will be collected and analyzed for TDS following installation of the production and monitoring wells described herein. The additional TDS data will be used to further evaluate the need for treatment of water to be used for panel washing.

If the TDS concentrations are sufficiently high to require treatment of pumped groundwater, a reverse osmosis (RO) system will be constructed on site and will be used to reduce TDS to acceptable concentrations. The high-TDS reject water from the RO system would be stored in on-site brine ponds. The lined ponds would be designed to allow evaporation of liquid, leaving salts and minerals behind that would be cleaned out periodically and disposed of at a licensed landfill.

1.3 PURPOSE AND SCOPE OF PLAN

1.3.1 Purpose of the Plan

The proposed project would use groundwater extracted from the Soda Mountain Valley for construction and operational needs. The GMMP has been prepared to describe groundwater monitoring activities, action criteria, and adaptive management protocols to avoid adverse impacts to the aquifer underlying the project site, as well as MC Spring and Lake Tuendae at Zzyzx within the Mojave National Preserve, approximately 4 miles east of the eastern project site boundary. MC Spring provides habitat for the federally and state-endangered Mohave tui chub (*Gila bicolor mohavensis*).

The GMMP describes methods to prevent a significant effect on groundwater and surface water users. The purpose of the GMMP is to describe the methodology for:

- Monitoring groundwater conditions throughout the life of the project
- Monitoring water use throughout the life of the project
- Implementing corrective measures if the potential for adverse impacts is identified during monitoring

Monitoring will be performed during three phases to accomplish the following monitoring objectives:

(1) **Preconstruction**: Confirm baseline groundwater conditions prior to initiating project-related pumping.
(2) **Construction**: Monitor effects of groundwater extraction during project construction to ensure Mohave tui chub habitat and critical groundwater resources are not adversely affected.

(3) **Operation**: Monitor effects of groundwater extraction during project operation to ensure Mohave tui chub habitat and critical groundwater resources are not adversely affected.

The GMMP includes methods and procedures to monitor:

(1) Groundwater levels in groundwater wells
(2) Groundwater extraction rates in groundwater production wells
(3) Surface water levels in surface water features
(4) Water quality (selected general mineral and physical parameters and constituents of concern specific to the project area)

The methods and procedures have been designed to monitor conditions in, and avoid effects to, the habitat for the Mohave tui chub.

1.3.2 Scope of Plan

The GMMP consists of the following sections:

1. Introduction
2. Existing Groundwater Conditions
3. Groundwater Modeling Results and Impact Analysis
4. Well Construction
5. Monitoring, Testing, and Reporting Procedures
6. Locations of Monitoring Wells, Production Wells, and Surface Water Monitoring Points
7. Monitoring Data Analysis Process
8. Action Criteria and Corrective Measures
9. References

Figure 1.2-1: Project Location

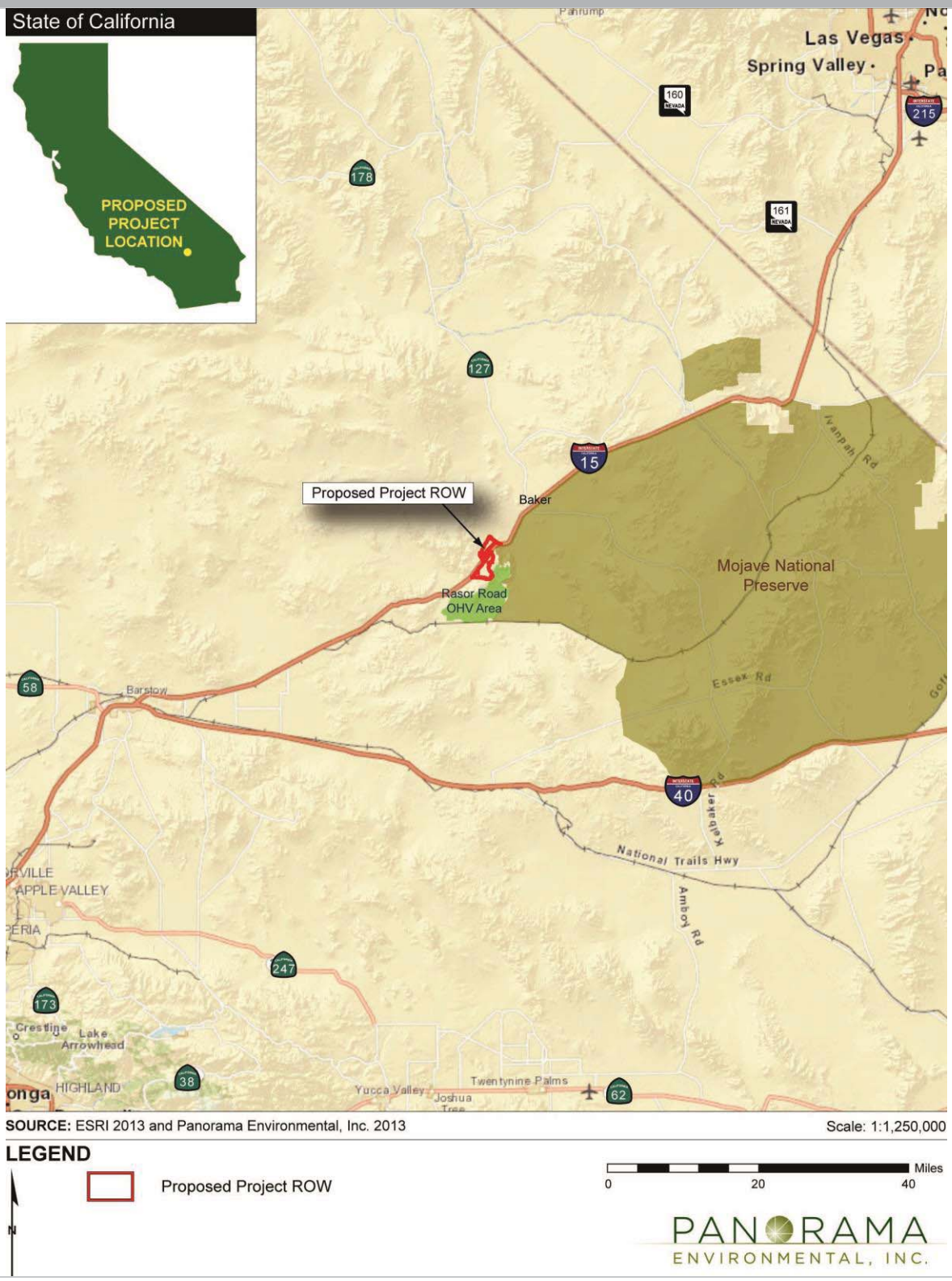
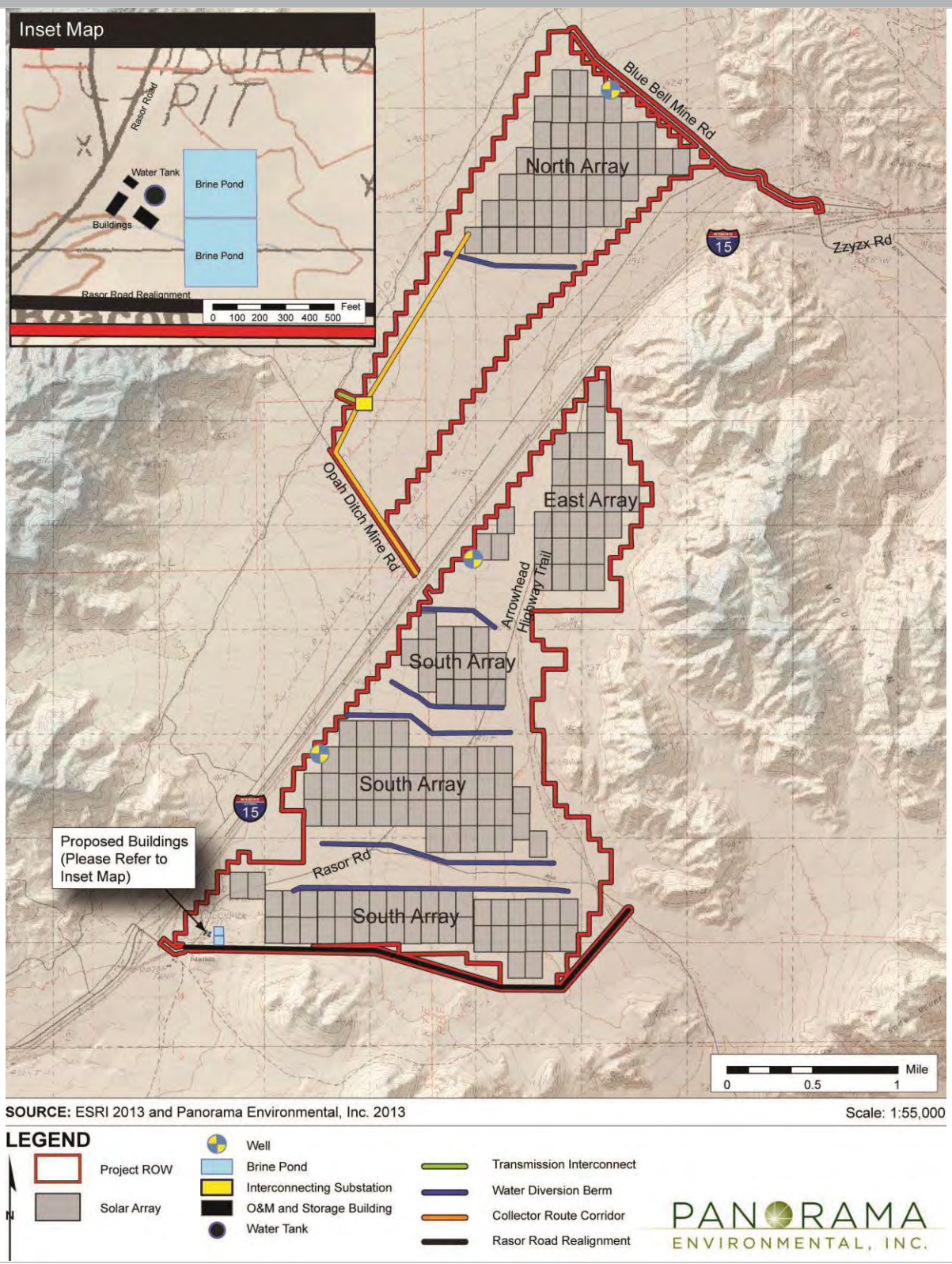


Figure 1.2-2: Proposed Project Layout



2 EXISTING GROUNDWATER CONDITIONS

2.1 PREVIOUS STUDIES

SMS has conducted geologic, geophysical, and hydrogeologic studies to evaluate groundwater resources and to characterize the geology and hydrogeology within the project area. The following studies provide information on the geologic and hydrogeologic characteristics of the project site:

- Geologic Characterization Report (WGI 2011)
- Geophysical Characterization of Subsurface Physical Properties (TerraPhysics 2010)
- Preliminary Geotechnical Investigation (Phase 1A) (DYA 2010)
- Hydrogeologic Conditions and Groundwater Modeling Report (RMT 2011)
- Hydrogeological Conditions and Groundwater Modeling Report Addendum (TRC 2013)

The Hydrogeology Report (RMT 2011) and the Addendum (TRC 2013) are provided in Appendix A. The Groundwater Well Permit Application (Panorama 2012) is included in Appendix B. These documents include additional information on the hydrogeologic conditions in the project area and in the Zzyzx area, and describe the details of the groundwater modeling effort.

2.2 EXISTING WELLS AND WATER RESOURCES

2.2.1 Wells

There are no alluvial wells within the Soda Mountain Valley. There are four wells located within 5 miles of the project area, as described in Table 2.2-1.

Table 2.2-1: Groundwater Wells Near the Project Area

Well	Location	Distance and Direction to Project Area (miles)	Screened Zone
Rasor Road Service Station Production Well	Rasor Road Service Station, Rasor Road at I-15	0.03 miles south	Bedrock
012N008E27N002A[1]	Rasor Road	4 miles southeast	Unknown
012N008E35A001S[1]	Rasor Road	4.5 miles southeast	Unknown
Desert Studies Center Production Well	Near MC Spring on west shore of Soda Lake, at Zzyzx	3.2 miles east	Alluvium

Note:

[1] Included in U.S. Geological Survey (USGS) National Water Information System database.

2.2.2 Surface Water

Project Region

MC Spring and Lake Tuendae, a manmade lake, are located approximately 4 miles east of the project, near the Desert Studies Center (DSC) on the west shore of Soda Lake. MC Spring and Lake Tuendae support populations of Mohave tui chub, a federal- and state-listed endangered species. Soda Lake and Silver Lake are dry (ephemeral) playa lakes that are located approximately 4 miles east and 7 miles north-northeast, respectively, of the project area (Figure 2.2-1).

MC Spring

MC Spring is a natural spring that discharges into an oval-shaped pond that supports a population of about 255 Mohave tui chub. The spring is recharged locally from water flow from alluvial fan deposits (Barthel 2008; Vargas 2012). The pond at the spring outlet is approximately 13 feet wide by 16 feet long (0.005 acres) and supports vegetation within a 0.4-acre watershed (Barthel 2008). The depth of the spring is about 6.5 feet with a total volume of approximately 8,300 gallons. Barthel (2008) observed the water level in the pond to be constant during a year of measurements, apparently unaffected by pumping in the alluvial aquifer production well located near the spring. This finding is consistent with results of DSC production well testing at up to 200 gallons per minute that indicated the alluvial aquifer is highly permeable and transmissive (Archbold 1994). This also suggests that there is ample water flow in the permeable alluvial aquifer to sustain water levels in MC Spring.

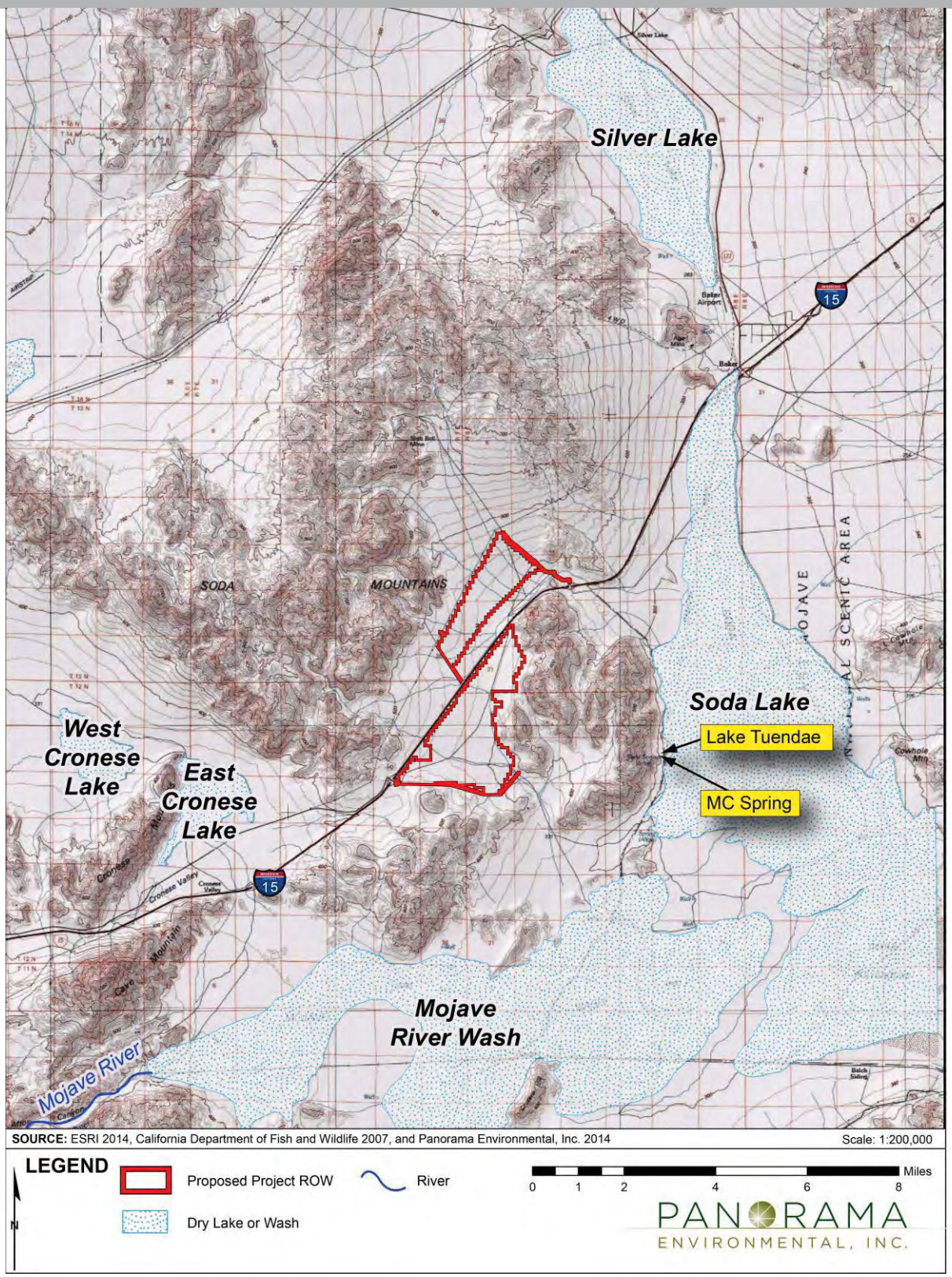
Lake Tuendae

Lake Tuendae is an approximately 1.5-acre manmade lake located about 800 feet northwest of MC Spring. The pumping rate required to support the lake and adjacent vegetation is estimated to be approximately 28.5 AFY (Barthel 2008). The lake is located within a 2-acre watershed. Lake Tuendae supports a population of about 1,318 Mohave tui chub, which was introduced to the lake (Barthel 2008). The lake is approximately 3.1 feet deep. The lake level is managed by the DSC to ensure adequate water depth for the tui chub and the Saratoga Springs pupfish (*Cyprinodon nevadensis nevadensis*), also an introduced species (Barthel 2008). Lake levels are maintained by pumping groundwater rather than natural groundwater discharge.

Soda Lake

Soda Lake is a playa lakebed located at the terminus of the Mojave River. Along with Silver Lake, it is a remnant of Lake Mojave, a large perennial lake that existed earlier in the Holocene period (i.e., 11,700 years ago to present). The lakebed may contain standing water in wet years. In dry years the lakebed contains water near the surface and is covered with a crust of evaporite (salt) minerals such as sodium carbonate and sodium bicarbonate (USGS 2004). Flooding that discharges to Soda Lake occurs on a decadal basis. The primary water sources to the lake are groundwater flow, stream discharge from streams originating in the surrounding mountain ranges, and stream discharge from the Mojave River during high-flow conditions (USGS 2004).

Figure 2.2-1: Regional Surface Water Resources



Silver Lake
Silver Lake is a playa lakebed located north of the Town of Baker that, together with Soda Lake, was part of ancient Lake Mojave. A low divide that has been modified into a channel separates the two lakes. The lakebed may contain standing water in wet years but is usually dry. Salt crusts do not occur at Silver Lake because the water table is lower than at Soda Lake (USGS 2004).

Mojave River
The Mojave River currently terminates in Soda Lake, but has historically flowed into Silver Lake. The Mojave River is an ephemeral river and the Mojave River Wash at the terminus of the Mojave River is dry in most years. Water is generally conveyed through the Mojave River Wash to Soda Lake via subsurface groundwater flow.

Project Area
There are no perennial surface waters or springs in the Soda Mountain Valley. The waters within the project site are all ephemeral desert washes, which are common within a desert hydrologic system. Water is present within the drainages during and immediately following a precipitation event and percolates quickly to the subsurface.

2.3 GEOLOGY AND HYDROGEOLOGY

Project area geology and hydrogeology are summarized below. The geologic reports listed in Section 2.1 contain more detailed information on project area geology. Appendix A contains more detailed information on the hydrogeology of the area.

2.3.1 Geology

Geologic units within the project site consist primarily of alluvium (sedimentary deposits derived from weathering, erosion, and transport) on the flanks of the Soda Mountains and in the central Soda Mountain Valley and washes. The alluvium is dominantly present as extensive alluvial fan deposits that originate in the mountains and slope down into the valley, forming fan-shaped wedges of predominantly coarse-grained material (i.e., sand, gravel, cobbles, and boulders). The alluvium is finer-grained with distance from the mountain fronts. The alluvial fans range in age from recent (decades to millennia) to very old (tens of thousands of years), with the older deposits forming the more elevated surfaces within the project area (WGI 2011).

Geologic mapping from Jenkins (1962) and WGI (2011) indicates that Mesozoic granitic rocks comprise much of the subsurface bedrock, with Jurassic-Triassic metavolcanic rocks forming significant portions and higher reaches of the Soda Mountains. Older and younger sedimentary formations are located at more distant locations and to the north of the project area. Bedrock is generally very hard and fractured, and forms the source materials that have been transported to from the alluvial fan deposits that fill the valley (WGI 2011). Limited areas of bedrock are present in the south and southwest portions of the project site. A localized outcrop of carbonate rock is present in the vicinity of MC Spring at Zzyzx, but its mapped extent appears to be limited to the vicinity of the spring (Jenkins 1962).

2.3.2 Hydrogeology

Project Region

California groundwater basins are described in California Department of Water Resources (DWR) Bulletin 118 (DWR 2004). DWR identifies the 381,000-acre Soda Lake Valley Groundwater Basin as Basin No. 6-33 in Bulletin 118. Basin No. 6-33 has not been adjudicated by the State of California and there is no evidence of overdraft conditions within the basin (DWR 2004). The basin is bounded by the Mark and Kelso Mountains on the east, the Bristol and Cady Mountains on the south, the Soda and Cave Mountains on the west, and a low divide with the Silver Lake Basin on the north (see Figure 5 in *Groundwater Well Permit Application* in Appendix B). These areas drain towards Soda Lake (DWR 2004).

Project Area

The project is located within a subbasin of the Soda Lake Valley Groundwater Basin: the approximately 32,946-acre Soda Mountain subbasin. State of California geologic mapping indicates that the project area overlies alluvium, which is the only water-bearing geologic unit in the valley (Gutierrez 2010). This finding was confirmed by geophysical and geotechnical studies of the project area (WGI 2011; TerraPhysics 2010).

The Soda Mountain subbasin is generally separated from the rest of Basin No. 6-33 by mountains to the south and east. Groundwater flow in the northeast portion of the subbasin is expected to be toward Baker to the northeast and Soda Lake to the east. Groundwater flow in the southwest portion of the subbasin is expected to be toward the Mojave wash to the south. The subbasin is surrounded by mountains; therefore, groundwater is funneled to Basin No. 6-33 through small breaks in the mountains to the east and southeast. Groundwater elevations within the Soda Mountain subbasin are about 200 to 300 feet higher than those measured by USGS in Basin No. 6-33, and the subbasin is topographically higher than areas to the east (RMT 2011). The higher topographic and groundwater elevations in the Soda Mountain subbasin above Basin No. 6-33 indicate that there is limited groundwater flow from Basin No. 6-33 into the Soda Mountain subbasin. Hydrogeologic cross-sections for the subbasin are presented in the Hydrogeology Report in Appendix A (Figures 2.4-1, 2.4-2, and 2.4-3).

2.4 GROUNDWATER DATA

2.4.1 Project Region

Regional groundwater data were obtained from the USGS National Water Information Service (NWIS) website (www.nwis.waterdata.usgs.gov), which provided information on the locations of groundwater wells in the project vicinity. The website also included data on depth-to-water, well depths, ground surface elevations, and water chemistry. Regional groundwater data are summarized below.

Groundwater Elevations

Depth-to-water in groundwater wells located within the project region recorded between 1957 and present is variable. Typical values, however, are within 100 feet of ground surface in the

surrounding basins: 7.4 to 24.7 feet below ground surface (bgs) in the Soda Lake Valley Basin, 18.1 to 52 feet bgs in the Cronese Valley Basin, and 3.5 to 76.5 feet bgs in the Silver Lake Valley Basin. These depth-to-water values correspond to groundwater elevations ranging from 873 to 1,065 feet above mean sea level (amsl). Groundwater elevations for wells located in the Caves Canyon Valley Basin (southwest of project area) are 350 to 400 feet higher, which is to be expected, given that the ground surface elevations in this basin are generally at least 300 to 500 feet higher than those of the other three groundwater basins in the project vicinity.

Groundwater Quality

Water chemistry within the South Lahontan Hydrologic Region, in which the project area is located, is variable and depends on aquifer characteristics, as well as well location and depth. For example, one well bore drilled near the town of Baker was abandoned due to poor (i.e., salty) water quality, which increased with depth (USGS 1955). Groundwater located near valley edges typically is lower in TDS (i.e., better water quality) compared to groundwater located in valley centers and dry lake beds, and generally is dominated by calcium or sodium bicarbonate, with other major components including sodium sulfate and chloride. Water quality is considered to be marginal to inferior for domestic and irrigation purposes due to the presence of elevated concentrations of fluoride, boron, and TDS (DWR 2004).

Specific conductance data for water well samples provided by USGS (1955) were converted to approximate TDS values using a common conversion factor.[1] Cronese Valley TDS values averaged 1,700 ppm and Soda Lake Valley/Silver Lake Valley TDS values averaged 1,200 ppm.[2] Additionally, groundwater samples collected from a test well bore drilled in the Soda Lake dry lake bed revealed an order-of-magnitude decrease in TDS with depth: TDS of 7,520 ppm at a depth of 75 feet bgs and TDS of 670 ppm at a depth of 400 feet bgs (USGS 1991).

2.4.2 Project Area

There are no wells screened in alluvium in the Soda Mountain Valley; therefore, there are no local groundwater data available. The information provided below is based on remote sensing work (geophysical studies) and provides estimates of the groundwater elevations and groundwater quality that can be expected to be encountered in the valley. Geotechnical borings have been drilled at the project site to a maximum depth of approximately 100 feet bgs, but did not encounter groundwater.

Groundwater Elevations

Three locations within the project area were investigated using transient electromagnetic resistivity (TEM) soundings in 2010 (TerraPhysics 2010). The results of the geophysical

---

[1] TDS in ppm = specific conductance (in microSiemens per centimeter) x 0.67.

[2] The report noted that several of the groundwater samples were collected from wells not undergoing active pumping and, therefore, the results may not be representative of groundwater quality in the area.

investigation indicate the depth to groundwater at the northern end of the project ROW is estimated to be approximately 182 feet bgs ±13 feet. Depth to groundwater near the southern end of the project ROW is estimated to range from 354 feet bgs ±30 feet to greater than 436 feet bgs ±49 feet.

Fifteen borings were drilled as part of a geotechnical study in the project area (DYA 2010). Fourteen boreholes were shallow and ranged in depth from 14 to 21 feet bgs. One borehole was drilled to a depth of 100 feet bgs. Groundwater was not encountered in any of the borings (DYA 2010).

As described above under *Regional Groundwater Elevations*, ground surface elevations and groundwater elevations within the Caves Canyon Valley Basin are about 300 to 500 feet higher than corresponding elevations in the Soda Lake, Silver Lake, and Cronese Valley basins. A similar relationship likely exists between the Soda Mountain Valley, in which the project site is located, and these nearby basins. The ground surface elevation of the project site ranges from approximately 1,300 to 1,575 feet amsl, which is 200 to 600 feet higher in elevation than that of the Soda Lake, Silver Lake, and Cronese Valley basins. Therefore, it is likely that the groundwater elevations within the Soda Mountain Valley are at least 200 feet higher in elevation than those in the surrounding basins. Topography also suggests that the water table in the valley likely is deeper than that in the surrounding basins (i.e., estimated to be at least 100 feet bgs or more). A deeper water table is expected in the upland areas of the valley, closer to the mountain fronts, which are farther from local discharge sources (e.g., dry lakes).

Groundwater Quality

The 2010 TEM soundings also were used to estimate groundwater quality in the valley. The geophysical data indicate that groundwater in the northern portion of the valley has very low resistivity (4 ohm-meters), indicating a high conductivity and a high concentration of TDS. Groundwater in the southern portion of the valley has higher resistivity values (15 ohm-meters), indicating relatively high TDS concentrations but lower than at the northern location.

A well located at the DSC was sampled in May 2000. Water quality data from the well are not likely representative of water quality at the project well locations due to the separation of the DSC from the project area by mountains (a granitic intrusion), as described in Section 2.3.2. TDS was quantified at 1,890 ppm in the DSC well.

3 GROUNDWATER MODELING RESULTS AND IMPACT ANALYSIS

A numerical, three-dimensional groundwater flow model was developed to simulate groundwater flow conditions (see RMT 2011, TRC 2013, and Appendix A). The model assumed a construction period of up to 3 years (to be conservative) and an operational period of 30 years (RMT 2011). The simulations included the use of one and three wells for groundwater withdrawal and recharge rates of 3 percent and 10 percent of precipitation.

The rationale for recharge values used in the original model, 0.125 to 0.5 inches per year, was discussed in detail in Section 3.2 of the Hydrogeology Report (RMT 2011; Appendix A). Average annual precipitation was estimated to be 4 inches per year or more, based on data from PRISM Climate Group (2012) and Western Regional Climate Center (2013).

BLM staff suggested using recharge rates ranging from 3 to 10 percent of precipitation (0.12 to 0.4 inches of recharge per year) in the revised model based on their experience elsewhere in arid and semi-arid regions of southern California. These estimates of recharge are slightly lower than the previous estimates of 0.125 to 0.5 inches used in the Hydrogeology Report (RMT 2011). The low-end (3 percent) and high-end (10 percent) recharge rates used in the model provide a total input of 376 to 1,330 AFY of recharge (corresponding to 0.12 to 0.4 inches of recharge per year).

The groundwater flow model predicted that drawdown in the Soda Mountain Valley would be minimal (i.e., a few feet) under all simulated conditions. The maximum simulated drawdown at the eastern edge of the valley (western edge of the South Soda Mountains) was predicted to be 2.2 feet and the maximum reduction in outflow from the valley via the northeast outlet was estimated at 1 percent (i.e., 4.6 AFY or less) under any scenario after 30 years of groundwater use. The model results show no discernable change in groundwater outflow after 3 years of project construction. The small drawdown at the edge of the valley would attenuate to negligible levels over the 3 miles of bedrock separating the valley from the MC Spring area at Zzyzx. In comparison, groundwater levels in monitoring wells near Zzyzx fluctuate naturally by 1 to 2 feet with no effect on the level of MC Spring (Barthel 2008).

The groundwater model results indicate that groundwater use for the project is not likely to affect existing wells or MC Spring at Zzyzx. The results also indicate that groundwater level declines would propagate slowly away from the well location and would be able to be detected at monitoring wells in the Soda Mountain Valley long before any impact could potentially be detected in wells outside of the Soda Mountain Valley.

Impacts related to groundwater supply and groundwater recharge are discussed in the Draft EIS/EIR for the project (BLM 2013). The impacts to these groundwater resources are expected to be less than significant based on the predictions of the groundwater model (refer to Appendix A). Concern has been expressed about the following potential adverse impacts that could occur as a result of project groundwater pumping:

- Reduction in discharge at MC Spring that could threaten the Mohave tui chub
- Decline in groundwater levels at the DSC that could reduce production from the DSC production well
- Impacts to seasonal seeps near Zzyzx Road that supply water for bighorn sheep

Implementation of Applicant Proposed Measures (APMs) 14 and 15 (BLM 2013) would ensure comprehensive groundwater monitoring and impact verification is conducted, including an aquifer pumping test, by a professional hydrogeologist or geologist. Implementation of APMs 17 and 18 (BLM 2013) would ensure that the groundwater model used to predict the effects of project groundwater use would be recalibrated using the measured aquifer properties and pumping responses occurring during the aquifer test. APM 18 also requires curtailment of project groundwater use to the extent required to avoid a decrease in the MC Spring water level to below 4 feet.

Corrective measures (see Section 8 of the GMMP) would supplement the APMs to further ensure that adequate groundwater and surface water monitoring and reporting are performed to avoid impacts to groundwater and surface water resources, especially at MC Spring.

4 WELL CONSTRUCTION

4.1 APPROACH

It is anticipated that up to three production wells and five monitoring wells will be installed during the well construction program. The number of wells will be confirmed following completion of the aquifer testing program as described in the *Groundwater Well Test Plan* (Test Plan; Panorama 2014; see also Section 5.1). All wells will be installed and tested prior to initiation of construction at the project site (i.e., in the project preconstruction phase). Wells will be constructed in general accordance with:

- DWR Bulletin 74-81, Water Well Standards – State of California
- DWR Bulletin 74-90, California Well Standards
- County of San Bernardino Desert Groundwater Management Ordinance

Specific well construction procedures and details are provided below. Most of the procedures will be the same as or similar to those described in the Test Plan (Panorama 2014). The Test Plan is included in Appendix C for reference and includes additional details for well construction and testing methods.

4.2 PRE-FIELD PREPARATION

Drilling locations and surrounding areas will be identified and marked in conjunction with BLM. Underground Service Alert (USA), a regional subsurface utility notification service, will be contacted at least 48 hours prior to any subsurface activities to notify local utility companies of the upcoming subsurface work and allow them time to mark the locations of their subsurface lines. A private utility locator will be contracted to perform a subsurface utility survey to screen the drilling locations for belowground utilities.

4.3 FIELD PROGRAM

Construction methods and procedures will be similar for production wells and monitoring wells. Well dimensions, well materials, and screen intervals will be finalized through discussions between the geologist and the well driller and will be based on local knowledge of area geology, observations during drilling, and required accommodations for pumping equipment. Well construction details and screen intervals will be chosen based on water table depth, geophysical logs, soil logs generated during drilling of the pilot holes, and geotechnical testing results (i.e., sieve testing).

4.3.1 Pilot Hole Drilling

Conductor Casing Installation

A California-licensed well driller (C-57 licensed) will drill a large-diameter borehole (26 inches) at each production well location to a depth of approximately 30 feet bgs under the oversight of a field geologist (either a California-licensed Professional Geologist or an experienced geologist under direct supervision of a Professional Geologist). Conductor casing (22-inch-diameter) will be installed in the borehole to a depth of approximately 30 feet bgs and sealed in place with a 10-sack sand-cement slurry (or equivalent). No separate conductor casing will be installed for the monitoring wells.

Drilling

A California-licensed well driller (C-57 licensed) will use air rotary casing hammer (ARCH) methods to drill the pilot holes for each well to the water table, and then mud rotary techniques will be used for the remaining footage to the total depth of the wells. The steel casing is advanced into the hole during the ARCH drilling process and, because no mud is used with this technique, the presence of the water table is readily observed. Once the water table is reached, the driller will switch to mud rotary methods, which will allow for the borehole to remain open in the presence of saturated sands and gravels.

A field geologist will log the soil cuttings in general accordance with ASTM International D2488-09: *Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)* using the Unified Soil Classification System for guidance. Soil descriptions and the depth to first water will be noted on boring logs. The field geologist will collect soil samples at depths where lithological changes are observed. Samples will be labeled with the boring number and the depth interval over which they were collected. A chip tray will be prepared for each borehole consisting of soil samples from each sampling interval. The field geologist will evaluate the stratigraphy after the completion of the pilot hole by reviewing the boring log and the samples collected, and select representative samples to submit for grain size and moisture content analysis by a geotechnical laboratory. Estimated total depths of pilot holes are presented in Table 4.3-1.

Geophysical Logging

Following attainment of total depth, drilling will be halted, the drill stem will be removed, and the well bore will be logged by a subcontracted geophysical logging contractor from ground surface to total depth. Natural gamma ray, spontaneous potential (SP), short-normal resistivity, long-normal resistivity, and caliper logs will be generated. All geophysical logging will be performed in general accordance with American Petroleum Institute standards.

Gamma logs and SP logs will provide data on stratigraphy and clay content (e.g., permeable zones such as sand and impermeable zones such as clay). Resistivity logs are electric logs used to determine presence of permeable zones. The short-normal resistivity log measures resistivity at a shallow depth of investigation (i.e., a short distance from the borehole wall). The long-normal resistivity log measures resistivity at a greater distance from the borehole wall. Separation between the short-normal and long-normal curves is indicative of fluid movement

Table 4.3-1: Preliminary Well Depths and Screen Intervals					
Well ID	**Surface Elevation**	**Total Depth**		**Screen Interval Depth**	
	Feet amsl	**Feet amsl**	**Feet bgs**	**Feet amsl**	**Feet bgs**
Production Wells					
PW-1	1,440	1,090	350	1,090 to 1,240	200 to 350
PW-2	1,385	1,030	355	1,030 to 1,170	215 to 355
PW-3	1,460	1,000	455	1,000 to 1,110	345 to 455
Monitoring Wells					
MW-1	1,340	1,090	350	1,090 to 1,260	180 to 350
MW-2	1,350	1,100	250	1,100 to 1,250	100 to 250
MW-3	1,345	1,000	340	1,000 to 1,150	190 to 340
MW-4	1,405	1,020	385	1,020 to 1,180	225 to 385
MW-5	1,280	960	320	960 to 1,110	170 to 320
Note: Depths are approximate and may be modified based on actual field conditions.					

(permeability). Caliper logs will be used to measure the borehole diameter and also can be used to identify permeable zones where the borehole diameter is larger due to washout.

Investigation-derived Waste Characterization

Soil samples will be collected and analyzed to characterize soil cuttings for disposal.

Sieve Analyses

Samples collected during pilot hole drilling will be submitted to a geotechnical laboratory for sieve analysis in accordance with ASTM Standards D6913-04 (2009), *Standard Test Methods for Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis*, and D2216-10, *Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass*. Grain size analysis curves and summary tables will be generated and summarized.

4.3.2 Well Design and Construction

Well Design

Each well will be designed independently and will be based on borehole- and location-specific data collected during pilot hole drilling. The results of the sieve analyses, the geologic log, the geophysical logs, observations recorded during drilling, and driller input will be used to develop a well design for the wells, following the method described in *Groundwater and Wells* (Johnson 1975), or similar. The information will be used to select a filter pack grade, casing depth, screen slot size, and screen interval.

The production well pilot holes will be reamed to a larger diameter (20 inches). An additional 5 to 10 feet of borehole may be drilled beyond the selected casing depth to provide space for slough (i.e., a sump). A large-diameter borehole is require for placement of a 3.5-inch-outside-diameter (OD) fill tube (to replace filter pack material as needed for well maintenance) and a 2-inch-diameter sounding tube for water measurements, adjacent to the well casing. The larger-diameter casing is required for the production wells to accommodate down-hole pump equipment and to minimize well loss effects on hydraulic head. Well reaming will not be required for the monitoring wells. Well materials (i.e., screen, riser, and sand/gravel pack) will be installed by the driller under oversight of the field geologist. Water displaced during sand/gravel pack installation will be pumped into a holding tank, if necessary. Well materials are described in Section 4.4.

4.3.3 Well Development and Sanitary Seal Installation

Initial Development Following Filter Pack Installation

Wells will be surged and pumped under oversight of the field geologist following installation of the filter pack to settle the filter pack material around the well screen. The process will involve swabbing the screen, followed by bailing with a large steel bailer or air-lift pumping. Surging and pumping will progress in intervals from the bottom to the top of the well. Discharge water will be visually monitored for sand content; the process will continue in each interval until the majority of the fines are removed. Following initial surging and pumping the filter pack will be tagged to determine its position in the well annulus and additional material will be installed, as needed, to bring it to the required depth in the annular space.

Transition Seal Installation

A minimum 5-foot-thick transition seal consisting of transition sand (e.g., Lapis Lustre #0/30 sand, or equivalent) will be installed above the sand pack in monitoring wells to provide a seal between the sand pack and the sanitary seal to be installed above. The transition seal will be emplaced with a tremie pipe to ensure proper placement.

Sanitary Seal Installation

A sanitary seal composed of neat cement will be installed from above the top of the transition seal to ground surface under oversight of the field geologist and in accordance with County requirements. Each well will have a minimum of 20 feet of annular surface seal per California Water Well Standards.

Well Development

Following completion of well construction activities, wells will be developed by pumping. Discharge water will be monitored for sand content using a sand content kit provided by the well development contractor. The field geologist will periodically collect groundwater samples to measure water quality parameters (e.g., pH, temperature, specific conductance, turbidity, oxidation-reduction potential [ORP], and dissolved oxygen [DO]) using field instrumentation. Results of field parameter testing will be recorded on field data sheets. Well development will continue until sand production is minimal (per the sand content measured using the sand content kit) and water quality parameters have stabilized for three successive readings. The three successive readings should be within the following ranges:

- ± 0.1 standard units for pH
- ± 3 percent for temperature
- ± 3 percent for specific conductance
- ± 10 millivolts for ORP
- ± 10 percent for turbidity
- ± 0.3 milligrams per liter for DO

4.3.4 Surface Completion

Wells will extend approximately 2 feet above ground surface and will be secured aboveground with a locking, hinged well cap that will be welded onto the well casing stick-up. A water-tight well cap will be placed on top of casing and secured with a lock. A concrete pad measuring approximately 4 feet by 4 feet (approximately 4 inches thick) will be installed around the casing and yellow bollards will be installed at four corners around the pad to ensure maximum visibility and protection of the wells.

4.3.5 Surveying

Wells will be surveyed for horizontal and vertical positions by a state-licensed land surveyor. Horizontal positions will be measured to an accuracy of 1.0 foot and will be referenced to the California State Coordinate System and the North American Datum of 1983 (NAD 83). Vertical positions will be measured to an accuracy of 0.01 foot and will be referenced to North American Vertical Datum of 1988 (NAVD 88). Vertical positions will be measured at the top of well casing (north side) and at the top of the concrete pad at each well location.

4.4 WELL SPECIFICATIONS

4.4.1 Well Dimensions and Materials

Each well will be drilled to the top of bedrock, and approximately 20 feet into the bedrock if feasible. Production wells will generally screen the full thickness of saturated alluvium, except for an interval within approximately 20 feet of the water table. The unscreened portion near the water table will avoid the buildup of mineral encrustation due to evaporation of water cascading down the well screen during pumping. Monitoring well screen intervals generally

will target the same intervals as the production wells, but will include the entire saturated interval that is screened, including the portion near the water table. This approach will ensure accurate measurement of any drawdown of the water table.

The depth of the static water table and depth of bedrock at each well location will be determined during pilot hole drilling. The water table depth and screen interval for each well will vary depending on well location, with shallower screen intervals expected at the northern well sites (where groundwater and bedrock are shallower) and deeper screen intervals expected at the southern well sites (where groundwater and bedrock are deeper). Preliminary well depths and screen intervals are presented in Table 4.3-1. Actual total depths and screen intervals in the constructed wells will depend on the depth to the water table and the depth to bedrock as observed during pilot hole drilling. Table 4.4-1 provides well construction information.

Table 4.4-1: Proposed Well Dimensions and Construction Materials

	Dimension or Material	
Parameter	**Production Wells**	**Monitoring Wells**
Borehole		
Pilot borehole diameter (inches)	12	10
Pilot borehole depth (feet bgs)	Variable; see Table 4.3-1	Variable; see Table 4.3-1
Reamed borehole diameter (inches)	20	N/A
Reamed borehole depth (feet bgs)	Variable; see Table 4.3-1	N/A
Conductor Casing		
Conductor casing borehole diameter (inches)	26	N/A
Conductor casing diameter (inches)	22	N/A
Conductor casing borehole depth (feet bgs)	30	N/A
Conductor casing depth (feet bgs)	30	N/A
Conductor casing type	0.375-inch wall, mild steel	N/A
Well Casing		
Well casing depth (feet bgs)	Variable; see Table 4.3-1	Variable; see Table 4.3-1
Well casing diameter (inches)	10.75	4
Screen interval (feet bgs)	Variable; see Table 4.3-1	Variable; see Table 4.3-1
Well casing type	Low-carbon black steel	Sch. 80 polyvinyl chloride (PVC)
Well screen type	Low-carbon steel, full-flow, louvered (slot size to be	Sch. 80 PVC, factory-slotted (slot size to be finalized in the

Table 4.4-1: Proposed Well Dimensions and Construction Materials		
	finalized in the field based on geologic log and sieve analyses)	field based on geologic log and sieve analyses)
Annular Materials		
Sanitary seal interval	Ground surface to 7 feet above top of screen interval	Ground surface to 7 feet above top of screen interval
Sanitary seal type	Neat cement grout	Neat cement grout
Transition seal interval	From 2 feet above top of screen interval to 7 feet above top of screen interval (5 feet long)	From 2 feet above top of screen interval to 7 feet above top of screen interval (5 feet long)
Transition seal type	Transition sand (e.g., Lapis Lustre #0/30)	Transition sand (e.g., Lapis Lustre #0/30)
Filter pack interval	From 2 feet above top of screen interval to total depth (variable)	From 2 feet above top of screen interval to total depth (variable)
Filter pack type	Sand pack mesh size of 8 to 12 (filter pack grade to be finalized based on geologic log and sieve analyses)	Sand pack mesh size of 8 to 12 (filter pack grade to be finalized based on geologic log and sieve analyses)

4.5 WELL TESTING

Production wells will be tested to identify the optimum pumping rate for each well. Well testing will be performed as described in the Test Plan (Panorama 2014), included as Appendix C. Well testing will occur immediately following completion of well construction and development activities.

Extracted groundwater from the pumping tests will be temporarily stored on site in 20,000-gallon temporary storage tanks. The water storage tanks will be located within the drilling work area and will allow for temporary storage of water during the pumping tests. If possible, the extracted groundwater will be used for dust control on the project site, if dust control activities are ongoing at that time. The water will be transferred to water trucks for distribution over the site. Alternatively, if extracted groundwater is not able to be used for dust control activities, it will be discharged to the land surface over a broad area using a sewer leach field distribution system. The surface discharge system is shown on Figure 2.1-2 of the Test Plan (Appendix C).

Discharge of extracted groundwater was discussed with the Lahontan Regional Water Quality Control Board (LRWQCB) (Cass 2014). Discharge will be alternated among three perforated leach field distribution pipes about every 15 to 20 hours during the tests to redistribute discharge and avoid overwatering any one area, causing erosion, and attracting wildlife such as ravens. The temporary water storage tanks will be used to temporarily store extracted

groundwater to manage the discharge. Discharge will be transferred from the storage tanks to conveyance pipes and the valves will be opened to direct flow away from the site to multiple dispersal areas. Water will be discharged downslope from the test and observation well sites approximately 500 feet from the wells to reduce the potential for groundwater infiltration to affect the test results.

A discharge permit is not required by LRWQCB under State Water Resources Control Board Order No. 2003-0003-DWQ – *General Waste Discharge Requirements for Discharges to Land with a Low Threat to Water Quality* because the discharge will be adequately distributed using sewer leach field piping and there has been limited activity in the valley; therefore, the groundwater is not suspected to be contaminated (Cass 2014). A map showing the test well location and a diagram showing the piping network and the anticipated discharge distribution will be submitted to LRWQCB prior to initiation of the aquifer testing program.

4.6 DOCUMENTATION

Well completion reports (DWR Form 188) will be completed for each well and submitted to DWR, BLM, and the County.

5 MONITORING, TESTING, AND REPORTING PROCEDURES

5.1 AQUIFER TEST

An aquifer test will be performed on a test well that will be installed prior to initiation of full-scale groundwater monitoring as described in this GMMP. The Test Plan (Panorama 2014) that describes the testing activities has been submitted to the County and BLM. The Test Plan describes procedures for installing, testing, and analyzing data from a test well at the project site. BLM and County comments on the plan were incorporated and the plan is included as Appendix C. The goals of the aquifer test are to:

1. Determine whether there is adequate groundwater capacity within the Soda Mountain Valley to meet the construction and operational water supply needs of the project.
2. Determine the likely impacts, if any, on sensitive receptors such as the Mohave tui chub at MC Spring at Zzyzx, located more than 4 miles east of the east project boundary along the western shore of Soda Lake.
3. Determine the number of wells that will be required to supply water for the project.
4. Determine total dissolved solids (TDS) concentrations in Soda Mountain Valley groundwater to evaluate the need for reverse osmosis water treatment during project operation.
5. Define the geochemistry of groundwater in the Soda Mountain Valley to evaluate the potential connectivity with MC Spring.
6. Test the assumptions of the groundwater model including hydraulic conductivity and specific yield.
7. Describe the geologic composition of the uppermost bedrock beneath the alluvial aquifer.
8. Re-run the groundwater model (if necessary) to further analyze potential effects of groundwater withdrawal to springs in the Mojave National Preserve and the Mohave tui chub.

The aquifer testing program will be completed prior to constructing the other production wells and the monitoring wells described in the GMMP. Results of the aquifer test may be used to update the GMMP, if appropriate. SMS will obtain groundwater quality samples for water quality analysis during completion of the aquifer testing program, as specified by APM 16 (BLM 2013).

> **APM 16:** A water quality sample will be collected from the test well and analyzed for TDS by a State of California-certified laboratory. The results will be evaluated by the project engineer to determine the need for a reverse osmosis facility to treat the water for panel washing.

Data collected during initial test well installation and aquifer testing may be used to recalibrate and re-run the groundwater model prepared for the project per APMs 15 and 17 (BLM 2013).

5.2 MONITORING

SMS will monitor production wells, monitoring wells, and surface water monitoring points to test baseline conditions and to identify any changes that occur due to groundwater pumping. The monitoring locations are described in Section 6.

5.2.1 Production Monitoring

Production data (i.e., pumped volumes) for all project production wells will be recorded from instantaneous readings of flow meters or using other approved methods of measurement at each well (e.g., flow totalizer). Flow data will be collected weekly during well operation using totalizer flow gauges. Flow gauges will be inspected for wear-and-tear and proper operation, which may involve periodic verification of accurate readings using manual methods.

The volume of water produced will be checked independently by determining the time needed to fill water trucks or water storage tanks and multiplying the total number of water trucks/tanks filled by the volume of the tanks.

5.2.2 Depth to Static Water Level Monitoring

The depth to groundwater will be monitored automatically using pressure transducers and manually using water level meters. Pressure transducers connected to vented cables (to correct for barometric pressure fluctuations) will be installed in each monitoring well and surface water monitoring point. Transducers inside wells will be affixed to a rigid pipe or rod of known length and inserted into the well, and affixed to the well casing so that readings are not compromised by unintended movement of the transducer in the well. Transducers in surface water bodies will be affixed to a stationary point to ensure it remains in the same location. Transducers will collect water level data at regular intervals (e.g., every 15 minutes). Data will be downloaded biweekly by trained personnel.

Manual depth-to-water measurements will be collected during data downloads to compare to transducer data and verify proper transducer operation. Manual measurements will be collected using an electronic water level meter and will be recorded from the surveyed north side of the well casing to an accuracy of 0.01 foot. Depth to static water levels in wells will be converted to groundwater elevations by subtracting depth to water from the surveyed well casing elevation and expressed as feet amsl.

Transducers will be recalibrated as needed (e.g., when the transducer reading differs from the manually measured water level by more than 1 percent throughout the duration of the monitoring program). Transducers that are not functioning properly and cannot be recalibrated will be replaced. Batteries will be replaced as needed to ensure continuous data collection.

Baseline Monitoring
SMS proposes a baseline monitoring program at the DSC and MC Spring to define the depths to static water level and evaluate baseline variability in the alluvial aquifer at the DSC and MC Spring. These data will be used to evaluate potential impacts from project pumping on MC Spring during the construction and operation phases. The baseline monitoring program will consist of:

- Installing pressure transducers in wells in the alluvial aquifer near MC Spring
- Obtaining production data from the DSC (through DSC records, water meters, or other method acceptable to the DSC and compatible with its infrastructure)
- Installing pressure transducers in MC Spring and Lake Tuendae
- Collecting water level data from the pressure transducers

Baseline data will be collected for a minimum of one season (3 months).

Data collection at the DSC, Lake Tuendae, and MC Spring will require review by the National Park Service (NPS) because these features are within the Mojave National Preserve.

Construction Monitoring
Data collected from pressure transducers installed in each monitoring and production well in the Soda Mountain Valley and at the DSC, MC Spring, and Lake Tuendae will be analyzed throughout the duration of construction. Data will be analyzed weekly for the first month of construction, monthly for the next five months of construction, and quarterly throughout the remaining construction period to observe patterns of groundwater level changes and provide early warning of potential impacts to area water levels resulting from project pumping.

Operation Monitoring
Data collected from pressure transducers installed in each monitoring and production well in the Soda Mountain Valley and at the DSC, MC Spring, and Lake Tuendae will be analyzed quarterly for the first 5 years of the project (which will include up to 3 years of project construction and at least 2 years of project operation), or until the Applicant can demonstrate there is no effect to water levels in MC Spring as a result of groundwater withdrawal and no effect would be anticipated in the future. The project groundwater model will be recalibrated if the observed groundwater decline at any of the monitoring wells in the valley exceeds the model-predicted groundwater decline by more than 20 percent, as discussed in Section 8.

5.2.3 Water Quality Monitoring
Water quality samples will be collected from each production well, monitoring well, and surface water monitoring location and analyzed for selected parameters (Table 5.2-1) on an annual basis. Groundwater samples will be collected after sufficient purging of stagnant water has been conducted. Low-flow purging and sampling techniques may be used, or a bailer or submersible pump may be used to collect samples after a minimum of three well volumes have been evacuated. Sampling will not be conducted until sufficient water has been purged to demonstrate that key water quality parameters (i.e., pH, temperature, and specific conductance)

have stabilized to within 0.1 standard units for pH, 3 percent for temperature, and 3 percent for specific conductance.

Samples will be collected following procedures that are consistent with *Representative Sampling of Groundwater for Hazardous Substances, Guidance Manual for Groundwater Investigations* (DTSC 2008), and the *National Field Manual* (USGS 2006). The samples will be submitted to a state-certified analytical laboratory under chain-of-custody protocols for analysis for the parameters listed in Table 5.2-1. All analyses will be performed within U.S. Environmental Protection Agency (EPA)-prescribed hold times.

Table 5.2-1: Water Sampling Analytical Program

Analyte	Analytical Method (EPA unless specified)
Field parameters (pH, specific conductance, ORP, temperature, and turbidity)	Field meter with pH, specific conductance, ORP, and temperature probes; turbidimeter
TDS	160.1
Total Nitrate/Nitrite (as N)	300.0
Pesticides/Herbicides	*Method to be selected to detect actual herbicides used on site, if any
Carbonate/Bicarbonate alkalinity	SM-2320B
Sulfate	300.0
Chloride	300.0
Calcium	6010B
Magnesium	6010B
Sodium	6010B
Potassium	6010B

5.2.4 Precipitation Monitoring

Monthly precipitation and temperature data will be collected for use in the analysis of groundwater level trends. Precipitation and temperature data may be collected from an existing monitoring station nearby or a dedicated monitoring station located at the project facility.

5.2.5 Land Subsidence Monitoring

SMS does not propose land subsidence monitoring. Land subsidence is not expected to occur because the magnitude of groundwater drawdown, which can lead to subsidence, is projected to be low, and the sediments are dominantly composed of sandy material and do not include a substantial thickness of compressible clay. These conditions are not conducive to causing land subsidence.

5.3 REPORTING PROCEDURES

Reporting procedures for the annual report and the 5-year report are described below.

5.3.1 Baseline Data Collection Report

A report of baseline conditions will be prepared at the end of the baseline monitoring period and submitted to BLM, NPS, and the County for review and comment. The baseline data collection report will confirm baseline water level and water quality conditions at the DSC for comparison with the data compiled for each annual report.

5.3.2 Quarterly Reports

Quarterly reports summarizing all monitoring data will be prepared and submitted to the County and BLM for review. A Professional Geologist will prepare and sign the monitoring reports. All monitoring reports will provide the following information:

- **Baseline** water level and water quality conditions; presentation of baseline conditions will include water level elevation contours, water quality contours, and a figure showing the sampling locations
- Tables summarizing maximum daily **production**, monthly average production rate, total monthly production, and total yearly production for each project production well (cumulative tables for each annual report)
- Tables summarizing monthly **depth** to static water level and groundwater elevation measurements for all monitoring wells (cumulative tables for each annual report)
- Tables summarizing monthly **depth** to static water level measurements for all surface water monitoring points (cumulative tables for each annual report)
- **Hydrographs** for all monitoring wells and surface water monitoring points
- **Groundwater elevation contours** for a selected period or periods (to remain consistent in subsequent annual reports)
- Tables summarizing **water quality analyses** results for the monitoring wells and surface water monitoring points (cumulative tables for each annual report)
- **Water quality contours** for a selected period or periods (to remain consistent in subsequent annual reports)
- Summary of **total groundwater pumped** from the basin for project needs during the reporting period
- Discussion of any **trends** in groundwater levels, water quality measurements, or surface water levels evident from the monitoring data
- **Summary of project developments** potentially affecting groundwater and the spring, such as increased production or use of new production wells
- **Evaluation of impacts** of groundwater development on surface and groundwater resources and suggested mitigation strategies including recommendations for changes to the groundwater extraction program
- Preliminary discussion of **potential problems** encountered during the reporting period and actions taken to correct the problems
- **Re-evaluation** of the adequacy of the monitoring network and GMMP

5.3.3 Five-year Report

The fifth annual report will be prepared in the form of a Supplemental Hydrogeology Report and submitted to the County and BLM for review.

In addition to the components of the quarterly reports, the 5-year report will include a re-evaluation of the hydrogeology of the project area based on 5 years of monitoring data and any other information available since the initial Hydrogeology Report and Addendum were prepared. The GMMP may be revised, as necessary, and included as an attachment to the 5-year report.

A Professional Geologist will prepare and sign the 5-year report, which will contain the following components in addition to those of the quarterly reports:

- Summary of **total groundwater pumped** from the basin for project needs
- Discussion of any **trends in groundwater levels** evident from the monitoring data
- Discussion of any **trends in water quality measurements** evident from the monitoring data
- Discussion of any **trends in surface water levels** evident from the monitoring data
- **Contours** of the most recent static groundwater level elevations and graphical representation of groundwater level elevation changes over the previous 5 years

The 5-year report will also include the following components that relate to re-evaluation of project area hydrogeology:

- Discussion and hydrogeologic interpretation of all groundwater production, water level elevation (groundwater and surface water), and water quality data collected during the previous 5 years
- Revised estimates of groundwater recharge and storage in the project area
- Recommendations for changes to the groundwater pumping program, if any
- Detailed evaluation of impacts of groundwater development on surface and groundwater resources
- Evaluation of the monitoring network, monitoring frequency, and overall GMMP adequacy

6 LOCATIONS OF MONITORING WELLS, PRODUCTION WELLS, AND SURFACE WATER MONITORING POINTS

The monitoring network will consist of groundwater wells and surface water monitoring points. The wells will be monitored for groundwater levels, groundwater quality, and groundwater production volume, as appropriate. The surface water monitoring points will be monitored for water levels and water quality.

6.1 MONITORING WELL REQUIREMENTS

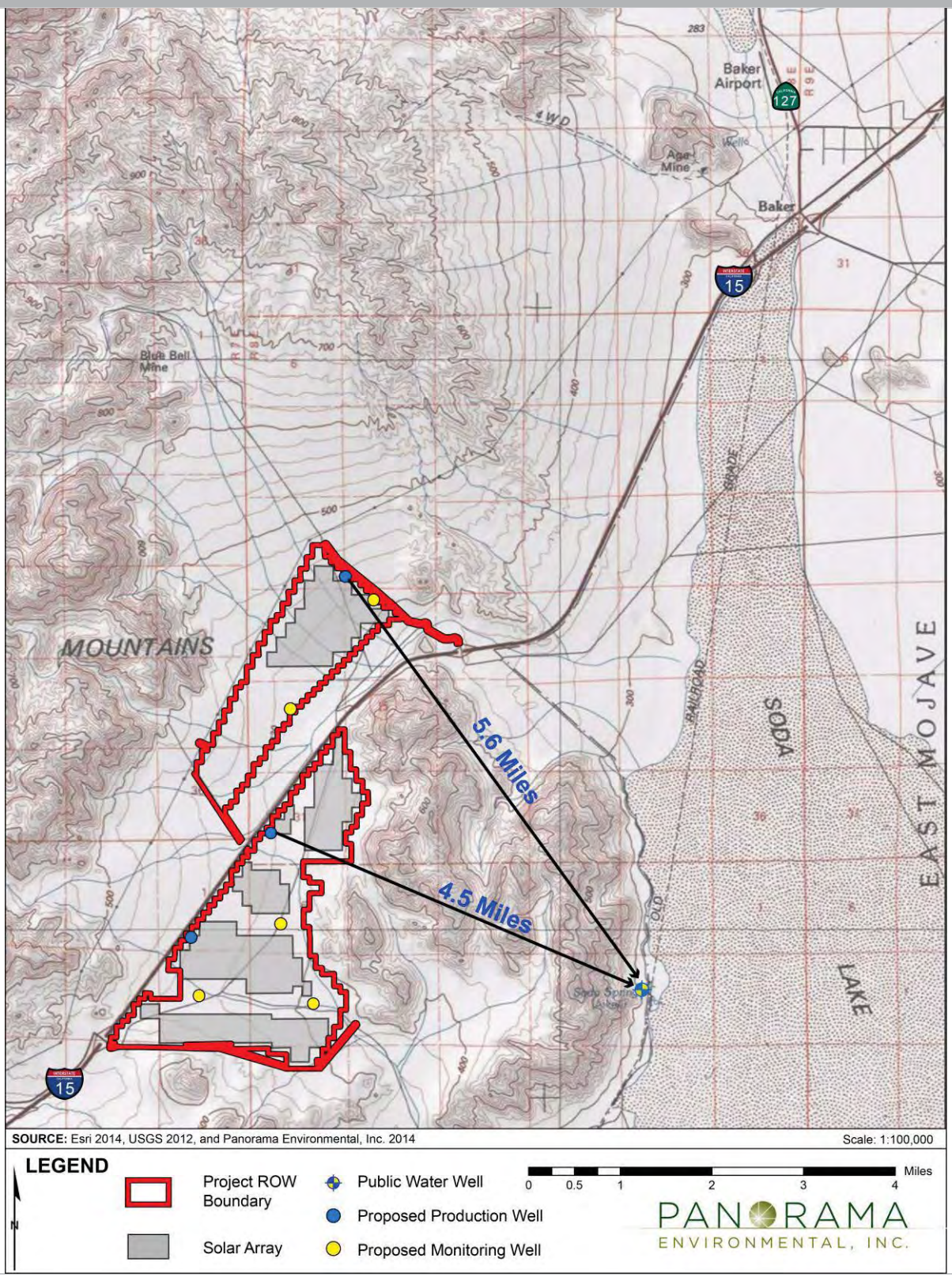
The monitoring well network will consist of five monitoring wells in the alluvial valley aquifer and two wells outside of the valley. The locations were selected in consultation with the County and BLM based on the following factors:

- Having an adequate distribution of wells to account for the large site acreage (approximately 4,179 acres)
- Previously collected site data, which provide information on site geology, hydrogeology, and expected groundwater conditions, and that were used to develop the groundwater model for the project site
- Well access, taking into account the current proposed layout of project infrastructure
- Magnitude of possible impacts due to project operation, as predicted by the groundwater model prepared for the project (RMT 2011; TRC 2013)
- Public concern regarding potential impacts to the Mohave tui chub, MC Spring, and wildlife

6.2 PROPOSED GROUNDWATER MONITORING WELL AND PRODUCTION WELL LOCATIONS

The project monitoring well network has been established to enable monitoring of groundwater level declines that are expected to occur near project production wells during groundwater extraction. Five groundwater monitoring locations (MW-1 through MW-5) have been selected in the project area and are shown on Figure 6.2-1, along with the proposed production well locations (PW-1 through PW-3). Figure 6.2-1 shows the locations of these monitoring wells relative to the wells at Zzyzx. This network of monitoring wells will provide data that are representative of potential drawdown effects for the project area. The data obtained from the groundwater monitoring network will be used to update the groundwater model if the observed groundwater declines in the monitoring wells

Figure 6.2-1: Proposed Monitoring and Production Well Locations within Project ROW



exceed the predicted decline by more than 15 percent per APM 18. The monitoring wells will provide early detection of groundwater declines that could result in potential impacts to groundwater resources outside of the valley. Production and monitoring wells will be installed prior to groundwater use for project construction.

6.3 OTHER WELL MONITORING

Groundwater will also be monitored at the DSC near MC Spring using existing monitoring and production wells. NPS will be consulted regarding monitoring of these wells, which are located in the Mojave National Preserve. The locations of these existing monitoring and production wells are shown on Figure 6.3-1 and their depths are listed below:

- Monitoring well JW-5: approximately 17.3 feet deep
- Monitoring well OPW: approximately 22 feet deep
- Production well PW: approximately 52 feet deep

This network of shallow and deeper wells will allow for a representative monitoring of groundwater levels at key locations in the DSC area.

6.4 SURFACE WATER MONITORING

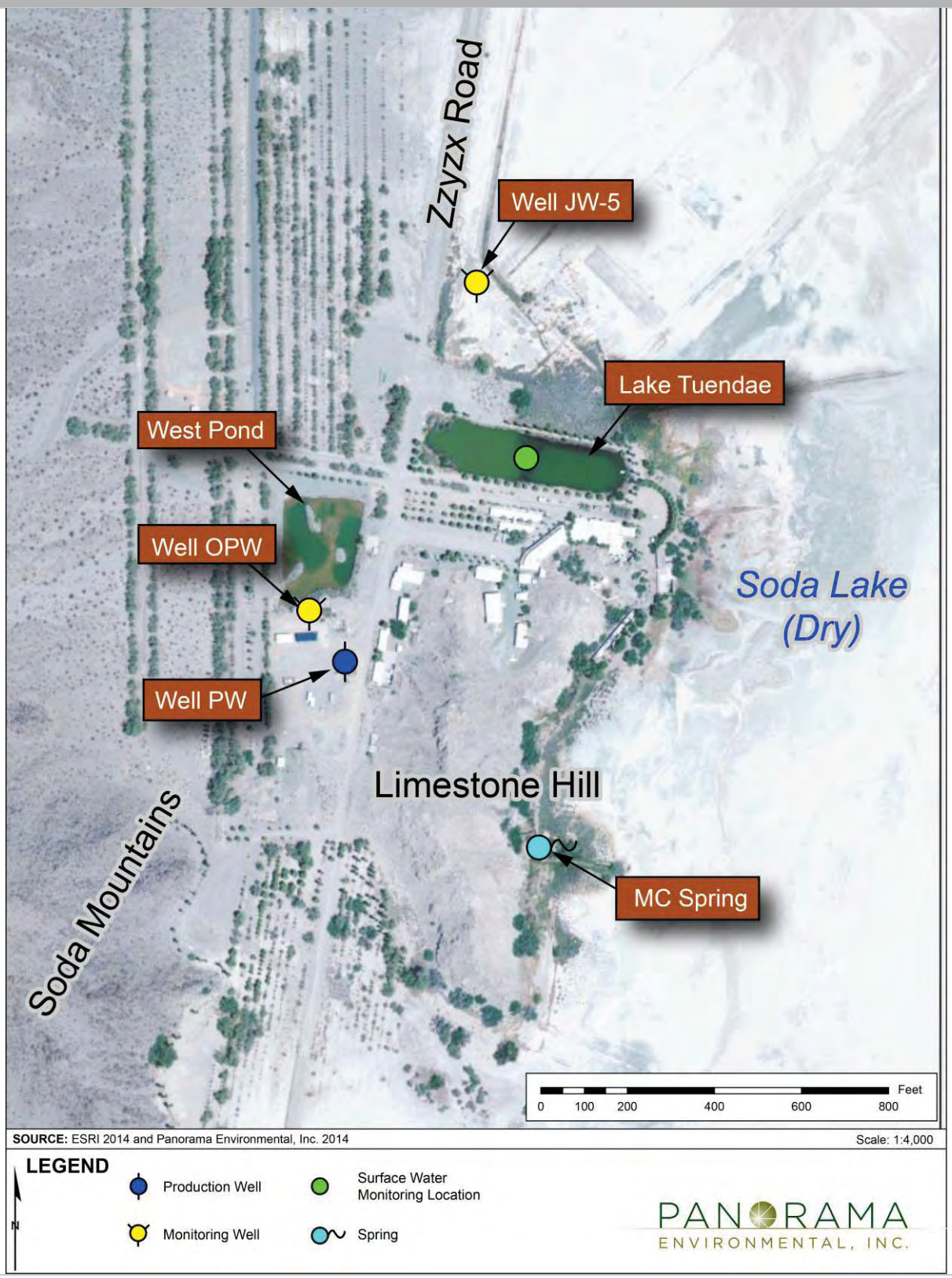
There is no perennial surface water in the Soda Mountain Valley. Surface water monitoring will be performed 4 miles east of the project at MC Spring and Lake Tuendae to monitor for any changes in water levels and water quality at the spring that may result from project-related groundwater extraction. NPS will be consulted regarding monitoring of water levels at MC Spring and Lake Tuendae, which are located in the Mojave National Preserve. Surface water monitoring locations are shown on Figure 6.3-1.

SMS will work with the DSC and NPS to obtain pumping data for the DSC production well.

6.5 PRECIPITATION MONITORING

Precipitation will be monitored either by periodically downloading rainfall data for a nearby monitoring station from the Western Regional Climate Center database (http://www.wrcc.dri.edu) or by obtaining rainfall data for an existing on-site rain gauge located at the DSC.

Figure 6.3-1: Proposed Monitoring Locations near MC Spring



7 MONITORING DATA ANALYSIS PROCESS

7.1 GROUNDWATER LEVELS

Groundwater level monitoring data will be analyzed to determine how groundwater levels are responding to the extraction of groundwater for the project. Production and monitoring wells in the Soda Mountain Valley and at the DSC (if possible) will be monitored. Once pumping begins for construction, data will be analyzed weekly for the first month of construction, monthly for the next five months of construction, and quarterly for the first 5 years of the project, which will include at least 2.5 years of the operation phase. The need for, and extent of, groundwater monitoring will be reevaluated and a recommendation for future groundwater monitoring frequency will be made in the Five-year Report.

Groundwater levels will be evaluated to determine whether the observed change in water levels at each designated monitoring well in the valley is consistent with the projected decline in water levels predicted by the existing groundwater flow model. Drawdown at any observation well that exceeds 20 percent of the model predicted at that time and location will trigger a re-calibration of the model to more accurately reflect the observed drawdown, and a re-calculation of the predicted outflow from Soda Mountain Valley, as discussed in Section 8. Water level trends that show declines of 3 feet or more for the designated monitoring wells at the DSC or 1 foot or more at MC Spring and Lake Tuendae over five successive quarters may trigger corrective measures, if the water level decline can be reliably attributable to project groundwater pumping, as described in Section 8. The water level data will be evaluated to filter out short-term fluctuations, such as effects caused from atmospheric pressure changes, periodic pumping of the nearby production well for the DSC, and seasonal fluctuations.

7.2 SURFACE WATER LEVELS

Surface water levels in MC Spring and Lake Tuendae at the DSC will be monitored (pending approval of NPS) using pressure transducers to collect continuous data (e.g., readings every 15 minutes). Trend analysis of the water level data will be conducted to evaluate long-term trends that may be a result of groundwater extraction in the Soda Mountain Valley. The data will be evaluated using well-established statistical time-trend analysis methods. The timing of changes in water levels will be compared to pumping records at the DSC and in the Soda Mountain Valley, and to groundwater levels near the DSC and in the Soda Mountain Valley. This comparison may help to determine if there is a relationship between surface water level changes, if any, and groundwater level declines.

7.3 GROUNDWATER PRODUCTION

Groundwater production rate data will be collected from totalizer meters installed at each active project production well in the Soda Mountain Valley. Water production rates from the DSC will also be reviewed, if available. These data will be important to evaluate whether observed changes in groundwater or surface water levels may be attributable to the timing and magnitude of groundwater production within the Soda Mountain Valley or at the DSC.

7.4 CALCULATED GROUNDWATER OUTFLOW

Groundwater outflow from the Soda Mountain Valley through two outlets has been calculated using the existing groundwater model, and will be recalculated any time (1) the groundwater flow model is recalibrated, or (2) long-term production rates increase significantly from those projected in the existing model. The revised model will be used to recalculate outflow from the Soda Mountain Valley, and to determine if the calculated outflow exceeds any Action Criterion as defined in Section 8.

7.5 GROUNDWATER AND SURFACE WATER QUALITY

Groundwater quality samples will be collected during the aquifer test as described in Section 5.1, and analyzed for major ions, as well as other indicators of groundwater quality, such as TDS, pH, conductivity, temperature, and dissolved oxygen. The results will be evaluated to determine whether the water may require treatment before use for PV panel washing, and also to evaluate potential age and origin of the water.

Annual groundwater and surface water (Lake Tuendae and MC Spring) monitoring will be conducted as per Section 5.2, to evaluate whether there might be any long-term trends in groundwater or surface quality changes, which may or may not be related to groundwater extraction at the project site. The results will be evaluated to identify significant changes in groundwater or surface water quality over time, if any.

8 ACTION CRITERIA AND CORRECTIVE MEASURES

8.1 DEFINITION OF ACTION CRITERIA AND CORRECTIVE MEASURES

Data collected for the groundwater monitoring program defined in Sections 5 and 6 will be used to identify deviations from baseline conditions and groundwater model projections at monitoring locations. Deviations will be identified as early as possible to allow for identification and prevention of adverse impacts to critical groundwater and surface water resources as a result of project groundwater use.

The GMMP identifies specific quantitative criteria or trends (action criteria) that will "trigger" review and corrective actions, where necessary, to prevent significant impacts to the following critical groundwater resources:

- MC Spring
- Lake Tuendae
- Groundwater wells at the DSC

Action criteria have been defined to provide a clear operating and decision-making framework related to project groundwater extraction. When an action criterion is triggered, the triggering event will be reviewed to determine whether the event is attributable to or exacerbated by project groundwater use and, if so, which specific corrective measures should be implemented to avoid adverse impacts to critical groundwater resources.

Triggering events may, in some circumstances, necessitate immediate review to define the cause of the triggering event and corrective actions.

Action criteria are intended to be used as predictors of potential adverse impacts to critical groundwater resources. The criteria will be applied to avoid substantial adverse impacts to critical groundwater resources. Action criteria have been developed to address public, USFWS, and NPS concerns about impacts to populations of Mohave tui chub at Lake Tuendae and MC Spring and seeps that supply water for bighorn sheep and other wildlife.

Corrective measures have been defined for each action criterion. The appropriate corrective measures and approach to implementing the corrective measures will be determined on a case-by-case basis following the decision-making process outlined in Section 8.2.

8.2 DECISION-MAKING PROCESS

The decision-making process described below will be followed in the event an action criterion is triggered or when refinements to the GMMP are considered. Action criteria are described in Section 8.3.

8.2.1 Oversight Committee

An SMS GMMP Oversight Committee shall be established to oversee monitoring, adaptive management strategies, mitigation implementation, and all reporting. The committee will include hydrogeologists representing the County, BLM, NPS, and the Applicant. The GMMP Oversight Committee will receive all notifications if action criteria are triggered. The GMMP Oversight Committee will review any recommendations for corrective actions.

8.2.2 Notification

The County and BLM will be notified within ten (10) business days if any action criterion is triggered. If the triggering event threatens immediate impacts to a critical groundwater resource then SMS will promptly implement appropriate corrective actions.

8.2.3 Recommendations

Within 60 calendar days of issuing notice that an action criterion is triggered, SMS will conduct an assessment of the triggering event and report the results to the GMMP Oversight Committee. SMS will implement the following steps:

1) Assess whether the triggering of any action criterion is attributable to project operations
2) Assess whether the triggering of any action criterion attributable to project operations constitutes a potential adverse impact
3) Assess, recommend, and implement corrective measure(s) (including refinements in monitoring or to the GMMP) necessary to avoid or minimize the potential adverse impact attributable to project operations

SMS will submit a report documenting the assessment of the triggering event to the County and BLM within the 60-day assessment period.

8.3 PROJECT-SPECIFIC ACTION CRITERIA AND CORRECTIVE MEASURES

This section presents project-specific action criteria and corresponding corrective measures that have been developed to ensure that sensitive receptors such as endangered species or residential homeowners with wells in the area are not significantly impacted by project-related groundwater withdrawal.

8.3.1 Summary Table

Action criteria and corrective measures are provided in Table 8.3-1. Table 8.3-1 presents:

1. Action criteria and associated thresholds for triggering the action criteria
2. Proposed corrective actions for each action criterion
3. Frequency for evaluating whether an action criterion has been triggered
4. Rationale used to develop the action criterion thresholds and corrective actions

Table 8.3-1: Action Criteria and Corrective Measures			
Action Criterion			
Action Criterion 1a. Declines in groundwater levels in project monitoring wells in the Soda Mountain Valley that exceed model predictions (TRC 2013) by 20 percent or more and at least 1 foot.	**Corrective Measure 1:** The project groundwater model (TRC 2013) will be recalibrated to match the observed groundwater levels, and the predicted decline in outflow from the valley will be recalculated. If the recalibrated model predicts a decline in outflow of more than 20 percent over pre-pumping outflow (Action Criterion 1b), SMS will use the recalibrated groundwater model to identify a safe rate of groundwater extraction that will be maintained. A safe rate of extraction is defined as the rate where model-predicted groundwater outflow from the valley will decrease by less than 20 percent of the pre-pumping outflow. The results of the recalibrated model will be submitted to BLM and the County within 60 days of the action criterion triggering event occurring. The rate of groundwater production for the project will be curtailed to the safe pumping rate, if necessary.	Weekly during the first month of groundwater withdrawal, monthly during the next five months of groundwater withdrawal, and quarterly thereafter throughout the duration of monitoring (unless modified as recommended in the Five-year Report).	The action criterion threshold for groundwater levels has been set at either 20 percent or greater than 1 foot because anything less than 20 percent or 1 foot is within the range of normal variation and would not impact groundwater resources outside of the Soda Mountain Valley.
Action Criterion 1b. Decrease in the calculated outflow of groundwater through the Soda Mountain Valley outlets by 20 percent or more of pre-pumping outflow (based on recalibrated model results).		Following recalibration of the groundwater flow model in response to triggering of Action Criterion 1a.	An action criterion of 20 percent for decrease in outflow is conservative because there is substantially more water flowing out of the Soda Mountain Valley than is needed to support groundwater resources at MC Spring and Lake Tuendae, especially when local recharge is considered. A reduction of outflow of 20 percent or less would therefore not affect water levels in MC Spring or Lake Tuendae.
Action Criterion 2: Triggering of Action Criteria 1a and 1b, and declining trend in groundwater levels in the aquifer near MC Spring or declining trend in water levels in MC Spring or Lake Tuendae, where such trends are attributable to the Soda	**Corrective Measure 2:** SMS shall evaluate declining trends in groundwater levels in the aquifer near MC Spring, or in water levels in MC Spring to determine the cause of the declining trend. If a declining trend in mean water levels totaling 3 feet or more for the designated monitoring wells at the DSC, or 1 foot of decline for MC Spring and Lake Tuendae cannot be attributed to seasonal variation, groundwater pumping or water level manipulation at the DSC, or	Quarterly throughout the duration of monitoring (unless modified as recommended in the Five-year Report).	The action criterion threshold of 3 feet in the monitoring wells and 1 foot at MC Spring is protective of the Mohave tui chub. The water level at MC Spring is over 5 feet and the Mohave tui chub requires a pool depth of approximately 4 feet. The loss

Table 8.3-1: Action Criteria and Corrective Measures

Action Criterion	Corrective Measure	Evaluation Frequency	Rationale
Mountain Solar project and could cause water levels to decline below sustainable levels for the Mohave tui chub. A declining trend is defined as five consecutive quarters of mean water level declines totaling 3 feet or more for the designated monitoring wells at the DSC, or 1 foot of decline for MC Spring and Lake Tuendae, that cannot be attributed to seasonal variation, groundwater pumping or water level manipulation at the DSC, or other non-project causes.	other non-project causes, SMS shall curtail, and, if necessary, cease, pumping to the extent the project triggers Action Criterion 2.		of 1 foot in water surface elevation would not impact the population of Mohave tui chub at MC Spring. The corrective measure requires curtailment and cessation of project groundwater pumping, as necessary to avoid impacts to Mohave tui chub.

8.3.2 Rationale

Comparison of Groundwater Levels and Outflow from Soda Mountain Valley to Pre-pumping Values

Initial groundwater modeling and analysis for the project indicates that current groundwater outflow from the Soda Mountain Valley through the northeast outlet is approximately 121 to 425 AFY. The estimated outflow of 121 to 425 AFY exceeds the water demand at MC Spring and Lake Tuendae by 107 to 470 AFY when local recharge on the east side of the Soda Mountains (26 to 87 AFY) and precipitation are considered. The decrease in groundwater outflow from the Soda Mountain Valley that may be caused by the project is predicted to be a maximum of 4.6 AFY. A reduction in outflow of 4.6 AFY (or less) of the estimated 121 to 425 AFY outflow from the northeast outlet would have a very low (if any) potential to affect MC Spring or Lake Tuendae. This level of reduction in outflow would occur after 30 years of operation. The reduction in outflow would be negligible (less than 1 AFY) during the 24- to 30-month construction period because sufficient time would not have elapsed for the cone of depression to extend to the outlet (Appendix A).

Action Criterion 1a sets a numeric threshold for drawdown values of 20 percent greater than predicted drawdown in project monitoring wells. Action Criterion 1b sets a numeric threshold for outflow of a 20 percent reduction in calculated groundwater outflow from the Soda Mountain Valley. This criterion has been established to serve as an early warning signal that will allow for changes to be made in the rate of groundwater extraction as needed to prevent impacts elsewhere outside the Soda Mountain Valley.

Action Criteria 1a and 1b have been conservatively set at a level where the project would not cause a measurable impact to groundwater levels in, or groundwater inflow to, the Soda Lake Basin. Initial groundwater modeling estimated drawdown of 2.2 feet or less at the eastern edge of the Soda Mountain Valley during groundwater extraction, and a reduction in outflow of groundwater from the Soda Mountain Valley of less than 4.6 AFY. These limited declines in groundwater levels and outflow would not have a measurable effect at MC Spring, located across the Soda Mountains, over 3 miles away from the eastern edge of the Soda Mountain Valley and at least 4.5 miles away from the closest production well. A reduction of 20 percent of outflow would not be expected to cause a decline in MC Spring because there is substantial excess flow out of the Soda Mountain Valley and even a 20 percent decline would be within the range of natural variability.

MC Spring and Lake Tuendae

NPS and the public have expressed concerns that the groundwater flow modeling for the project could be inaccurate and may understate potential impacts to critical water resources.

Action Criterion 2 consists of the triggering of Action Criteria 1a and 1b and a declining trend in groundwater levels in the aquifer near MC Spring or a declining trend in water levels in MC Spring and Lake Tuendae, where such trends are attributable to the Soda Mountain Solar project and could cause water levels to decline below sustainable levels for the Mohave tui chub. A declining trend is defined as five consecutive quarters of mean water level declines

totaling 3 feet or more for the designated monitoring wells at the DSC, or 1 foot of decline for MC Spring and Lake Tuendae, that cannot be attributed to seasonal variation, groundwater pumping or water level manipulation at the DSC, or other non-project causes. Triggering of Action Criterion 2 requires evaluation of water levels in the Soda Mountain Valley as well as trends at MC Spring, an area of critical water resources. This action criterion requires additional evaluation of groundwater resources at MC Spring. This criterion would only be triggered if drawdown in the Soda Mountain Valley exceeds the expected (modeled) drawdown.

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APPENDIX A

GROUNDWATER MODELING REPORT AND ADDENDUM

Hydrogeologic Conditions and Groundwater Modeling Report

SODA MOUNTAIN SOLAR PROJECT

BLM Case Number - CACA49584

Proposed Caithness Soda Mountain Solar Facility Near Baker, San Bernardino County, California

March 1, 2011

Prepared for:

United States Department of the Interior
Bureau of Land Management
California Desert District Office
22835 Calle San Juan De Los Lagos
Moreno Valley, CA 92553

Submitted by:

Caithness Soda Mountain, LLC
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Hydrogeologic Conditions and Groundwater Modeling Report

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1: Project Description and Groundwater Modeling Objectives

1.1 Project Description

The Caithness Soda Mountain Solar Project (Project) will include the installation, operation, and maintenance of approximately 1.5 million polycrystalline silicon solar photovoltaic (PV) panels for a 350-megawatt electric generating facility (Caithness, 2009). The Project Area is located in a small valley on federal lands managed by the U.S. Department of the Interior, Bureau of Land Management (BLM), approximately 6 miles southwest of the town of Baker in San Bernardino County, California (Figure 1.1-1).

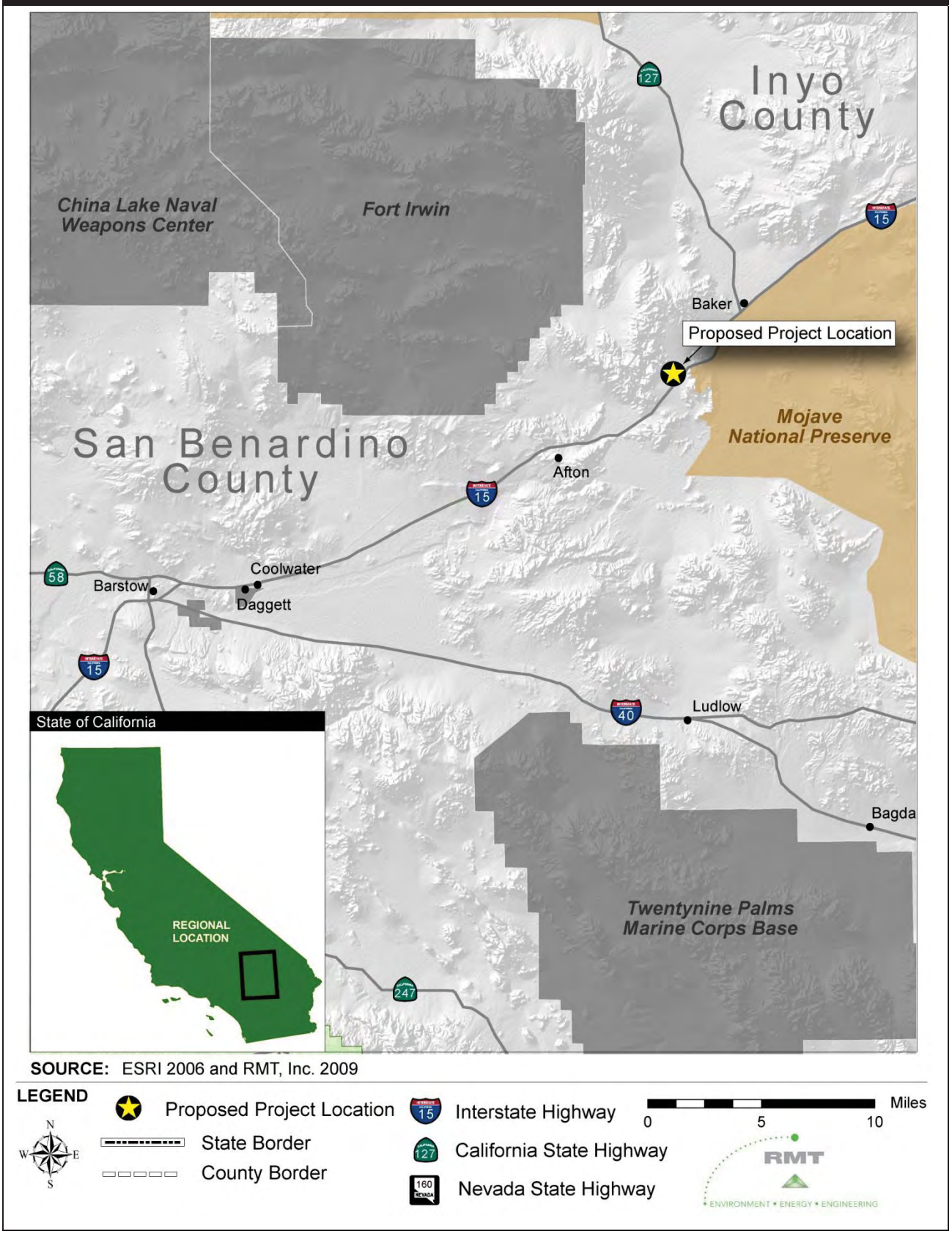
Caithness Soda Mountain LLC submitted an application for a right-of-way grant to the BLM to construct and operate the proposed solar project. The project is defined in a Plan of Development (POD), submitted to BLM on December 1, 2009 (Caithness, 2009). A revised POD will be submitted in March 2011.

The currently defined Project Area right-of-way consists of approximately 4,397 acres of land. Approximately 2,691 acres would be occupied by the solar arrays, with a portion of the remainder of the area used for access roads, storm water drainage, project-related buildings, and other project uses.

The goal of this report is to assist the BLM in its evaluation of the Plan of Development for the Project, and to provide the Project Applicant with an evaluation of the feasibility of obtaining the needed water supplies for the Project. Groundwater modeling was used to help evaluate whether the hydrogeologic conditions at the Project site could sustain the withdrawal of water needed during construction, operation, and maintenance of the proposed facility, without causing impacts to adjacent water users.

Numerical groundwater modeling is an effective tool to evaluate the effects of groundwater withdrawal, because the model can be constructed to represent the three-dimensional geometry of the aquifer, with realistic estimates of key aquifer parameters. The equations of groundwater flow are then applied using site-specific hydraulic parameters, aquifer geometry, and boundary conditions, and the resulting hydraulic head distribution can be compared to measured hydraulic heads. The calibration process involves adjusting aquifer parameters and boundary conditions within reasonable limits until there is a match between measured heads and model-predicted heads. Once the model is calibrated to existing conditions, it can then be used in a predictive mode to test for future effects of a stress, such as groundwater withdrawal. When hydrogeologic data are scarce, the model can be used to test specific questions using the upper and lower ends of a reasonable range of aquifer parameter values. Specific groundwater modeling objectives are described in Section 1.2.

Figure 1.1-1: Regional Location Map



1.2 Modeling Objectives

The objectives of the groundwater flow modeling were as follows:

- To evaluate whether subsurface conditions would likely allow for one or more groundwater wells to successfully be installed that would yield sufficient quantities of water for Project construction and operation activities
- To evaluate whether groundwater withdrawals needed to support Project construction and operation activities would interfere with water use and springs located elsewhere in the region, such as the Town of Baker, Zzyzx Spring, and the Rasor Road Service Station
- To estimate the number of groundwater wells that may be required to obtain the desired water supplies
- To identify area(s) within the Project Area where conditions may be favorable for installing one or more water supply wells

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2: Hydrogeologic Setting

2.1 Topography and Surface Water Drainage

The valley in which the Project Area is located is surrounded by low mountains, with broad and deep alluvial fans overlying the bedrock (Figure 2.1-1). The valley is part of the South Lahontan Hydrologic Study Area and is part of the Soda Lake Watershed, but is not part of any formal groundwater basin (Department of Water Resources, 2003). The Soda Lake Valley and Silver Lake Valley Basins are located east and northeast of the Project Area, respectively, and the Cronise Lake Valley Basin is west of the Project Area, across a surface water divide (Figure 2.1-2). The valley includes two drainage basins (Basin A and Basin B shown on Figure 2.1-2, and encompasses a combined area of approximately 32,946 acres. Figures 2.1-3 and 2.1-4 are Google Earth images of the valley looking north and southwest, respectively, showing steeply sloping alluvial sediments in the upper reaches of the alluvial fans gradually leveling off as they approach the floor of the valley.

There are two ephemeral surface water outlets to the valley, located northeast and southeast of the Project Area (Figure 2.1-1). During storm events, precipitation runoff from Basin A in the northern portion of the drainage basin is funneled into the northeast outlet, and runoff from Basin B in the southern portion of the basin flows through the southeast outlet.

2.2 Hydrogeologic Conditions Based on TEM Data

There are limited data in the Project Area from which to evaluate deep subsurface geologic conditions (i.e., below approximately 100 feet below ground surface [bgs]). Three locations within the Project Area were investigated using Transient Electromagnetic Resistivity (TEM) soundings in September 2010. The results of the TEM investigation were discussed in the Geologic Characterization Report (Wilson Geosciences, 2011) and the Geophysical Characterization Report (Terra Physics, 2010) prepared for the Project. The three TEM locations are presented on Figure 2 in the Geophysical Characterization Report (Terra Physics, 2010): TEM-02, located at the northwest boundary of the project area, and TEM-09 and TEM-11, located in the southwest and southeast portions of the project area, respectively. The locations are shown in this report on Figure 2.1-1

The geophysical data for TEM-02 were interpreted to indicate that coarse-grained alluvium is present from ground surface to approximately 67 feet bgs, under which fine-grained alluvium is present (Table 2.1-1). The water table was interpreted to be present at 182 feet bgs, with saturated alluvium below that depth. Bedrock was interpreted to occur at a depth of approximately 332 feet bgs. At TEM-09, the boundary between shallower coarse-grained alluvium and deeper fine- to coarse-grained alluvium was interpreted to be at a depth of approximately 143 feet bgs, with the water table estimated to be at a depth of approximately 354 feet bgs. Bedrock at TEM-09 was estimated to be at least 500 feet bgs. Similarly, the bedrock was interpreted to be deep (436 feet bgs) at TEM-11, with the upper 436 feet composed of dry, coarse- and fine-grained alluvium. The water table was undetected at TEM-11, and was estimated to be at least 386 feet bgs.

Figure 2.1-1: Project Area and Model Domain

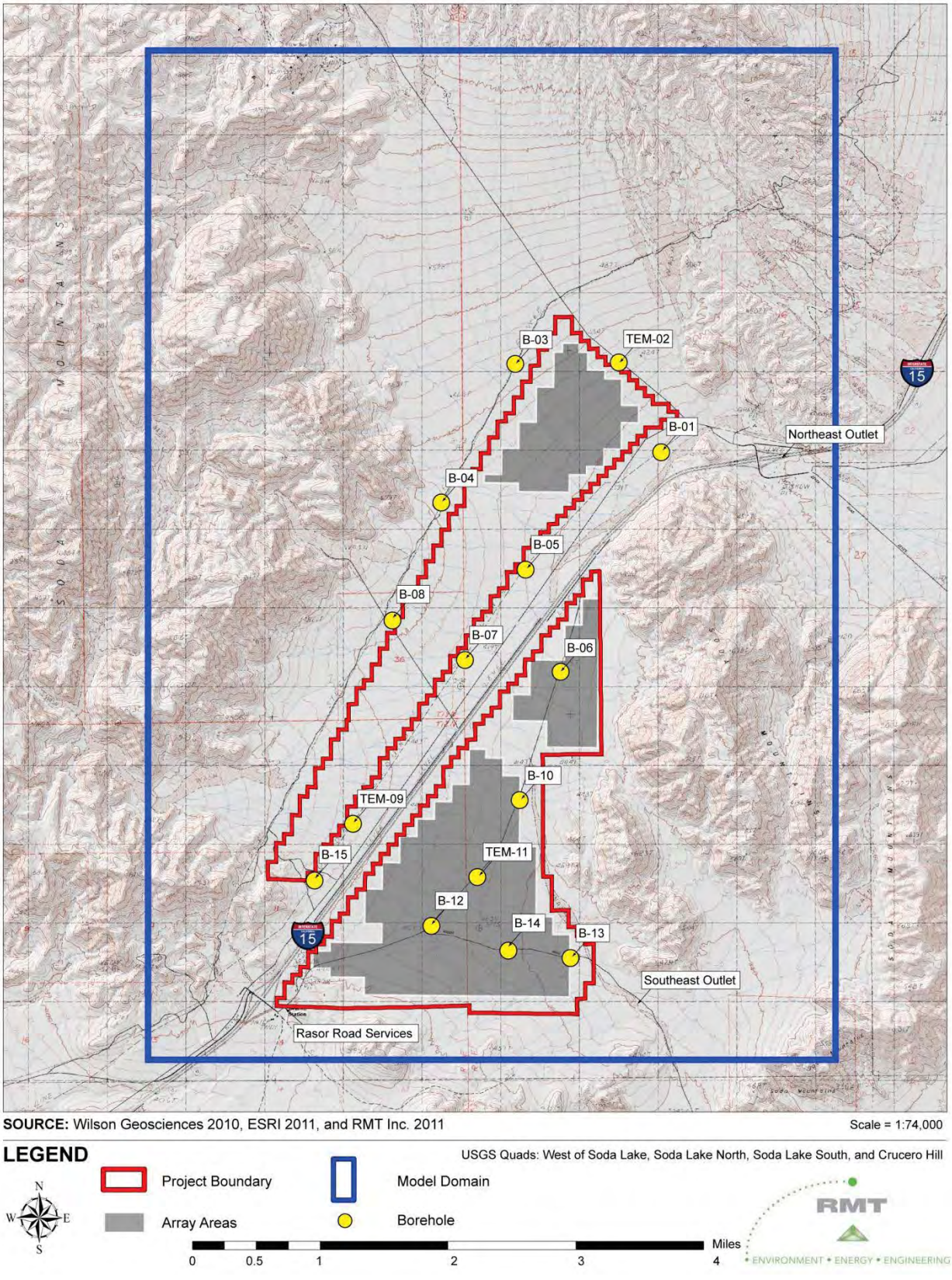


Figure 2.1-2: Drainage Basins of Project Area

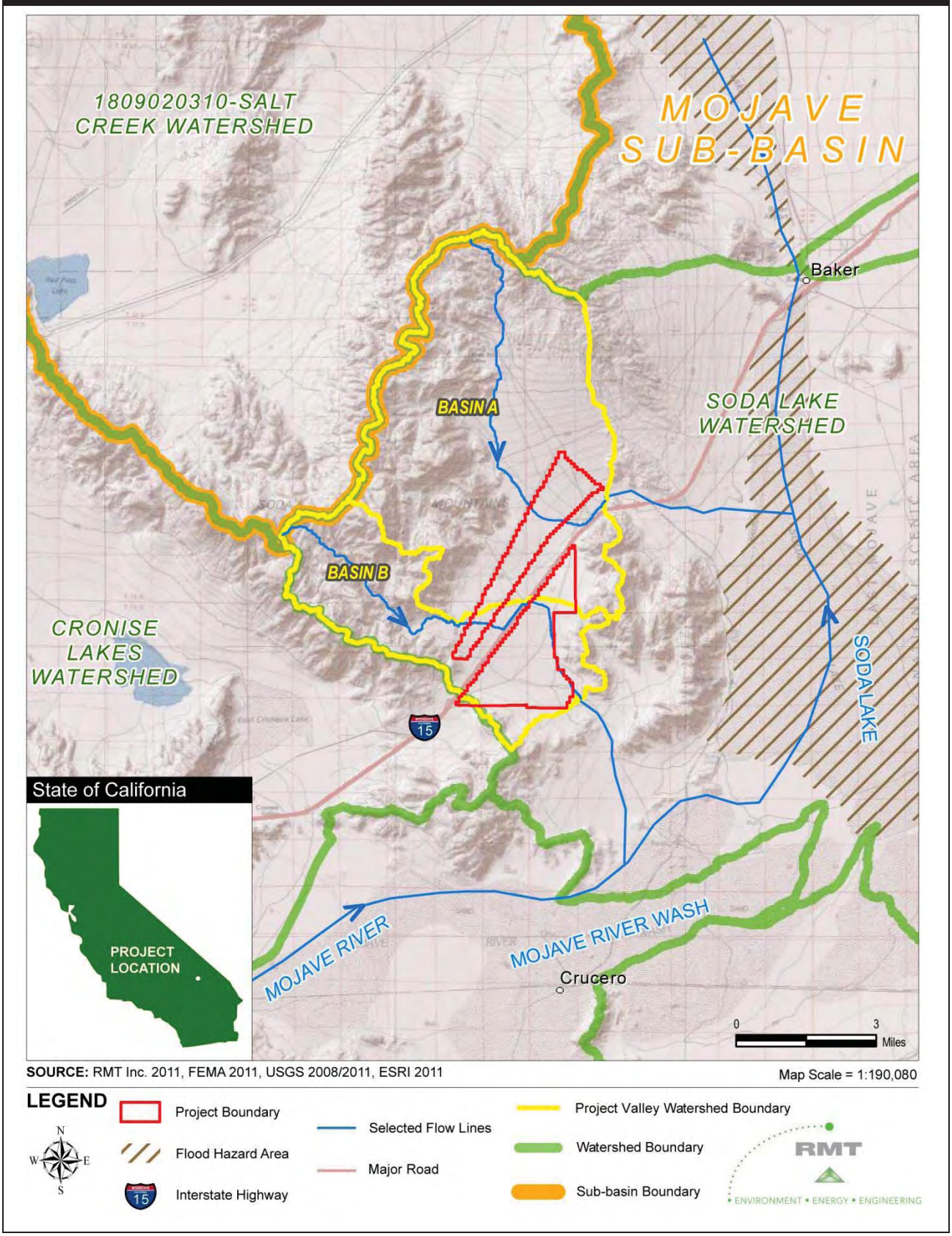
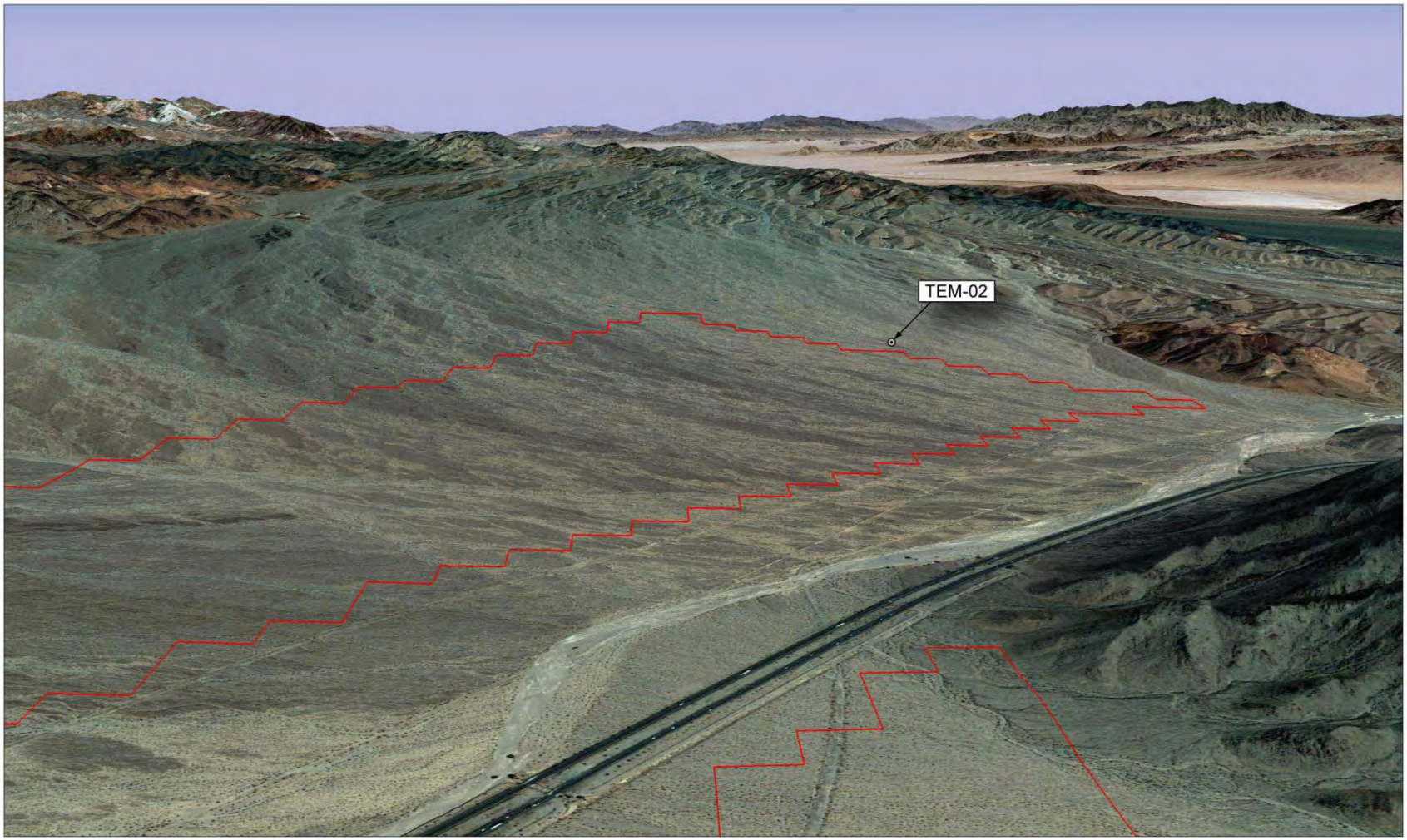


Figure 2.1-3: Project Area Valley, Aerial View North



SOURCE: RMT Inc. 2011, Google Earth Pro 2010, Digital Globe 2011

Project Boundary

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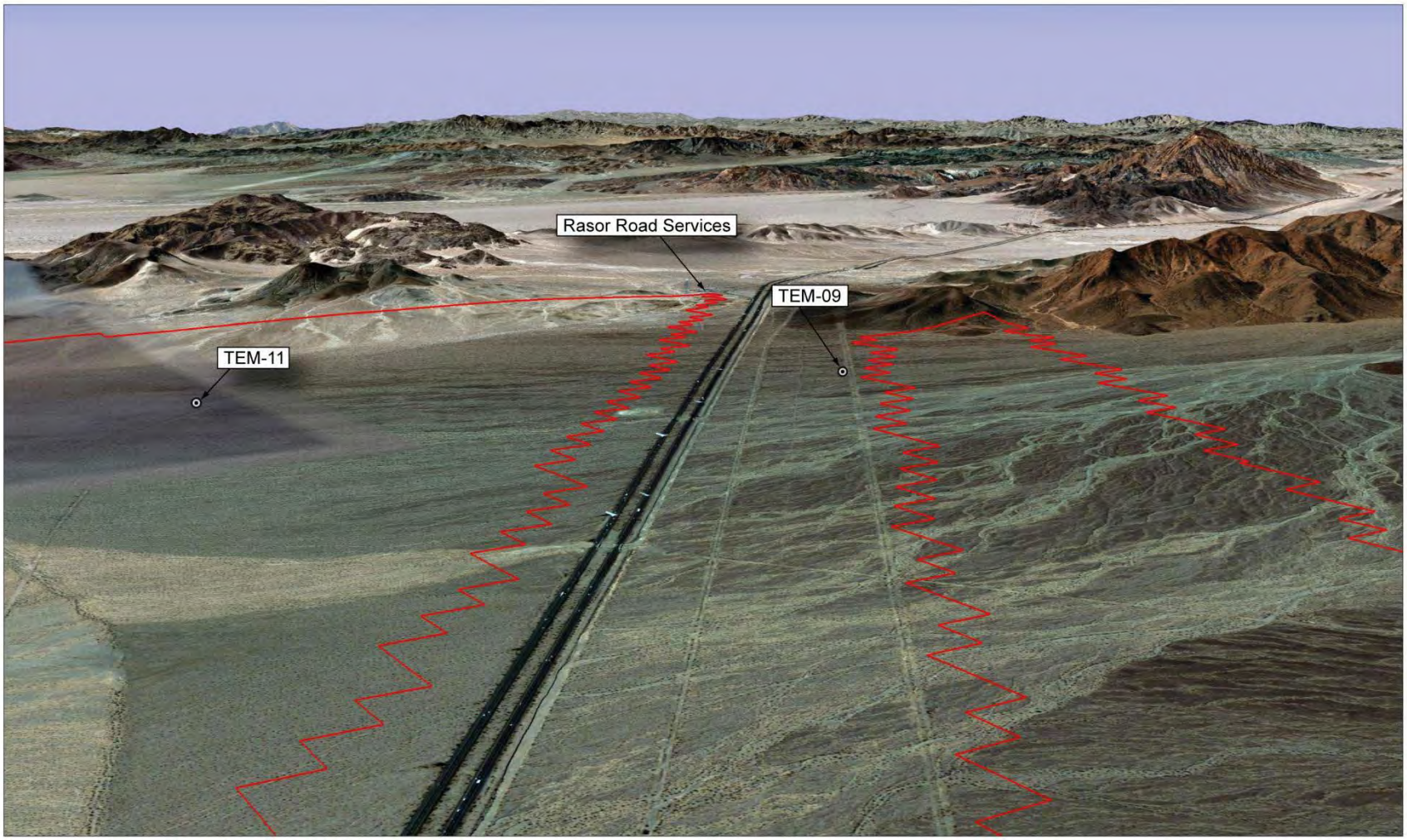
Figure 2.1-4: Project Area Valley, Aerial View Southwest



SOURCE: RMT Inc. 2011, Google Earth Pro 2010, Digital Globe 2011

Project Boundary

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Table 2.1-1: Hydrogeologic Conditions from TEM Survey Results

Sounding	Depth Range (feet)	Elevation Range (feet)	Electrical Resistivity (ohm-meters)	Stratigraphy Inferred from TEM Results
TEM-02	0±00 to 67±14	1414±00 to 1347±14	330±40	DRY,COARSE-GRAINED ALLUVIUM
	67±14 to 182±13	1347±14 to 1232±13	37±10	DRY TO VERY MOIST, FINE-GRAINED ALLUVIUM
	182±13 to 332±26	1232±13 to 1082±26	4±0.8	SATURATED ALLUVIUM
	BELOW 332±26	BELOW 1082±26	530±100	BEDROCK
TEM-09	0±00 to 143±36	1524±00 to 1381±36	360±50	DRY, COARSE-GRAINED ALLUVIUM
	143±36 to 354±30	1381±36 to 1170±30	98±20	DRY, COARSE- & FINE-GRAINED ALLUVIUM
	BELOW 354±30	BELOW 1170±30	15±03	SATURATED ALLUVIUM
	---	---	---	ESTIMATED BEDROCK IS AT LEAST 500 FEET DEEP
TEM-11	0±00 to 436±49	1358±00 to 922±49	80±12	DRY, COARSE- AND FINE-GRAINED ALLUVIUM
	BELOW 436±49	BELOW 922±49	610±92	BEDROCK
				GROUNDWATER WAS NOT DETECTED. IF IT IS PRESENT THEN THE ESTIMATED MAXIMUM UNDETECTABLE THICKNESS IS ABOUT 50 FEET. THEREFORE, GROUNDWATER WOULD BE BELOW AN ELEVATION OF 972 FEET.

SOURCE: Terra Physics, 2010

2.3 Hydrogeologic Conditions Based on Well and Boring Data

A 760-foot-deep bedrock well is located on the Rasor Road Services property, which lies at the southern boundary to the valley, as shown on Figures 2.1-1 and 2.1-4. The well bore encountered bedrock at or near the surface, and reportedly is capable of delivering approximately 1,500 gallons

per day (personal communication, Terry Young, owner, September 15, 2009). The Rasor Road Services well is the only known well in the vicinity of the Project Area. Because it is screened in bedrock and no saturated alluvium was encountered in the well bore, the well is interpreted to be hydrogeologically separated from the saturated alluvium in the valley. The well yields only small amounts of water derived from fractures in the bedrock, which also provides evidence of hydraulic separation between the Rasor Road bedrock well and the valley alluvial sediments. No wells are known to exist in the interior of the valley.

During August through November 2010, TEM geophysical surveys were conducted and 15 soil borings were drilled to a maximum depth of 100 feet bgs in the Project Area (Terra Physics, 2010). The geologic data collected from this investigation were evaluated in the construction of hydrogeologic cross sections (see Section 2.4 below). However, data from the soil borings were of limited usefulness because of the shallow depths explored and because groundwater was not encountered at any of the boring locations. As a result, the hydrogeologic interpretations presented on the cross sections relied heavily on the data collected from the three TEM locations, and on the interpreted configuration of the bedrock extrapolated into the subsurface from the mountain outcrops in the Project vicinity.

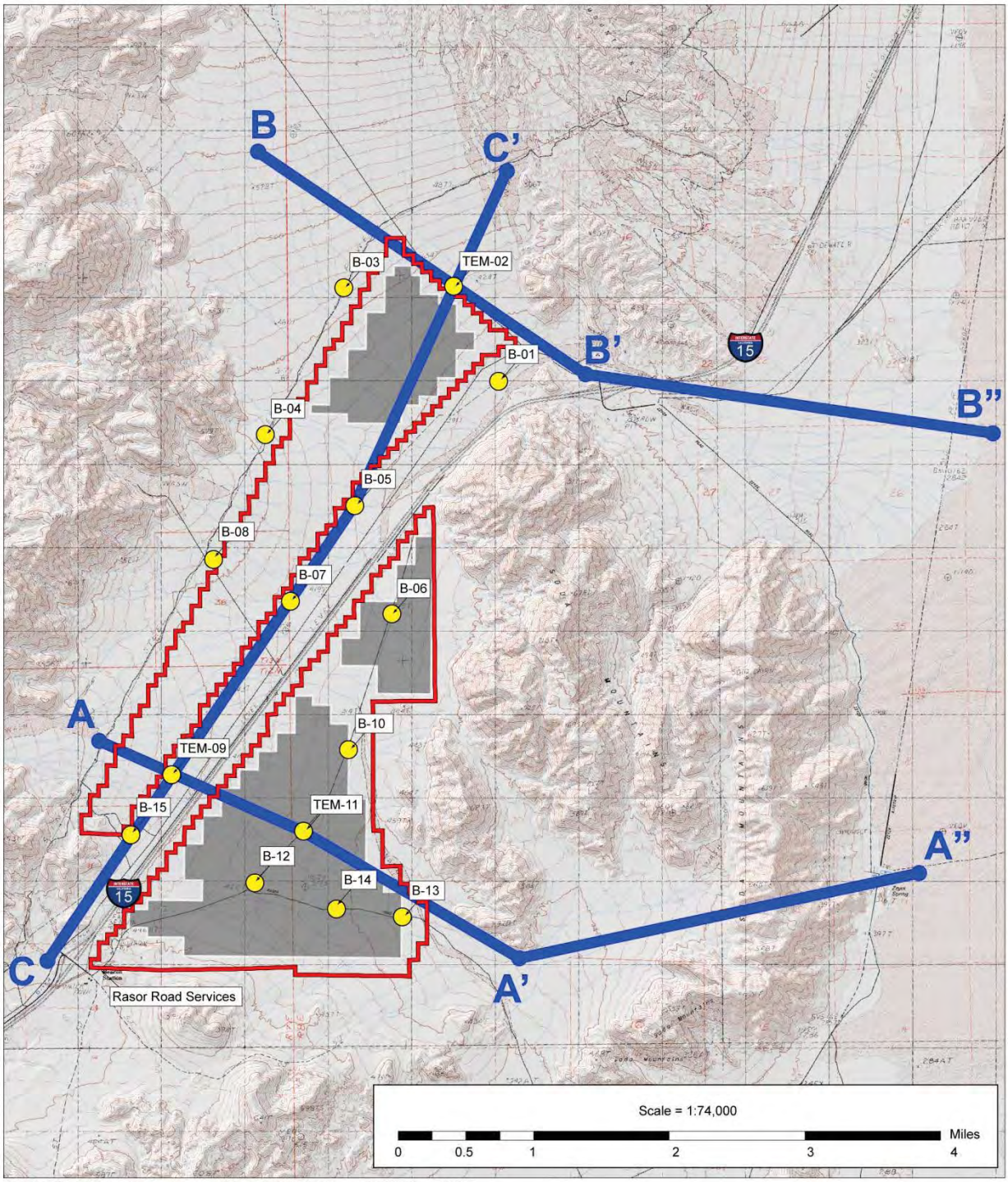
2.4 Hydrogeologic Cross Sections

A cross section location map is presented on Figure 2.4-1. Cross sections A-A′, B-B′, and C-C′ are presented on Figures 2.4-2, 2.4-3, and 2.4-4.

Cross section A-A′ extends west to east and incorporates data from TEM-09 and TEM-11 located near the southern end of the valley (Figure 2.4-2). The cross section extends eastward across the mountain range to Zzyzx Spring, located on the eastern slope of the eastern Soda Mountains, above Soda Lake. Bedrock occurs at depths of 500 feet or more bgs at TEM-09 and 436 feet bgs at TEM-11, and then outcrops on the slopes of the eastern mountain range. The water table occurs at an elevation of approximately 1,170 feet amsl at TEM-09, and appears to be below an elevation of approximately 922 feet amsl at TEM-11. The apparently much lower water table at TEM-11 suggests that there is an outlet for groundwater southeast of TEM-11 that allows the water table to drain to this lower elevation. A surface water outlet is present in the southeast portion of the valley (Figures 2.1-1 and 2.1-4), and it is reasonable that a buried bedrock valley may have been carved into the bedrock in the geologic past by floodwaters, then filled with alluvial sediments, allowing groundwater outflow from the valley. This conceptual model satisfies the need for a groundwater outlet to occur in the southeast portion of the valley, where the water table is apparently much lower than elsewhere, as seen at TEM-11.

Cross section B-B′ extends west to east along the northern boundary of the Project Area, and shows a similar topographic slope to the east as was shown on cross section A-A′, paralleling the surface water outlet to the east (Figure 2.4-3). Drainage from large alluvial fans converges into the surface water outlet that flows through a relatively narrow valley between low mountains to the north and south (Figure 2.4-1). The funneling of the surface water outflow suggests that, as for cross section A-A′, there may be a buried bedrock valley at this location that was carved by floodwaters in the geologic past, and subsequently filled with alluvium. The funneling of surface

Figure 2.4-1: Cross Section Locater Map



SOURCE: Wilson Geosciences 2010, ESRI 2011, and RMT Inc. 2011

LEGEND

Project Boundary

Array Areas

A A' Cross Section Line

Borehole

USGS Quads: West of Soda Lake, Soda Lake North, Soda Lake South, and Crucero Hill

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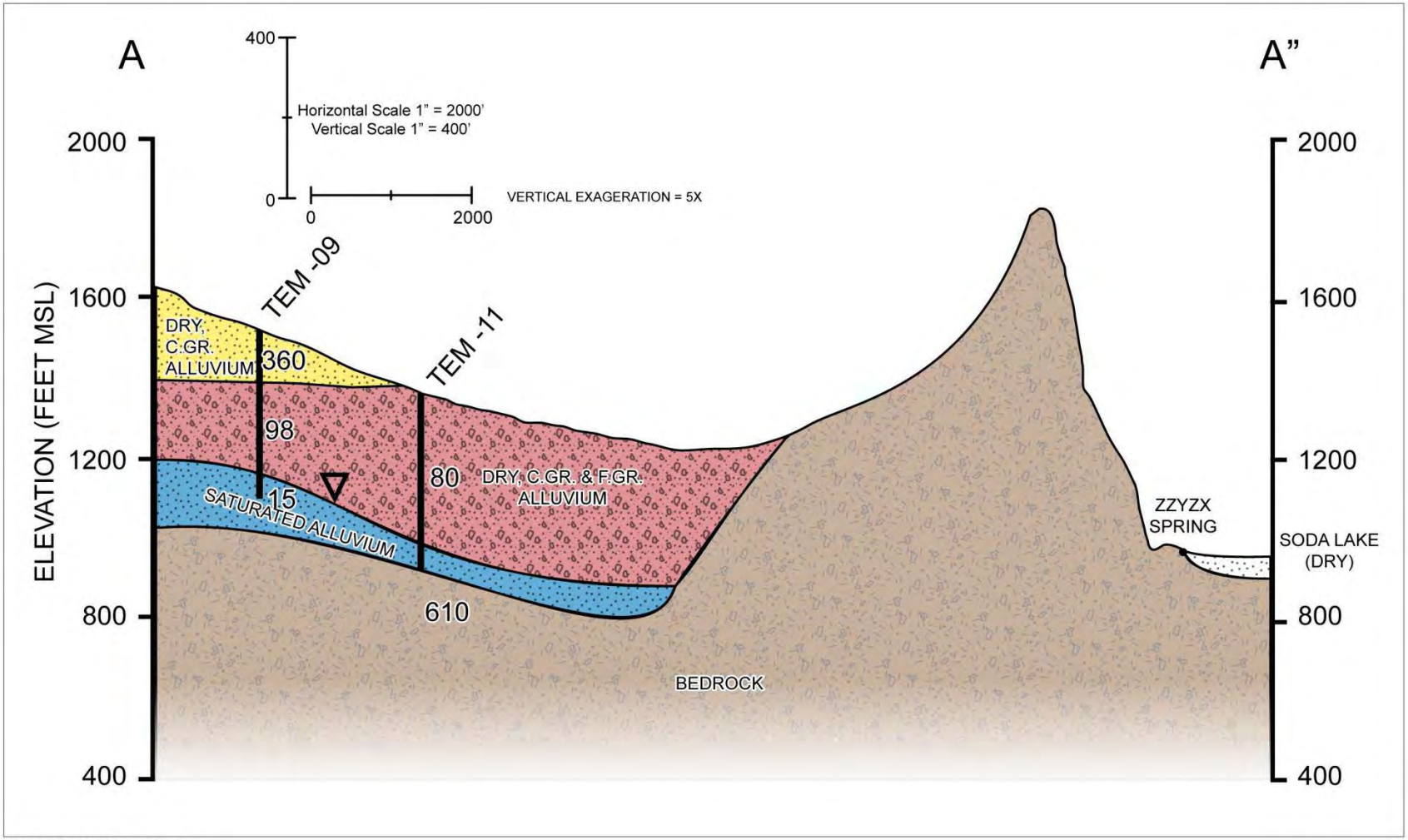
Figure 2.4-2: Hydrogeologic Cross Section A-A'



SOURCE: RMT Inc. 2011

LEGEND

Stratigraphic Boundary (Dashed Where Inferred)

80 Resistivity (ohm-meters), TEM Survey

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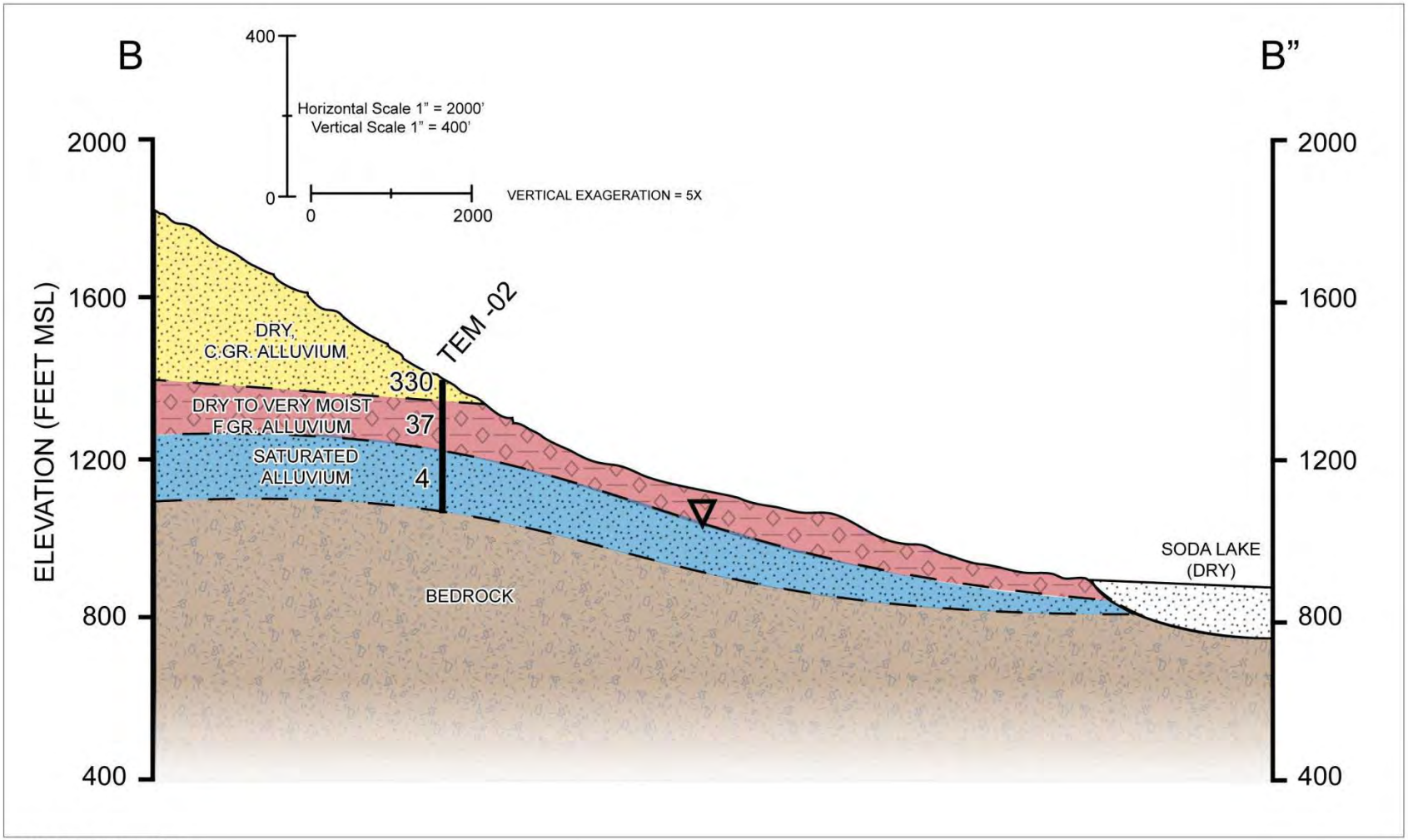
Figure 2.4-3: Hydrogeologic Cross Section B-B'



SOURCE: RMT Inc. 2011

LEGEND

Stratigraphic Boundary (Dashed Where Inferred)

80 Resistivity (ohm-meters), TEM Survey

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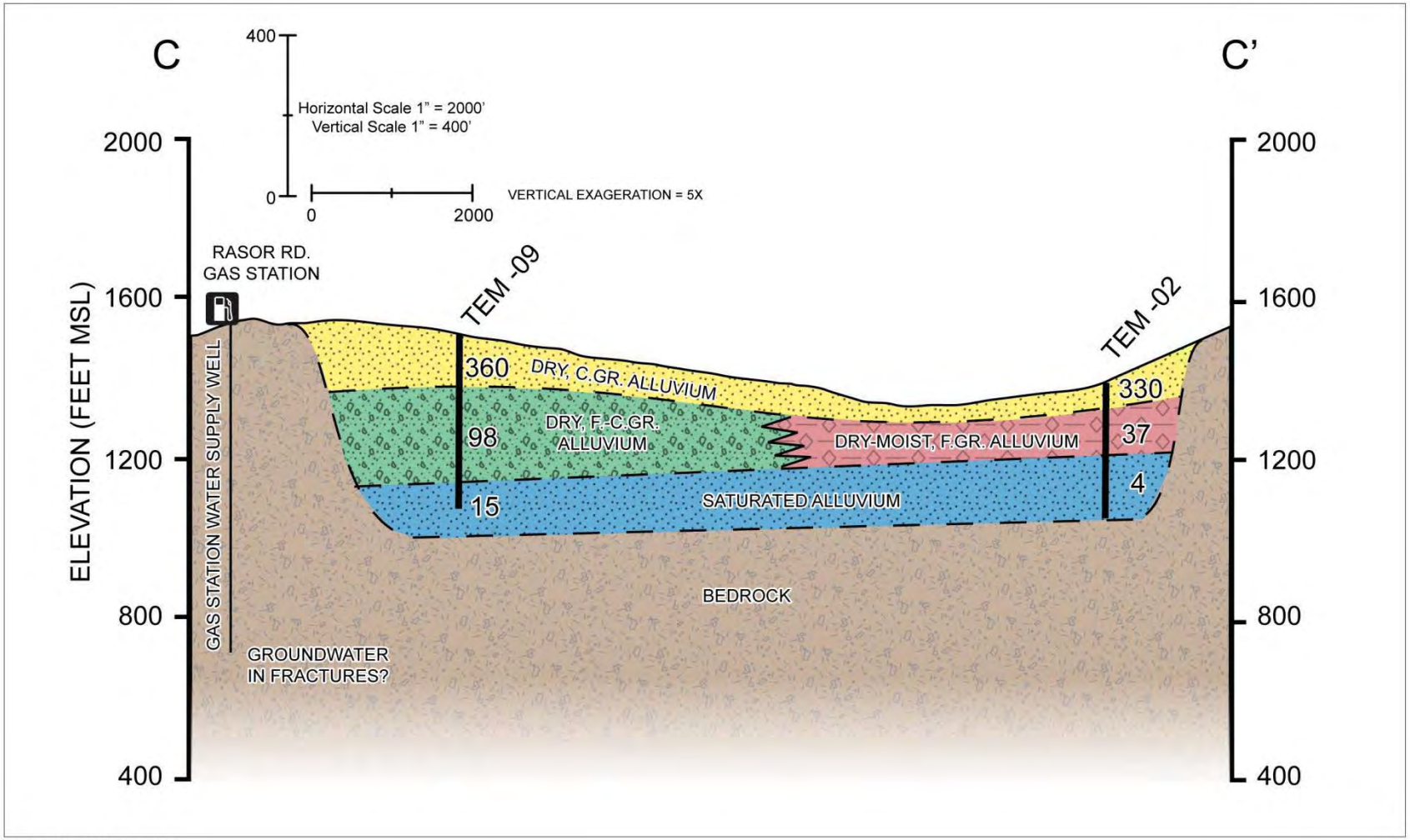
Figure 2.4-4: Hydrogeologic Cross Section C-C'



SOURCE: RMT Inc. 2011

LEGEND

Stratigraphic Boundary (Dashed Where Inferred)

80 Resistivity (ohm-meters), TEM Survey

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water through this narrow gap suggests that there may be coarser sediments within the valley fill at this location.

The water table is interpreted to be at a depth of approximately 182 feet bgs at TEM-02 (elevation of 1,232 feet amsl), the shallowest groundwater occurrence of any of the three TEM locations. The groundwater elevation at TEM-02 is approximately 300 feet higher than the water table in the Soda Lake plain located east of the valley (Figure 2.1-2), based on available U.S. Geological Survey (USGS) data. The conceptual model illustrated on cross section B-B' is that the water table slopes steadily eastward from the upper reaches of the alluvial fans to the base of the valley. Groundwater is channeled through the relatively narrow buried valley outlet located near the northeast corner of the Project Area, flowing eastward toward the Soda Lake lowlands.

Cross section C-C' extends northeast to southwest down the longitudinal axis of the valley (Figure 2.4-4). A surface water divide located approximately 1.5 miles north of TEM-11 separates water flowing to the northeast outlet from that flowing to the southeast outlet (Figure 2.1-2). It is likely that groundwater flow approximately mimics the surface water flow, flowing northward in the northern half of the valley, and southward in the southern half.

TEM data indicate that the resistivity of the saturated subsurface differs between the northern and southern portions of the valley, consistent with the interpretation of different groundwater flow directions in the two portions of the valley. Groundwater at TEM-02 has very low resistivity (i.e., 4 ohm-meters), indicating a high concentration of total dissolved solids (TDS). Groundwater in the southern portion of the valley exhibits higher resistivity values at TEM-09 (i.e., 15 ohm-meters), indicating relatively high TDS concentrations but lower than at TEM-02.

3: Model Setup

3.1 Model Code

The USGS modular three-dimensional finite-difference groundwater flow model (MODFLOW) (MacDonald and Harbaugh, 1988) was used to simulate hydrogeologic conditions in the Project valley. MODFLOW has been thoroughly tested and widely used for groundwater simulations, and has become a standard upon which other models are compared. It has the capability to accurately simulate a wide variety of aquifer conditions for porous media such as the saturated alluvial aquifer that occurs in the Project valley.

3.2 Model Layers

A single layer model was used to simulate the valley aquifer. The results of the TEM survey suggest that the entire thickness of unconsolidated sediment below the water table can be considered a single hydrologic unit, justifying the use of a single model layer. No low-permeability layers such as clays or caliche units were found below the water table, based on limited TEM results.

3.3 Model Domain and Boundary Conditions

The model domain shown on Figure 2.1-1 encompasses the limits of saturated alluvium in the valley that surrounds the Project Area. Reasonable projections of the slope of the water table and the bedrock were used to estimate the lateral and vertical limits of saturated alluvium. The limits of the aquifer were initially set as the limits of the alluvium where it intersects the bedrock on the hillsides. Initial model runs resulted in a number of boundary nodes as “dry” (unsaturated), which was reasonable considering the depth to the water table at known locations was greater than 182 feet bgs. The outer ring of model nodes at the upper reaches of alluvial fans tended to become dry; subsequently, these nodes were set to inactive, thereby making them outside the model domain.

The northeast and southeast outlets were extended 4,000 to 8,000 feet farther east than adjacent nodes that bounded the valley walls. This allowed for the model boundaries at the important outlet locations to be distant from potential water supply well locations, and to not overly constrain model results.

The water table constituted the upper boundary of the model. The lower boundary was set to be the bedrock surface, a conservative measure because it caused the model to ignore any groundwater that might be derived from the bedrock. The bedrock consists primarily of igneous intrusive and extrusive rocks, with little to no available water expected in the matrix. Fractures are likely in the rocks and may provide minor additional water supply.

The sides of the model domain were generally set to be no-flow boundaries, which is a conservative assumption that ignores any contribution from fractured bedrock. At two locations, the northeast and southeast surface water outlets, general head boundaries (GHB) were set. A limited number of nodes in the narrow outlet areas were set as GHB nodes, which allowed the

model to converge on a solution. Models require a small number of constant-head boundaries or general-head boundaries to be defined in order to converge on a solution. GHBs have an advantage over a constant-head boundary because there is a limit to the flow that can move through the node, depending on the hydraulic conductivity assigned to the node, thereby keeping the flow volumes realistic. It is also important to avoid having GHBs too close to a pumping well, which could falsely constrain drawdown associated with pumping. Care was taken during the simulations to test that the proximity of the model boundary did not constrain the calculated drawdown.

The model domain was configured with a nodal array of 142 rows and 113 columns (Figure 3.3-1). Node dimensions were generally 500 feet by 500 feet. In the vicinity of the simulated water supply well, the node size was refined to as low as 1 foot for the well node to provide for a more accurate calculation of expected drawdown under pumping conditions. Small node size more realistically simulated the actual conditions inside a well that may be only 6 to 8 inches in diameter.

3.4 Model Parameters

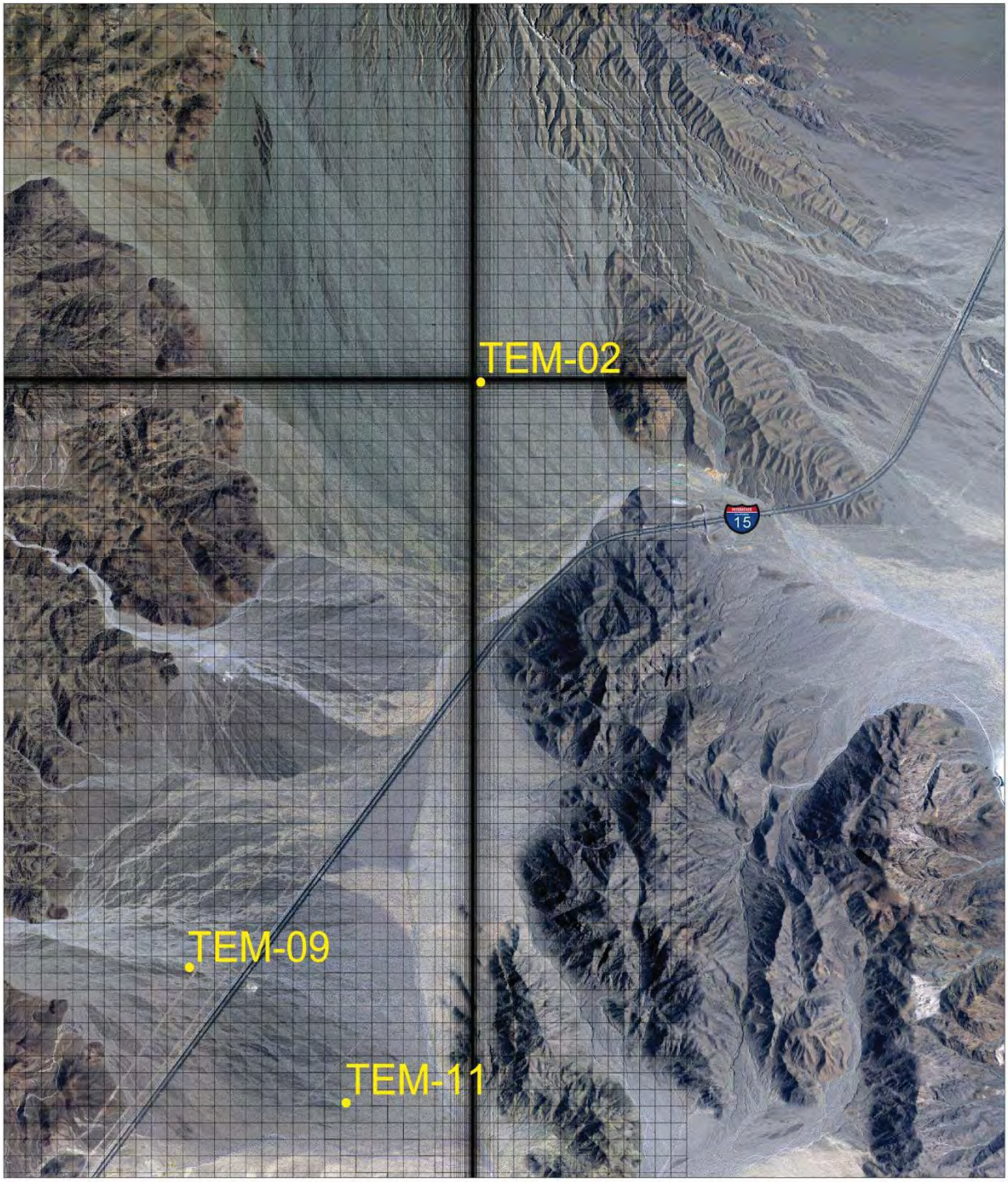
3.4.1 RECHARGE

Aquifer recharge (R) is a difficult parameter to determine directly, and is generally estimated based on area precipitation and evaporation data, or data from well-reviewed groundwater flow model simulations from similar areas. The Desert Studies Center website reports a mean precipitation value of 3.5 inches/year since 1980 for the Center, located about 4 miles east of the Project Area (http://biology.fullerton.edu/dsc/school/climate.html; accessed November 10, 2010). Danskin (1998) reported that he and others used a value of approximately 0.5 to 1.0 inch/year for R for Owens Valley, located east of the Sierra Nevada (Danskin, 1998; Danskin, 1988; Hutchinson, 1988). Lee (1912) suggested that approximately 16 percent of direct precipitation in Owens Valley infiltrated as groundwater recharge. Within the Project Area, this would equate to 0.56 inch/year. However, Danskin (1998) argued that the actual recharge may be lower than 16 percent of precipitation in arid regions.

For the Project Area, a range of R values was used (Table 3.4-1). At the high end, an R value of 0.5 inches/year was assigned. The low end estimate of R used in simulations was 0.125 inches/year. These values are believed to bracket the reasonable estimates of groundwater recharge from direct precipitation for the valley.

Nodes on the boundary of the model were assigned higher R values to accommodate for mountain-front runoff that infiltrated the alluvial fan at the boundaries. The precipitation falling over the drainage area in the mountains was assumed to result in about 0.5 inch/year of R. This rate was totaled for the drainage area in the mountains, and added into the boundary nodes as mountain-front recharge. Similarly, for the low-end model, an estimated 0.125 inch/year of R was assumed for all of the mountain area, and this total amount was allocated to the boundary nodes. As a result, the boundary nodes were assigned R values that were 26 times as high on average as the interior nodes, to account for all the runoff from the bedrock outcrop that would be transported to the boundary nodes. This approach is consistent with the work of others in

Figure 3.3-1: Model Grid



SOURCE: U.S. Geological Survey, EROS Data Center, Sioux Falls, SD 2010, RMT Inc. 2011

N
W E
S

0 0.25 .5 1 1.5 2 Miles

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Table 3.4-1: Selected Model Parameters

Aquifer Parameters			
Parameter Set Name	*Hydraulic Conductivity (K) (feet/day)*	*Groundwater Recharge (R) (inches/year*	*Storage Coefficient (unitless)*
High End	4	0.5	0.1
Low End	1	0.125	0.1

Note: Values given are for main body of model domain. Nodes at the model boundaries have higher R values. Nodes near the northeast and southeast outlets have higher K values.

southeastern California, such as Danskin (1998), who noted that mountain-front recharge was significantly higher than areal recharge in Owens Valley.

No additional recharge from infiltration from ephemeral streams was assumed. This approach may underestimate the actual amount of recharge in the valley, and thus would be a conservative assumption. Using this approach, the high end estimate of recharge from direct precipitation and mountain front runoff is 1,373 ac-ft/yr. The low-end estimate of recharge is 343 ac-ft/yr. In comparison, the expected highest water use, which would occur during construction, would be 61.6 ac-ft/yr (55,000 gpd), which equals 4.5 percent of the high-end recharge estimate, and 18 percent of the low-end recharge estimate.

3.4.2 HYDRAULIC CONDUCTIVITY

Hydraulic conductivity (K) values were estimated based on:

- Mean K value of 10 feet/day for shallow in-field permeability tests at 20 locations in the Project Area (Diaz-Yourman and Associates, 2010)
- TEM data from three sites to depths of up to 500 feet bgs (Terra Physics, 2010)
- Observations of grain size from 15 on-site borings, including one deeper boring to 100 feet bgs (Diaz-Yourman and Associates, 2010)

The in-field K values and field observations indicate that shallow soils can be characterized with a relatively high K value, with a mean K value of 10 feet/day (Diaz-Yourman and Associates, 2010). Values for soils at depth are less certain because of the lack of K tests and direct observations of soil samples. TEM data suggest that there may be somewhat finer-grained sediments at TEM-02, and alternating coarse-grained and fine-grained sediments at TEM-09 and TEM-11.

Calibration of a numerical model is highly dependent on values of K and R. Several combinations of K and R can result in a suitable “match” to the existing measured heads. To account for the uncertainty in K and R values, high-end and low-end values were used in calibrating the model to measured heads. The high-end and low-end values were chosen based their ability to reach calibration within a reasonable range of values for K and R.

Calibration of the model indicated that a high-end K value of 4 feet/day resulted in a reasonably good fit to known head values. This K value was less than the 10 feet/day recorded as a mean K value for shallow sediments, but was still a relatively high value, consistent with the presence of coarse sediments noted at the TEM locations. Attempts to increase the K value higher than 4 feet/day resulted in predicted head values that were too low for the valley, even when coupled with the upper-end recharge values (0.5 inch/year). The 4 feet/day value for K was selected as a high-end K value for the model.

For the second parameter set, a low-end K value of 1 foot/day was assigned. This K value allowed the model to reach calibration to the measured head values when coupled with the low-end R estimate of 0.125 inch/year. Attempts to reach calibration using lower values of K were not successful when coupled with the low-end R estimate.

For both the low-end and high-end models, zones of relatively higher K values were input into the model near the northeast and southeast outlets. Coarser sediments would be expected near the outlets, where funneling of surface water likely winnows out finer-grained sediments. The model was not able to achieve a good match to the measured heads without the presence of the higher K zones near the outlets. Values of K that were 2.5 to 5 times higher than the rest of the model domain were input for the areas near the outlets.

Vertical hydraulic conductivity (Kv) values were set to be 10 percent of the horizontal hydraulic conductivity (K) values. Values of Kv are commonly in the range of 10 percent of K (Freeze and Cherry, 1979). A single-layer model is generally insensitive to Kv values because there is no interlayer (vertical) transfer of water.

3.4.3 STORAGE COEFFICIENT

A storage coefficient of 0.1 was assigned to the entire model domain. This is a reasonable value for an unconfined aquifer (Davis, 1969). There are no data to indicate that the aquifer is confined with any low-permeability unit; therefore, it was assumed to be unconfined. The 0.1 value is consistent with values used by Danskin (1998) in Owens Valley for the upper sequence of sediments.

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4: Model Results

4.1 Calibration

The steady-state hydraulic head distribution for the calibrated model is presented on Figure 4.1-1 for the high-end set of K and R. Figure 4.1-2 portrays the head distribution for the low-end set of K and R. The steady-state head distributions are virtually identical. Table 4.1-1 shows the results of the calibration, comparing model results to heads estimated from TEM results.

Predicted head values at TEM-02 were 1,232 feet amsl, matching the value estimated based on TEM results. The predicted head value for TEM-09 in the model (1,156 feet amsl) was well within the range of uncertainty for the estimated value based on TEM results (1,170±30 feet amsl). For the TEM-11 location, the model prediction was 1,089 feet amsl, almost 100 feet higher than the TEM result of less than 992±49 feet amsl. The TEM value at TEM-11 was not judged to be reliable because the water table was not detected and because the head value predicted by TEM results (below 992 feet amsl) was anomalously low, nearly as low as the head values measured in the Soda Lake area, which is located 4 miles east and 500 feet lower in ground elevation.

Mass balance errors were extremely low for the calibrated model, at 6×10^{-4} percent. All water entering the model is derived from areal recharge. Outflow is through the northeast and southeast outlets, through GHB nodes assigned to those locations. In general, the match of the model values to the two "measured" values was considered adequate for an area with such sparse hydrogeologic data.

Table 4.1-1: Predicted Hydraulic Heads Versus "Measured" Heads from TEM Results

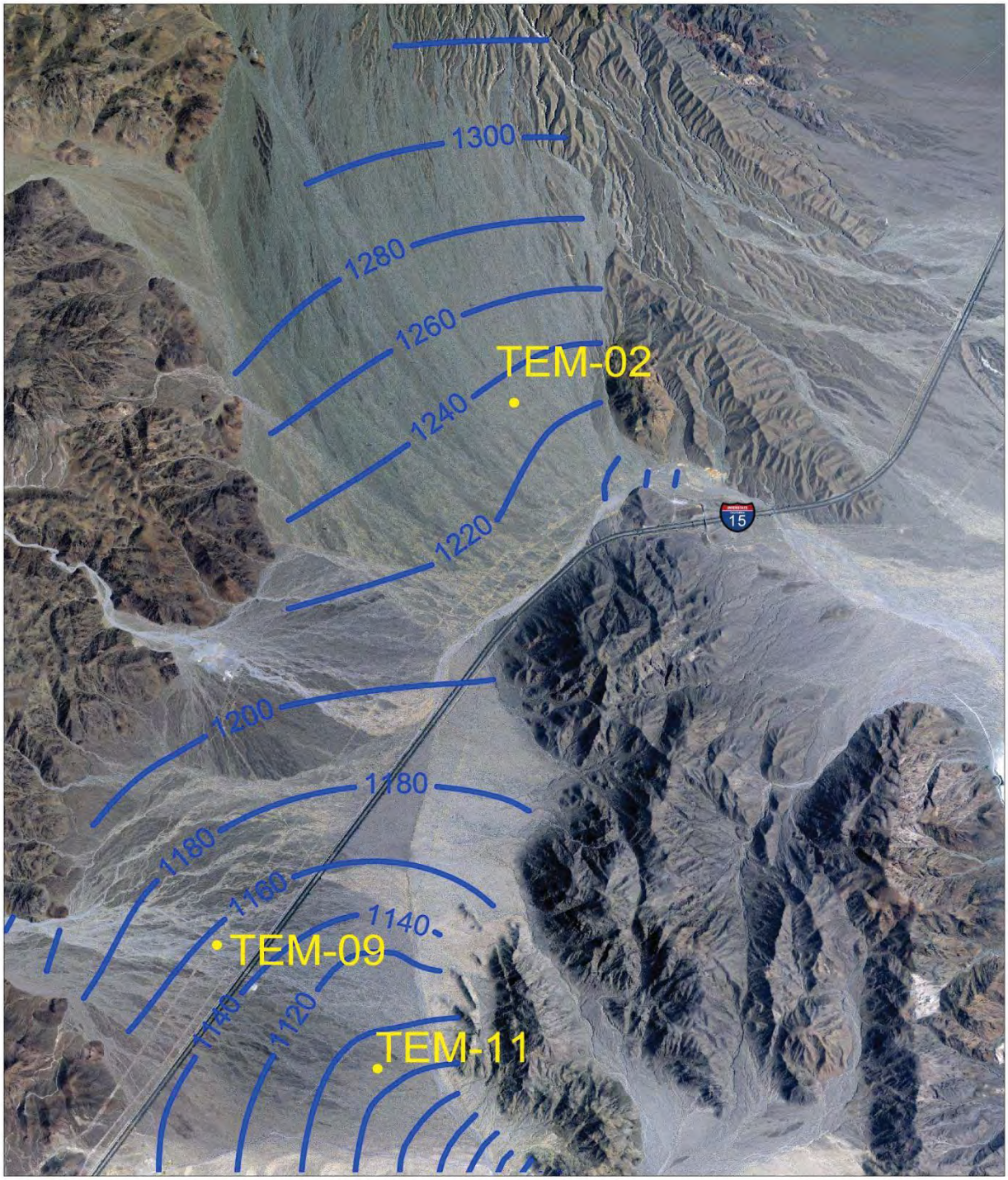
	High-End Parameter Set		Low-End Parameter Set	
Measurement Location	*Predicted Head (feet amsl)*	*Measured Head (feet amsl)*	*Predicted Head (feet amsl)*	*Measured Head (feet amsl)*
TEM-02	1,232	1,232±13	1,229	1,232±13
TEM-09	1,156	1,170±30	1,154	1,170±30

Note: Measured head values were estimated based on TEM survey results from Terra Physics (2010).

4.2 Effects of Groundwater Extraction

The effects of pumping a water supply well at the rate needed for construction and operation were evaluated by conducting transient flow simulations. Transient flow simulations take into account the change in hydraulic heads over time in a dynamic condition of pumping, where the cone of depression spreads downward and outward over time. Simulations were conducted using the calibrated high-end and low-end models. The model grid spacing was refined in the vicinity of the simulated well to as small as 1 foot, so that a more accurate estimate of drawdown in the well itself could be obtained.

Figure 4.1-1: Steady State Calibration Run, High End Parameter Set



SOURCE: U.S. Geological Survey, EROS Data Center, Sioux Falls, SD 2010, RMT Inc. 2011

N W E S

SM37B Steady State Calibration Run, High End K, R

0 0.25 .5 1 1.5 2 Miles

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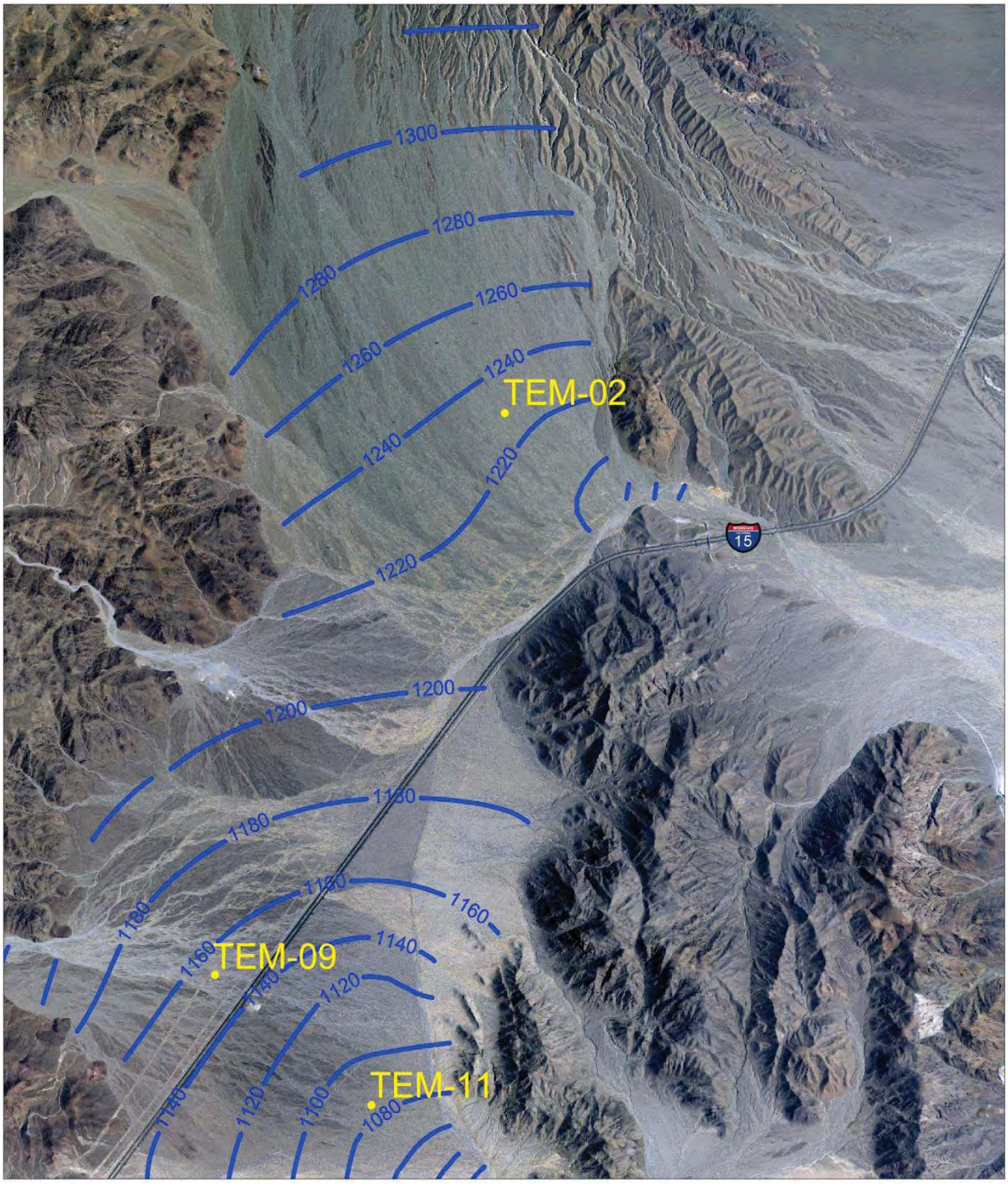
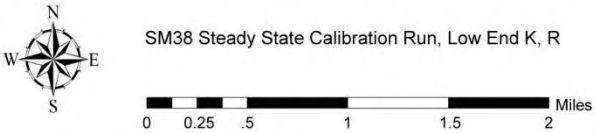
Figure 4.1-2: Steady State Calibration Run, Low End Parameter Set



SOURCE: U.S. Geological Survey, EROS Data Center, Sioux Falls, SD 2010, RMT Inc. 2011



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4.2.1 PUMPING RATES NEEDED FOR CONSTRUCTION AND OPERATION

Water needs for construction were estimated to be approximately 55,000 gallons/day (7,352 cubic feet per day [ft^3/day]) for a duration of two to three years (RMT, 2009). Water needs for operation and maintenance (i.e., for PV panel cleaning) were estimated to be approximately 42,000 gallons/day (5,615 ft^3/day), over a 21-day period occurring twice per year (RMT, 2009). Other water needs (domestic uses) during the operation and maintenance phase are expected to be much lower that than the water needs during construction.

4.2.2 SELECTED LOCATION OF WATER SUPPLY WELLS

Examination of hydrogeologic data from TEM locations and borings indicates that the north end of the Project Area is likely to yield sufficient quantities of groundwater for the Project. The interpreted depth to the water table at TEM-02 near the north end of the Project Area is about 182 feet bgs, with approximately 150 feet of saturated alluvium overlying bedrock. Locations at the south end of the Project Area (i.e., TEM-09 and TEM-11) apparently have a much deeper water table (354 feet bgs at TEM-09 and more than 386 feet bgs at TEM-11), making these locations less desirable. At TEM-09 there is an estimated 150 feet or more of saturated alluvium overlying bedrock, indicating that a well could be placed there to withdraw from a substantial thickness of aquifer. However, given that the water table is substantially shallower at location TEM-02, the north end of the Project Area was judged to be more favorable for the location of one or more water supply wells.

A water supply well was simulated near the location of TEM-02, operating under the conditions expected during construction. Specifically, a well was simulated to be pumping continuously at a rate of 55,000 gallons/day (7,352 ft^3/day) over a period of three years, the upper estimate of construction time.

4.2.3 RESULTS OF SIMULATED GROUNDWATER WITHDRAWALS

High-End Parameter Set

Figure 4.2-1 shows the resulting drawdown predicted around a water supply well after three years of pumping at 55,000 gallons/day, or 61.6 ac-ft/yr (representing the construction phase), for the high-end parameter set. For the high-end K and R parameter set, the results indicate a predicted maximum drawdown of about 20 feet in the well node after three years of pumping at 55,000 gallons/day (Table 4.2-1). The cone of depression contours extend generally less than 3,000 feet from the well, with a slightly elongated extension to the bedrock lying to the east.

Low-End Parameter Set

Figure 4.2-2 shows the drawdown predicted after three years of pumping at 55,000 gallons/day (representing the construction phase), for the low-end parameter set. With low-end values of K and R, the predicted drawdown is much higher than with the high-end parameter set, with a maximum drawdown of about 81 feet in the well node. The radius of drawdown was generally less than 3,000 feet, similar to that of the high-end parameter set.

Figure 4.2-1: Predictive Run – High End Parameter Set - Drawdown After 3 years of Pumping

SOURCE: U.S. Geological Survey, EROS Data Center, Sioux Falls, SD 2010, RMT Inc. 2011

Run SM37b Transient - High End K, R - Drawdown of Water Table
After 3 Years of Pumping at 55,000 gallons per day

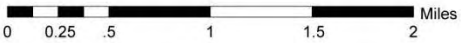
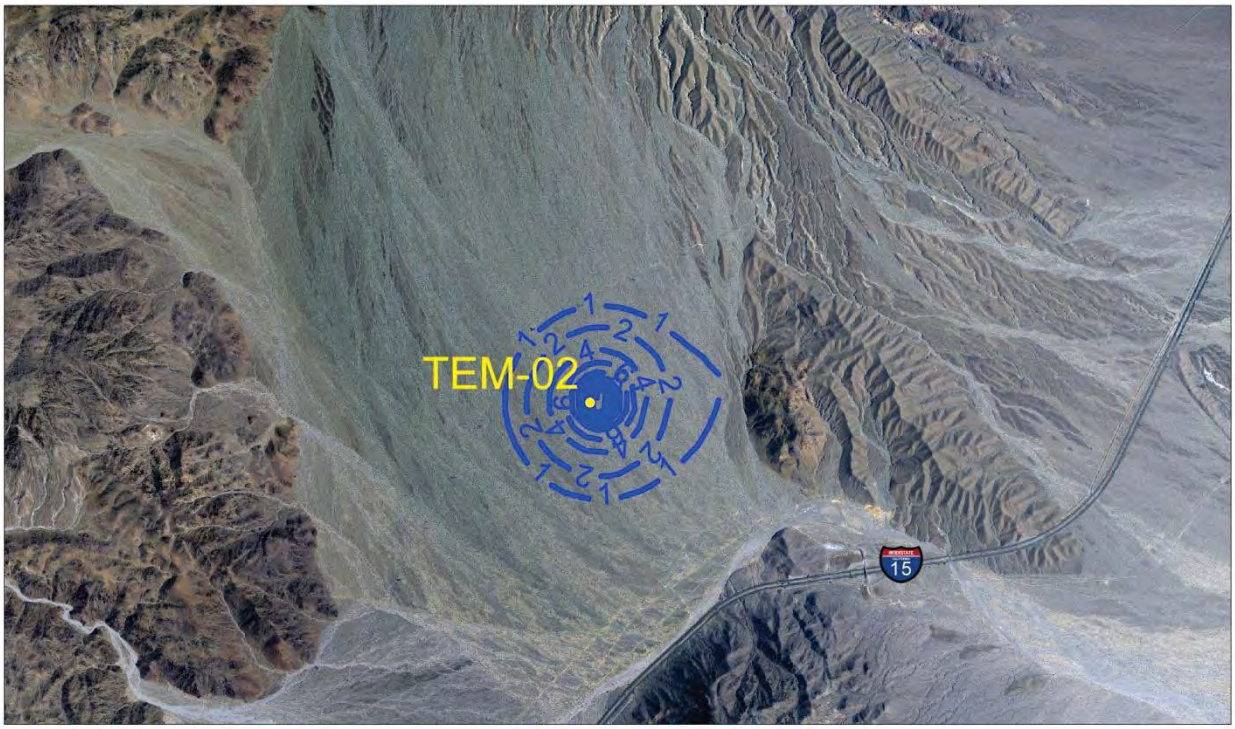


Table 4.2-1: Effects of Groundwater Withdrawals at Maximum Withdrawal Rates

Parameter Set Name	*Maximum Predicted Drawdown near Well (feet)*	*Radius of Area with Drawdown Greater than 1 Foot(feet)*
High End	20	2,500 – 3,800
Low End	81	2,400 – 3,050

Note: Maximum drawdown inside the well itself will likely be somewhat higher than predicted for the aquifer near the well because of typical well inefficiencies.

Figure 4.2-2: Predictive Run – Low End Parameter Set - Drawdown After 3 years of Pumping



SOURCE: U.S. Geological Survey, EROS Data Center, Sioux Falls, SD 2010, RMT Inc. 2011

Run SM38 Transient - Low End K, R - Drawdown of Water Table
After 3 Years of Pumping at 55,000 gallons per day

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Simulations of operating conditions indicate that drawdown would be much lower than during the construction phase because the rate of pumping would be lower, and would have a much shorter duration. As stated earlier, it is expected that 42,000 gallons/day, for 21 days, twice per year, would be needed for PV panel cleaning and other activities. The results indicate that minor drawdown would occur, less than 25 percent of that which would occur with the higher rates of pumping under construction conditions. Because the drawdown under operating conditions would be substantially less than that under construction conditions, only the drawdown results during construction are shown on Figure 4.2-2.

5: Conclusions

Groundwater modeling results indicate that conditions are favorable for obtaining sufficient water to conduct construction and operation activities on site that require non-potable water. Conservative estimates of groundwater recharge are between 343 and 1,373 ac-ft/yr, compared to an expected use of 61.6 ac-ft/yr. for a period of three years. The modeling results indicate that one or two wells screened in alluvium near the northern end of the Project Area, near TEM-02, would likely be capable of supplying sufficient water required during construction for dust control and other construction-related activities. Drawdown values for the area near the modeled water supply well range from 20 feet for the high-end parameter set to 81 feet for the low-end parameter set. Actual drawdown inside a well will likely be higher than the aforementioned values because of well inefficiencies that are caused by frictional losses in the well screen and turbulent flow in the well.

Water needs for long-term operation of the site would be much less than during construction, and one or two wells would be expected to be capable of supplying the water required for PV panel cleaning and other non-potable water needs. Water needs for potable uses are not intended to be obtained from the aquifer and, therefore, were not simulated.

Drawdown impacts in excess of 1 foot are not expected to extend more than about 3,000 feet from the well(s) that would be installed, at the projected pumping rates. In comparison, the town of Baker lies more than ten times as far from the Project Area as the drawdown impacts would extend, approximately 33,000 feet northeast of the recommended location of the water supply well(s) near TEM-02. Similarly, Zzyzx Spring is located approximately 29,000 feet from TEM-02, and the Rasor Road Services well is located approximately 30,000 feet southwest of TEM-02. No impacts from groundwater withdrawals would be expected to be measurable at these three locations. No other groundwater users are known to exist in the Project valley or anywhere close to the estimated cone of depression of the recommended well(s).

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6: Recommendations

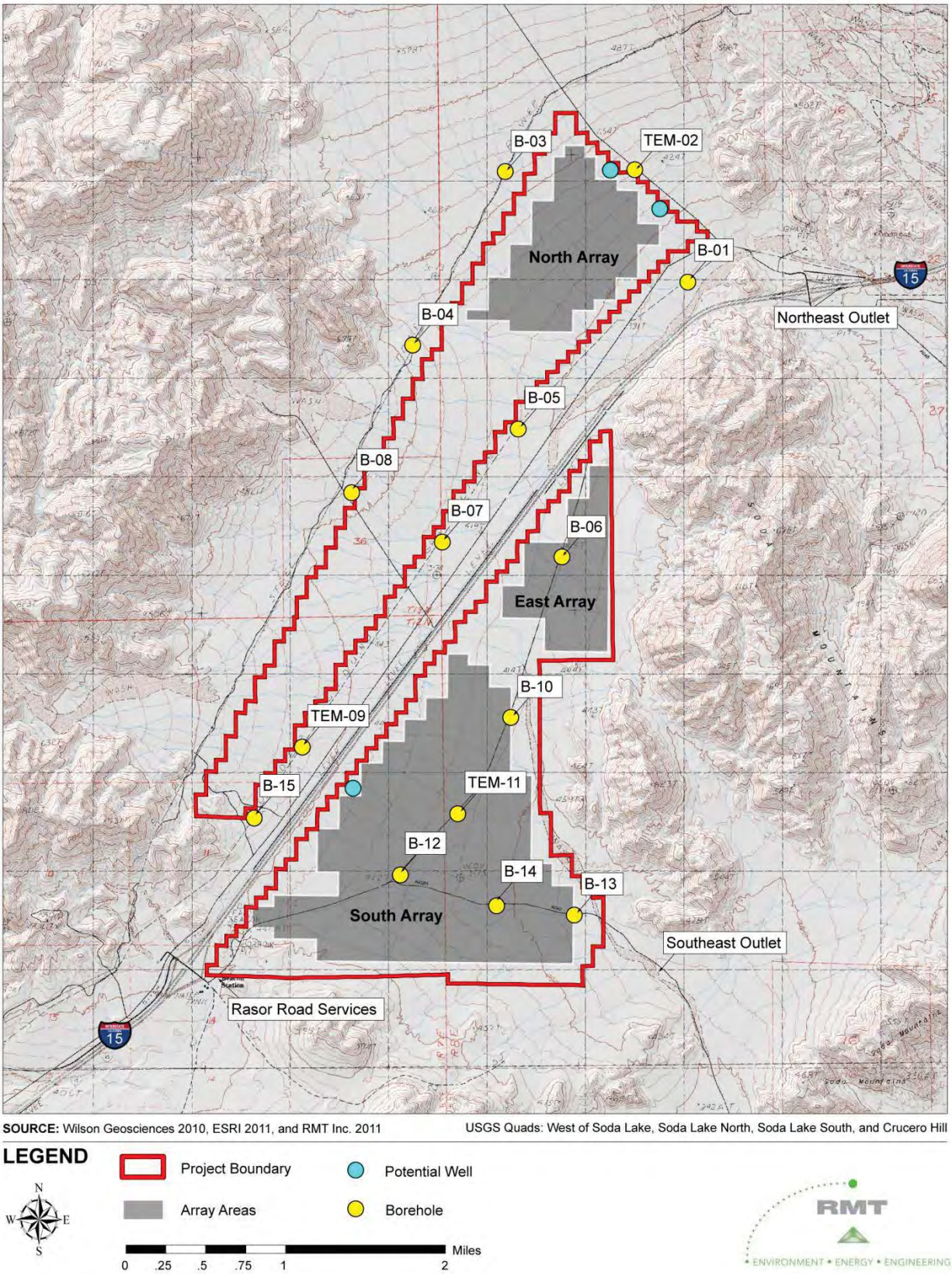
RMT recommends that two water supply wells should be planned for, to be located in the vicinity of TEM-02, at a location that is convenient for access. To minimize well interference, the two wells should ideally be separated by a distance of 2,000 feet or more. Drawdown effects from one well on the other well would be expected to be insignificant at this separation distance. Although the model results indicate a single well would be adequate for the high-end K and R conditions, and a single well may also be adequate for the low-end K and R conditions, planning for a second well to be installed has distinct advantages:

- A second well would be available in case well or pump repair is required, without shutting down planned activities (especially during construction) that require water
- A second well may be needed if significantly more water per day is required for certain days than the average rate
- A second well may be needed if the actual K is near or below the low-end K value of 1 foot/day

Data gathered during drilling of a well will be valuable in evaluating whether the soils at the location of the well are at least as permeable as the low-end K values used in this modeling. While it is expected that the K and thickness of saturated sediments would be sufficient to yield the required amounts of water, if actual conditions encountered during drilling indicate a lower K or thinner thickness of saturated soils than expected, extending the borehole into the bedrock to intercept potential water-bearing fractures may be an effective solution.

Location of a second well nearer to the southeast portion of the Project area may be desirable to provide water to the planned Operations Building for non-potable uses, and for fire-suppression. The planned location of the Operations Building near Rasor Road Services is not judged to be a favorable location for a well because bedrock is close to the surface and there apparently is no saturated alluvium overlying bedrock. A more favorable location for the well would be nearer to TEM-09, but on the southeastern side of I-15 (see Figure 6.1-1). A well at this location would facilitate transport of water between the well and a water storage tank to be located at the Operations building. It is expected, based on the geologic data from TEM-09 and TEM-11 locations, that operation of a water supply well at this location would not have any negative impact on the nearest water supply users, such as Rasor Road, the town of Baker, or Zzyzx Spring. This is because the sediments appear to be of similar character to those in the northern end of the Project valley and are part of an extensive saturated alluvial sediment aquifer. It is recommended that a potential water supply well this location be simulated with the existing groundwater flow model to confirm that the predicted effects would be negligible.

Figure 6.1-1: Potential Water Supply Well Locations



7: Limitations

The accuracy of the model results is limited by the scarcity of measured hydraulic head values and other hydrogeologic data in the Project valley. “Measured” hydraulic heads were estimated values based on TEM data, with uncertainties of 13 to 30 feet or more. Measured values of hydraulic conductivity exist for shallow soils only, and K values were estimated for the deeper soil horizons based on TEM data. Similarly, depth to bedrock was derived from the limited TEM data. Recharge values were estimated based on measured rainfall and comparison to other investigation areas. Despite these limitations, the approach taken – to bracket the expected range of values of R and K with high-end and low-end data sets – represents a reasonable approach to reduce the uncertainty and obtain meaningful results. The predictions presented here were based on bulk (average) hydraulic parameter values; actual values of hydraulic conductivity can vary by an order of magnitude or more over short distances at typical sites. A localized zone of low-permeability sediments could limit the performance of an installed well.

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Hydrogeological Conditions and Groundwater Modeling Report Addendum

Soda Mountain Solar Project

BLM Case No. CACA 49584

August 2014

Hydrogeological Conditions and Groundwater Modeling Report Addendum

Soda Mountain Solar Project

BLM Case No. CACA 49584

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Appendix A NPS Comments

1 BACKGROUND

The Soda Mountain Solar Project (project) will include the installation, operation, and maintenance of a 350-megawatt electric generating facility (Caithness 2011). The project area is located in a small valley on federal lands managed by the U.S. Department of the Interior, Bureau of Land Management (BLM), approximately 6 miles southwest of the town of Baker in San Bernardino County, California (Figure 1). Groundwater modeling was used to help evaluate whether the hydrogeologic conditions at the Project site could sustain the withdrawal of water needed during construction, operation, and maintenance of the proposed solar facility, without causing impacts to nearby water users or environmental resources located within the Mojave National Preserve. The initial groundwater modeling results were presented in *Hydrogeologic Conditions and Groundwater Modeling Report* (RMT 2011) ("Model Report").

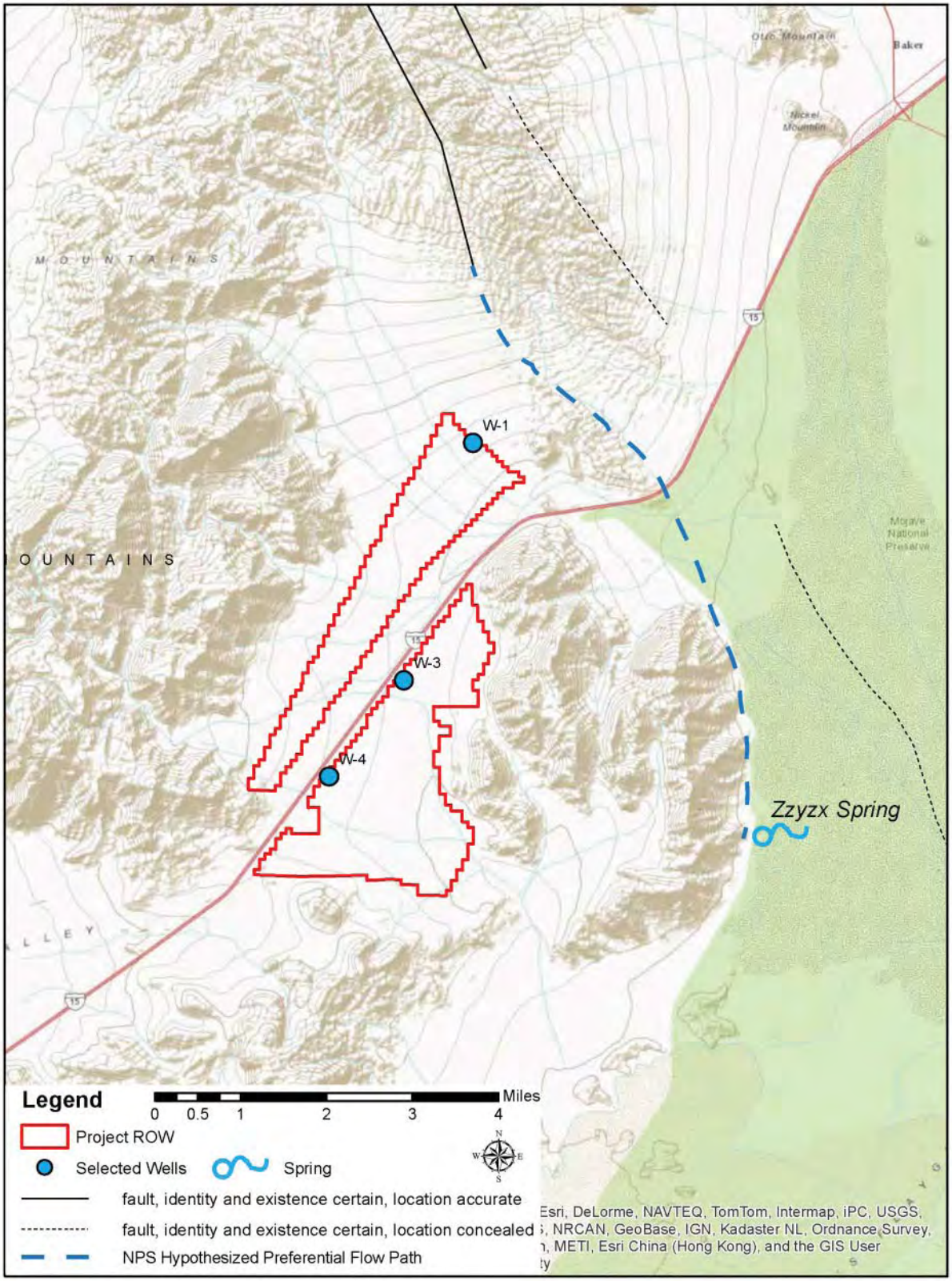
This addendum to the Model Report has been prepared to address:

1. Revised water use estimate for construction from 61 acre feet per year (AFY) to 192 AFY
2. Modeling of water use for project operation
3. Possible use of up to three groundwater wells
4. National Park Service (NPS) comments on the Model Report

NPS, Mojave National Preserve, presented scoping comments on the project in a letter dated November 21, 2012 (NPS 2012) addressed to San Bernardino County Land Services Department, Planning Division, and to the BLM, California Desert District Office, Moreno Valley (Appendix A). NPS comments on the Model Report, included:

- The recharge "assumptions likely substantially overestimate the actual recharge rate for the project area."
- "The no-flow boundary assumptions used in the model preclude analysis of ground water pumping on [Soda Spring] habitat".
- "One possible flow path for recharge to Soda Springs is "through the locations of the proposed pumping, along the northerly end of the Soda Mountains, and then along the westerly edge of Soda Dry Lake following the permeable beach and colluvial sediments at the playa margin." The NPS's hypothesized preferential flow path is illustrated in Figure 1.
- The analysis does not "account for potentially adverse impacts to the springs at Zzyzx that are habitat for the endangered Mohave tui chub".

Figure 1: Project Location



2 HYDROGEOLOGIC CROSS SECTIONS

A cross section location map is presented in Figure 2. Revised cross sections A–A′, B–B′, and C–C′ are presented in Figure 3. These cross sections were previously presented in RMT's 2011 Model Report. The revised cross sections do not display the vertical exaggeration used in the Model Report (which caused potential confusion over the distance between the springs at Zzyzx and the proposed groundwater wells). The revised cross sections also include the type and extent of bedrock units. The following discussion is derived largely from the Model Report, with additional discussion of the bedrock geology.

2.1 CROSS SECTION A–A'

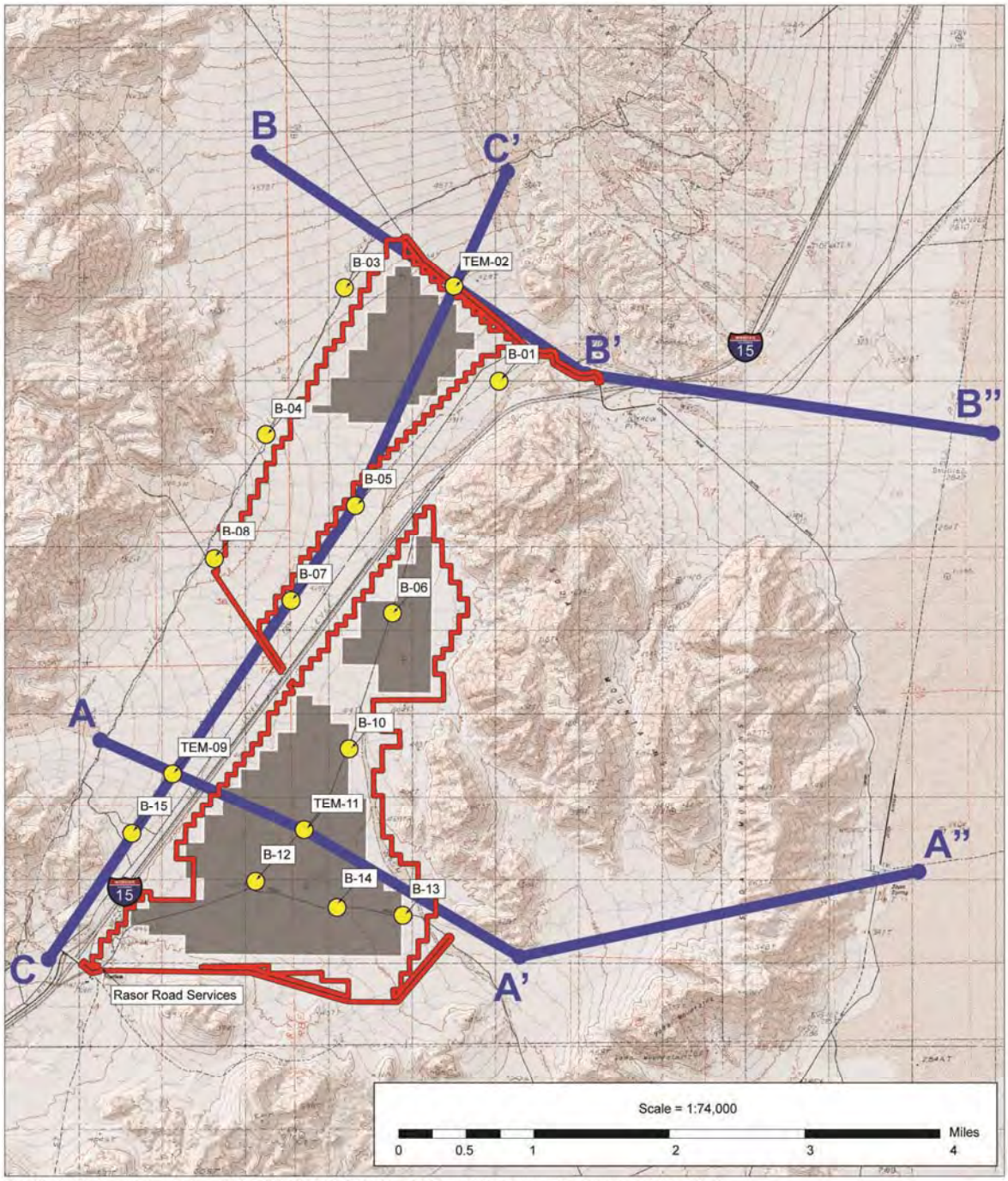
Cross section A–A′ extends west to east and incorporates geophysical data from TEM-09 and TEM-11, which are located near the southern end of the valley (Figure 3). The cross section extends eastward across the mountain range to Soda Springs at Zzyzx, located on the eastern slope of the eastern Soda Mountains, above Soda Lake. Bedrock occurs at depths of 500 feet or more below ground surface (bgs) at TEM-09 and 436 feet bgs at TEM-11. The bedrock outcrops on the slopes of the Soda Mountains. Geologic mapping from Jenkins (1962) and Wilson (2011) indicates that Mesozoic granitic rocks make up much of the subsurface bedrock, with Jurassic-Triassic metavolcanic rocks forming significant portions and higher reaches of the Soda Mountains. A localized outcrop of carbonate rock is present in the vicinity of Soda Springs at Zzyzx, but its mapped extent appears to be limited to the vicinity of the spring (Jenkins 1962).

The water table occurs at an elevation of approximately 1,170 feet amsl at TEM-09, and appears to be below an elevation of approximately 922 feet amsl at TEM-11. The apparently much lower water table at TEM-11 suggests that there is an outlet for groundwater southeast of TEM-11 that allows the water table to drain to this lower elevation. A surface-water outlet is present in the southeast portion of the valley (Figure 2), and it is reasonable to assume an alluvium valley fill bedrock cut exists at this location. This conceptual model satisfies the need for a groundwater outlet to occur in the southeast portion of the valley, where the water table is apparently much lower than elsewhere, as seen at TEM-11.

2.2 CROSS SECTION B–B'

Cross section B–B′ extends west to east along the northern boundary of the project area, and shows a similar topographic slope to the east as was shown on cross section A–A′, paralleling the surface water outlet to the east (Figure 3). Drainages from large alluvial fans converge into the surface water outlet that flows through a relatively narrow valley between low mountains to the north and south (Figure 2). The funneling of the surface water outflow suggests that, as for

Figure 2: Locations of Geologic Cross Sections



SOURCE: Wilson Geosciences 2010, ESRI 2011, RMT Inc. 2011, and Panorama Environmental, Inc. 2013

LEGEND

- Project Boundary
- Array Areas
- A A' Cross Section Line
- Borehole

USGS Quads: West of Soda Lake, Soda Lake North, Soda Lake South, and Crucero Hill

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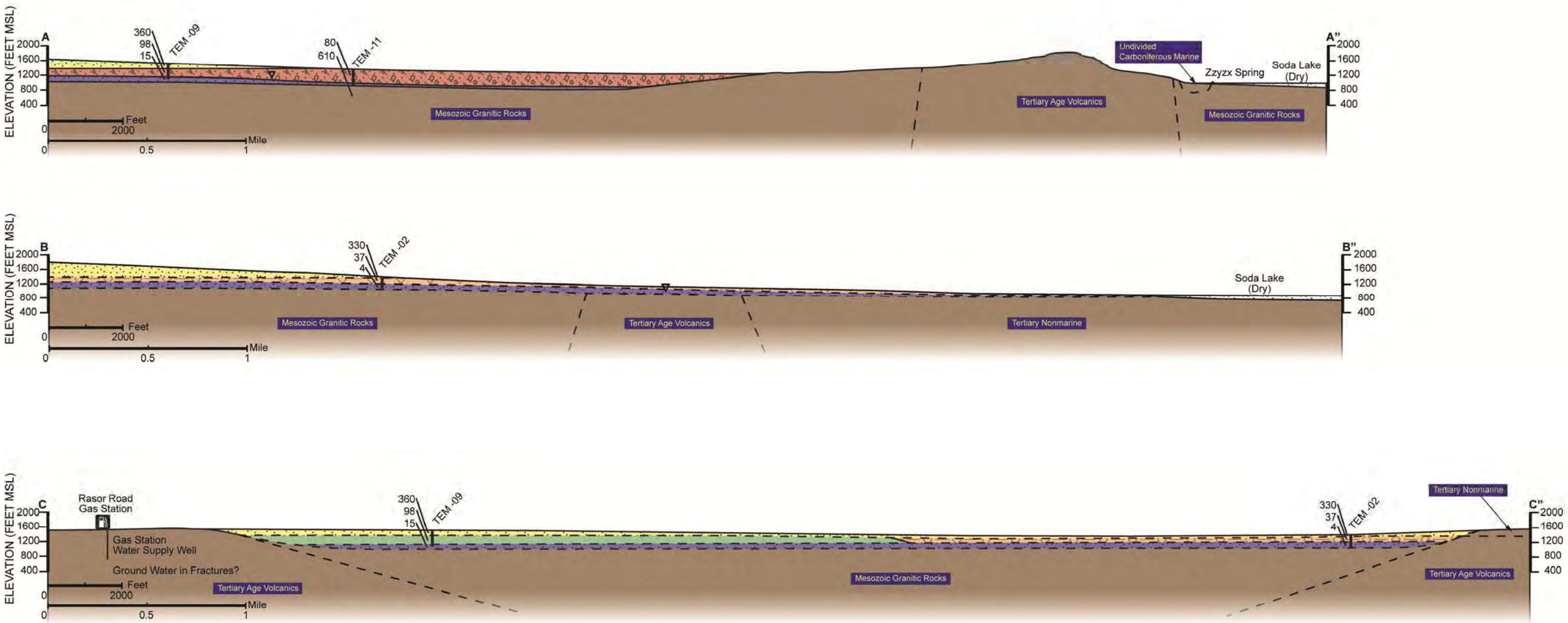
Figure 3: Geologic Cross Sections



SOURCE: TRC 2013

LEGEND

- Stratigraphic Boundary (Dashed Where Inferred)
- 80 Resistivity (ohm-meters), TEM Survey
- Dry, C. GR. Alluvium
- Dry, C. GR. & F. GR. Alluvium
- Dry to Very Moist F. GR. Alluvium
- Dry, F.-C. GR. Alluvium
- Saturated Alluvium
- Bedrock

NOTE: Bedrock geology based on Bedrossian (2012) and Jenkins (1962).

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cross section A–A′, there may be a buried bedrock valley at this location. The funneling of surface water through this narrow gap suggests that there may be coarser sediments in the valley fill at this location. A small outcrop of limestone present near Zzyzx east of Soda Mountain on cross section point A is labeled as Undivided Carboniferous Marine. Extrapolation of mapped bedrock units into the subsurface indicates that Mesozoic granitic rocks predominate in the western portion of cross section point B, and Tertiary volcanic rocks form the central portion of the cross section. Tertiary nonmarine rocks are mapped in the eastern portion of the cross section, extending to the areas beneath Soda Lake.

The water table is interpreted to be at a depth of approximately 182 feet bgs at TEM-02 (elevation of 1,232 feet amsl), the shallowest groundwater occurrence of any of the three TEM locations. The groundwater elevation at TEM-02 is approximately 300 feet higher than the water table in the Soda Lake Valley located east of the project area (Figure 2). Groundwater elevations in the Soda Lake Valley range from 945 feet amsl to 958 feet amsl based on available U.S. Geological Survey (USGS) data (USGS 2013). Soda Springs at Zzyzx is located at an elevation of 948 feet approximately 200 to 300 feet below the groundwater elevation in the Soda Mountain Valley. The conceptual model illustrated on cross section B–B′ is that the water table slopes steadily eastward from the upper reaches of the alluvial fans to the base of the valley. Groundwater is channeled through the relatively narrow buried valley outlet located near the northeast corner of the project area, flowing eastward toward the Soda Lake lowlands.

2.3 CROSS SECTION C–C’

Cross section C–C′ extends northeast to southwest down the longitudinal axis of the valley (Figure 3). From south to north, bedrock units represented in the valley include Tertiary volcanic rocks (rhyolite, andesite), Mesozoic granitic rocks, and Jurassic-Triassic metavolcanic rocks.

A surface water divide located approximately 1.5 miles north of TEM-11 separates water flowing to the northeast outlet from water flowing to the southeast outlet (Figure 2). It is likely that groundwater flow approximately mimics the surface water flow, flowing northward in the northern half of the valley, and southward in the southern half.

TEM data indicate that the saturated subsurface resistivity differs between the northern and southern portions of the valley, consistent with the interpretation of different groundwater flow directions in the two portions of the valley. Groundwater at TEM-02 has very low resistivity (i.e., 4 ohm-meters), indicating a high concentration of total dissolved solids (TDS). Groundwater in the southern portion of the valley exhibits higher resistivity values at TEM-09 (i.e., 15 ohm-meters), indicating high TDS concentrations but lower concentrations than at TEM-02.

3 MODEL REVISIONS

The existing three-dimensional MODFLOW (MacDonald and Harbaugh 1988) groundwater flow model (RMT 2011) was revised through consideration of comments by staff at NPS and BLM as well as updated water use estimates. Model revisions included the following:

- Reduction of recharge values for the high-end parameter set from 0.5 inches per year to 0.4 inches per year (10 percent of rainfall, which averages 4 inches per year), and accompanying reduction of hydraulic conductivity (K) from 4.0 to 3.2 feet/day (ft/d) for the majority of the site (see Table 1). Equivalent reductions were made in the focused recharge at the boundary nodes, simulating mountain front runoff. The rationale for the selected recharge values is presented in Section 5.1.
- Revision of recharge value for the low-end parameter set from 0.125 inches per year to 0.12 inches per year (3 percent of rainfall), and accompanying reduction of K from 1.0 ft/d to 0.86 ft/d for majority of site (Table 1). Equivalent reductions were made in the focused recharge at the boundary nodes, simulating mountain front runoff.
- Increase in estimated groundwater extraction rates during a 3-year period of construction from 61 to 192 AFY.
- Increase in estimated groundwater extraction rates during operation from 7 to 33 AFY to allow for water use in dust control mitigation during operation of the project.
- Extraction from a single well in the southern portion of the site.
- Extraction from three wells located at select locations across the site.
- Refinement of grid spacing in the vicinity of well locations for greater accuracy.

Table 1: Revised Model Parameters

Aquifer Parameters			
Parameter Set Name	*Hydraulic Conductivity (K) (ft/d)*	*Groundwater Recharge (R) (inches/year) [AFY]*	*Storage Coefficient (unitless)*
High End	3.2	0.4 in/yr [1,330 AFY]	0.1
Low End	0.86	0.12 in/yr [376 AFY]	0.1
Note: Values given are for main body of model domain. Nodes at the model boundaries have higher R values. Nodes near the northeast and southeast outlets have higher K values.			

4 MODEL RESULTS

4.1 CALIBRATION

The revised model grid and model domain are shown in Figure 4. Figure 5 presents the steady-state hydraulic head distribution for the calibrated model for the revised high-end set of hydraulic conductivity (K) and recharge (R), with values of 0.4 inches per year (total of 1,330 AFY) for recharge. Figure 6 portrays the head distribution for the low-end set of K and R, with values of 0.12 inches recharge per year (total of 376 AFY). The steady-state head distributions are virtually identical for the high-end and low-end model runs. Table 2 shows the results of the calibration, comparing model results to heads estimated from TEM results.

For the high-end parameter set (10 percent recharge), predicted head values at TEM-02 were 1,233 feet amsl, nearly matching the 1,232 value estimated based on TEM results. The predicted head value for TEM-09 in the model (1,157 feet amsl) was well within the range of uncertainty for the estimated value based on TEM results (1,170 ± 30 feet amsl).

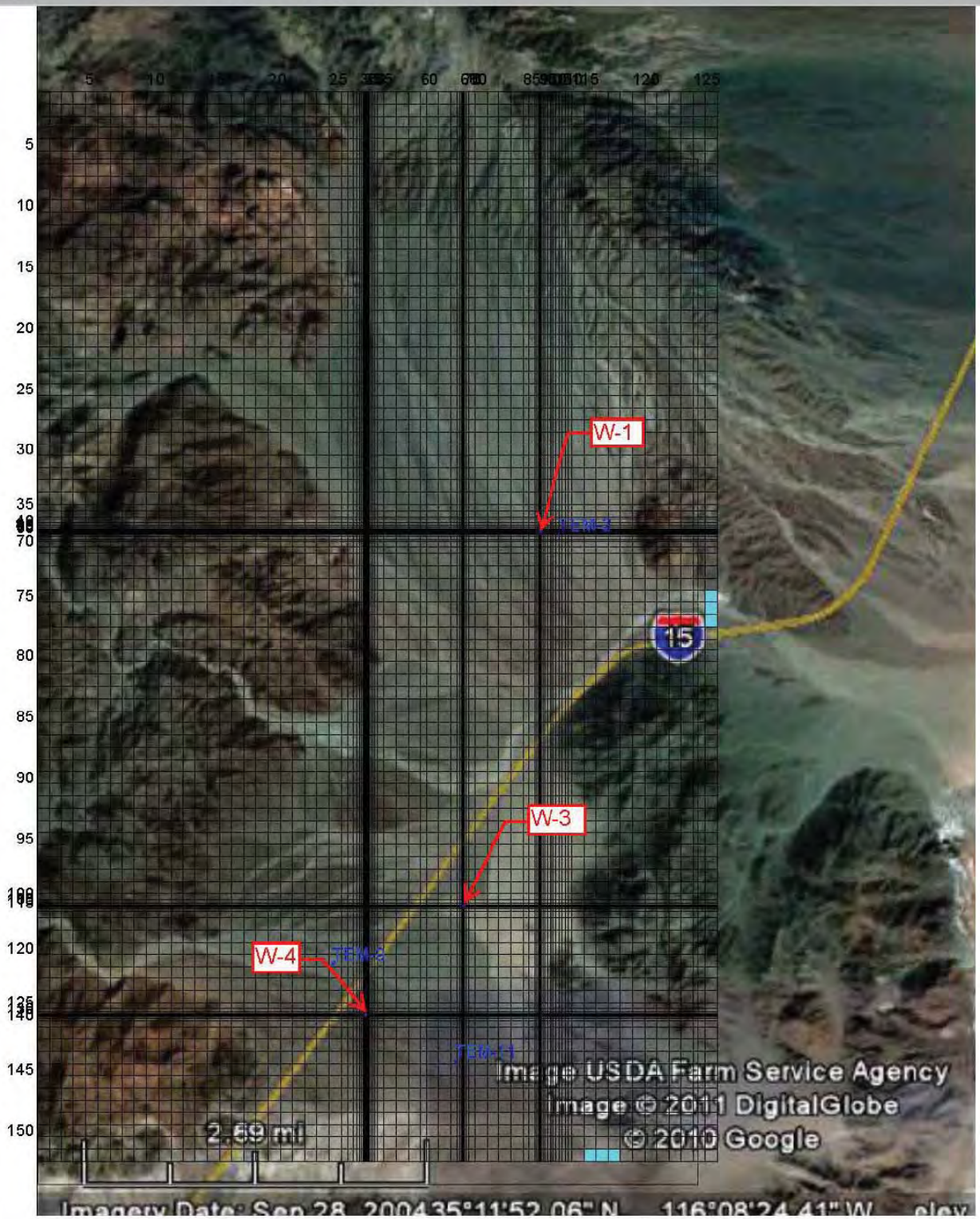
For the low-end parameter set (3 percent recharge), predicted head values at TEM-02 were 1,235 feet amsl, nearly matching the 1,232 value estimated based on TEM results. The predicted head value for TEM-09 in the model (1,157 feet amsl) was well within the range of uncertainty for the estimated value based on TEM results (1,170 ± 30 feet amsl).

Mass balance errors were low for the calibrated model, at 0.02 percent and 0.03 percent respectively for the high-end and low-end parameter sets. All water entering the model is derived from areal recharge. Outflow is through the northeast and southeast outlets, through general head boundary (GHB) nodes assigned to those locations. In general, the match of the model values to the two values interpreted from geophysical data is considered adequate for an area with such sparse hydrogeologic data.

Table 2: Predicted Hydraulic Heads Versus "Measured" Heads from TEM Results

	High-End Parameter Set		Low-End Parameter Set	
Measurement Location	*Predicted Head (feet amsl)*	*Measured Head (feet amsl)*	*Predicted Head (feet amsl)*	*Measured Head (feet amsl)*
TEM-02	1,233	1,232±13	1,235	1,232±13
TEM-09	1,157	1,170±30	1,164	1,170±30
Note: Measured head values were estimated based on TEM survey results from Terra Physics (2010).				

Figure 4: Model Grid and Model Domain[1]



[1] Blue nodes represent general-head boundary conditions where groundwater is allowed to flow out of the model domain.

Figure 5: Steady State Calibration, High-End Parameters

Figure 6: Steady State Calibration, Low-End Parameters

4.2 EFFECTS OF PROPOSED GROUNDWATER EXTRACTION - PREDICTIVE SIMULATIONS

4.2.1 Pumping Rates Needed for Construction and Operation

Water needs for construction were revised from earlier estimates and are now estimated to be approximately 192 AFY for two to three years (Soda Mountain Solar 2013). Water needs for operation and maintenance (i.e., for PV panel cleaning, potable water use, and dust control during operation) are estimated to be approximately 33 AFY (Soda Mountain Solar 2013).

Water supply wells were simulated as operating under the conditions expected during construction and operation. Specifically, one and three wells were simulated to be pumping continuously at a combined rate of 192 AFY to accommodate the proposed water use of 200,000 gallons per day, 6 days per week (average continuous withdrawal of 171,000 gallons/day, or 22,913 ft^3/day) for a period of three years, the upper estimate of construction duration. Subsequently, one and three wells were simulated with combined extraction of 33 AFY for an additional 27 years (total simulation time of 30 years, the anticipated life of the project).

4.2.2 Selected Location of Water Supply Wells

Three potential locations for groundwater extraction wells have been selected, based on existing hydrogeologic data from TEM locations and borings and based on proximity to project operational facilities. The three locations are shown on Figure 1 and are named W-1, W-3, and W-4. W-4 was selected as the optimal location for simulation of a single water supply well; however, it is likely that two to three wells will be constructed to provide backup water supply and allow for well maintenance. Simulations were conducted for single well and three-well scenarios to evaluate the feasibility of obtaining sufficient water with acceptable drawdown under these scenarios.

4.2.3 Results of Simulated Groundwater Withdrawals

Three Wells, High-End Parameter Set (10 Percent Recharge)

Figure 7 shows the resulting drawdown and radius of influence predicted around a water supply well after three years of pumping at three wells, with a combined total of 171,000 gallons per day, or 192 AFY (representing the construction phase), for the high-end parameter set (10 percent recharge). The results of the model run (SM237transient) indicate a predicted maximum drawdown of about 28 feet, 20 feet, and 25 feet in the nodes representing Wells 1, 3, and 4 respectively after three years of pumping at 171,000 gallons per day (Table 3). Extraction rates would lower to 33 AFY during operation, and the cones of depression become much less steep but slightly wider in extent (Figure 8). The maximum drawdown would be approximately 1 foot at the closest bedrock interface east of the wells. The model results also indicate groundwater flow through the northeast outlet would be diminished by only one percent (from 424.8 AFY to 420.2 AFY, as shown in Table 4). This reduced flow through the northeast outlet would occur primarily during project operations.

Figure 7: Three Wells, 3 Years, High-end Parameters

Figure 8: Three Wells, 30 Years, High-End Parameters

Table 3: Summary of Results at Each Well Point			
Scenario	**Well 1 Drawdown (ft)**	**Well 3 Drawdown (ft)**	**Well 4 Drawdown (ft)**
3 Wells, 3 Years, High End	28	20	25
3 Wells, 30 Years, High End	5	4	5
3 Wells, 3 Years, Low End	110	68	91
3 Wells, 30 Years, Low End	16	12	15
1 Well, 3 years, High End	N/A	N/A	80
1 Well, 30 Years, High End	N/A	N/A	13
1 Well, 3 Years, Low End	N/A	N/A	Dry
1 Well, 30 Years, Low End	N/A	N/A	Not Modeled
Note: Model predicts declines in hydraulic head and does not account for well loss (head losses due to friction flowing through the well screen). Actual drawdown in the well is expected to be greater due to well loss.			

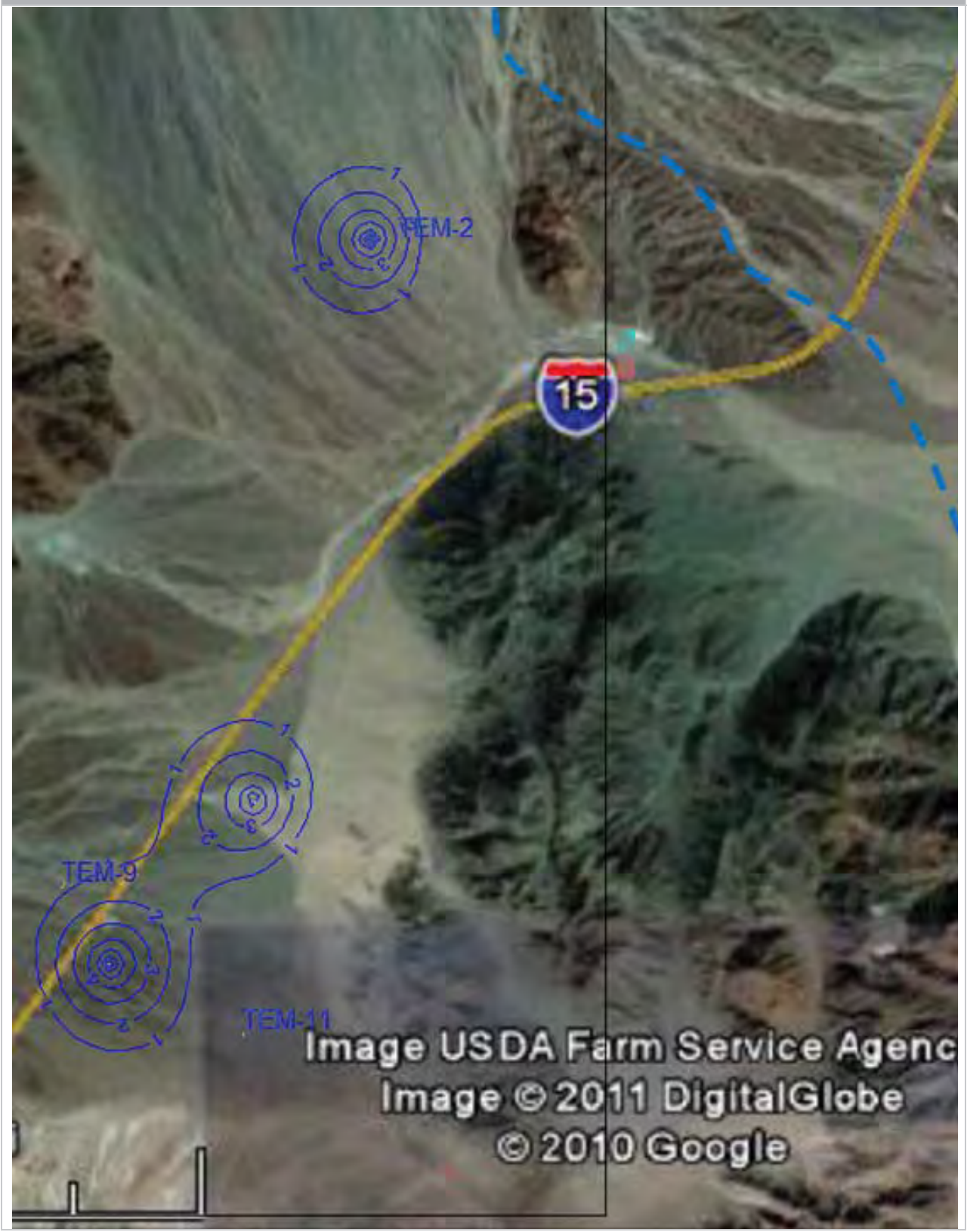
Table 4: Groundwater Discharge at Northeast Outlet of Soda Mountain Valley				
Model Scenario	**Discharge (AFY), After 3 Years**	**Reduction (AFY)**	**Discharge (AFY), After 30 Years**	**Reduction (AFY)**
High Recharge, Existing Conditions	**424.8**	**N/A**	**424.8**	**N/A**
High Recharge, 3 wells	422.2	2.6	420.2	4.6
High Recharge, 1 well	424.8	ND	424.3	0.5
Low Recharge, Current Conditions	**121.2**	**N/A**	**121.2**	**N/A**
Low Recharge, 3 wells	121.2	ND	118.9	2.3
Notes: ND = Not detectable. No change from existing conditions was measured by the model				

Three Wells, Low-End Parameter Set (3 Percent Recharge)

Figure 9 shows the drawdown predicted after three years of pumping at three wells, with a combined withdrawal of 192 AFY for the low-end parameter set (3 percent recharge). With low-end values of K and R, the predicted drawdown is much higher at the well point than with the high-end parameter set. The maximum predicted drawdown is approximately 110 feet, 68 feet, and 91 feet in the nodes for Wells 1, 3, and 4 respectively (Table 3). The model run (SM240transient2) indicates the maximum drawdown at the closest bedrock interface east of the wells would be less than 1 foot after 3 years of construction. The cones of depression would become much less steep and would not spread significantly during operation (Figure 10).

Figure 9: Three Wells, 3 Years, Low-End Parameters

Figure 10: Three Wells, 30 Years, Low-End Parameters



The maximum predicted drawdown is less than 1 foot at the closest bedrock interface to the east of the wells. The model also predicts that there would be an approximately 2 percent reduction in groundwater flow through the northeast outlet during operation (from 121.2 AFY to 118.9 AFY).

One Well, High-End Parameter Set (10 Percent Recharge)

Figure 11 shows the resulting drawdown predicted around a water supply well after three years of pumping at one well (W-4) of 192 AFY with the high-end parameter set (10 percent recharge). The results from the model run (SM250hiR-tr) indicate a predicted maximum drawdown of about 80 feet in the node representing Well 4 after three years of pumping at 171,000 gallons/day during the construction phase (Table 3). The cone of depression would become much less steep but somewhat wider in extent during operation (Figure 12). The results indicate the maximum drawdown at the closest bedrock interface east of the wells would be approximately 2.2 feet. The model also indicates groundwater flow through the northeast outlet would decrease by approximately 0.1 percent from 424.8 AFY to 424.3 AFY. This reduced flow through the northeast outlet would occur primarily during the period of operations.

One Well, Low-End Parameter Set (3 Percent Recharge)

The model results indicate that with the low-end parameter set, the node containing the well would go dry quickly once pumping begins. The results of the model run (SM260) indicate a single well would not be able to sustain the required extraction rate of 192 AFY during the construction phase. The 30-year, one-well scenario was therefore not modeled.

Figure 11: One Well, 3 Years, High-End Parameters

Figure 12: One Well, 30 Years, High-End Parameters

5 DISCUSSION

5.1 RECHARGE

NPS stated that recharge estimates used in the MODFLOW model "likely substantially overestimate the actual recharge rate for the project area." NPS further noted that "the Maxey-Eakin method, which is commonly used for estimating recharge in this arid region, would predict approximately zero recharge at such low an elevation".

The rationale for recharge values used in the original model, 0.125 inches per year to 0.5 inches per year, was discussed in detail in Section 3.2 of the Model Report (RMT 2011). Average annual precipitation was estimated to be 4 inches per year or more, based on data from PRISM Climate Group (2012) and Western Regional Climate Center (2013).

Other researchers have questioned the applicability of the Maxey-Eakin method to regions in California. Bredehoeft (2007) notes that, while the Maxey-Eakin method is still useful in Nevada, it has many uncertainties. Davisson and Rose (2013) point out that the Maxey-Eakin method was calibrated to a drier climate in Arizona rather than areas in southern California, similar to the study area, and thus could lead to underestimates of recharge in this area. A recharge rate of zero for the project area is unreasonable because a zero recharge rate in a basin this small would result in a dry basin with no groundwater. Geophysical evidence from this valley shows the presence of up to several hundred feet of saturated alluvium in the valley floor, which directly contradicts a recharge rate of zero (TerraPhysics 2010; Wilson 2011).

With relatively coarse-grained sediments overlying much of the valley floor (Wilson 2011; Diaz-Yourman and Associates 2010) and approximately 4 inches of rainfall per year in the valley and mountains (PRISM Climate Group 2012), it is estimated that 7.8 to 8.8 percent of the precipitation in the mountains becomes mountain front recharge (Panorama Environmental 2012). This estimate is comparable to the value of approximately 10 percent of runoff becoming recharge in the Mojave Desert (Izbicki 2002). Recharge rates presented in the project well permit application were estimated to be approximately 641 to 723 acre-feet per year (AFY), with much of it derived from mountain front runoff (Panorama Environmental 2012).

BLM staff suggested recharge rates ranging from 3 percent to 10 percent of precipitation (0.12 to 0.4 inches recharge per year) should be used in the revised model based on their experience elsewhere in arid and semi-arid regions of southern California. These estimates of recharge are slightly lower than the previous estimates of 0.125 to 0.5 inch used in the Model Report (RMT 2011). The low-end (3 percent) and high-end (10 percent) recharge rates used in the model provide a total input of 376 to 1,330 AFY of recharge (corresponding to 0.12 to 0.4 inches of recharge per year).

5.2 MODEL BOUNDARIES CONSIDER OUTFLOW TO EAST

NPS commented that the model "does not account for the possibility of permeable bedrock".

The model boundaries were defined using geologic data and geophysical information. The Soda Mountain Valley is surrounded by low-permeability granitic and volcanic rock. The model covers the alluvium within the valley. The low permeability rocks define the model boundaries. The cross sections in the Model Report have been updated with geologic information from existing published geologic maps (Figure 3). The geologic cross sections illustrate the nature and extent of bedrock that forms the mountains in the area, and verifies that carbonate rocks, which might have solution openings and be more permeable than the typical bedrock, are not pervasive in the area. The model domain reflects the geologic conditions in the area by assuming no flow through the granitic and volcanic rock to the east and flow through an outlet to the east and an outlet to the south where alluvium is present.

Observed conditions at the site and in the regional groundwater system support the presence of low permeability through fractured bedrock in the Soda Mountain. The water table in the valley is situated approximately 200 to 300 feet above the surface of Soda Lake and substantial fracturing and groundwater discharge through the mountains would have drained the Soda Mountain Valley groundwater basin. As discussed previously, geophysical evidence shows the presence of several hundred feet of saturated alluvium in the valley (Terra Physics 2010).

The existing model incorporated focused discharge through two outlets from the valley, the northeast and the southeast outlets, that allowed groundwater to flow from the model domain to the east. The model simulated groundwater discharge into Soda Lake through these two outlets. The model was therefore not surrounded entirely with impermeable boundaries.

5.3 POTENTIAL FOR IMPACTS TO SODA SPRINGS AT ZZYZX AND MOHAVE TUI CHUB

NPS commented that the model "neglects to account for potentially adverse impacts to the springs at Zzyzx that are habitat for the endangered Mohave tui chub" (*Siphateles bicolor* ssp. *Mohavensis*).

The U.S. Fish and Wildlife Service (USFWS) listed the tui chub as endangered in 1970. California Department of Fish and Wildlife (CDFW) lists the species as endangered and a fully protected species. The revised modeling presented in this addendum evaluated groundwater drawdown at two locations to assess potential impacts on Soda Springs at Zzyzx and associated tui chub habitat:

1. NPS's hypothesized preferential flow path (Figure 1)
2. The western edge of the Soda Mountains

5.3.1 Mohave Tui Chub Habitat Requirements

There are specific requirements for suitable Mohave tui chub habitat, including pool configuration, water temperature, water quality, and food sources. Pools should be at least 4

feet deep to resist cattails and to stabilize temperature and dissolved oxygen content. Aquatic plants are needed for attachment of eggs and to prevent anoxic conditions in the water. Vegetation (aquatic and riparian) also provides shade to protect the fish from extreme temperatures Temperature tolerance ranges from 37 to 97 degrees Fahrenheit (3 to 36 degrees Celsius). The tui chub cannot tolerate high salt content; therefore, there must be a flow of fresh water into the pool to counteract high evaporation rates in the desert. Insufficient water supply to existing populations is a threat to the viability of Mohave tui chub populations. Mohave tui chub feed on aquatic invertebrates (USFWS 2009).

5.3.2 Mohave Tui Chub Habitat Locations

The Mohave tui chub historically existed in the Mojave River. Today, there are only four known populations: China Lake, Soda Springs and Lake Tuendae at Zzyzx, CDFW's Camp Cady Wildlife Area, and the Deppe Pond. There is no suitable habitat for Mohave tui chub within the Soda Mountain Valley.

Lake Tuendae

Lake Tuendae is an approximately 1.5-acre man-made lake approximately 800 feet northwest of Soda Springs. Evapotranspiration rates at the Lake were measured by Barthel (2008) based on groundwater withdrawal to support the lake. The pumping rate to support the Lake and adjacent vegetation is 9.27 million gallons per year (28.5 AFY) (Barthel 2008). The Lake is located within an approximately 2 acre watershed and the rate of evapotranspiration was therefore estimated to be 14.25 feet per year over each acre (28.5 AFY/2 acres = 14.25 feet per year) (Barthel 2008). Lake Tuendae supports a population of 1,318 Mohave tui chub (Barthel 2008). This population was introduced to the Lake. The Lake is approximately 3.1 feet deep and the level is managed by the Desert Studies Center to ensure adequate water depth for the tui chub and Saratoga Springs pupfish (also introduced) (Barthel 2008). Lake Tuendae is a managed system and lake levels are maintained by pumping groundwater rather than natural groundwater discharge.

Soda Springs at Zzyzx

Soda Springs at Zzyzx is a natural spring that discharges into an oval shape pond which supports a population of 255 Mohave tui chub. The pond at the spring outlet is approximately 13 feet by 16 feet wide (0.005 acre) and supports vegetation within a 0.4-acre watershed (Barthel 2008). The depth of the spring is approximately 6.5 feet with a total volume of 8,300 gallons. The estimated evapotranspiration from Soda Springs at Zzyzx and the surrounding phreatophytic vegetation is approximately 5.7 AFY (0.4 acre x 14.25 feet per year = 5.7 AFY of evapotranspiration) with approximately 0.07 AFY of evaporation from the pond surface (0.005 acre x 14.25 feet per year = 0.07 AFY).

Observations by Barthel (2008) indicate the water level in the pond has been constant during a year of measurements, apparently unaffected by pumping in the alluvial aquifer production well located near the spring. This finding is consistent with results of the production well testing at up to 200 gallons per minute that indicate the alluvial aquifer is highly permeable and

transmissive, at approximately 400,000 gpd/ft^2 (Archbold 1994). This also suggests that there is ample flow of water in the permeable alluvial aquifer to sustain water levels in Soda Springs.

5.3.3 Groundwater Outflows

Groundwater outflows at Lake Tuendae, Soda Springs, and the Desert Studies Center are summarized in Table 5.

Table 5: Groundwater Use at Zzyzx

Location	Use	Amount (acre-feet per year)
Lake Tuendae	Evapotranspiration from approximately 2-acre watershed	28.5
Desert Studies Center	Pumped into pool and reservoir	4.0
Soda Springs at Zzyzx	Evapotranspiration from 0.4-acre watershed	5.7
Total		38.2
Note: Evapotranspiration rate is 14.25 feet per year		

Source: Barthel 2008

5.3.4 Source of Soda Springs at Zzyzx

Local Recharge

Research conducted at the Desert Studies Center indicates that Soda Springs at Zzyzx is recharged locally by water flow from alluvial fan deposits. Vargas (2012) showed that water from the spring was similar in stable isotopes and inorganic chemistry to water on the alluvial fan on the east side of the Soda Mountains. The determination was made after analysis of water quality samples from a well located approximately 500 feet west of the spring. The spring water differs substantially from shallow groundwater from the nearby playa of Soda Lake in isotope geochemistry and major ion chemistry. The spring thus does not appear to be recharged from groundwater from the playa area.

The water quality data indicate that the spring is sustained by water that originates locally on the eastern side of the Soda Mountains, infiltrating the alluvial fan sediments and flowing toward the spring under semi-confined conditions (Barthel 2008; Vargas 2012). It is likely that a broad area of alluvial fan sediments on the eastern edge of the Soda Mountains contributes recharge water to the spring flow, based on the age of the water (mostly pre-1950 based on tritium data [Vargas 2012]). The area of local recharge along the eastern face of the South Soda Mountains is approximately 2,600 acres. Assuming that 3 to 10 percent of rainfall becomes recharge, local recharge is in the range of 26 AFY to 86.7 AFY. The combined groundwater withdrawal at the Desert Studies Center, Lake Tuendae, and discharge at Soda Springs is approximately 38.2 AFY (Table 5). Local recharge is therefore sufficient to support all, or the majority of groundwater withdrawal and discharge at Soda Springs and Lake Tuendae.

Soda Mountain Valley Groundwater Outflow

Groundwater outflow through the northeast and southeast outlets of the Soda Mountain Valley is also thought to contribute additional recharge to the alluvial fans east of the Soda Mountains (Hughson 2013). This outflow from the valley may flow towards the Soda Lake Playa and evaporate off the playa, or it may combine with local recharge on the east side of the South Soda Mountains and flow towards Soda Springs. NPS hypothesizes that "one potential source of recharge for Soda Springs is the mountains west of the project site. One possible flow path for this recharge is through the location of the proposed pumping, along the northerly end of the Soda Mountains, and then along the westerly edge of Soda Dry Lake following the permeable beach and colluvial sediments at the playa margin". Discharge from the valley may follow permeable rocks along the fault line as a preferential flow path, shown in Figure 1 (Appendix A). Groundwater outflow from the eastern outlet of the Soda Mountain Valley is estimated in the groundwater flow model for existing (steady-state) conditions to be 121.2 AFY with low-end recharge and 424.8 AFY with high-end recharge. Assuming that this flow contributes to local recharge and flows to the spring, the total combined groundwater flow from the eastern side of the Soda Mountains and Soda Mountain Valley groundwater outflow that is available at the spring is 147.2 AFY to 511.5 AFY.

5.3.5 Potential Impacts to Soda Springs Groundwater Levels

Reduced Flow out of the Soda Mountain Valley

Model results indicate that under any scenario, the discharge of groundwater from the Soda Mountain Valley through the northeast outlet would be diminished only slightly by the Project. The maximum potential reduction in flow is modeled to be 4.6 AFY or less after 30 years of pumping three wells under high recharge, equivalent to about 2 percent or less of the current outflow[1]) as shown in Table 4, with a lower level of reduction of 2.6 AFY (0.6 percent reduction) or less during the three-year construction period for the Project. The groundwater discharge from the Soda Mountain Valley would continue to follow the current flowpath, including potential flow down the alluvial fans along the east side of the Soda Mountains.

A groundwater budget for Soda Springs and Lake Tuendae was prepared to estimate the impact of the reduced outflow from the Soda Mountain Valley on Soda Springs (refer to Table 6). It is assumed in the groundwater budget that the Soda Mountain Valley is a source of groundwater for Soda Springs and Lake Tuendae. The groundwater budget indicates there is more than adequate groundwater flow from local recharge and outflow from the Soda Mountain Valley under project conditions to support existing groundwater use at Soda Springs and Lake Tuendae. There is surplus groundwater flow in excess of 100 AFY that drains to the Soda Lake playa under all scenarios. This analysis is supported by aquifer test results at Zzyzx

[1] Discharge was determined as an output of the calibrated model and each model scenario.

that indicate there is ample flow of water in the permeable alluvial aquifer to sustain water levels in Soda Springs, as discussed previously. The minor reduction in outflow from the Soda Mountain Valley as a result of project groundwater use would therefore have no impact on groundwater flow at Soda Springs or groundwater withdrawal for Lake Tuendae.

Table 6: Groundwater Budget

Element	Low-End Recharge Scenario (AFY)	High-End Recharge Scenario (AFY)
Potential Inflows to Soda Springs and Lake Tuendae		
Local Recharge	26.0	86.7
Soda Mountain Outflow	121.2	424.8
Direct Precipitation on Soda Springs and Lake Tuendae	0.7*	0.7*
Subtotal Inflows	147.9	512.2
Outflows		
Groundwater Use at Zzyzx	38.2*	38.2*
Reduction in Groundwater Flow Due to Project Pumping	2.3	4.6
Subtotal Outflows	40.5	42.8
Surplus Groundwater Flow (Flows to Soda Lake)	107.4	469.4
*Source: Barthel 2008		

Potential Impacts from Groundwater Table Decline at Western Edge of South Soda Mountains

It is highly unlikely that the volcanic bedrock forming the Soda Mountains and sidewalls of the Soda Mountain Valley are permeable enough to allow for a significant outflow of groundwater from the valley. Groundwater levels in the valley are approximately 1232 feet amsl at TEM-02, and 1170 feet amsl at TEM-09, and thus are over 200 feet higher than groundwater levels near Soda Springs (Barthel 2008; Vargas 2012). If there were substantial discharge through the bedrock, elevated groundwater levels could not be maintained in the valley over 200 feet higher than the water level near Soda Springs adjacent to the Soda Lake playa; the Soda Mountain Valley groundwater basin would drain.

Groundwater modeling results presented here indicate that drawdown of water levels near the edge of the valley adjacent to the west flank of the south Soda Mountains would generally be less than 2 feet at any time during construction or operation. The small drawdown at the edge of the valley would attenuate to negligible levels over the 3 miles of bedrock separating the valley from the Soda Springs area at Zzyzx. In comparison, groundwater levels in monitoring

wells near Zzyzx fluctuate naturally by 1 to 2 feet with no effect on the level of Soda Springs (Barthel 2008).

5.3.6 Potential Impacts to Groundwater Quality

The withdrawal of groundwater for the project would not affect groundwater quality in the Soda Mountain Valley or at Zzyzx. Groundwater use would have a minor impact on groundwater levels in the Soda Mountain Valley (as discussed previously) and would not introduce contaminants to the groundwater system or change the chemistry of the groundwater. Construction and operation of the project would involve the use of hazardous materials that could potentially impact water quality (e.g., diesel fuel, solvents, etc.). These hazardous materials would be contained and managed in accordance with State regulations to prevent spills.

6 CONCLUSIONS

6.1 WATER AVAILABILITY AND NUMBER OF WELLS

The groundwater pumping simulations show that that there is adequate groundwater in the Soda Mountain Valley to support construction and operation of the solar project without adversely affecting nearby wells or sensitive resources. The model scenarios included scenarios with use of one well and scenarios with use of three water supply wells; however, current plans are to have two or three extraction wells to provide adequate water supply and a backup well for reliability. The results of the single-well scenario indicate that a single well could support construction water demand with high-end recharge but would be inadequate under a low-end recharge and low-end hydraulic conductivity scenario. The simulations show that three wells would supply an adequate amount of water for construction under all scenarios. It is recommended that an aquifer test be completed after construction of the first well to assess hydraulic properties of the aquifer. If the hydraulic properties are towards the lower end of the modeled range, three wells should be constructed for project water supply. If the hydraulic properties are towards the upper end of the modeled range, only two wells would be needed for the project.

6.2 EFFECTS OF GROUNDWATER PUMPING

The proposed use of water for construction and operation of the project is within the safe yield of the Soda Mountain Valley (Panorama 2013). The low-end recharge rate of 376 AFY would exceed annual project water demand of 192 AFY for the 3 years of construction. The operation pumping of 33 AFY is also within the safe yield with the low-end recharge rate. Groundwater pumping simulations conducted using both the low-end and high-end recharge rates and hydraulic conductivity values indicate a decline in the groundwater table of less than 1 foot to approximately 2 feet at the nearest bedrock interface east of the wells after 3 years of construction and over the operational period of the project.

This groundwater level decline would attenuate over the 3 miles of bedrock between the project wells and Soda Springs and is expected to be negligible at Soda Springs. Moreover, model results indicate the outflow of groundwater from the Soda Mountain Valley northeast outlet would be reduced during construction and operation by 4.6 AFY or less due to groundwater use for the project. Groundwater outflow from the Soda Mountain Valley would return to pre-existing conditions after decommissioning of the project.

6.3 EFFECTS TO SODA SPRINGS AT ZZYZX

There are approximately 3 to 4 miles of bedrock separating the project groundwater wells from Soda Springs. A drawdown of 2.2 feet or less at the nearest bedrock interface is not expected to propagate to a distance of over 3 to 4 miles, particularly through the granitic and volcanic bedrock that comprises the South Soda Mountains. The presence of low permeability bedrock between Soda Springs and the project valley indicate that there would be no change in groundwater levels at Soda Springs as a result of 2.2 feet or less of drawdown at the bedrock interface on the west side of the South Soda Mountains. Modeling results presented in Section 4 indicate the reduction in groundwater flow out of the northeast outlet of the Soda Mountain Valley to a preferential flow path along the east face of the south Soda Mountains would be less than two percent of current outflow (reduction of approximately 4.6 AFY or less) under all model scenarios (Table 4). The analysis of local recharge presented in Section 5.1.3 showed that there is likely sufficient local recharge on the east side of the South Soda Mountains to support discharge at Soda Springs and current groundwater withdrawal at the Desert Studies Center. It is uncertain whether the outflow from the Soda Mountain Valley contributes to groundwater flow at Soda Springs or whether the source of groundwater for Soda Springs is entirely local recharge on the east side of the south Soda Mountains. The outflow from the Soda Mountain Valley may flow east towards the Soda Lake playa rather than south towards Soda Springs at Zzyzx.

Approximately 5.7 AFY of groundwater inflow are needed to balance the evapotranspiration rate in Soda Springs, and 32.5 AFY of groundwater pumping to support Lake Tuendae and groundwater use at the Desert Studies Center Barthel (2008). Assuming that outflow from the Soda Mountain Valley contributes to groundwater flow at Zzyzx, there is a surplus of over 100 AFY of groundwater needed to support current groundwater use at Zzyzx under all model scenarios (Table 6). The potential impact from the project groundwater pumping on Soda Springs would therefore not be measurable or discernible from baseline water level in the Springs.

Pumping of groundwater into Lake Tuendae, located close to Soda Springs, has apparently had no significant effect on spring flow. Barthel (2008) reports that 32.5 AFY of groundwater was pumped from a well in the alluvial aquifer during a 1-year period. During this period, there was no impact to the water level in Soda Springs, which is located approximately 800 feet from the well. This also indicates that the natural flow of groundwater to Soda Springs is robust (Barthel, 2008). The results of the revised groundwater modeling support the conclusion that potential impacts of groundwater extraction for the project on Soda Springs would be negligible.

7 RECOMMENDATIONS

The following measures were developed based on the results of groundwater modeling for the Soda Mountain Solar Project.

Groundwater 1: Soda Mountain Solar will construct a test well observation wells and a distance observation well within the project ROW prior to project construction. The distance observation well shall be located approximately 1,000 feet from the test well and within the alluvial aquifer underlying the project site. The exact location of the test and observation wells will be determined by a professional hydrogeologist or geologist. A test plan will be submitted to San Bernardino County and BLM a minimum of 14 days prior to performing the aquifer test. The aquifer test shall be conducted upon completion of the test and observation wells for a minimum of 72-hours, or as determined by the professional hydrogeologist or geologist. During the aquifer test, groundwater shall be discharged from the test well at a rate of approximately 200gpm (equivalent to maximum project demand of 300,000 gpd). The necessary permit(s) shall be obtained from the Regional Water Quality Control Board prior to the discharge of groundwater.

Groundwater 2: The aquifer test data shall be analyzed by a professional hydrogeologist or geologist. The professional hydrogeologist or geologist will determine the number of project water supply wells required for the project by calculating the estimated drawdown in two wells using the actual aquifer parameters from the 72-hour aquifer test (see Groundwater 1, above) and the maximum pumping rate of approximately 300,000 gpd for a period of 3 years. If one or more of the wells are expected to run dry at the maximum pumping rate, a third well will be required for the project.

Groundwater 3: A water quality sample will be collected from the test well and analyzed for total dissolved solids (TDS) by a State of California certified laboratory. The results will be evaluated by the project engineer to determine the need for a reverse osmosis facility to treat the water for panel washing.

Groundwater 4: The groundwater model will be recalibrated using the measured aquifer properties resulting from the 72-hour aquifer test (see Groundwater 1, above). If the results of the recalibrated model indicate that reduction in outflow from the valley would be less than 50 AFY under proposed project conditions, then no further action will be taken. If the recalibrated model predicts reduced outflow from the northeast outlet of the Valley in excess of 50 AFY, Groundwater 5 will be implemented.

Groundwater 5: The Applicant will hire a professional hydrogeologist or geologist to develop a groundwater monitoring plan for submittal to and acceptance of BLM and San Bernardino County if the recalibrated model predicts reduced outflow from the northeast outlet of the

Valley in excess of 50 AFY, as described in Groundwater 4. The groundwater monitoring plan would include monitoring and quarterly reporting of groundwater levels within the Soda Mountain Valley, in the alluvial aquifer adjacent to Soda Springs at Zzyzx, and at Soda Springs at Zzyzx during construction of the project. If the project is shown to cause a decline in groundwater levels is 5 feet or more in the alluvial aquifer near Soda Springs or there is a decrease in groundwater discharge at Soda Springs that threatens the tui chub as a result of project groundwater withdrawal, an evaluation would be conducted to determine if the project is causing reduced groundwater discharge at Soda Springs. If it is determined that the project has caused a decrease in the volume of groundwater discharged at Soda Springs then the project shall curtail or, if necessary, cease withdrawal of groundwater and import a corresponding amount of water from outside of the Soda Mountain Valley.

Groundwater level measurements in the monitoring wells located in the Soda Mountain Valley would be compared to the model predictions on an annual basis during construction and every 5 years during project operation. The groundwater model would be recalibrated if the measured drawdown values in the monitoring wells exceed the predicted values by more than 15 percent. Monitoring would cease after 5 years of operational monitoring if two conditions are met:

- The monitoring data support the model predictions.
- The model predicts the reduction in outflow from the northeast outlet will be less than 50 AFY under proposed project conditions, as detailed in Groundwater 4.

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Appendix A

United States Department of the Interior

NATIONAL PARK SERVICE
Mojave National Preserve
2701 Barstow Road
Barstow, California 92311

RECEIVED
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CALIF. DESERT DISTRICT
MORENO VALLEY, CA

In Reply Refer To:
1.B. Temporary (long-term) (Formerly L3215) (MOJA)

November 21, 2012

Mr. Matthew Slowik
Senior Planner
San Bernardino County
Land Use Services Dept., Planning Division
385 N. Arrowhead Avenue, First Floor
San Bernardino, CA 92415-0182

Mr. Jeffrey Childers
Project Manager
Bureau of Land Management
California Desert District Office
22835 Calle San Juan de Los Lagos
Moreno Valley, CA 92553

Dear Mr. Slowik:

Dear Mr. Childers:

The National Park Service (NPS) appreciates the opportunity to comment on the Notice of Intent/Preparation (NOI/NOP) of the Draft Environmental Impact Statement/Environmental Impact Report (EIS/EIR) for the Soda Mountain Solar Project (project). NPS supports renewable energy projects on public lands as long as such projects can be constructed and operated in an environmentally responsible manner that serves the public interest, protects natural resources, and protects our treasured landscapes. It is the role of NPS to contribute to the process and the analysis of renewable energy projects to help ensure that they meet the Secretary's goal that such projects on public lands are "Smart from the Start." Our goal is to provide expertise and practical and specific feedback in order to avoid significant adverse impacts to the resources of Mojave National Preserve (Preserve).

NPS has reviewed the project description, location, and potential environmental effects as described in your NOI/NOP dated October 23, 2012, and October 26, 2012. Our comments are as follows:

NPS has significant concerns related to potential project impacts to two federally listed endangered species, one California species of special concern, loss of wildlife connectivity and potential habitat de-fragmentation, viewshed degradation, air quality, storm water management, and hydrogeology and groundwater. The proximity of the proposed Soda Mountain Solar Project to the Preserve is less than one mile. Direct and indirect impacts associated with the project have potential to impact park resources significantly that have been mandated by Congress in the Organic Act of 1916 and the California Desert Protection Act of 1994 (PL 103-433 §2) to be protected by the Preserve.

Hydrogeology and Groundwater

During construction, the project proponent intends to pump approximately 60 acre-feet per year followed by approximately 6 acre-feet per year for operations during the life of the project. The

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Hydrogeologic Conditions and Groundwater Modeling Report (RMT Inc. 2011) submitted by the project proponent inadequately addresses potential impacts to the springs at Zzyzx that are habitat for the endangered Mohave tui chub. The report supports the proposal to pump groundwater from the alluvial sediments underlying the project site and lacks subsurface data from boreholes on groundwater levels or geologic formation properties. It assumes an overly high recharge rate for this low-elevation area, incorporates unsupported assumptions in the model, does not account for the possibility of permeable bedrock, and neglects to account for potentially adverse impacts to the springs at Zzyxz that are habitat for the endangered Mohave tui chub.

The groundwater flow model employed a distributed recharge rate ranging between 0.125 and 0.5 inches per year (3.5% - 14% of direct precipitation) and a recharge rate 26 times greater at the boundary nodes on the assumption that mountainous areas act as precipitation collectors and funnel precipitation directly into the subsurface. Based on these assumptions, total recharge was calculated at a range of 343 to 1,373 acre-feet per year (af/y) over an area of 33,000 acres. These assumptions likely substantially overestimate the actual recharge rate for the project area. For example, the Maxey-Eakin method commonly used for estimating recharge in this arid region, would predict about zero recharge at this low an elevation. Recharge efficiency (percent of total precipitation that enters the subsurface as aquifer recharge) for total annual precipitation in the range of 10 cm/year that occurs in the project area is likely less than 3% and probably closer to zero (Dettinger 1989). Other groundwater studies in the eastern Mojave Desert (e.g. Izbicki et al. 1995) show groundwater with carbon-14 dates in the range of 20,000 years before present; this indicates very low to no modern recharge. The model used to estimate impacts from groundwater pumping for this project (RMT Inc. 2011), however, simply assumed a recharge rate and used it to calibrate the parameters of a flow model with no actual measured formation properties for comparison or analyses of recharge using accepted methodologies. The baseline model assumes impermeable, no-flow boundaries in the Soda Mountains and underlying bedrock. The only subsurface data presented in the report, however, comes from an existing well in fractured bedrock, which does not support the assumption of impermeable bedrock. This well near Rasor was drilled to 760 feet and produces up to 1,500 gallons per day (RMT Inc. 2011).

The Soda Springs at Zzyzx lie less than one mile from the Soda Mountain Solar project site and include MC Spring, which is habitat for the source population of the endangered Mohave tui chub (*Siphateles mohavensis bicolor*). The Mohave tui chub is listed as endangered under both the federal Endangered Species Act and the California Endangered Species Act. The no-flow boundary assumptions used in the model preclude analyses of potential effects of groundwater pumping on this spring-fed habitat. For example, one possible source of recharge for Soda Springs is the mountains west of the project site. One possible flow path for this recharge is through the location of the proposed pumping, along the northerly end of the Soda Mountains, and then along the westerly edge of Soda Dry Lake following the permeable beach and colluvial sediments at the playa margin. Pumping at the proposed project location might extract groundwater that would otherwise discharge from the springs. Estimates of groundwater discharge at Zzyzx are in the range of 50 af/y (Barthel 2008), less than the amount proposed to be pumped by the project during the construction phase. The groundwater modeling report does not address this potential flow path, and data used to support the model are limited to surface electrical resistivity surveys. The groundwater modeling and analyses need to be based on actual

field data, including recharge estimates obtained by accepted methods (e.g. chloride mass balance) and subsurface data from boreholes on groundwater levels and aquifer formation properties. Project analysis should consider alternatives to the water use described in the project proposal. The proponent should consider alternatives to groundwater pumping, such as use of dust palliatives, panel cleaning by air blowing, dust cloths, or other means.

For each facility site with a drainage system crossing it, the proponent should include a map identifying all surface water resources within the vicinity and include a narrative discussion of the delineation methods used to discern those surface waters in the field and what modifications would occur from project implementation. Specific information regarding the potential impacts to surface waters should be addressed, including both permanent and temporary impacts. Alternatives and mitigation measures to reduce and/or eliminate such impacts should be addressed. If impacts are unavoidable, then impacts need to be minimized, with the project designed such that it would maintain existing hydrologic features and patterns. All unavoidable impacts should be mitigated to ensure no net loss of function and value as the result of project implementation.

Storm water management needs to be considered as a significant component in the project design and implementation. In particular, storm water runoff collects into channels and natural drainage systems. Without adequate design, the consequences of combining these flows will likely be aggradation and head-cutting upstream of the confluence and channel incision, increased sediment transport, and eventual widening downstream of the confluence. The proponent needs to evaluate all potential storm water impacts, describe controls needed during construction, mitigation necessary for potential post-construction hydrologic impacts, and describe specific best-management practices that, when implemented, would reduce those potential impacts to insignificant levels. Where feasible, consideration should be given to design alternatives that maintain the existing hydrology of the site and/or redirect excess flows created by hardscapes and reduced permeability from surface waters to areas where they will dissipate by percolation into the landscape. All potential impacts associated with changes in drainage patterns, changes in water volume, velocity, quantity, quality, soil erosion and sedimentation in streams and water courses on or near the project site need to be modeled and analyzed. Mitigation measures to alleviate such impacts shall be included in the project proposal and environmental documents. The practice of channelizing, straightening, and lining streambeds would change a stream's hydrology by decreasing water storage capacity and increasing water flow velocity, and this, in turn, would lead to increases in the severity of peak discharges. These hydrologic changes can exacerbate flooding, erosion, scouring, and sedimentation, and could lead to loss of natural functions and values.

Biological Resources

The construction site for the proposed project includes desert tortoise habitat modeled by the U.S. Geological Survey to be high quality, in the range of 0.7 to 0.9 on a scale of 0 to 1 (Nussear et al. 2009). Recent population collapses, perhaps due to disease and/or drought (Tracy et al. 2004), make location of cryptic desert tortoises (*Gopherus agassizii*) even more difficult. Thus, absence of live tortoise observations during relatively brief field surveys, as reported by the project proponent, should not be used as justification for destruction of otherwise high-quality

habitat as this would preclude the possibility for recovery of tortoise populations in the area and reoccupation of habitat.

The Soda Mountains are habitat for a recently established herd of desert bighorn sheep (*Ovis canadensis nelsoni*). This herd established itself at the Soda Mountains without human intervention with the source population unknown. Even in the absence of an active sheep population, however, the Soda Mountains are a high priority for desert bighorn sheep conservation (John Wehausen, personal communication, 2012) due to the presence of a number of significant bridges under Interstate 15 that serve as rare and important opportunities for gene flow between the northern and north-central bighorn sheep metapopulation segments (Epps et al. 2007). Construction of the proposed solar energy project would preclude desert bighorn sheep gene flow to the north under Interstate 15 as well as to the south with the population in the Cady Mountains. Further fragmentation of the habitat is likely to irreversibly harm the viability of species metapopulations. High mountain habitat is no longer adequate to support permanent populations of sheep (Bleich et al. 2005). All areas used by sheep, including the lower elevation habitat connecting mountain ranges, are essential for the long-term survival of the species.

The Soda Mountain Solar project might also impact other wildlife, including raptors, song birds, and bats. A two-year or longer inventory, depending on environmental conditions, utilizing accepted protocols is needed to identify all potentially impacted species. Modeling techniques should be used to estimate flight patterns and periods of use of birds and bats and to identify potential impacts and potential mitigations. The project should identify significant direct and indirect loss of plant and wildlife habitat from all aspects of the project, including installing towers, constructing, improving, or re-routing roads, burying lines, and constructing ancillary facilities. This analysis needs to identify impacts to all species during each season. Species should include locally unique species, rare natural communities, wetlands, threatened and endangered species, California threatened, endangered, and species of special concern. The inventory needs to list all species present in the project area and include a distribution map with potential migratory and dispersal routes. It should demonstrate how the project will affect wildlife and plant distributions under each alternative. The analysis needs to address the potential loss of wildlife connectivity, include impacts from non-native and invasive plants, and address the association of invasive plants with disturbance, including the cumulative effects of the Rasor Off-Highway Vehicle Area and other disturbed areas.

The project proponent needs to develop a salvage plan for any special-status plants or species associated with habitat loss in the project area. Plant salvage needs to address, at a minimum, location of the mitigation site, plant species, schematic of the mitigation area, schedule, exotic vegetation control, planned monitoring, and plans for long-term conservation of the mitigation site.

Physical Resources

Mojave National Preserve is renowned for its dark night skies. NPS manages the Preserve to protect this valued and increasingly rare resource. The General Management Plan for the Preserve identifies as a resource protection goal "to partner with communities and local government agencies to minimize reflected light and artificial light intrusion on the dark night

sky". All exterior lighting should comply with International Dark-Skies standards and should be hooded to prevent light from shining up into the sky and shielded and directed to aim it at the places where it is needed to prevent light from spilling off the site. Low-pressure sodium lamps and fixtures of a non-glare type are required.

Potential impacts to all visual and natural sound need to be evaluated and analyzed. The scenic vistas associated with Mojave National Preserve are considered unique, as described in the California Desert Protection Act of 1994 (PL 103-433 §2). An assessment of visual impacts must include analyses of scenic vistas from specific key observation points, both towards the Preserve and from the Preserve towards the project site. In order to protect the natural soundscapes of Mojave National Preserve, analyses are needed of noises created during both the construction and operation phases of the project, including timing, intensity, duration, frequency spectrum, and impacts to both people and wildlife. Soundscape assessment needs to address the number of vehicle trips per day for delivering personnel, equipment, and supplies to the project during both construction and operational phases of the project. Construction and operation traffic could affect wildlife, soundscapes, and air quality. A traffic study needs to address project impacts to the roads and surrounding environment and to address mitigation measures needed to reduce the impacts. Such analysis should be consistent with the California Department of Transportation's Guide for the Preparation of Traffic Impact Studies.

An analysis of ambient air quality according to the National Ambient Air Quality Standards is needed, including potential air quality impacts of the proposed project (cumulative and indirect impacts). The analysis needs to identify all potential impacts from temporary or cumulative degradation of air quality. It should describe and estimate air emissions from potential construction and maintenance activities and propose avoidance or minimization measures. Emission sources should be identified by pollutant from mobile sources, stationary sources, and ground disturbance. The environmental analyses should include a Construction Emissions Mitigation Plan that addresses degradation of air quality and wilderness values.

A Fugitive Dust Control Plan should be prepared. Dust is the primary source of PM-10 (Particulate Matter 10 microns or smaller) pollution in the Mojave Desert. The environmental analyses needs to model the sources of dust that presently occur from the project area, then show their timing, duration, and transport on- and off-site. Modeling should also identify variations during construction and operational phases of the project for each alternative. Human health and the environment of sensitive receptors should be protected during any construction or demolition activities. If necessary, a health risk assessment should be conducted to determine if there are, have been, or will be, any releases of hazardous materials that might pose a risk to human health or the environment.

Cumulative Impacts

Direct and indirect cumulative impacts need to be analyzed as they apply to both the project site and the greater vicinity. Plans for past, present, and anticipated future projects should all be analyzed relative to their impacts to Mojave National Preserve.

The Soda Mountain Solar project has potential for causing significant impacts to Mojave National Preserve. Potential impacts include decreased spring discharge at Zzyzx as a consequence of groundwater pumping, loss of habitat for the endangered Mohave tui chub, loss of high-quality desert tortoise habitat, increased habitat fragmentation for desert bighorn sheep, and loss of important conservation opportunities. In addition, there are potential impacts from the project to air quality, storm water management, and scenic vistas. We believe that the environmental analysis of these potential impacts has been inadequately addressed in the documents provided by the project proponent.

If you have any questions, feel free to contact Mr. Ted Weasma at (760) 252-6106 or at ted_weasma@nps.gov.

Sincerely,

Stephanie R. Dubois

Stephanie R. Dubois
Superintendent

cc:
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APPENDIX B

GROUNDWATER WELL PERMIT APPLICATION

Groundwater Well Permit Application for the Soda Mountain Solar Project

September 2012

Groundwater Well Permit Application

Soda Mountain Solar Project, San Bernardino County, California

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Appendix A Hydrogeologic Conditions and Groundwater Modeling Report
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1 INTRODUCTION

1.1 PURPOSE

1.1.1 Proposed Project

This groundwater well permit application is submitted for the proposed Soda Mountain Solar Project (Project). The Project consists of a 350-megawatt photovoltaic (PV) solar generating facility located within an approximately 4,500-acre right-of-way (ROW) to be obtained from the U.S. Bureau of Land Management (BLM). One or more groundwater supply wells are proposed to supply water for the Project. Groundwater will be used during Project construction for dust control and soil compaction. Groundwater will be used during Project operation for PV panel washing, fire protection, and, potentially, as a source of potable water for the operations and maintenance building. The proposed project would use up to three wells depending on project needs. Six potential well locations are included in this application to provide flexibility depending on hydrogeologic characteristics encountered in the field.

1.1.2 San Bernardino County Groundwater Ordinance

The application has been prepared in accordance with the requirements for a groundwater well permit provided in §33.06554 of the San Bernardino County Code of Ordinances. The County Code of Ordinances requires that a permit be obtained prior to constructing or operating a new groundwater well within the desert region of San Bernardino County. Although the proposed groundwater wells would be located on federal lands, they are subject to San Bernardino County jurisdiction pursuant to a December 2, 2003, inter-agency Memorandum of Understanding between the County and BLM for implementation of the Desert Groundwater Management Ordinance on public lands within the eastern Mojave Desert. This permit is a discretionary permit under the California Environmental Quality Act (CEQA). References to specific requirements for well permit applications within §33.06554 of the County Code of Ordinances are provided throughout the application, as appropriate. Table 1 provides a readers guide to this permit application.

Table 1: Guide to Permit Application	
Permit Requirement §33.06554 (b)	**Page Number**
(1) A plot plan depicting the location of the proposed well(s) on a section map depicting the location of the following items within 0.5 mile of the well(s): (A) property lines, location and ownership of all parcels and easements; (B) all intermittent, perennial, natural, or artificial bodies of water or watercourses; (C) notable nearby geographic features (faults, etc.); (D) all other wells; and (E) landfills, septic systems or other liquid or solid waste facilities	10
(2) Proposed well diameter, depth and completion interval (screen or perforation locations) for proposed well(s)	12
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(4) Anticipated groundwater safe yield of the affected groundwater aquifer	23
(5) Anticipated static and pumping levels	23
(6) Anticipated water quality	25
(7) The intended use of groundwater from the proposed well(s)	27
(8) The proposed months of operation of the proposed well(s) (year-round, irrigation months, etc.)	27
(9) The proposed pumping cycles (one eight-hour/day cycle, two six-hour/day cycles, etc.)	28
(10) Estimated annual pumpage from the proposed well(s) in acre-feet	29
(11) System description (irrigation, domestic, etc.)	29
(12) Anticipated return flows (deep percolation, runoff, etc.)	29
(13) The estimated rate of natural recharge to the affected groundwater aquifer(s) calculated in accordance with generally accepted scientific methodologies and as deemed appropriate by the enforcement agency	21
(14) A description of the affected groundwater aquifer(s) including estimated storage capacity and the overall quality of water within the aquifer	17-18
(15) Other information as may be reasonably necessary for the County to determine the potential effects of the proposed well operations on the groundwater safe yield and aquifer health of the affected aquifer	29
(16) Supporting documentation, where available, for all of the foregoing items	32; Appendix A; Appendix B

1.2 LOCATION

The Project is located approximately 6 miles southwest of Baker, San Bernardino County, California, along Interstate 15 (I-15). The site location and nearby terrain are presented on Figure 1. The north panel array area of the Project is accessible from Zzyzx Road from I-15. The south and east array areas are accessible from Rasor Road from I-15. Zzyzx Road and Rasor Road are connected to I-15 by freeway exits.

1.3 APPLICANT

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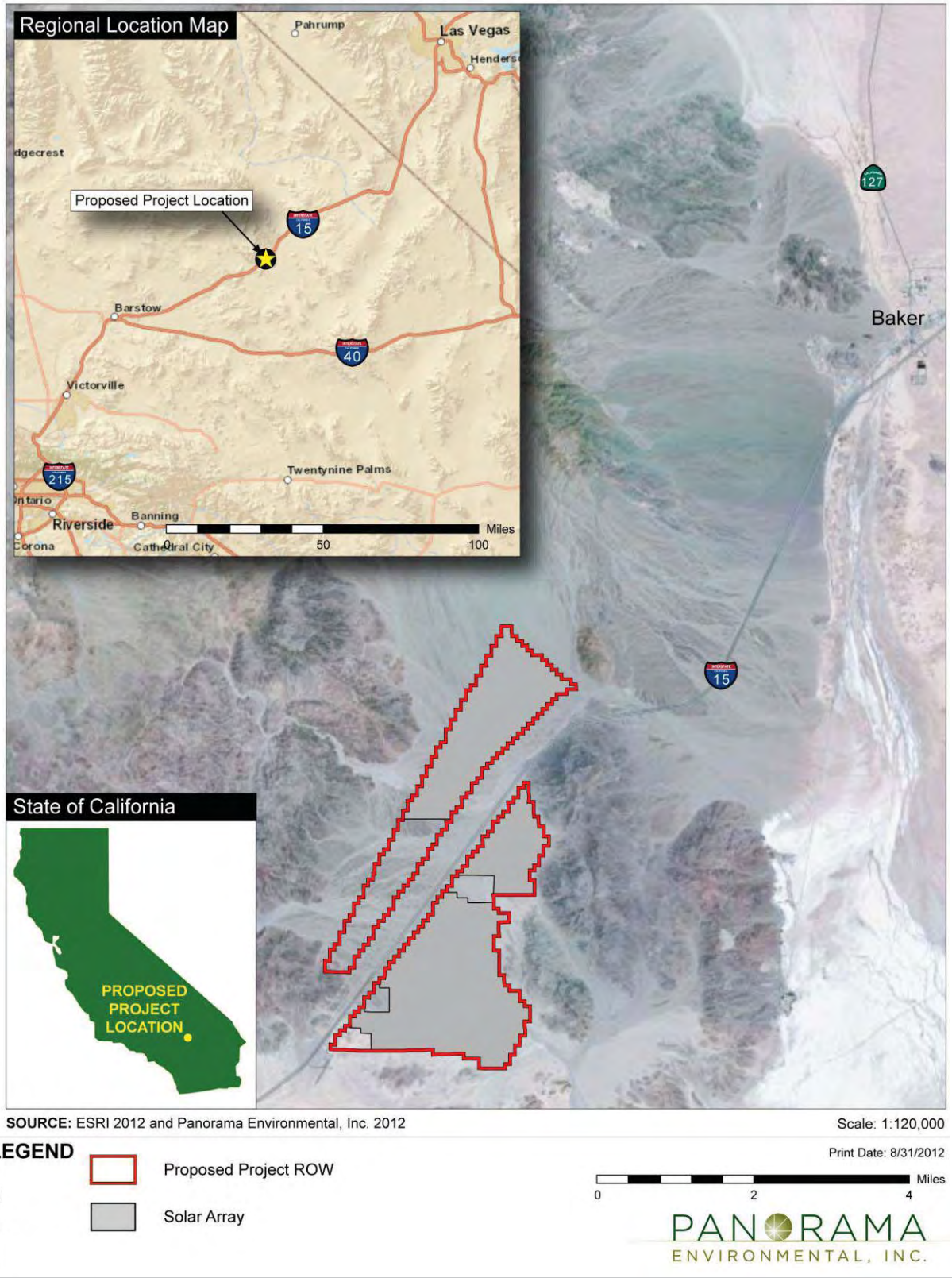
Figure 1: Project Location



2 BACKGROUND

2.1 PREVIOUS STUDIES

Previous studies were conducted to evaluate groundwater resources and to characterize the geology and aquifer within the Project area. Studies that provide information on the geology and hydrogeologic characteristics of the aquifer consist of the following:

- *Geologic Characterization Report* (Wilson Geosciences Inc. 2011)
- *Geophysical Characterization of Subsurface Physical Properties* (TerraPhysics 2010)
- *Hydrogeologic Conditions and Groundwater Modeling Report* (RMT 2011)

The *Hydrogeologic Conditions and Groundwater Modeling Report* (RMT 2011) is provided in Appendix A. This report was prepared to address the following objectives:

- Identify potential well locations
- Determine the number of wells needed for groundwater production
- Estimate expected production capacity for groundwater wells
- Evaluate whether the hydrogeologic conditions in the Project area could support the withdrawal of water needed for the Project
- Identify the radius of influence[1] resulting from groundwater withdrawal for the Project
- Estimate the decline in water level at both the well and at distance from the well as a result of groundwater pumping[2]

[1] The radius of influence is the area beyond the well point that would experience a decline in water level as a result of groundwater pumping.
[2]A cone of depression would occur whereby the decline in water level would be greatest at the well location and water level decline would decrease with increased distance from the well.

3 ENVIRONMENTAL SETTING

3.1 LOCATION

The Project lies south and west of the town of Baker, California, within an intermontane desert valley composed of alluvial fan deposits and surrounded by the Soda Mountains. Elevations in the Project area range from approximately 1,550 feet in the north to 1,250 feet in the southeast. The Soda Mountains north and west of the Project area reach an elevation of approximately 3,600 feet. Lower mountains to the south and east of the Project area form a discontinuous border reaching elevations of approximately 2,400 feet.

3.2 VEGETATION AND LAND USE

The Mojave creosote bush scrub is the predominant vegetation community throughout the Project area. There are also disturbed unvegetated areas adjacent to the Project area. Disturbed unvegetated areas include the following:

- Interstate Highway I-15
- Two transmission lines (and associated access roads)
- Power distribution line
- Two petroleum product pipelines
- Fiber optic line
- Cellular tower
- Opah Ditch mine
- Rasor Road
- Rasor Road off-highway vehicle recreation area

3.3 WATER RESOURCES AND PRECIPITATION

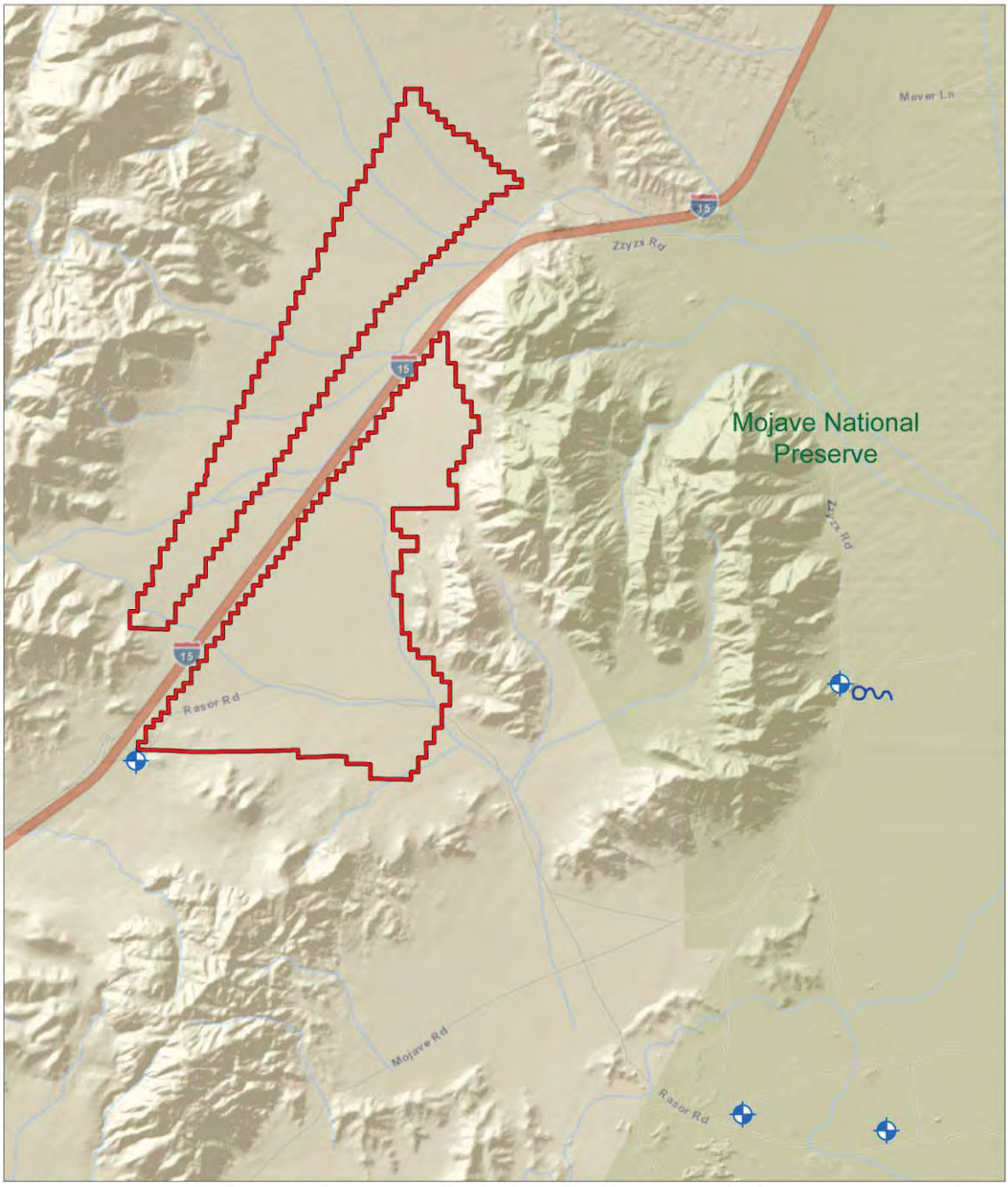
There are no perennial water sources within the Project area or surrounding valley. Water draining from the Soda Mountains during rain events is conveyed through the Project area through a series of unnamed desert washes. Surface water is only available within the Project area during and shortly after rain events. The Project area receives approximately 4 inches of precipitation annually (Western Regional Climate Center 2012).

3.4 GROUNDWATER WELLS

Four wells are located within 5 miles of the Project area. These wells are shown on Figure 2 and include:

- The Rasor Road service station well located on the gas station property at the Rasor Road exit from I-15.
- Wells 012N008E27N002A and 012N008E35A001S (identified in the USGS National Water Information System database), located 4 and 4.5 miles southeast of the Project area, respectively, on Rasor Road.
- The Desert Studies Center well located near Soda Spring (also called Zzyzx Spring) on the west shore of Soda Lake.

Figure 2: Groundwater Wells



SOURCE: ESRI 2012, USGS National Water Information System 2012, and Panorama Environmental, Inc. 2012

Scale: 1:100,000

LEGEND

Proposed Project ROW

Well

Soda Spring

N

0 0.5 1 2 3 4 Miles

PANORAMA ENVIRONMENTAL, INC.

4 WELL LOCATION AND DESIGN

4.1 WELL LOCATION

§33.06554 (b) (1) A plot plan depicting the location of the proposed well(s) on a section map depicting the location of the following items within 0.5 mile of the well(s): (A) property lines, location and ownership of all parcels and easements; (B) all intermittent, perennial, natural, or artificial bodies of water or watercourses; (C) notable nearby geographic features (faults, etc.); (D) all other wells; and (E) landfills, septic systems or other liquid or solid waste facilities

Figure 3 is a plot plan depicting six potential well locations (W-1 through W-6). The map also shows the locations of various features within 0.5 mile of each potential well location, as described below.

4.1.1 Property Ownership

All land within 0.5 mile of the six potential well locations has federal ownership (BLM). ROWs are present within 0.5 mile of some of the well locations for the following features (Figure 3):

- I-15
- Two transmission lines (i.e., Southern California Edison 115-kilovolt [kV] ROW and Los Angeles Department of Water and Power 500-kV ROW)
- Power distribution line
- Two petroleum product pipelines
- Fiber optic line

4.1.2 Water Resources

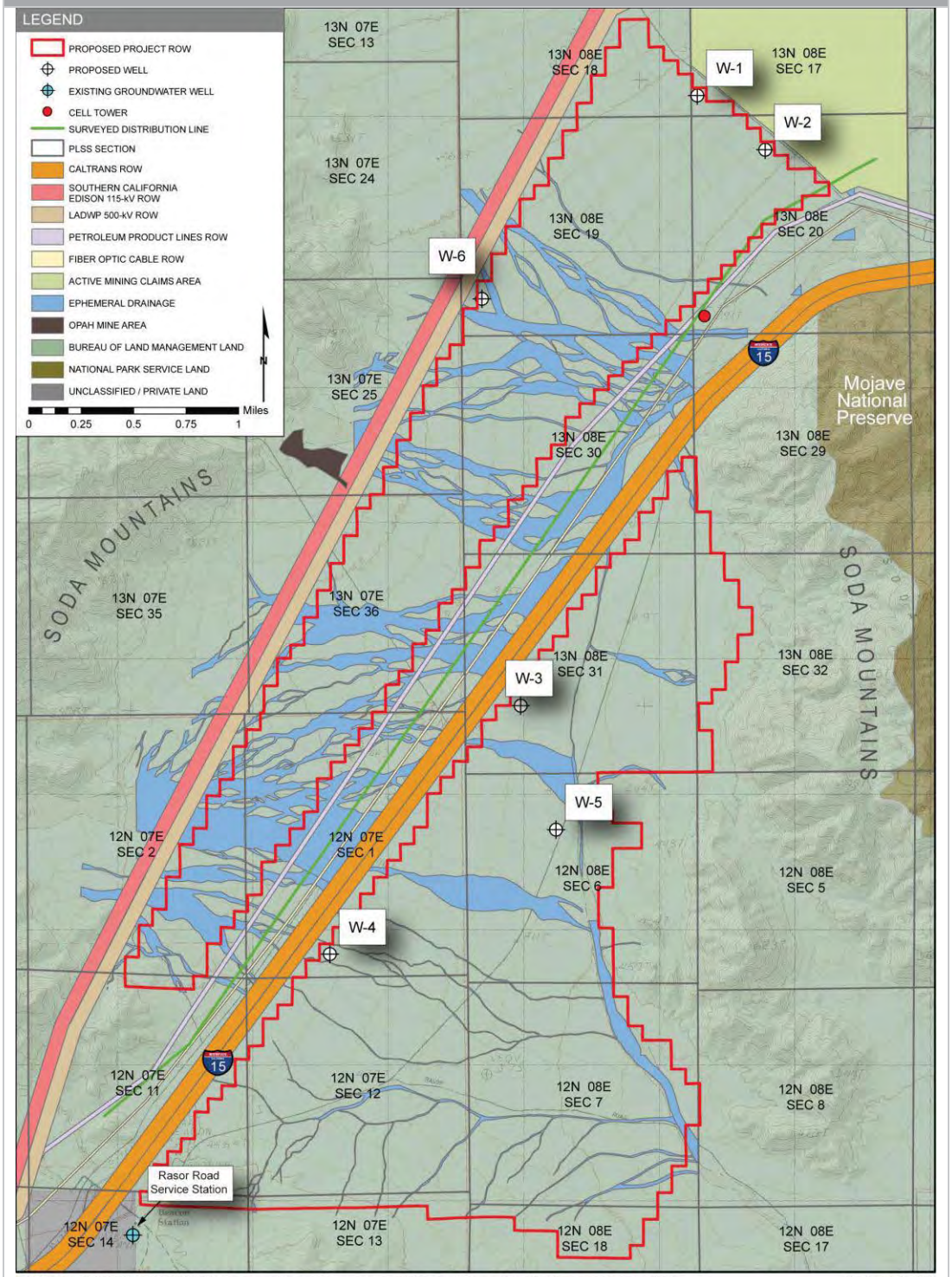
There are ephemeral drainages or washes within 0.5 mile of proposed well locations (Figure 3). Ephemeral drainages are present throughout the Project area. There are no lakes, streams, or reservoirs within 0.5 mile of the six potential well locations.

The closest surface water feature is Soda Spring on the west side of Soda (dry) Lake. Soda Spring is approximately 4 miles east of the Project area on the east slope of the eastern Soda Mountains.

4.1.3 Geographic Features

There are no faults within 0.5 mile of the potential well locations. The proposed Project ROW is surrounded by the Soda Mountains (Wilson Geosciences Inc. 2011). The closest faults are an unnamed, northwest-trending Quaternary fault approximately 2 miles northeast of the northeast corner of the ROW, and an unnamed, northwest-trending Holocene fault located approximately 2 miles southwest of the southwest corner of the ROW.

Figure 3: Proposed Well Locations



SOURCE: ESRI 2012, URS 2009, Bureau of Land Management 2011, and Panorama Environmental, Inc. 2012 Scale: 1:40,000

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4.1.4 Nearby Wells

There are no existing wells within 0.5 mile of the six potential well locations. The Rasor Road service station well, which is screened in bedrock, is more than 1 mile away from the closest potential well location (i.e., within T12N, R07E, Section 14 on Figure 3). Other wells identified in Section 3.3 are more than 4 miles from the nearest proposed well, and are separated from the Project area by the Soda Mountains range.

4.1.5 Landfills, Septic Systems, or Other Liquid or Solid Waste Facilities

There are no landfills, septic systems, or other liquid or solid waste facilities within 0.5 mile of the six potential well locations. There is a septic system at the Rasor Road gas station more than 1 mile from the closest potential well.

4.2 WELL DESIGN

§33.06554 (b) (2) Proposed well diameter, depth, and completion interval (screen or perforation locations) for proposed well(s)

4.2.1 Well Schematic

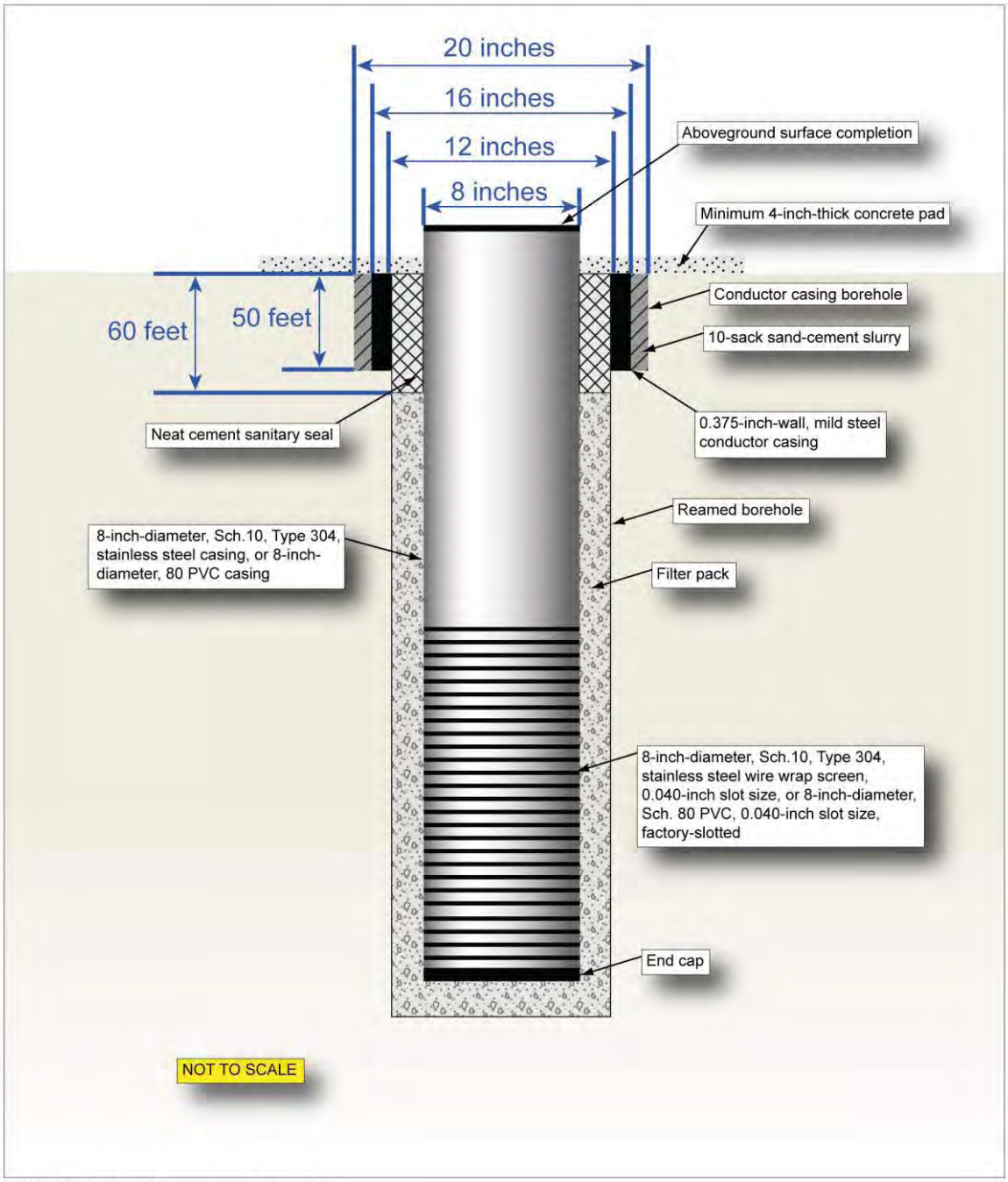
A schematic showing the proposed design of the six potential wells is presented on Figure 4. The schematic is a generalized representation of potential well construction details. Actual well design details will be finalized in the field and will be based on driller input, information collected during drilling (e.g., drilling conditions and rotary drive pressures), area geologic information, the geologic log generated for the pilot hole, sieve analyses for samples collected from the pilot hole, and other data, as available (e.g., geophysical logs).

4.2.2 Well Dimensions and Materials

As discussed in additional detail in Section 6, estimates of depth to water and depth to bedrock in the Project area were developed using geophysical data collected at the Project site. The depth to groundwater in the northern portion of the Project area is estimated to be between 150 and 200 feet below ground surface (bgs). Bedrock is estimated to be between 300 and 350 feet bgs in this portion of the valley. Both the water table and bedrock are deeper in the southern portion of the Project area than in the north, estimated to be between 350 and 400 feet bgs and between 400 and 500 feet bgs, respectively. Hydrogeologic cross-sections for the basin are presented in the groundwater modeling report in Appendix A (refer to Figures 2.4-1, 2.4-2, and 2.4-3 in Appendix A).

Each groundwater supply well would be drilled to the top of bedrock. Each well will screen the full thickness of saturated alluvium. The depth of the static water table at each well location will be determined during pilot hole drilling. The screened interval for each well will vary depending on well location, with shallower screen intervals at the northern well sites and

Figure 4: Groundwater Well Schematic



SOURCE: Panorama Environmental, Inc. 2012

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Table 2: Preliminary Well Depths and Screen Intervals		
Well ID(s)	**Total Depth (feet bgs)**	**Screen Interval (feet bgs)**
W-1 and W-2	400	200 to 400
W-6	425	225 to 425
W-3 and W-5	450	250 to 450
W-4	500	300 to 500
Note: Depths are approximate.		

deeper screen intervals at the southern well sites. Preliminary well depths and screen intervals are presented in Table 2. Actual total depths and screen intervals in the constructed wells will depend on the depth to the water table and the depth to bedrock as observed during pilot hole drilling.

A small-diameter pilot hole will be drilled to total depth to facilitate geologic data collection and economize resources. Based on data collected during the pilot hole phase, the well bore will be reamed to a larger diameter to a selected depth; well materials (i.e., casing, screen, filter pack, and sanitary seal) will then be installed. Table 3 provides additional well construction information, including two options for well casing and screen material (stainless steel or polyvinyl chloride [PVC]). The type of material selected for the well casing and screen will be finalized based on discussion with BLM, the Project proponent, and the drilling subcontractor.

4.2.3 Well Design Capacity

33.06554 (b) (3) Well design capacities for proposed well(s)

It is anticipated that one to three wells will be constructed to provide the water supply for the proposed Project. Multiple wells are expected to be required to provide spatial coverage over the approximate 4,500-acre ROW on both sides of I-15 and also to provide redundancy when a Project well is out of service for scheduled or unscheduled maintenance. Six well locations have been identified to provide siting flexibility (Figure 3). Each well will be designed to produce a portion of the water required. The amounts pumped from each well will be determined by the results of previous groundwater modeling (RMT 2011), the capacity of the well, and the anticipated water supply needs for the proposed Project (see Section 6).

Construction Water Production

Water required for construction will be used primarily for dust control and soil compaction. Additional water will be stored on site for fire suppression, as mandated by the County of San Bernardino. An average of approximately 288,000 gallons per day (gpd) (equivalent to 275 acre-feet per year [AFY] for a construction work schedule of 6 days/week) will be used during the

Table 3: Proposed Well Dimensions and Construction Materials	
Parameter	**Detail**
Borehole	
Pilot borehole diameter (inches)	7
Pilot borehole depth (feet bgs)	Variable; see Table 2
Reamed borehole diameter (inches)	12
Reamed borehole depth (feet bgs)	Variable; see Table 2
Conductor Casing	
Conductor casing borehole diameter (inches)	20
Conductor casing diameter (inches)	16
Conductor casing borehole depth (feet bgs)	50
Conductor casing depth (feet bgs)	50
Conductor casing type	0.375-inch wall, mild steel
Well Casing	
Well casing depth (feet bgs)	Variable; see Table 2
Well casing diameter (inches)	8
Screen interval (feet bgs)	Variable; see Table 2
Well casing type	Option 1: Sch. 10, Type 304, stainless steel Option 2: Sch. 80 PVC
Well screen type	Option 1: Sch. 10, Type 304, stainless steel wire wrap, 0.040-inch slot size (slot size to be finalized in the field based on geologic log and sieve analyses) Option 2: Sch. 80 PVC, factory-slotted, 0.040-inch slot size (slot size to be finalized in the field based on geologic log and sieve analyses)
Annular Materials	
Sanitary seal interval (feet bgs)	2-60
Sanitary seal type	Neat cement grout
Filter pack interval (feet bgs)	60-total depth (Variable; see Table 2)
Filter pack type	Sand pack mesh size of 8 to 12 (filter pack grade to be finalized based on geologic log and sieve analyses)

Table 4: Estimated Average and Maximum Pumping Rates during Construction Phase		
	Pumping Rate (gpm)	
Number of Wells	Average (288,000 gpd or 200 gpm)	Maximum (504,000 gpd or 350 gpm)
1	200	350
2	100	175
3	67	117
Note: Pumping rates assume pumping occurs 24 hours/day, 6 days/week during construction.		

3-year construction phase. This water demand equates to an extraction rate of approximately 200 gallons per minute (gpm) for 24 hours/day. It is possible that a maximum of 504,000 gpd will be used at certain times during the construction phase when additional water is needed for construction activities. This equates to an extraction rate of approximately 350 gpm when extracted 24 hours/day.

Table 4 presents estimated average and maximum pumping rates for production, assuming one-, two-, and three-well scenarios during Project construction. The values presented in Table 4 represent the average pumping rates for each well. It is likely that each well will have a higher capacity than that presented in Table 4.

Pumps will be designed to accommodate the maximum pumping rate for a particular well, based on hydrogeologic data collected during pilot hole drilling and during aquifer testing. Wells will vary in pumping capacity based on site-specific geologic characteristics, permeability, and other factors, such as distance to subsurface bedrock, barriers to groundwater flow, presence of low-permeability fine-grained geologic material, and degree of aquifer heterogeneity. The rates in Table 4 have been calculated to present pumping needs averaged over a specific number of wells. Each well will be pumped at a different rate based on the optimal hydrogeologic conditions for each specific well location and construction requirements. The amount of pumping from each well will also be related to the location of the array being constructed (e.g., well(s) installed in the north may be pumped more for construction of the northern array).

Operation and Maintenance Water Production

Operation and maintenance water needs will generally be restricted to water required for PV panel washing, which will be performed once or twice annually. Other operational water needs will include providing water for an on-site fire suppression water supply tank and, possibly, potable water for the operations and maintenance building. Water supply needs during Project operation will be much lower than those required for construction. Water needs for panel washing are estimated to be about 42,000 gpd over a 21-day period, twice per year (equivalent to 5.4 AFY). This water use equates to an extraction rate of approximately 29 gpm when

Table 5: Estimated Pumping Rates during Operation Phase		
Number of Wells	**Pumping Rate during Panel Washing**	
	Gallons per Minute	Gallons per Day Per Well
1	43	43,000
2	15	21,500
3	10	14,500
Note: Pumping rates assume pumping occurs 24 hours/day during each 21-day-long panel washing window.		

extracted 24 hours/day. Potable water requirements for the operations and maintenance building would be approximately 1,330 gpd or 1.5 AFY. Total water use during operations and maintenance would be approximately 7 AFY. Table 5 presents estimated operation phase pumping rates for one-, two-, and three-well scenarios. The values presented in Table 5 represent the minimum average pumping rates that will be required to be obtainable for each well. The caveats presented above for Table 4 also apply to Table 5.

5 GROUNDWATER AQUIFER/BASIN

5.1 HYDROGEOLOGY

5.1.1 Soda Lake Valley Groundwater Basin

California groundwater basins are described in the California Department of Water Resources (DWR) Bulletin 118 (DWR 2004). DWR identifies the 381,000-acre Soda Lake Valley Groundwater Basin as Basin No. 6-33 in Bulletin 118. Basin No. 6-33 has not been adjudicated by the State of California and there is no evidence of overdraft conditions within the Basin (DWR 1980). The basin is bounded by the Mark and Kelso Mountains on the east, the Bristol and Cady Mountains on the south, the Soda and Cave Mountains on the west, and a low divide with the Silver Lake Basin on the north. These areas drain towards Soda Dry Lake (DWR 2004).

5.1.2 Soda Mountains Subbasin

The Project is located within a subbasin of the Soda Lake Valley Groundwater Basin. The Soda Mountain subbasin covers approximately 32,946 acres. Geologic mapping from the State of California indicates that the Soda Mountain Project area overlies alluvium and the alluvium is the only water-bearing geologic unit in the subbasin (Gutierrez 2010). This finding was confirmed by geophysical and geotechnical studies of the Project area (Wilson 2011; TerraPhysics 2010). The alluvium within the subbasin is located within the valley and covers an area of approximately 12,632 acres. The remaining 20,314 acres within the subbasin are in the granitic, volcanic, and metavolcanic formations of the mountains surrounding the Soda Mountain valley (Gutierrez 2010) (Figure 5).

The Soda Mountain subbasin is generally separated from the rest of Basin No. 6-33 by mountains to the south and east (Figure 6). The direction of groundwater flow within the Soda Mountain subbasin is expected to generally mimic surface water flow. Groundwater flow in the northeast portion of the subbasin is expected to be toward the Town of Baker to the northeast and Soda Lake to the east. Groundwater flow in the southwest portion of the subbasin is expected to be toward the Mojave wash to the south. Because the Soda Mountain subbasin is surrounded by mountains, groundwater is funneled to Basin No. 6-33 through small breaks in the mountains to the east and south. These gaps within the bedrock are shown on the geologic map for the area (Figure 6). Groundwater elevations (as determined from geophysical data; see Section 6) within the Soda Mountain subbasin are about 300 feet higher than those measured by the U.S. Geological Survey (USGS) in Basin No. 6-33 and the subbasin is topographically higher

than areas to the east (RMT 2011). The higher topographic and groundwater elevations in the Soda Mountain subbasin above Basin No. 6-33 indicate that there is no groundwater flow from Basin No. 6-33 into the Soda Mountain subbasin. The Soda Mountain subbasin is for the most part physically separated from Basin No. 6-33 by mountains that surround the valley and by higher groundwater elevations. This separation requires that the groundwater resources within the Soda Mountain subbasin be analyzed separately from those within Basin No. 6-33. Hydrogeologic cross-sections for the subbasin are presented in the groundwater model report in Appendix A (refer to Figures 2.4-1, 2.4-2, and 2.4-3 in Appendix A).

5.2 STORAGE

§33.06554 (b) (14) A description of the affected groundwater aquifer(s) including estimated storage capacity and the overall quality of water within the aquifer

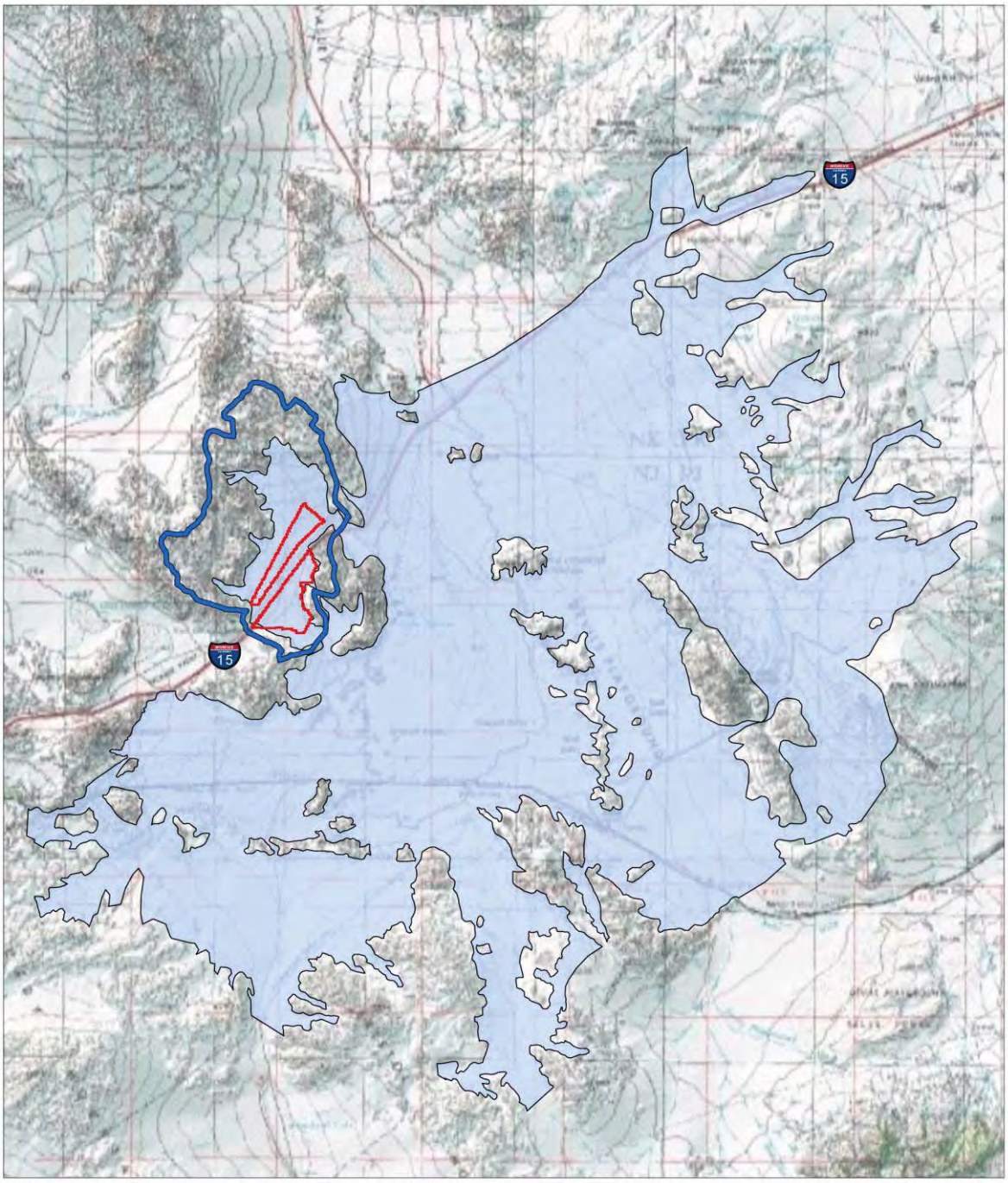
The subsurface geologic conditions within the basin were evaluated using the results of three transient electromagnetic resistivity (TEM) soundings in the Project area (RMT 2011). The results indicate that in the northern portion of the Project area (near proposed well locations W-1 and W-2) the depth to bedrock is approximately 332 feet bgs +/-26 feet and the water table is present within alluvium at approximately 182 feet bgs +/- 13 feet. In the southern portion of the Project area, bedrock was estimated to be at least 500 feet bgs and the water table is present within alluvium at approximately 354 feet +/-30 feet or deeper. The aquifer is unconfined, as determined from available geotechnical boring and TEM data. Cross-sections illustrating the conceptual aquifer conditions are provided in Appendix A (Figures 2.4-2 and 2.4-3).

DWR estimated the storage in Basin No. 6-33 to be 9,300,000 acre-feet; the storage of the Soda Mountain subbasin was not estimated (DWR 2003).

The storage volume of the Soda Mountain subbasin is estimated by multiplying the total volume of the aquifer by the specific yield for the basin. The acreage of the alluvium in the Soda Mountain subbasin is 12,632 acres (see Section 5.1.2 above), the average thickness of the saturated alluvium (as estimated from the TEM survey results) is approximately 99 feet, and the specific yield of the aquifer is estimated at 0.1 (RMT 2011). The storage of the Soda Mountain basin is estimated to be approximately 125,000 acre-feet.

$$12{,}632 \times 99 \times 0.1 = 125{,}057$$

Figure 5: Groundwater Basin



SOURCE: ESRI 2012, CA Department of Water Resources 2003, and Panorama Environmental, Inc. 2012

Scale: 1:500,000

LEGEND

- Proposed Project ROW
- Proposed Project Groundwater Basin Area
- Soda Lake Valley Groundwater Basin

N

0 2.5 5 10 15 20 Miles

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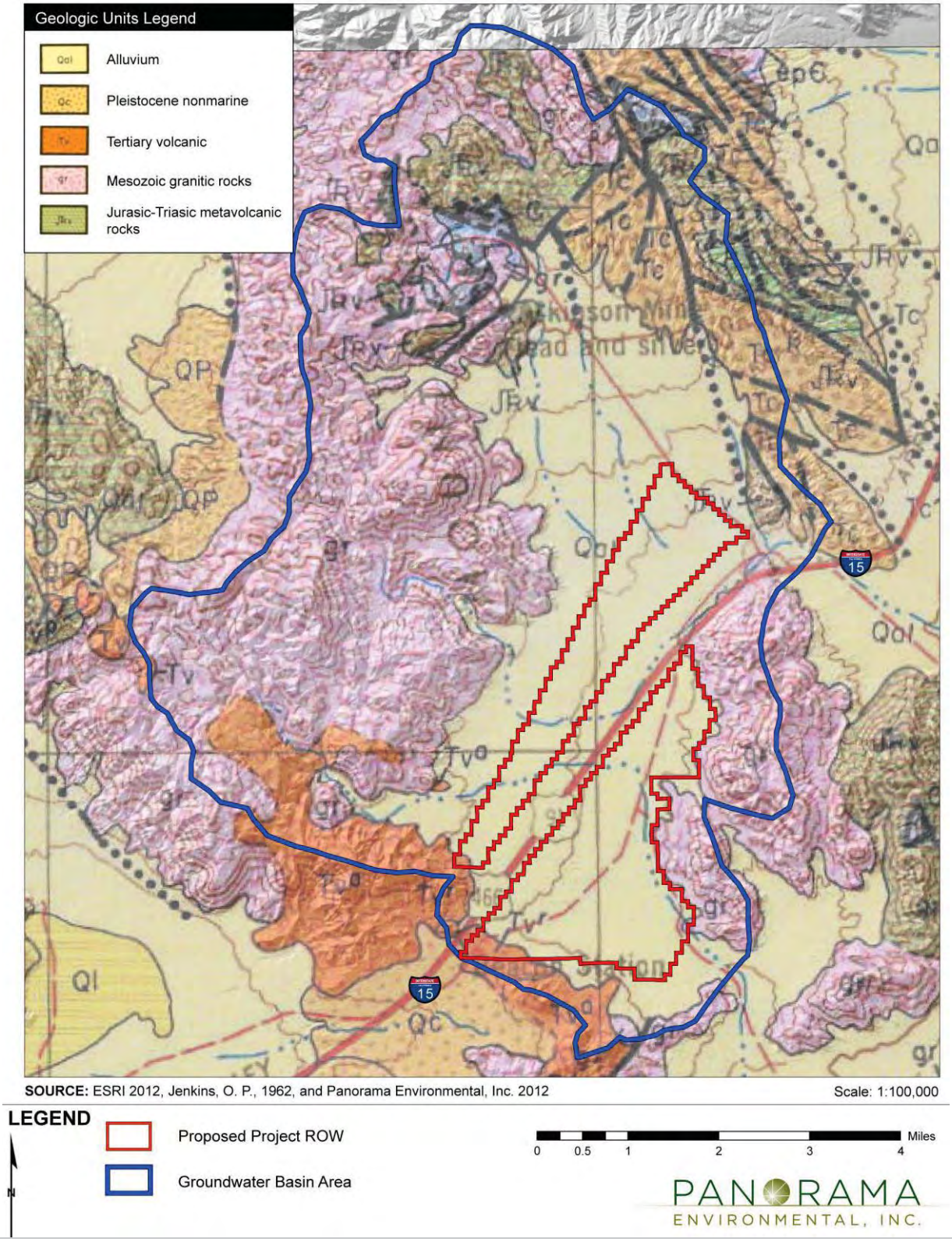
Figure 6: Geologic Map of Soda Mountains Subbasin



5.3 RECHARGE

§33.06554 (b) (13) The estimated rate of natural recharge to the affected groundwater aquifer(s) calculated in accordance with generally accepted scientific methodologies and as deemed appropriate by the enforcement agency

5.3.1 Recharge Methodologies

Many studies have been conducted to determine mountain-front recharge. A 2004 study (Wilson and Guan) included an analysis of quantitative assessments of mountain-front recharge using multiple methods. Recharge rates ranged from 38 percent for highly permeable rock to 0.2 percent for a system where recharge was dominated by streamflow. In similar systems consisting of weathered and fractured granitic rock and metamorphic rock, recharge ranged from 7.8 to 8.8 percent. Studies within the Mojave Basin and Death Valley found that 10 percent of runoff becomes recharge (Izbicki 2002 and Hevesi et al. 2003). An estimate of 7.8 percent for mountain-front recharge is used in this analysis and is conservative based on the results of these studies.

5.3.2 Recharge in the Soda Mountains

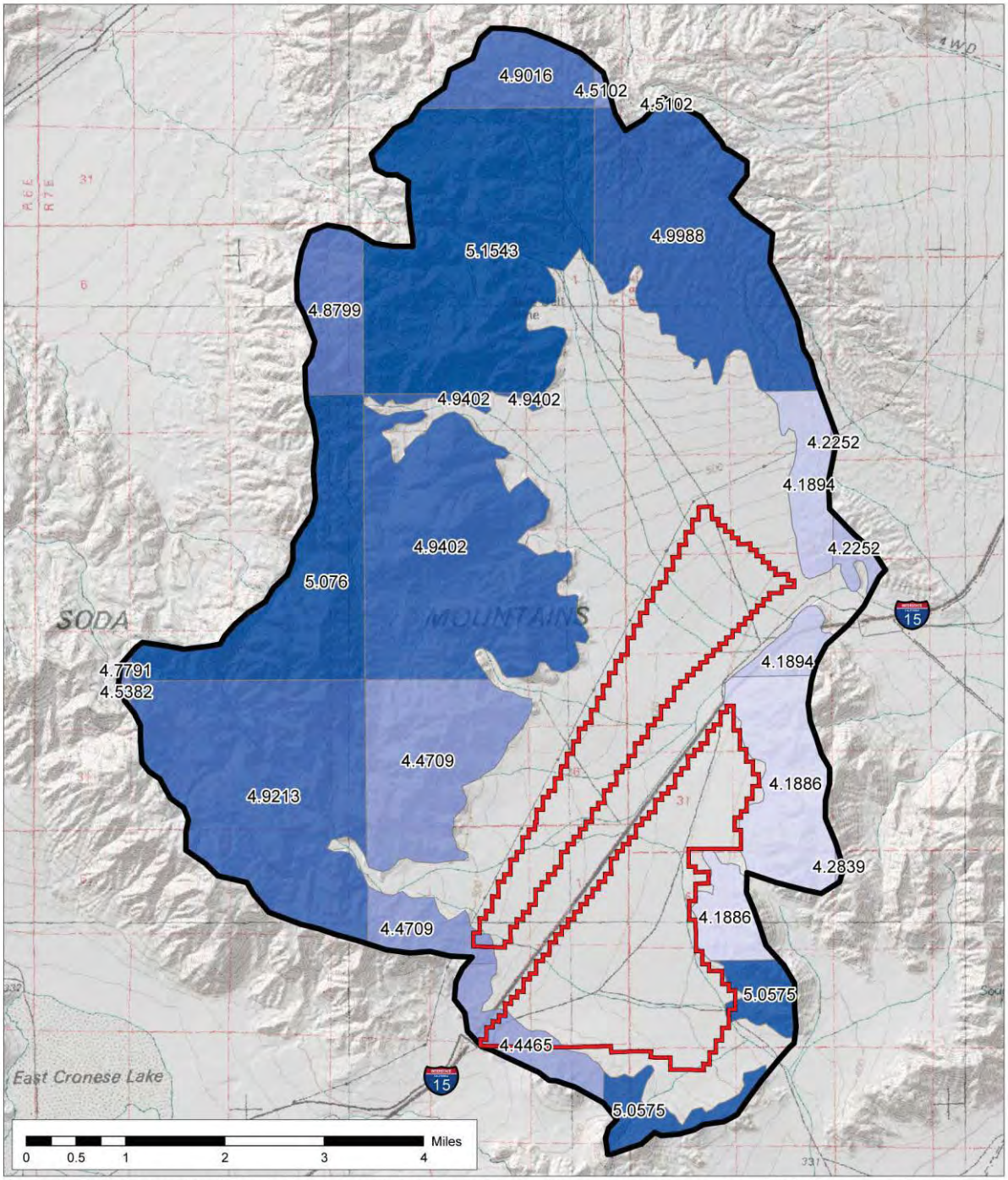
Precipitation data for the Project area were obtained from PRISM (PRISM Climate Group 2012) and overlain on the mountain bedrock portions of the Soda Mountain subbasin (Figure 7). Only mountain bedrock areas were considered for recharge because precipitation on the valley floor does not contribute consistently to recharge (Danskin 1998).

GIS was used to identify the acreage within the bedrock portion of the Soda Mountain subbasin that corresponded with each data cell in PRISM. Each PRISM data cell provided a different annual average rainfall over the subbasin. The acreage of each data cell was then multiplied by the annual rainfall for that cell, and the inches were converted to feet to identify the annual average rainfall in the bedrock portion of the basin in AFY. The 20,314-acre mountainous portion of the subbasin receives approximately 8,219 AFY of precipitation.

As stated above, data analysis for arid basins in the U.S. southwest indicates that approximately 7.8 to 8.8 percent of mountain precipitation becomes mountain-front recharge. Mountain-front recharge within the Soda Mountains subbasin is, therefore, approximately 641 to 723 AFY. The estimated recharge of 641 AFY is used in this application to be conservative.

The Soda Mountain subbasin is geographically and topographically isolated and does not receive much, if any inflow from adjacent groundwater basins. It is hypothesized that there is interbasin flow throughout the historic Great Basin, though it does not occur uniformly between all basins (Belcher et al. 2009). There is no other input to recharge in the subbasin.

Figure 7: Annual Rainfall (PRISM Climate Group 2012)



SOURCE: ESRI 2012, PRISM Climate Group, Oregon State University 2012, and Panorama Environmental, Inc. 2012 Scale: 1:100,000

LEGEND

Proposed Project ROW

Groundwater Basin Area

PRISM Precipitation Data (1971-2000 annual totals in inches)

4.1886 — 5.1543

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5.4 SAFE YIELD

§33.06554 (b) (4) Anticipated groundwater safe yield of the affected groundwater aquifer

Safe yield is defined in Bulletin 118 as the "amount of groundwater that can be continuously withdrawn from a basin without adverse impact" (DWR 2003). An adverse effect would occur if groundwater use were to result in overdraft or impacts to existing water use.

The source of groundwater for the Soda Mountain subbasin is from precipitation recharge as described above. The only existing groundwater use in the subbasin is a groundwater well installed at the Rasor Road service station (southwest corner of Figure 3), which is screened in bedrock and is hydrologically separated from the saturated alluvium in the valley (RMT 2011). No wells are known to exist in the interior of the valley. The amount of water that is estimated to be used at the Rasor Road service station is approximately 10 to 12 gpm (16 to 19 AFY) (pers. comm. Terry Young, August 23, 2012). There are no other uses of groundwater within the Soda Mountains subbasin and no existing uses within the aquifer. Water within the Soda Mountain subbasin that is available for withdrawal without adverse impact is represented as recharge less existing water uses.

The safe yield is calculated as follows:

Recharge – Rasor Road Well Extraction = Safe Yield

641 AFY – 19 AFY = 622 AFY

This calculation is conservative because the 19 AFY is extracted from bedrock and is considered to be isolated from the alluvial aquifer.

5.5 WATER LEVELS

§33.06554 (b) (5) Anticipated static and pumping levels

5.5.1 Static Water Levels

Groundwater levels typically vary seasonally in California, with shallower groundwater levels occurring during the winter, when recharge from precipitation occurs, and deeper groundwater levels occurring during the summer when precipitation is minimal or absent and groundwater withdrawal for agricultural irrigation occurs.

The results of the geophysical investigation conducted in September 2010 (TerraPhysics 2010) showed the depth to groundwater at the northern end of the Project ROW to be 182 feet bgs ±13 feet. The depth to groundwater near proposed well locations W-1 and W-2 during equilibrium (i.e., non-pumping) conditions is expected to be 150 to 200 feet bgs. There may be some variation based on the time of year that the well is drilled.

Depth to groundwater near the southern end of the Project ROW was determined to range from 354 feet bgs ±30 feet at a location across I-15 from well location W-4 to greater than 436 feet bgs ±49 feet at a location southeast of W-4. Therefore, depth to groundwater near proposed well locations W-4 and W-5 during equilibrium conditions is expected to be 350 to 450 feet bgs. The depth to groundwater at proposed well location W-3 will likely be between the northern and southern values, or in the range of 200 to 350 feet bgs.

5.5.2 Pumping Water Levels

Pumping water levels in each well and in the vicinity of the well will depend on the number of wells installed and on the actual geologic conditions encountered in each well bore (i.e., radius of influence; see Section 2). The more wells that are installed, the lower the rate at which each well will need to be pumped, and, generally, the smaller the decline in water levels during pumping. Groundwater modeling was performed to model the estimated drawdown at a Project production well installed in the northern portion of the Project ROW between proposed well locations W-1 and W-2 (RMT 2011). The groundwater modeling report is included in Appendix A.

The production well was assumed to pump at a rate of 61.6 AFY (55,000 gpd) in the groundwater model. This rate was determined based on earlier estimates of Project construction needs and is about a quarter of the current estimate for average construction needs (i.e., 288,000 gpd). The results of the modeling may be used to generally estimate the pumping water level in a well installed in the northern Project area. If a minimum of three wells are installed for the Project (at a distance of more than 1 mile away from each other[3]), each will be pumped at an approximate average rate of 96,000 gpd, which is nearly double the modeled rate of 55,000 gpd. Two sets of parameters[4] were modeled because there are limited hydrogeologic data available for the valley in which the wells will be installed. Modeling results are presented in Table 6. Because more water is proposed for use at each well location, the potential drawdown at the well location would likely exceed the modeled drawdown after 3 years of construction water use. Water levels would be expected to rebound after construction as water use will be seasonal and will only be used for panel washing, potable water and fire suppression (approximately 7 AFY).

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[3] The groundwater model results indicate that a radius of influence with drawdown of 1 foot from each well could extend up to 3,800 feet after 3 years of pumping. A 1-mile separation between wells would result in limited potential for interference.

[4] The high end parameters estimated hydraulic conductivity at 4 and recharge at 0.5 inch/year. The low end parameters estimated hydraulic conductivity at 1 and recharge at 0.125 inch/year.

Table 6: Effects of Groundwater Pumping during Project Construction		
Parameter Set Name	**Maximum Predicted Drawdown (feet)**	**Radius of Area with Drawdown Greater than 1 Foot (feet)**
High End	20	2,500-3,800
Low End	81	2,400-3,050
Note: Maximum drawdown inside the well itself will likely be somewhat higher than predicted for the aquifer near the well because of typical well inefficiencies.		

5.6 WATER QUALITY

§33.06554 (b) (6) Anticipated water quality

5.6.1 Regional Water Quality

The Desert Studies Center (Center) is located along Zzyzx Road on the west side of Soda Dry Lake, southeast of the Project ROW. The Center is located on other side of the Soda Mountains from the Project ROW, outside of the Soda Mountain subbasin. A well located at the Center was sampled in May 2000. Water quality data from the well are not likely representative of water quality at the Project well locations due to the separation of the Desert Studies Center from the Project area by mountains (a granitic intrusion). The data for the Desert Studies Center well are provided here because there are limited water quality data available for the Project area. TDS was quantified at 1,890 milligrams per liter. A full summary of the analytical results is included in Appendix B.

Several USGS wells are present in the region surrounding the Project ROW, although none are located within the Soda Mountain subbasin. Water quality data for USGS wells in the region are included in Appendix B.

5.6.2 Soda Mountain Subbasin Water Quality

The September 2010 Project TEM survey (TerraPhysics 2010) collected subsurface resistivity data. Resistivity is the inverse of conductivity. Conductivity is directly correlative to total dissolved solids (TDS) (i.e., higher conductivity is indicative of higher TDS and, conversely, lower resistivity is also indicative of higher TDS). TEM data from the geophysical investigation indicate that the resistivity of the saturated subsurface differs between the northern and southern portions of the valley, consistent with the interpretation of different groundwater flow directions in the two portions of the valley (RMT 2011). Groundwater at the northern TEM location (i.e., between W-1 and W-2) has very low resistivity (4 ohm-meters), indicating a high conductivity and a high concentration of TDS. Groundwater in the southern portion of the valley (i.e., across I-15 from W-4) has higher resistivity values (15 ohm-meters) than in the northern part of the valley, indicating relatively high TDS concentrations but lower than at the northern TEM location. There are no groundwater wells within the alluvial portions of the Soda

Mountain subbasin and no groundwater sampling has been conducted within the aquifer. There are no known hazardous materials sites in the basin. The only intensive land use within the basin that may impact water quality is the I-15 highway. Vehicle pollutants are unlikely to have a substantial impact on groundwater quality due to the depth to groundwater within the basin.

6 GROUNDWATER USE AND IMPACTS

6.1 GROUNDWATER USE

6.1.1 Intended Use

§33.06554 (b) (7) The intended use of groundwater from the proposed well(s)

During Project construction groundwater will be used primarily for dust control and soil compaction. Groundwater will also be used to fill fire suppression tanks. During Project operation, extracted groundwater will be used primarily for PV panel washing. Other water needs during Project operation will include fire suppression and, possibly, potable water supply for the operations and maintenance building.

6.1.2 Operation Schedule

§33.06554 (b) (8) The proposed months of operation of the proposed well(s) (year-round, irrigation months, etc.)

Construction will occur continuously for a period of about 3 years. Groundwater will be extracted continuously over this 3-year period at an estimated average rate of 288,000 gpd (275 AFY) with periodic peak use at an estimated rate of 504,000 gpd. Table 7 provides projected water use.

Operational water requirements will generally be restricted to PV panel washing and potable water for the operations and maintenance building. Panel washing would be performed once or twice per year over an estimated 21-day period. Operational water use would be about 7 AFY. Panel washing is expected to require:

2,500 gal/MW/wash* 350 MW * 2 washes /year =1.75 million gal/year

Table 7: Soda Mountain Water Demand Estimates	
Construction	
Construction, Dust Control	288,000 gpd average; 275 AFY
Operations Period	
PV Panel Washing	42,000 gpd, 42 days per year; 5.4 AFY
Potable Supply	1,330gpd, 365 days per year; 1.5 AFY (from groundwater or off-site source)
Fire Suppression	Periodic tank filling of 22,500 gallons

The average daily water usage for cleaning is:

1.75 million gallons per year / 42 days/year = 42,000 gpd or 29 gpm

The two panel washing periods will occur roughly 6 months apart. The months during which panel washing will be performed are not defined at this time. The on-site fire suppression water tank will periodically be refilled as needed (i.e., at irregular intervals depending on use/evaporation) during Project operation. Potable water use is expected to be 1.5 AFY per year. A reverse osmosis treatment system may be installed if necessary, or potable water may be trucked to the site.

6.1.3 Pumping Cycles

§33.06554 (b) (9) The proposed pumping cycles (one eight-hour/day cycle, two six-hour/day cycles, etc.)

Construction

It is anticipated that three to five 20,000-gallon water tanks will be located on site for water storage during construction. The 22,500 gallon fire suppression water tank will also be installed during construction. Water supply wells are proposed to be in use continually and would be used to fill the water storage tanks to allow for continuous water availability. Wells will periodically be out of service while maintenance is performed (e.g., pump service, video-log inspection, and descaling) to ensure optimum performance. As discussed in Section 4, it is likely that wells will be capable of producing water at a higher rate than the average required rates presented in Table 4. It is therefore likely that some wells will not operate continuously during Project construction. The response of the aquifer during initial use of the wells will be used to determine an optimal pumping cycle. This approach will minimize the amount of time required to pump wells, while also ensuring that sufficient water is available for construction.

Operation
From three to five 20,000-gallon water tanks and a 100,000-gallon fire suppression storage tank will be located on site for water storage during operations. The pumping cycle to supply this water will differ from that required during construction because most non-potable water will be used only once or twice a year for PV panel washing. Immediately prior to and throughout the panel washing period (estimated to be about 21 days long), all operational water supply wells will be pumped to fill the water storage tanks so that water is available for panel washing needs.

6.1.4 Annual Pumping
§33.06554 (b) (10) Estimated annual pumpage from the proposed well(s) in acre-feet

Construction
During Project construction approximately 275 AFY would be extracted from the water supply wells. This water withdrawal is equivalent to a pumping rate of 288,000 gpd, 6 days/week. Pumping rates may periodically peak at 504,000 gpd, but the amount of water pumped yearly would equate to an average of 275 AFY.

Operation
Approximately 7 AFY or groundwater would be used during the operational life of the Project. Approximately 5.4 AFY would be extracted from the site water supply wells for panel washing for the life of the Project (approximately 30 years). Water would be pumped for a total of approximately 42 days per year. Water for fire suppression would be used as needed and is expected to be minimal. A 22,500 gallon water tank would be on-site for fire suppression. Potable water use is expected to be 1.5 AFY. If groundwater quality is suitable for drinking water, groundwater could be used for potable water supply. Alternatively, potable water may be trucked to the site.

6.1.5 System Description
§33.06554 (b) (11) System description (irrigation, domestic, etc.)

The water supply system will provide non-potable water for industrial use. The major uses of the water are construction, dust control, panel washing, and fire suppression, as described in Section 6.1.1.

6.1.6 Anticipated Return Flows
§33.06554 (b) (12) Anticipated return flows (deep percolation, runoff, etc.)

Return flows for dust control and soil compaction water applied during Project construction are expected to be low and in the range of 10 percent of applied water. To be conservative, the impact evaluation assumes no return flows. Water for dust control and soil compaction would

be applied at a rate that would not cause runoff. Similarly, the impact evaluation assumes no return flows for panel washing during Project operation.

6.2 GROUNDWATER IMPACTS

§33.06554 (b) (15) Other information as may be reasonably necessary for the County to determine the potential effects of the proposed well operations on the groundwater safe yield and aquifer health of the affected aquifer

6.2.1 Construction

Construction-related water use of approximately 275 AFY (288,000 gpd) will be temporary and will cease after approximately 3 years, once construction is complete. The amount of water required for Project construction is less than the calculated safe yield of 622 acre-feet. The amount of water required for construction activities is 44 percent of the safe yield for the Soda Mountain subbasin. Project construction will not contribute to overdraft of the alluvial aquifer underlying the Project area.

The Project would not impact wells within Basin No. 6-33. The project area is separated from the remainder of Basin No. 6-33 by mountains. The nearest existing well within Basin No. 6-33 to any of the proposed Project well locations is approximately 4 miles. The Project would not draw on water resources within Basin No. 6-33 or cause drawdown in wells located in Basin No. 6-33 because of the separation of the basins and because Basin No. 6-33 is downgradient of the Soda Mountain subbasin. Because of the temporary duration of water use (i.e., 3 years), and the proposed use of 275 AFY for construction, the Project would not result in substantial alteration of groundwater flow or availability because the expected recharge over the 3 years would be 641 AFY. Groundwater would continue to flow from the Soda Mountain subbasin to Basin No. 6-33. After construction, groundwater use for operation and maintenance would be less than 7 AFY (including panel washing and potable water requirements) and this amount is less than the estimated current water use at the Rasor Road service station. Water levels within the groundwater aquifer would be expected to rebound and achieve equilibrium following construction of the project.

The only other groundwater use in the subbasin is the water supply well at the Rasor Road service station, which is screened in bedrock and would be approximately 1.25 miles from the nearest proposed well. The groundwater model predicted that drawdown of 1 foot could extend up to 3,800 feet from a proposed well. The proposed wells for the Project are located more than 3,800 feet from any existing well and would be the only wells located within the alluvial aquifer.

Groundwater used during Project construction will be applied to roads and other work areas for dust control and soil compaction purposes. A water-only application will not contribute any contaminants to the water supply and will not alter water quality. Water enhanced with dust

suppressants is unlikely to have any impacts on groundwater quality (U.S. Environmental Protection Agency 2008). The Project will obtain coverage under the State Water Resources Control Board National Pollutant Discharge Elimination System Order No. 2009-0009-DWQ, which requires a Stormwater Pollution Prevention Plan (SWPPP) to be prepared and implemented during and after Project construction. Adherence to the best management practices (BMPs) specified in the SWPPP will ensure that impacts to water quality do not occur.

6.2.2 Operation

Operation-related water use of approximately 7 AFY is much lower than the estimated water use during construction, and will occur over the lifespan of the Project. Project operation water use will be restricted to PV panel washing, water for fire suppression (if needed), and potable water use. The amount of water required for operation is approximately 1 percent of the safe yield for the subbasin. Project construction will not contribute to overdraft of the alluvial aquifer underlying the Project area.

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APPENDIX A: HYDROGEOLOGIC CONDITIONS AND GROUNDWATER MODELING REPORT

Hydrogeologic Conditions and Groundwater Modeling Report

SODA MOUNTAIN SOLAR PROJECT

BLM Case Number - CACA49584

Proposed Caithness Soda Mountain Solar Facility Near Baker, San Bernardino County, California

March 1, 2011

Prepared for:

United States Department of the Interior
Bureau of Land Management
California Desert District Office
22835 Calle San Juan De Los Lagos
Moreno Valley, CA 92553

Submitted by:

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Hydrogeologic Conditions and Groundwater Modeling Report

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1: Project Description and Groundwater Modeling Objectives

1.1 Project Description

The Caithness Soda Mountain Solar Project (Project) will include the installation, operation, and maintenance of approximately 1.5 million polycrystalline silicon solar photovoltaic (PV) panels for a 350-megawatt electric generating facility (Caithness, 2009). The Project Area is located in a small valley on federal lands managed by the U.S. Department of the Interior, Bureau of Land Management (BLM), approximately 6 miles southwest of the town of Baker in San Bernardino County, California (Figure 1.1-1).

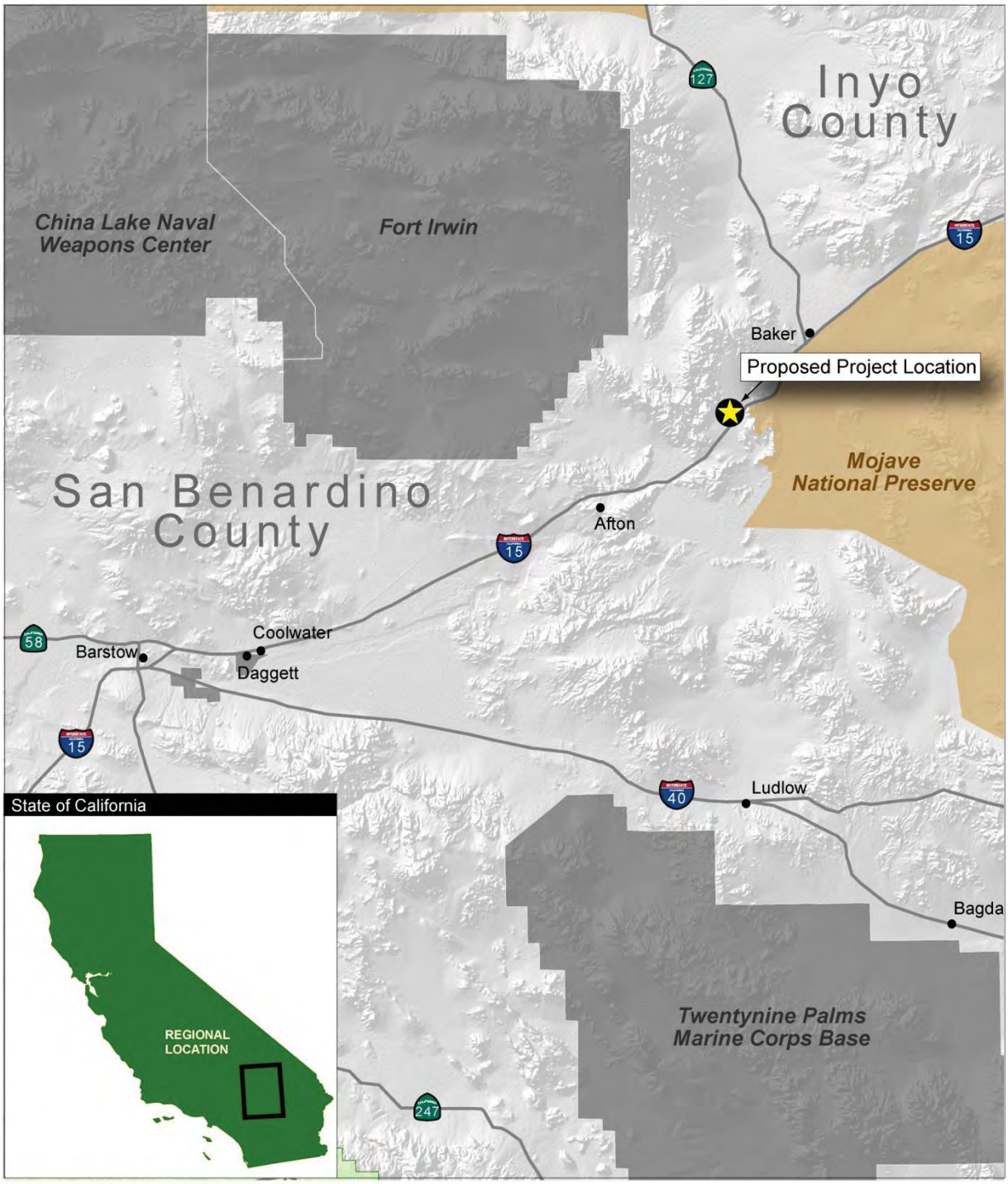
Caithness Soda Mountain LLC submitted an application for a right-of-way grant to the BLM to construct and operate the proposed solar project. The project is defined in a Plan of Development (POD), submitted to BLM on December 1, 2009 (Caithness, 2009). A revised POD will be submitted in March 2011.

The currently defined Project Area right-of-way consists of approximately 4,397 acres of land. Approximately 2,691 acres would be occupied by the solar arrays, with a portion of the remainder of the area used for access roads, storm water drainage, project-related buildings, and other project uses.

The goal of this report is to assist the BLM in its evaluation of the Plan of Development for the Project, and to provide the Project Applicant with an evaluation of the feasibility of obtaining the needed water supplies for the Project. Groundwater modeling was used to help evaluate whether the hydrogeologic conditions at the Project site could sustain the withdrawal of water needed during construction, operation, and maintenance of the proposed facility, without causing impacts to adjacent water users.

Numerical groundwater modeling is an effective tool to evaluate the effects of groundwater withdrawal, because the model can be constructed to represent the three-dimensional geometry of the aquifer, with realistic estimates of key aquifer parameters. The equations of groundwater flow are then applied using site-specific hydraulic parameters, aquifer geometry, and boundary conditions, and the resulting hydraulic head distribution can be compared to measured hydraulic heads. The calibration process involves adjusting aquifer parameters and boundary conditions within reasonable limits until there is a match between measured heads and model-predicted heads. Once the model is calibrated to existing conditions, it can then be used in a predictive mode to test for future effects of a stress, such as groundwater withdrawal. When hydrogeologic data are scarce, the model can be used to test specific questions using the upper and lower ends of a reasonable range of aquifer parameter values. Specific groundwater modeling objectives are described in Section 1.2.

Figure 1.1-1: Regional Location Map



SOURCE: ESRI 2006 and RMT, Inc. 2009

LEGEND

- Proposed Project Location
- State Border
- County Border
- Interstate Highway
- California State Highway
- Nevada State Highway

Miles: 0 5 10

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1.2 Modeling Objectives

The objectives of the groundwater flow modeling were as follows:

- To evaluate whether subsurface conditions would likely allow for one or more groundwater wells to successfully be installed that would yield sufficient quantities of water for Project construction and operation activities
- To evaluate whether groundwater withdrawals needed to support Project construction and operation activities would interfere with water use and springs located elsewhere in the region, such as the Town of Baker, Zzyzx Spring, and the Rasor Road Service Station
- To estimate the number of groundwater wells that may be required to obtain the desired water supplies
- To identify area(s) within the Project Area where conditions may be favorable for installing one or more water supply wells

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2: Hydrogeologic Setting

2.1 Topography and Surface Water Drainage

The valley in which the Project Area is located is surrounded by low mountains, with broad and deep alluvial fans overlying the bedrock (Figure 2.1-1). The valley is part of the South Lahontan Hydrologic Study Area and is part of the Soda Lake Watershed, but is not part of any formal groundwater basin (Department of Water Resources, 2003). The Soda Lake Valley and Silver Lake Valley Basins are located east and northeast of the Project Area, respectively, and the Cronise Lake Valley Basin is west of the Project Area, across a surface water divide (Figure 2.1-2). The valley includes two drainage basins (Basin A and Basin B shown on Figure 2.1-2, and encompasses a combined area of approximately 32,946 acres. Figures 2.1-3 and 2.1-4 are Google Earth images of the valley looking north and southwest, respectively, showing steeply sloping alluvial sediments in the upper reaches of the alluvial fans gradually leveling off as they approach the floor of the valley.

There are two ephemeral surface water outlets to the valley, located northeast and southeast of the Project Area (Figure 2.1-1). During storm events, precipitation runoff from Basin A in the northern portion of the drainage basin is funneled into the northeast outlet, and runoff from Basin B in the southern portion of the basin flows through the southeast outlet.

2.2 Hydrogeologic Conditions Based on TEM Data

There are limited data in the Project Area from which to evaluate deep subsurface geologic conditions (i.e., below approximately 100 feet below ground surface [bgs]). Three locations within the Project Area were investigated using Transient Electromagnetic Resistivity (TEM) soundings in September 2010. The results of the TEM investigation were discussed in the Geologic Characterization Report (Wilson Geosciences, 2011) and the Geophysical Characterization Report (Terra Physics, 2010) prepared for the Project. The three TEM locations are presented on Figure 2 in the Geophysical Characterization Report (Terra Physics, 2010): TEM-02, located at the northwest boundary of the project area, and TEM-09 and TEM-11, located in the southwest and southeast portions of the project area, respectively. The locations are shown in this report on Figure 2.1-1

The geophysical data for TEM-02 were interpreted to indicate that coarse-grained alluvium is present from ground surface to approximately 67 feet bgs, under which fine-grained alluvium is present (Table 2.1-1). The water table was interpreted to be present at 182 feet bgs, with saturated alluvium below that depth. Bedrock was interpreted to occur at a depth of approximately 332 feet bgs. At TEM-09, the boundary between shallower coarse-grained alluvium and deeper fine- to coarse-grained alluvium was interpreted to be at a depth of approximately 143 feet bgs, with the water table estimated to be at a depth of approximately 354 feet bgs. Bedrock at TEM-09 was estimated to be at least 500 feet bgs. Similarly, the bedrock was interpreted to be deep (436 feet bgs) at TEM-11, with the upper 436 feet composed of dry, coarse- and fine-grained alluvium. The water table was undetected at TEM-11, and was estimated to be at least 386 feet bgs.

Figure 2.1-1: Project Area and Model Domain

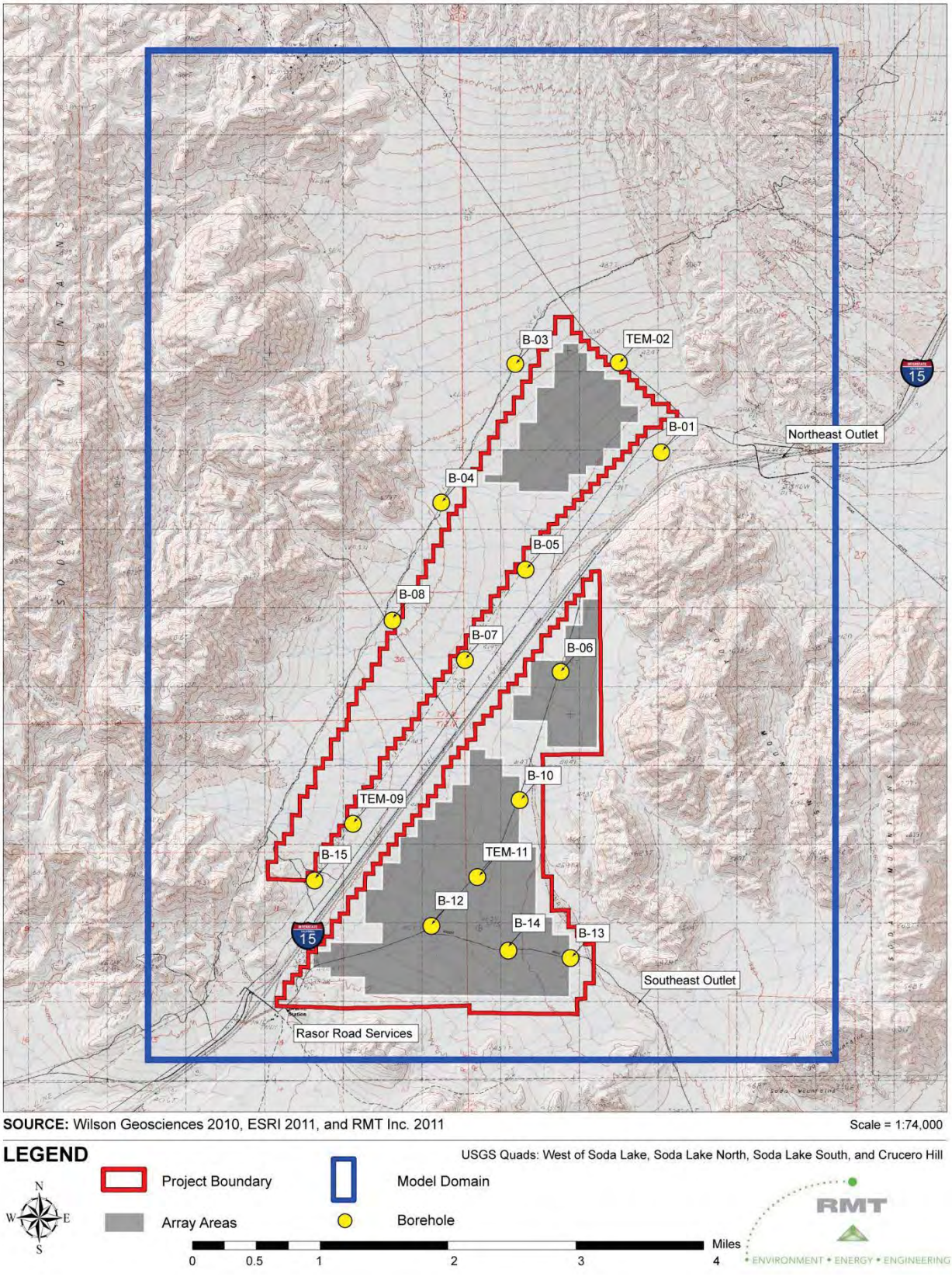


Figure 2.1-2: Drainage Basins of Project Area

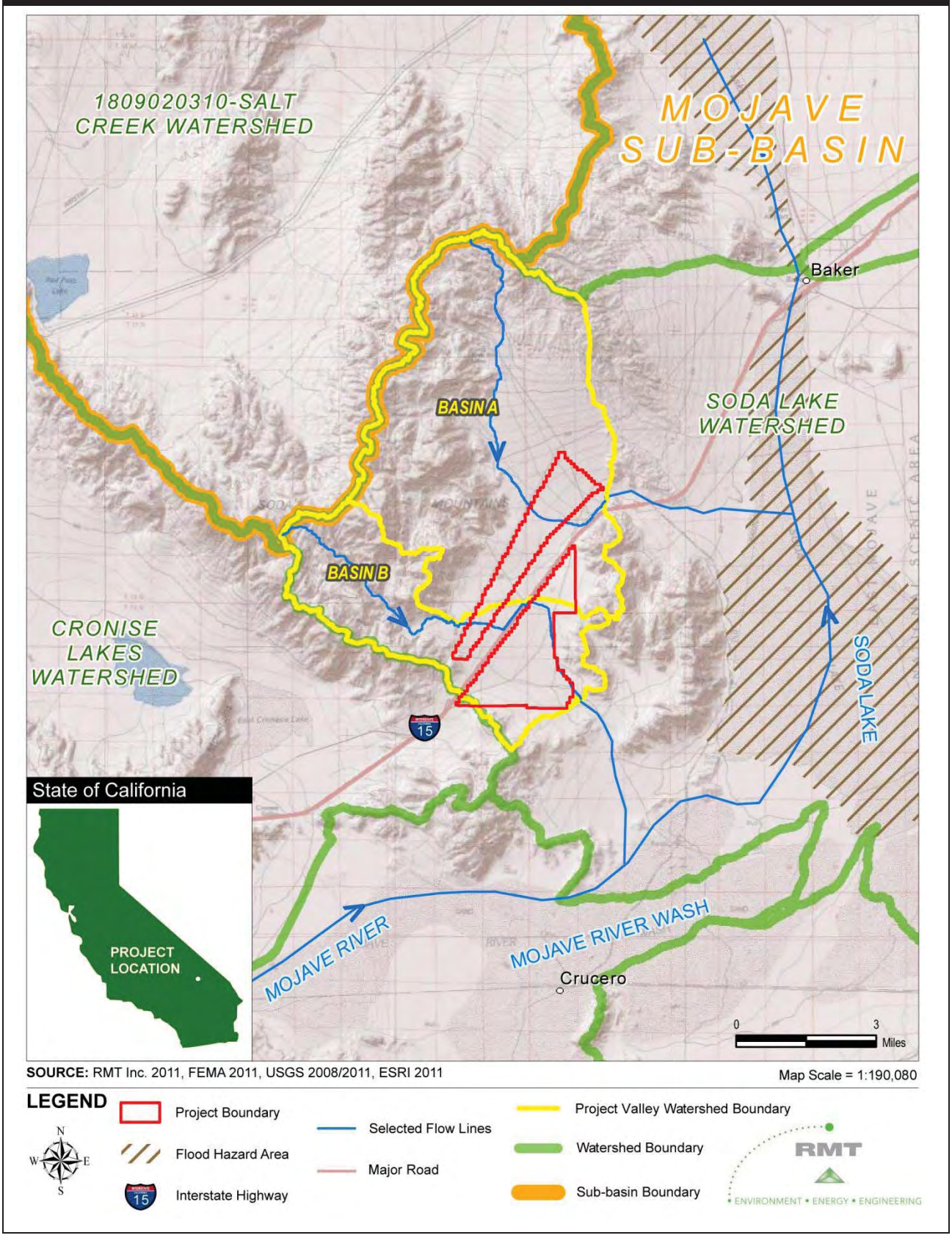
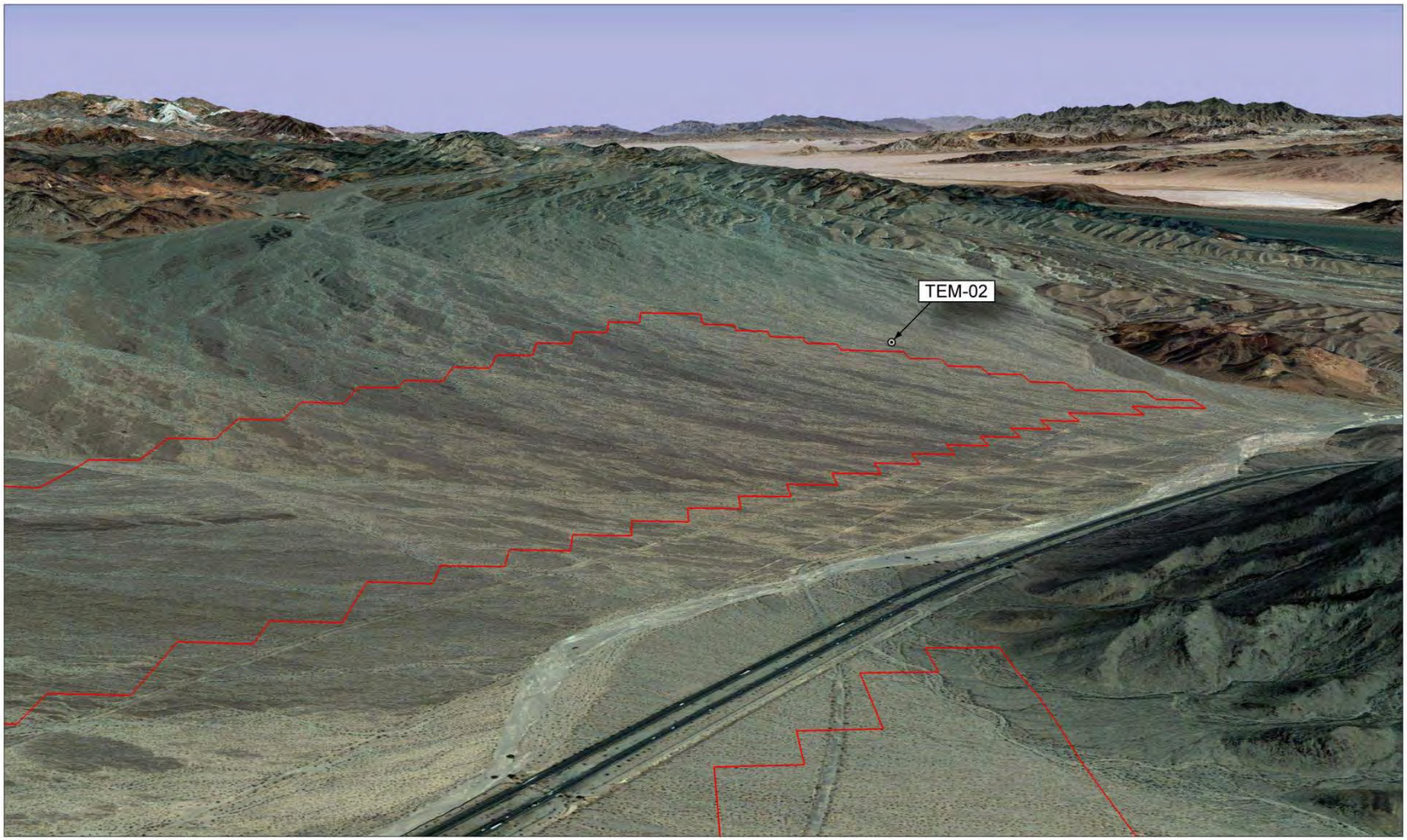


Figure 2.1-3: Project Area Valley, Aerial View North



SOURCE: RMT Inc. 2011, Google Earth Pro 2010, Digital Globe 2011

Project Boundary

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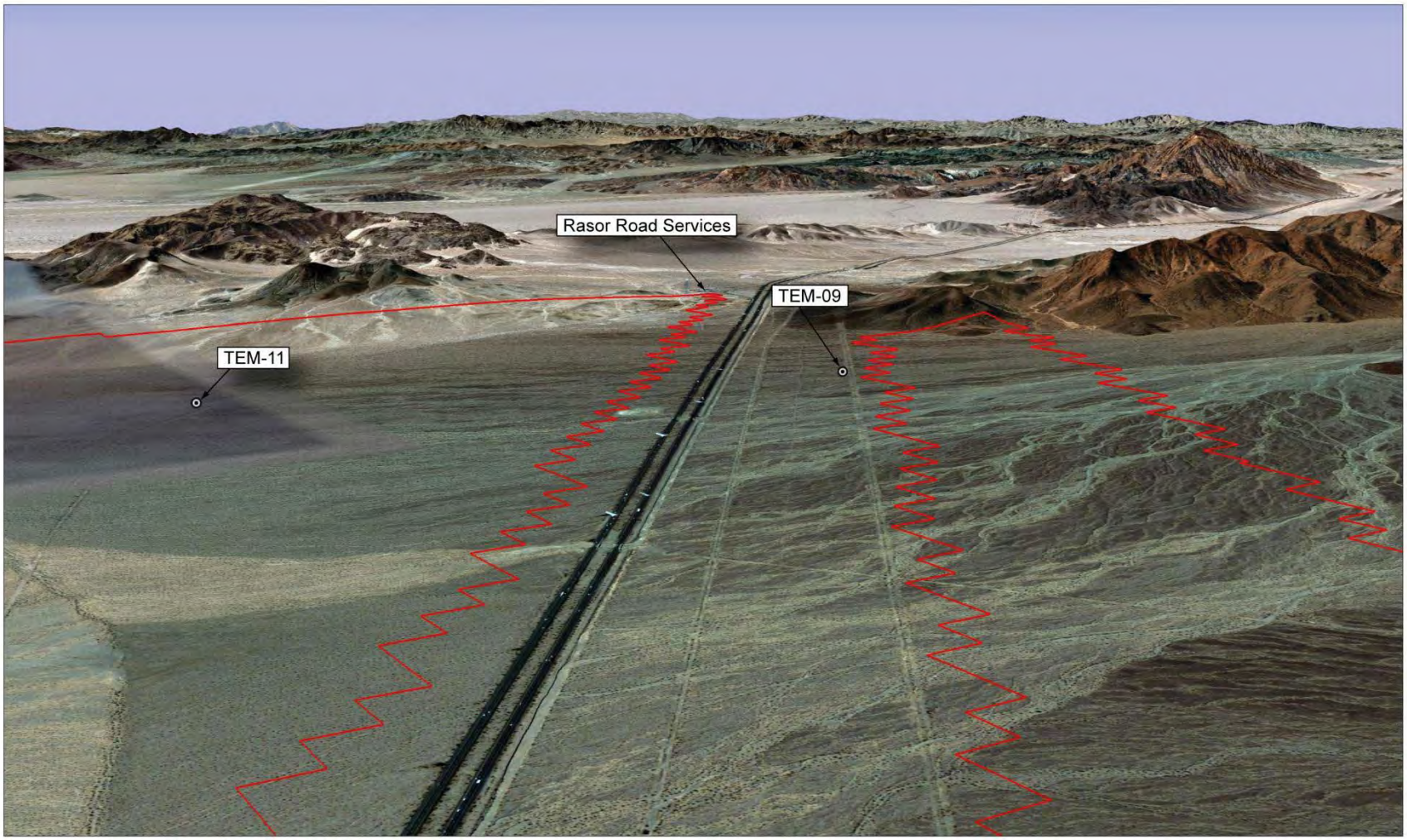
Figure 2.1-4: Project Area Valley, Aerial View Southwest



SOURCE: RMT Inc. 2011, Google Earth Pro 2010, Digital Globe 2011

Project Boundary

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Table 2.1-1: Hydrogeologic Conditions from TEM Survey Results

Sounding	Depth Range (feet)	Elevation Range (feet)	Electrical Resistivity (ohm-meters)	Stratigraphy Inferred from TEM Results
TEM-02	0±00 to 67±14	1414±00 to 1347±14	330±40	DRY,COARSE-GRAINED ALLUVIUM
	67±14 to 182±13	1347±14 to 1232±13	37±10	DRY TO VERY MOIST, FINE-GRAINED ALLUVIUM
	182±13 to 332±26	1232±13 to 1082±26	4±0.8	SATURATED ALLUVIUM
	BELOW 332±26	BELOW 1082±26	530±100	BEDROCK
TEM-09	0±00 to 143±36	1524±00 to 1381±36	360±50	DRY, COARSE-GRAINED ALLUVIUM
	143±36 to 354±30	1381±36 to 1170±30	98±20	DRY, COARSE- & FINE-GRAINED ALLUVIUM
	BELOW 354±30	BELOW 1170±30	15±03	SATURATED ALLUVIUM
	---	---	---	ESTIMATED BEDROCK IS AT LEAST 500 FEET DEEP
TEM-11	0±00 to 436±49	1358±00 to 922±49	80±12	DRY, COARSE- AND FINE-GRAINED ALLUVIUM
	BELOW 436±49	BELOW 922±49	610±92	BEDROCK
				GROUNDWATER WAS NOT DETECTED. IF IT IS PRESENT THEN THE ESTIMATED MAXIMUM UNDETECTABLE THICKNESS IS ABOUT 50 FEET. THEREFORE, GROUNDWATER WOULD BE BELOW AN ELEVATION OF 972 FEET.

SOURCE: Terra Physics, 2010

2.3 Hydrogeologic Conditions Based on Well and Boring Data

A 760-foot-deep bedrock well is located on the Rasor Road Services property, which lies at the southern boundary to the valley, as shown on Figures 2.1-1 and 2.1-4. The well bore encountered bedrock at or near the surface, and reportedly is capable of delivering approximately 1,500 gallons

per day (personal communication, Terry Young, owner, September 15, 2009). The Rasor Road Services well is the only known well in the vicinity of the Project Area. Because it is screened in bedrock and no saturated alluvium was encountered in the well bore, the well is interpreted to be hydrogeologically separated from the saturated alluvium in the valley. The well yields only small amounts of water derived from fractures in the bedrock, which also provides evidence of hydraulic separation between the Rasor Road bedrock well and the valley alluvial sediments. No wells are known to exist in the interior of the valley.

During August through November 2010, TEM geophysical surveys were conducted and 15 soil borings were drilled to a maximum depth of 100 feet bgs in the Project Area (Terra Physics, 2010). The geologic data collected from this investigation were evaluated in the construction of hydrogeologic cross sections (see Section 2.4 below). However, data from the soil borings were of limited usefulness because of the shallow depths explored and because groundwater was not encountered at any of the boring locations. As a result, the hydrogeologic interpretations presented on the cross sections relied heavily on the data collected from the three TEM locations, and on the interpreted configuration of the bedrock extrapolated into the subsurface from the mountain outcrops in the Project vicinity.

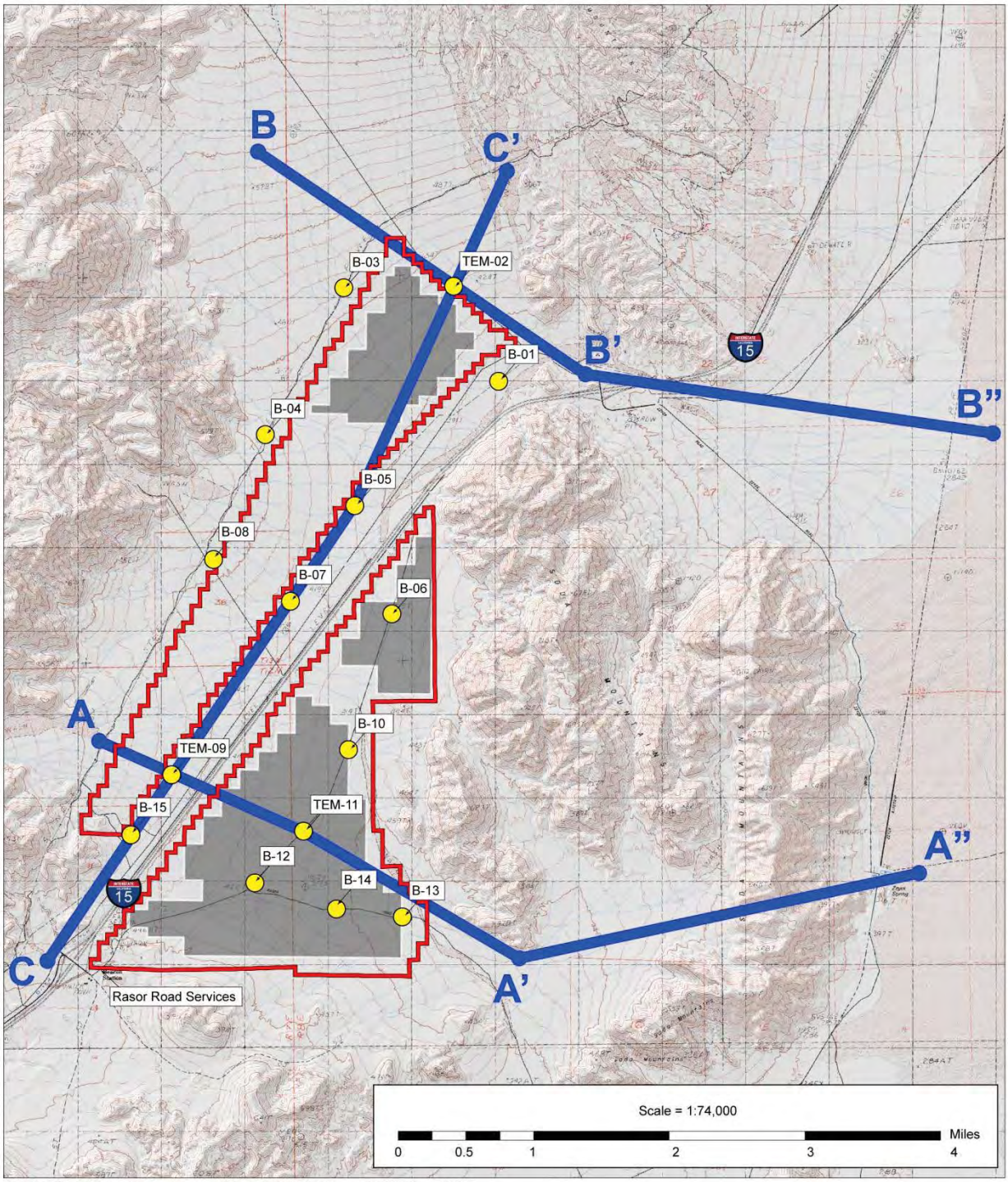
2.4 Hydrogeologic Cross Sections

A cross section location map is presented on Figure 2.4-1. Cross sections A-A′, B-B′, and C-C′ are presented on Figures 2.4-2, 2.4-3, and 2.4-4.

Cross section A-A′ extends west to east and incorporates data from TEM-09 and TEM-11 located near the southern end of the valley (Figure 2.4-2). The cross section extends eastward across the mountain range to Zzyzx Spring, located on the eastern slope of the eastern Soda Mountains, above Soda Lake. Bedrock occurs at depths of 500 feet or more bgs at TEM-09 and 436 feet bgs at TEM-11, and then outcrops on the slopes of the eastern mountain range. The water table occurs at an elevation of approximately 1,170 feet amsl at TEM-09, and appears to be below an elevation of approximately 922 feet amsl at TEM-11. The apparently much lower water table at TEM-11 suggests that there is an outlet for groundwater southeast of TEM-11 that allows the water table to drain to this lower elevation. A surface water outlet is present in the southeast portion of the valley (Figures 2.1-1 and 2.1-4), and it is reasonable that a buried bedrock valley may have been carved into the bedrock in the geologic past by floodwaters, then filled with alluvial sediments, allowing groundwater outflow from the valley. This conceptual model satisfies the need for a groundwater outlet to occur in the southeast portion of the valley, where the water table is apparently much lower than elsewhere, as seen at TEM-11.

Cross section B-B′ extends west to east along the northern boundary of the Project Area, and shows a similar topographic slope to the east as was shown on cross section A-A′, paralleling the surface water outlet to the east (Figure 2.4-3). Drainage from large alluvial fans converges into the surface water outlet that flows through a relatively narrow valley between low mountains to the north and south (Figure 2.4-1). The funneling of the surface water outflow suggests that, as for cross section A-A′, there may be a buried bedrock valley at this location that was carved by floodwaters in the geologic past, and subsequently filled with alluvium. The funneling of surface

Figure 2.4-1: Cross Section Locater Map



SOURCE: Wilson Geosciences 2010, ESRI 2011, and RMT Inc. 2011

LEGEND

Project Boundary

Array Areas

A A' Cross Section Line

Borehole

USGS Quads: West of Soda Lake, Soda Lake North, Soda Lake South, and Crucero Hill

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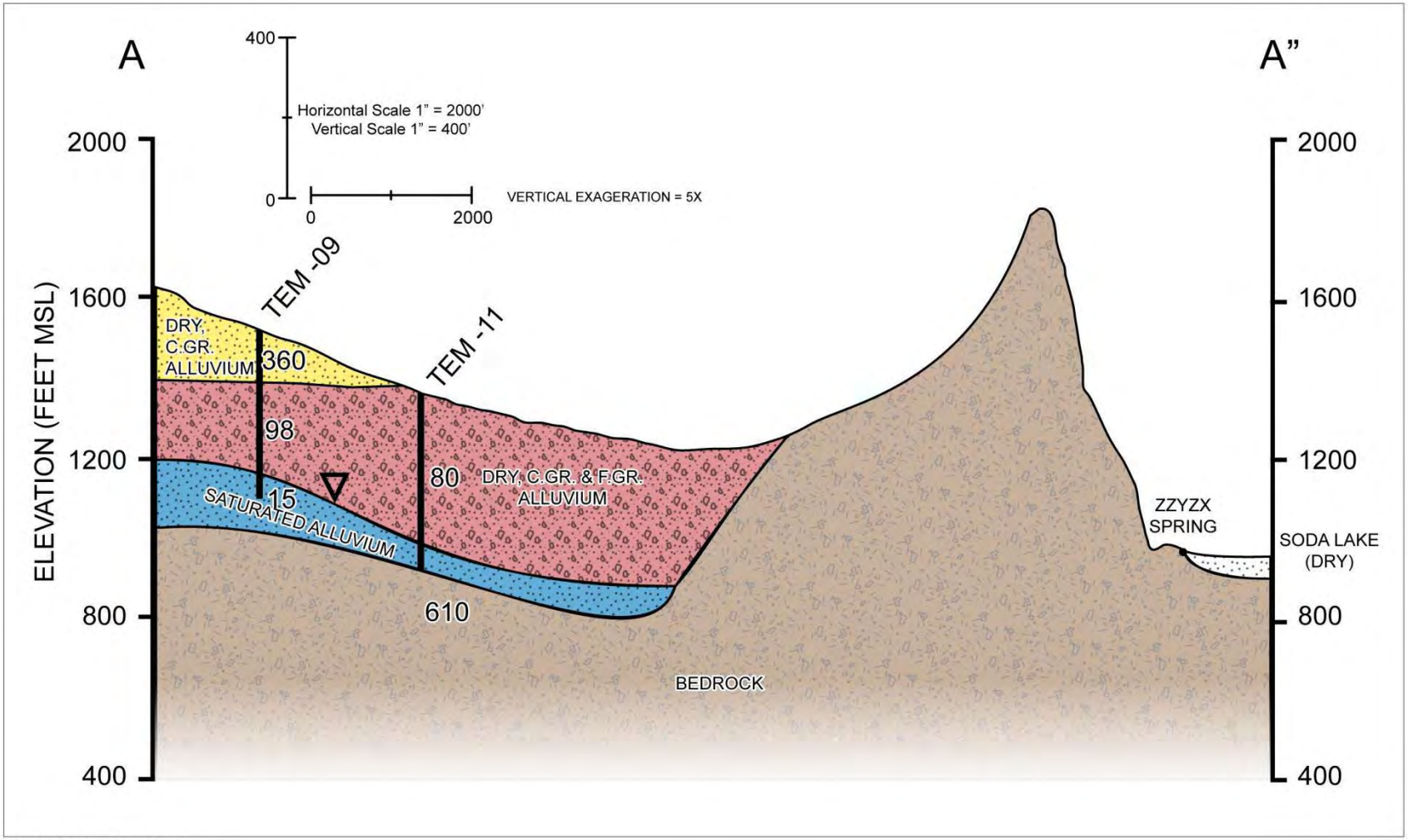
Figure 2.4-2: Hydrogeologic Cross Section A-A'



SOURCE: RMT Inc. 2011

LEGEND

Stratigraphic Boundary (Dashed Where Inferred)

80 Resistivity (ohm-meters), TEM Survey

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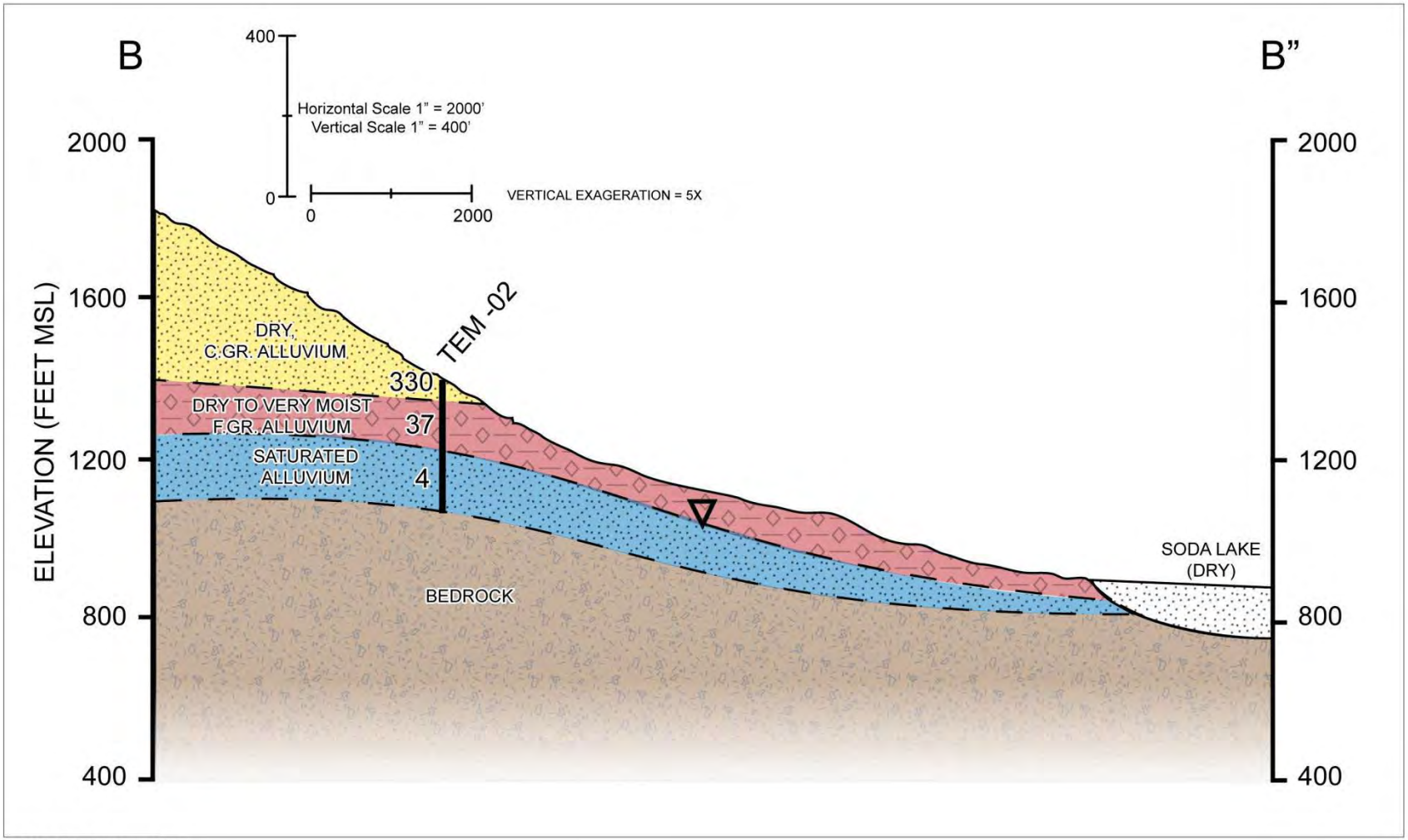
Figure 2.4-3: Hydrogeologic Cross Section B-B'



SOURCE: RMT Inc. 2011

LEGEND

Stratigraphic Boundary (Dashed Where Inferred)

80 Resistivity (ohm-meters), TEM Survey

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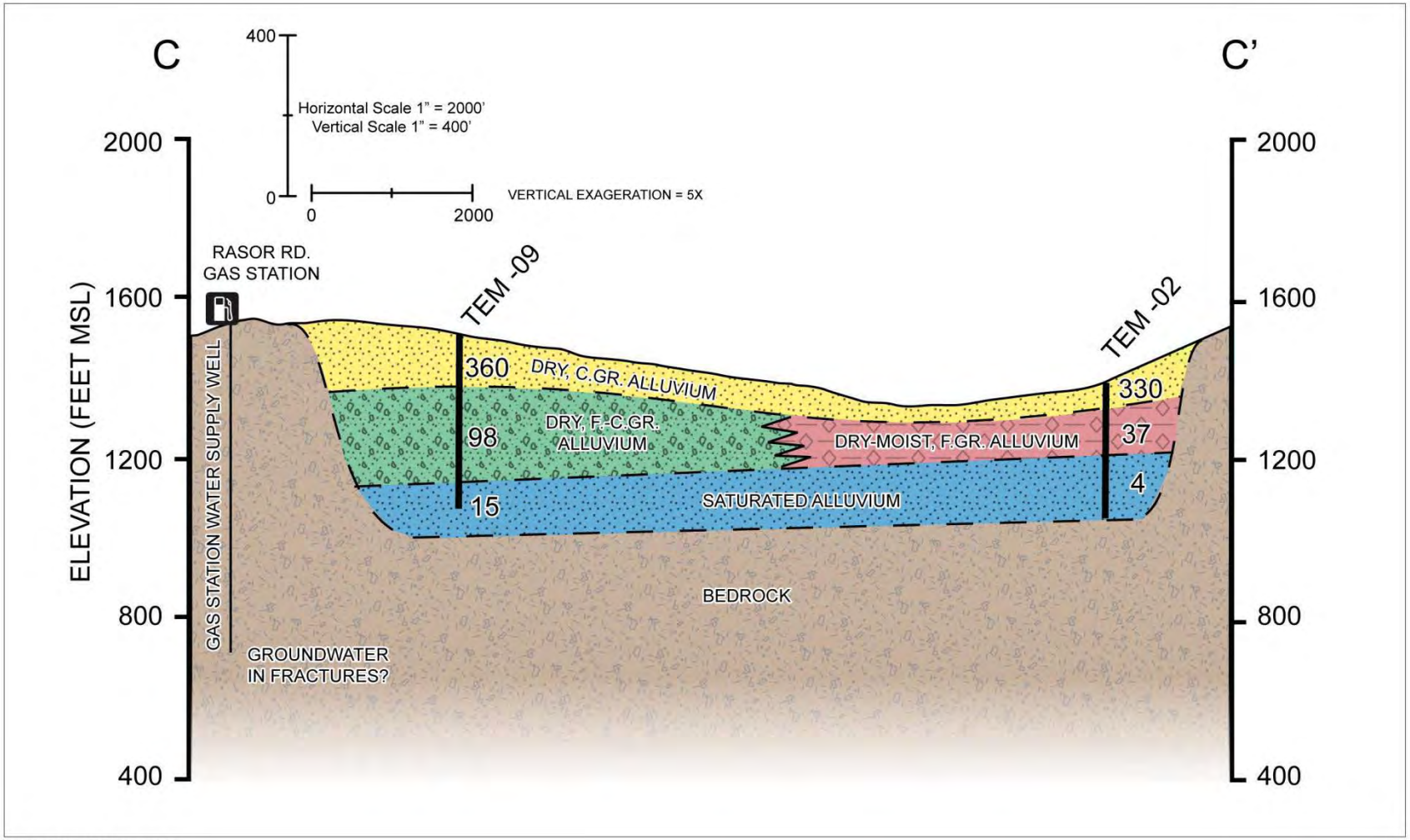
Figure 2.4-4: Hydrogeologic Cross Section C-C'



SOURCE: RMT Inc. 2011

LEGEND

Stratigraphic Boundary (Dashed Where Inferred)

80 Resistivity (ohm-meters), TEM Survey

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water through this narrow gap suggests that there may be coarser sediments within the valley fill at this location.

The water table is interpreted to be at a depth of approximately 182 feet bgs at TEM-02 (elevation of 1,232 feet amsl), the shallowest groundwater occurrence of any of the three TEM locations. The groundwater elevation at TEM-02 is approximately 300 feet higher than the water table in the Soda Lake plain located east of the valley (Figure 2.1-2), based on available U.S. Geological Survey (USGS) data. The conceptual model illustrated on cross section B-B' is that the water table slopes steadily eastward from the upper reaches of the alluvial fans to the base of the valley. Groundwater is channeled through the relatively narrow buried valley outlet located near the northeast corner of the Project Area, flowing eastward toward the Soda Lake lowlands.

Cross section C-C' extends northeast to southwest down the longitudinal axis of the valley (Figure 2.4-4). A surface water divide located approximately 1.5 miles north of TEM-11 separates water flowing to the northeast outlet from that flowing to the southeast outlet (Figure 2.1-2). It is likely that groundwater flow approximately mimics the surface water flow, flowing northward in the northern half of the valley, and southward in the southern half.

TEM data indicate that the resistivity of the saturated subsurface differs between the northern and southern portions of the valley, consistent with the interpretation of different groundwater flow directions in the two portions of the valley. Groundwater at TEM-02 has very low resistivity (i.e., 4 ohm-meters), indicating a high concentration of total dissolved solids (TDS). Groundwater in the southern portion of the valley exhibits higher resistivity values at TEM-09 (i.e., 15 ohm-meters), indicating relatively high TDS concentrations but lower than at TEM-02.

3: Model Setup

3.1 Model Code

The USGS modular three-dimensional finite-difference groundwater flow model (MODFLOW) (MacDonald and Harbaugh, 1988) was used to simulate hydrogeologic conditions in the Project valley. MODFLOW has been thoroughly tested and widely used for groundwater simulations, and has become a standard upon which other models are compared. It has the capability to accurately simulate a wide variety of aquifer conditions for porous media such as the saturated alluvial aquifer that occurs in the Project valley.

3.2 Model Layers

A single layer model was used to simulate the valley aquifer. The results of the TEM survey suggest that the entire thickness of unconsolidated sediment below the water table can be considered a single hydrologic unit, justifying the use of a single model layer. No low-permeability layers such as clays or caliche units were found below the water table, based on limited TEM results.

3.3 Model Domain and Boundary Conditions

The model domain shown on Figure 2.1-1 encompasses the limits of saturated alluvium in the valley that surrounds the Project Area. Reasonable projections of the slope of the water table and the bedrock were used to estimate the lateral and vertical limits of saturated alluvium. The limits of the aquifer were initially set as the limits of the alluvium where it intersects the bedrock on the hillsides. Initial model runs resulted in a number of boundary nodes as “dry” (unsaturated), which was reasonable considering the depth to the water table at known locations was greater than 182 feet bgs. The outer ring of model nodes at the upper reaches of alluvial fans tended to become dry; subsequently, these nodes were set to inactive, thereby making them outside the model domain.

The northeast and southeast outlets were extended 4,000 to 8,000 feet farther east than adjacent nodes that bounded the valley walls. This allowed for the model boundaries at the important outlet locations to be distant from potential water supply well locations, and to not overly constrain model results.

The water table constituted the upper boundary of the model. The lower boundary was set to be the bedrock surface, a conservative measure because it caused the model to ignore any groundwater that might be derived from the bedrock. The bedrock consists primarily of igneous intrusive and extrusive rocks, with little to no available water expected in the matrix. Fractures are likely in the rocks and may provide minor additional water supply.

The sides of the model domain were generally set to be no-flow boundaries, which is a conservative assumption that ignores any contribution from fractured bedrock. At two locations, the northeast and southeast surface water outlets, general head boundaries (GHB) were set. A limited number of nodes in the narrow outlet areas were set as GHB nodes, which allowed the

model to converge on a solution. Models require a small number of constant-head boundaries or general-head boundaries to be defined in order to converge on a solution. GHBs have an advantage over a constant-head boundary because there is a limit to the flow that can move through the node, depending on the hydraulic conductivity assigned to the node, thereby keeping the flow volumes realistic. It is also important to avoid having GHBs too close to a pumping well, which could falsely constrain drawdown associated with pumping. Care was taken during the simulations to test that the proximity of the model boundary did not constrain the calculated drawdown.

The model domain was configured with a nodal array of 142 rows and 113 columns (Figure 3.3-1). Node dimensions were generally 500 feet by 500 feet. In the vicinity of the simulated water supply well, the node size was refined to as low as 1 foot for the well node to provide for a more accurate calculation of expected drawdown under pumping conditions. Small node size more realistically simulated the actual conditions inside a well that may be only 6 to 8 inches in diameter.

3.4 Model Parameters

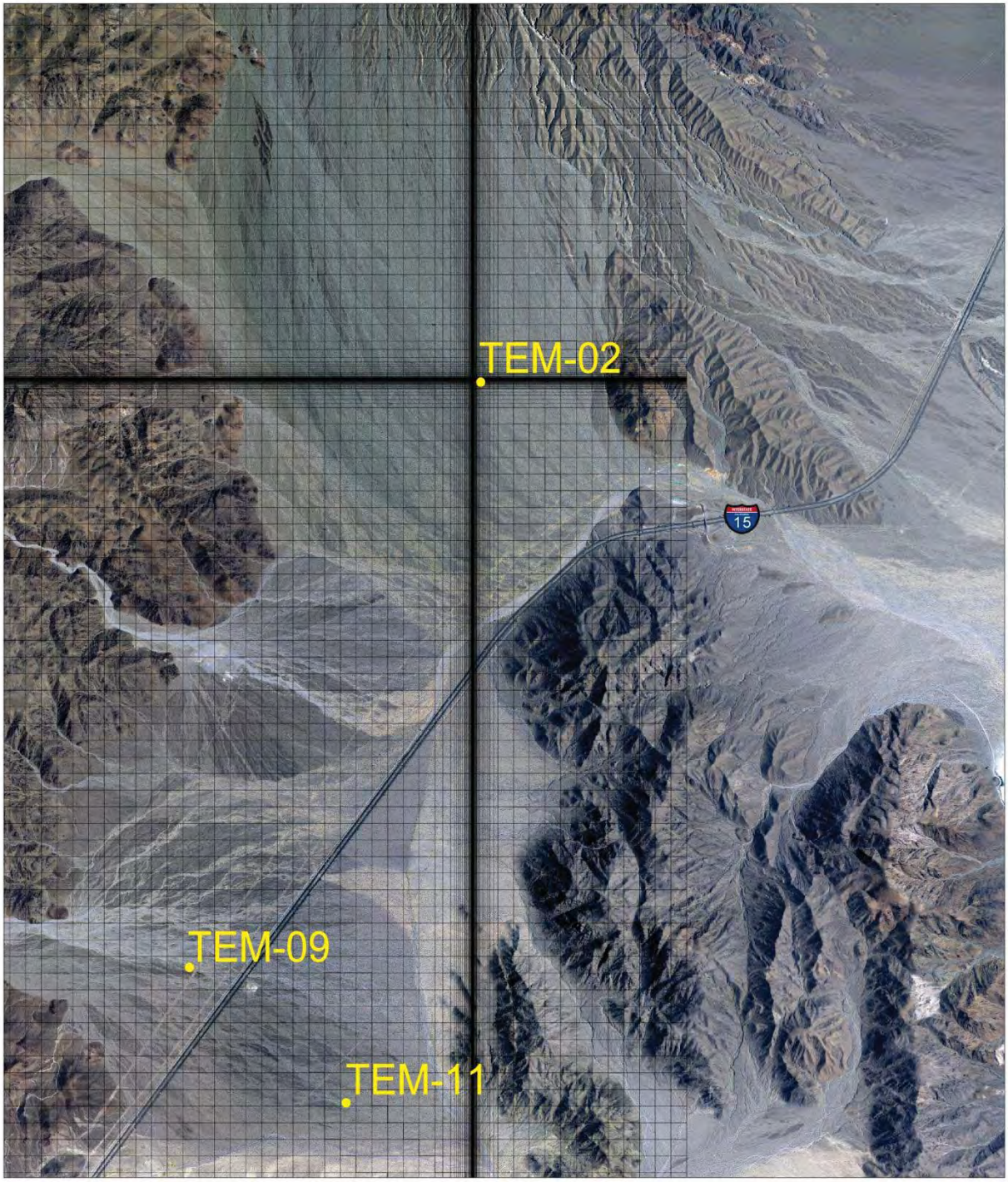
3.4.1 RECHARGE

Aquifer recharge (R) is a difficult parameter to determine directly, and is generally estimated based on area precipitation and evaporation data, or data from well-reviewed groundwater flow model simulations from similar areas. The Desert Studies Center website reports a mean precipitation value of 3.5 inches/year since 1980 for the Center, located about 4 miles east of the Project Area (http://biology.fullerton.edu/dsc/school/climate.html; accessed November 10, 2010). Danskin (1998) reported that he and others used a value of approximately 0.5 to 1.0 inch/year for R for Owens Valley, located east of the Sierra Nevada (Danskin, 1998; Danskin, 1988; Hutchinson, 1988). Lee (1912) suggested that approximately 16 percent of direct precipitation in Owens Valley infiltrated as groundwater recharge. Within the Project Area, this would equate to 0.56 inch/year. However, Danskin (1998) argued that the actual recharge may be lower than 16 percent of precipitation in arid regions.

For the Project Area, a range of R values was used (Table 3.4-1). At the high end, an R value of 0.5 inches/year was assigned. The low end estimate of R used in simulations was 0.125 inches/year. These values are believed to bracket the reasonable estimates of groundwater recharge from direct precipitation for the valley.

Nodes on the boundary of the model were assigned higher R values to accommodate for mountain-front runoff that infiltrated the alluvial fan at the boundaries. The precipitation falling over the drainage area in the mountains was assumed to result in about 0.5 inch/year of R. This rate was totaled for the drainage area in the mountains, and added into the boundary nodes as mountain-front recharge. Similarly, for the low-end model, an estimated 0.125 inch/year of R was assumed for all of the mountain area, and this total amount was allocated to the boundary nodes. As a result, the boundary nodes were assigned R values that were 26 times as high on average as the interior nodes, to account for all the runoff from the bedrock outcrop that would be transported to the boundary nodes. This approach is consistent with the work of others in

Figure 3.3-1: Model Grid



SOURCE: U.S. Geological Survey, EROS Data Center, Sioux Falls, SD 2010, RMT Inc. 2011

N
W E
S

0 0.25 .5 1 1.5 2 Miles

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Table 3.4-1: Selected Model Parameters

Aquifer Parameters			
Parameter Set Name	*Hydraulic Conductivity (K) (feet/day)*	*Groundwater Recharge (R) (inches/year*	*Storage Coefficient (unitless)*
High End	4	0.5	0.1
Low End	1	0.125	0.1

Note: Values given are for main body of model domain. Nodes at the model boundaries have higher R values. Nodes near the northeast and southeast outlets have higher K values.

southeastern California, such as Danskin (1998), who noted that mountain-front recharge was significantly higher than areal recharge in Owens Valley.

No additional recharge from infiltration from ephemeral streams was assumed. This approach may underestimate the actual amount of recharge in the valley, and thus would be a conservative assumption. Using this approach, the high end estimate of recharge from direct precipitation and mountain front runoff is 1,373 ac-ft/yr. The low-end estimate of recharge is 343 ac-ft/yr. In comparison, the expected highest water use, which would occur during construction, would be 61.6 ac-ft/yr (55,000 gpd), which equals 4.5 percent of the high-end recharge estimate, and 18 percent of the low-end recharge estimate.

3.4.2 HYDRAULIC CONDUCTIVITY

Hydraulic conductivity (K) values were estimated based on:

- Mean K value of 10 feet/day for shallow in-field permeability tests at 20 locations in the Project Area (Diaz-Yourman and Associates, 2010)
- TEM data from three sites to depths of up to 500 feet bgs (Terra Physics, 2010)
- Observations of grain size from 15 on-site borings, including one deeper boring to 100 feet bgs (Diaz-Yourman and Associates, 2010)

The in-field K values and field observations indicate that shallow soils can be characterized with a relatively high K value, with a mean K value of 10 feet/day (Diaz-Yourman and Associates, 2010). Values for soils at depth are less certain because of the lack of K tests and direct observations of soil samples. TEM data suggest that there may be somewhat finer-grained sediments at TEM-02, and alternating coarse-grained and fine-grained sediments at TEM-09 and TEM-11.

Calibration of a numerical model is highly dependent on values of K and R. Several combinations of K and R can result in a suitable “match” to the existing measured heads. To account for the uncertainty in K and R values, high-end and low-end values were used in calibrating the model to measured heads. The high-end and low-end values were chosen based their ability to reach calibration within a reasonable range of values for K and R.

Calibration of the model indicated that a high-end K value of 4 feet/day resulted in a reasonably good fit to known head values. This K value was less than the 10 feet/day recorded as a mean K value for shallow sediments, but was still a relatively high value, consistent with the presence of coarse sediments noted at the TEM locations. Attempts to increase the K value higher than 4 feet/day resulted in predicted head values that were too low for the valley, even when coupled with the upper-end recharge values (0.5 inch/year). The 4 feet/day value for K was selected as a high-end K value for the model.

For the second parameter set, a low-end K value of 1 foot/day was assigned. This K value allowed the model to reach calibration to the measured head values when coupled with the low-end R estimate of 0.125 inch/year. Attempts to reach calibration using lower values of K were not successful when coupled with the low-end R estimate.

For both the low-end and high-end models, zones of relatively higher K values were input into the model near the northeast and southeast outlets. Coarser sediments would be expected near the outlets, where funneling of surface water likely winnows out finer-grained sediments. The model was not able to achieve a good match to the measured heads without the presence of the higher K zones near the outlets. Values of K that were 2.5 to 5 times higher than the rest of the model domain were input for the areas near the outlets.

Vertical hydraulic conductivity (Kv) values were set to be 10 percent of the horizontal hydraulic conductivity (K) values. Values of Kv are commonly in the range of 10 percent of K (Freeze and Cherry, 1979). A single-layer model is generally insensitive to Kv values because there is no interlayer (vertical) transfer of water.

3.4.3 STORAGE COEFFICIENT

A storage coefficient of 0.1 was assigned to the entire model domain. This is a reasonable value for an unconfined aquifer (Davis, 1969). There are no data to indicate that the aquifer is confined with any low-permeability unit; therefore, it was assumed to be unconfined. The 0.1 value is consistent with values used by Danskin (1998) in Owens Valley for the upper sequence of sediments.

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4: Model Results

4.1 Calibration

The steady-state hydraulic head distribution for the calibrated model is presented on Figure 4.1-1 for the high-end set of K and R. Figure 4.1-2 portrays the head distribution for the low-end set of K and R. The steady-state head distributions are virtually identical. Table 4.1-1 shows the results of the calibration, comparing model results to heads estimated from TEM results.

Predicted head values at TEM-02 were 1,232 feet amsl, matching the value estimated based on TEM results. The predicted head value for TEM-09 in the model (1,156 feet amsl) was well within the range of uncertainty for the estimated value based on TEM results (1,170±30 feet amsl). For the TEM-11 location, the model prediction was 1,089 feet amsl, almost 100 feet higher than the TEM result of less than 992±49 feet amsl. The TEM value at TEM-11 was not judged to be reliable because the water table was not detected and because the head value predicted by TEM results (below 992 feet amsl) was anomalously low, nearly as low as the head values measured in the Soda Lake area, which is located 4 miles east and 500 feet lower in ground elevation.

Mass balance errors were extremely low for the calibrated model, at 6×10^{-4} percent. All water entering the model is derived from areal recharge. Outflow is through the northeast and southeast outlets, through GHB nodes assigned to those locations. In general, the match of the model values to the two "measured" values was considered adequate for an area with such sparse hydrogeologic data.

Table 4.1-1: Predicted Hydraulic Heads Versus "Measured" Heads from TEM Results

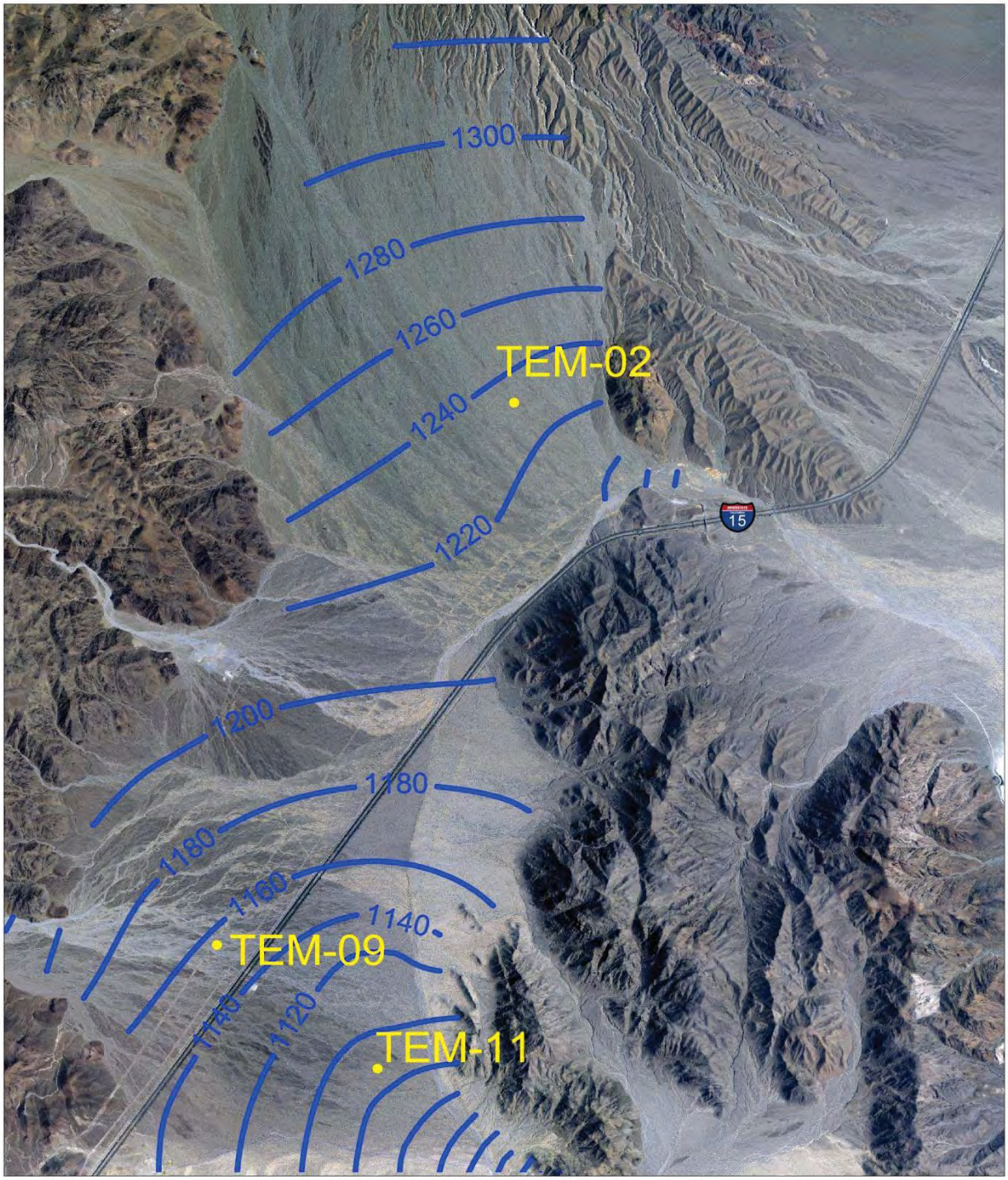
	High-End Parameter Set		Low-End Parameter Set	
Measurement Location	*Predicted Head (feet amsl)*	*Measured Head (feet amsl)*	*Predicted Head (feet amsl)*	*Measured Head (feet amsl)*
TEM-02	1,232	1,232±13	1,229	1,232±13
TEM-09	1,156	1,170±30	1,154	1,170±30

Note: Measured head values were estimated based on TEM survey results from Terra Physics (2010).

4.2 Effects of Groundwater Extraction

The effects of pumping a water supply well at the rate needed for construction and operation were evaluated by conducting transient flow simulations. Transient flow simulations take into account the change in hydraulic heads over time in a dynamic condition of pumping, where the cone of depression spreads downward and outward over time. Simulations were conducted using the calibrated high-end and low-end models. The model grid spacing was refined in the vicinity of the simulated well to as small as 1 foot, so that a more accurate estimate of drawdown in the well itself could be obtained.

Figure 4.1-1: Steady State Calibration Run, High End Parameter Set



SOURCE: U.S. Geological Survey, EROS Data Center, Sioux Falls, SD 2010, RMT Inc. 2011

N W E S

SM37B Steady State Calibration Run, High End K, R

0 0.25 .5 1 1.5 2 Miles

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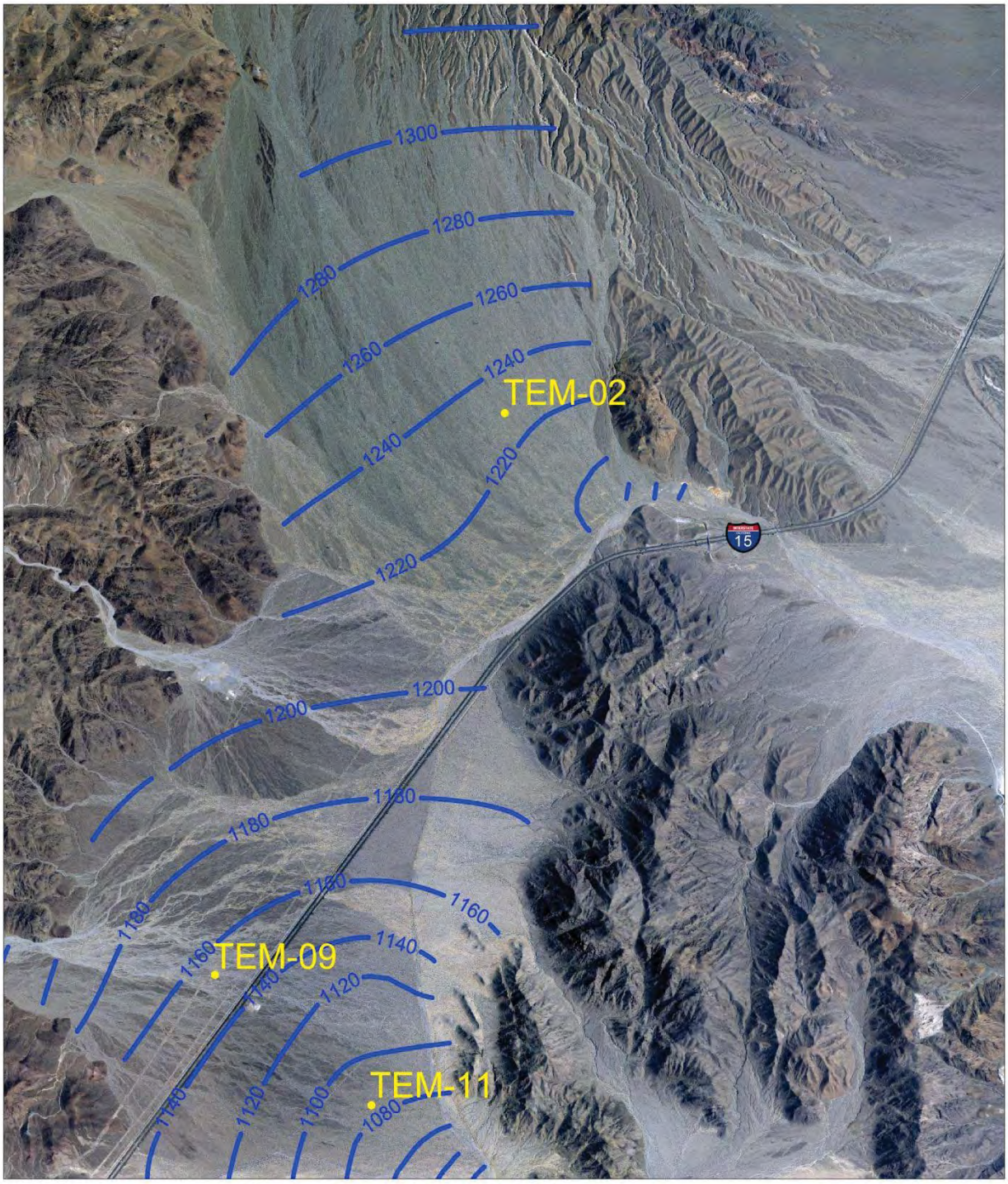
Figure 4.1-2: Steady State Calibration Run, Low End Parameter Set



SOURCE: U.S. Geological Survey, EROS Data Center, Sioux Falls, SD 2010, RMT Inc. 2011

N W E S

SM38 Steady State Calibration Run, Low End K, R

0 0.25 .5 1 1.5 2 Miles

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4.2.1 PUMPING RATES NEEDED FOR CONSTRUCTION AND OPERATION

Water needs for construction were estimated to be approximately 55,000 gallons/day (7,352 cubic feet per day [ft^3/day]) for a duration of two to three years (RMT, 2009). Water needs for operation and maintenance (i.e., for PV panel cleaning) were estimated to be approximately 42,000 gallons/day (5,615 ft^3/day), over a 21-day period occurring twice per year (RMT, 2009). Other water needs (domestic uses) during the operation and maintenance phase are expected to be much lower that than the water needs during construction.

4.2.2 SELECTED LOCATION OF WATER SUPPLY WELLS

Examination of hydrogeologic data from TEM locations and borings indicates that the north end of the Project Area is likely to yield sufficient quantities of groundwater for the Project. The interpreted depth to the water table at TEM-02 near the north end of the Project Area is about 182 feet bgs, with approximately 150 feet of saturated alluvium overlying bedrock. Locations at the south end of the Project Area (i.e., TEM-09 and TEM-11) apparently have a much deeper water table (354 feet bgs at TEM-09 and more than 386 feet bgs at TEM-11), making these locations less desirable. At TEM-09 there is an estimated 150 feet or more of saturated alluvium overlying bedrock, indicating that a well could be placed there to withdraw from a substantial thickness of aquifer. However, given that the water table is substantially shallower at location TEM-02, the north end of the Project Area was judged to be more favorable for the location of one or more water supply wells.

A water supply well was simulated near the location of TEM-02, operating under the conditions expected during construction. Specifically, a well was simulated to be pumping continuously at a rate of 55,000 gallons/day (7,352 ft^3/day) over a period of three years, the upper estimate of construction time.

4.2.3 RESULTS OF SIMULATED GROUNDWATER WITHDRAWALS

High-End Parameter Set

Figure 4.2-1 shows the resulting drawdown predicted around a water supply well after three years of pumping at 55,000 gallons/day, or 61.6 ac-ft/yr (representing the construction phase), for the high-end parameter set. For the high-end K and R parameter set, the results indicate a predicted maximum drawdown of about 20 feet in the well node after three years of pumping at 55,000 gallons/day (Table 4.2-1). The cone of depression contours extend generally less than 3,000 feet from the well, with a slightly elongated extension to the bedrock lying to the east.

Low-End Parameter Set

Figure 4.2-2 shows the drawdown predicted after three years of pumping at 55,000 gallons/day (representing the construction phase), for the low-end parameter set. With low-end values of K and R, the predicted drawdown is much higher than with the high-end parameter set, with a maximum drawdown of about 81 feet in the well node. The radius of drawdown was generally less than 3,000 feet, similar to that of the high-end parameter set.

Figure 4.2-1: Predictive Run – High End Parameter Set - Drawdown After 3 years of Pumping

SOURCE: U.S. Geological Survey, EROS Data Center, Sioux Falls, SD 2010, RMT Inc. 2011

N W E S

Run SM37b Transient - High End K, R - Drawdown of Water Table
After 3 Years of Pumping at 55,000 gallons per day

0 0.25 .5 1 1.5 2 Miles

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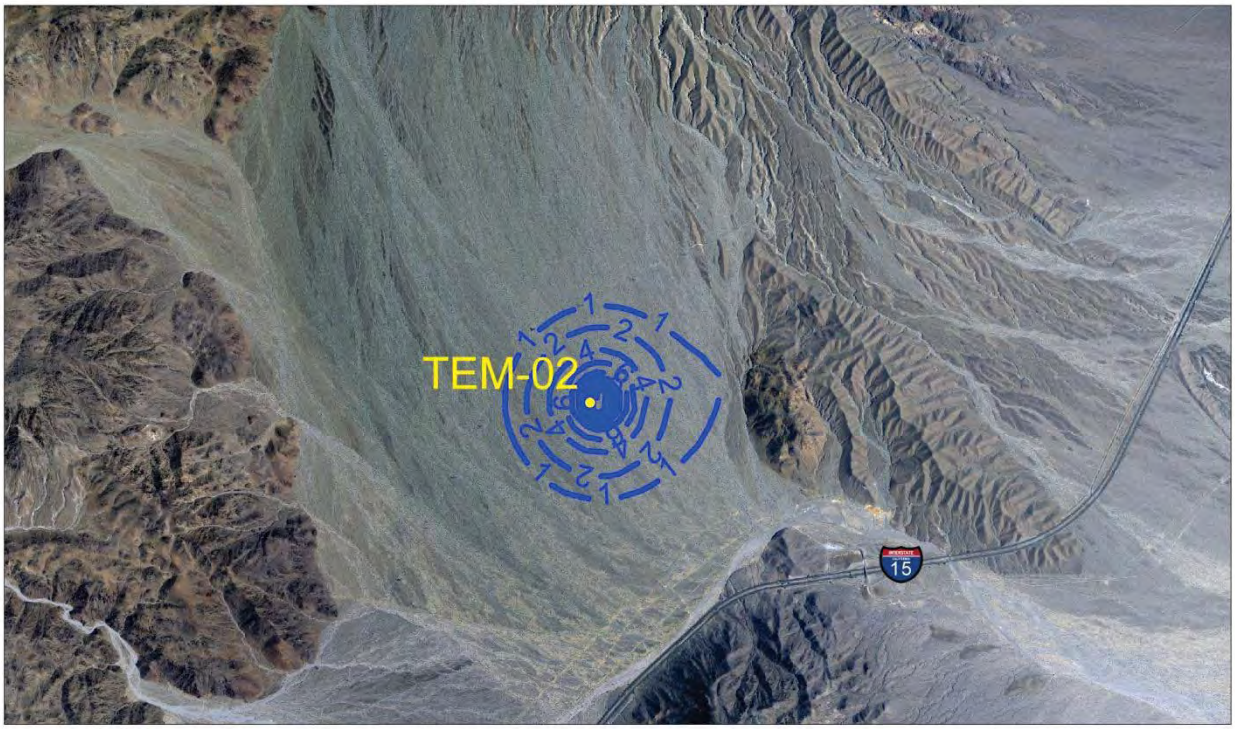
Table 4.2-1: Effects of Groundwater Withdrawals at Maximum Withdrawal Rates

Parameter Set Name	*Maximum Predicted Drawdown near Well (feet)*	*Radius of Area with Drawdown Greater than 1 Foot(feet)*
High End	20	2,500 – 3,800
Low End	81	2,400 – 3,050

Note: Maximum drawdown inside the well itself will likely be somewhat higher than predicted for the aquifer near the well because of typical well inefficiencies.

Figure 4.2-2: Predictive Run – Low End Parameter Set - Drawdown After 3 years of Pumping



SOURCE: U.S. Geological Survey, EROS Data Center, Sioux Falls, SD 2010, RMT Inc. 2011

Run SM38 Transient - Low End K, R - Drawdown of Water Table
After 3 Years of Pumping at 55,000 gallons per day

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Simulations of operating conditions indicate that drawdown would be much lower than during the construction phase because the rate of pumping would be lower, and would have a much shorter duration. As stated earlier, it is expected that 42,000 gallons/day, for 21 days, twice per year, would be needed for PV panel cleaning and other activities. The results indicate that minor drawdown would occur, less than 25 percent of that which would occur with the higher rates of pumping under construction conditions. Because the drawdown under operating conditions would be substantially less than that under construction conditions, only the drawdown results during construction are shown on Figure 4.2-2.

5: Conclusions

Groundwater modeling results indicate that conditions are favorable for obtaining sufficient water to conduct construction and operation activities on site that require non-potable water. Conservative estimates of groundwater recharge are between 343 and 1,373 ac-ft/yr, compared to an expected use of 61.6 ac-ft/yr. for a period of three years. The modeling results indicate that one or two wells screened in alluvium near the northern end of the Project Area, near TEM-02, would likely be capable of supplying sufficient water required during construction for dust control and other construction-related activities. Drawdown values for the area near the modeled water supply well range from 20 feet for the high-end parameter set to 81 feet for the low-end parameter set. Actual drawdown inside a well will likely be higher than the aforementioned values because of well inefficiencies that are caused by frictional losses in the well screen and turbulent flow in the well.

Water needs for long-term operation of the site would be much less than during construction, and one or two wells would be expected to be capable of supplying the water required for PV panel cleaning and other non-potable water needs. Water needs for potable uses are not intended to be obtained from the aquifer and, therefore, were not simulated.

Drawdown impacts in excess of 1 foot are not expected to extend more than about 3,000 feet from the well(s) that would be installed, at the projected pumping rates. In comparison, the town of Baker lies more than ten times as far from the Project Area as the drawdown impacts would extend, approximately 33,000 feet northeast of the recommended location of the water supply well(s) near TEM-02. Similarly, Zzyzx Spring is located approximately 29,000 feet from TEM-02, and the Rasor Road Services well is located approximately 30,000 feet southwest of TEM-02. No impacts from groundwater withdrawals would be expected to be measurable at these three locations. No other groundwater users are known to exist in the Project valley or anywhere close to the estimated cone of depression of the recommended well(s).

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6: Recommendations

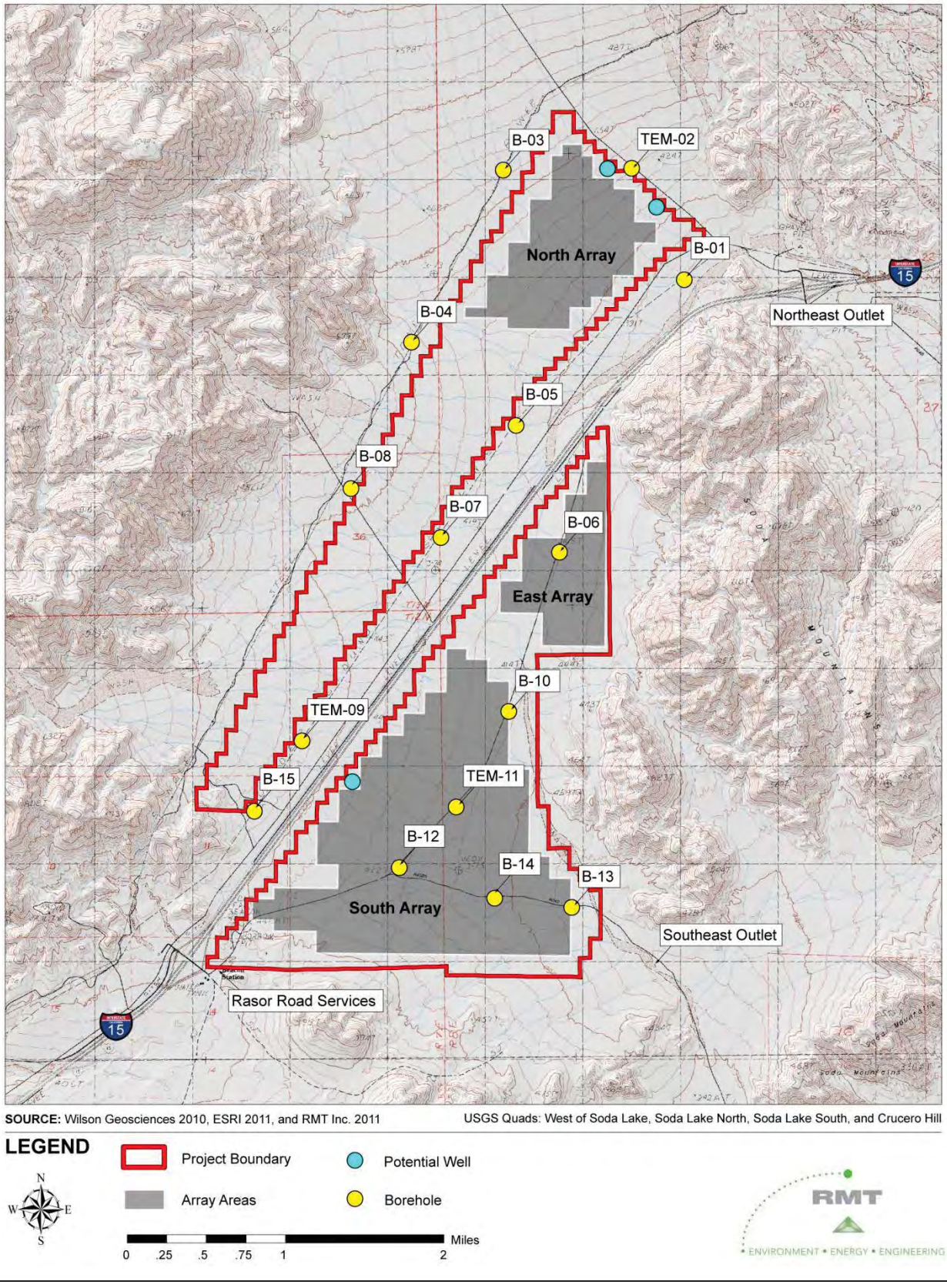
RMT recommends that two water supply wells should be planned for, to be located in the vicinity of TEM-02, at a location that is convenient for access. To minimize well interference, the two wells should ideally be separated by a distance of 2,000 feet or more. Drawdown effects from one well on the other well would be expected to be insignificant at this separation distance. Although the model results indicate a single well would be adequate for the high-end K and R conditions, and a single well may also be adequate for the low-end K and R conditions, planning for a second well to be installed has distinct advantages:

- A second well would be available in case well or pump repair is required, without shutting down planned activities (especially during construction) that require water
- A second well may be needed if significantly more water per day is required for certain days than the average rate
- A second well may be needed if the actual K is near or below the low-end K value of 1 foot/day

Data gathered during drilling of a well will be valuable in evaluating whether the soils at the location of the well are at least as permeable as the low-end K values used in this modeling. While it is expected that the K and thickness of saturated sediments would be sufficient to yield the required amounts of water, if actual conditions encountered during drilling indicate a lower K or thinner thickness of saturated soils than expected, extending the borehole into the bedrock to intercept potential water-bearing fractures may be an effective solution.

Location of a second well nearer to the southeast portion of the Project area may be desirable to provide water to the planned Operations Building for non-potable uses, and for fire-suppression. The planned location of the Operations Building near Rasor Road Services is not judged to be a favorable location for a well because bedrock is close to the surface and there apparently is no saturated alluvium overlying bedrock. A more favorable location for the well would be nearer to TEM-09, but on the southeastern side of I-15 (see Figure 6.1-1). A well at this location would facilitate transport of water between the well and a water storage tank to be located at the Operations building. It is expected, based on the geologic data from TEM-09 and TEM-11 locations, that operation of a water supply well at this location would not have any negative impact on the nearest water supply users, such as Rasor Road, the town of Baker, or Zzyzx Spring. This is because the sediments appear to be of similar character to those in the northern end of the Project valley and are part of an extensive saturated alluvial sediment aquifer. It is recommended that a potential water supply well this location be simulated with the existing groundwater flow model to confirm that the predicted effects would be negligible.

Figure 6.1-1: Potential Water Supply Well Locations



7: Limitations

The accuracy of the model results is limited by the scarcity of measured hydraulic head values and other hydrogeologic data in the Project valley. “Measured” hydraulic heads were estimated values based on TEM data, with uncertainties of 13 to 30 feet or more. Measured values of hydraulic conductivity exist for shallow soils only, and K values were estimated for the deeper soil horizons based on TEM data. Similarly, depth to bedrock was derived from the limited TEM data. Recharge values were estimated based on measured rainfall and comparison to other investigation areas. Despite these limitations, the approach taken – to bracket the expected range of values of R and K with high-end and low-end data sets – represents a reasonable approach to reduce the uncertainty and obtain meaningful results. The predictions presented here were based on bulk (average) hydraulic parameter values; actual values of hydraulic conductivity can vary by an order of magnitude or more over short distances at typical sites. A localized zone of low-permeability sediments could limit the performance of an installed well.

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APPENDIX B: GROUNDWATER QUALITY DATA

MAY 2000 well

EDT

CLINICAL LABORATORY OF SAN BERNARDINO, INC.
21881 BARTON ROAD
GRAND TERRACE, CA 92313
GENERAL MINERAL & PHYSICAL, & INORGANIC ANALYSIS (4/95)

Date of Report: 05/25/00
Sample ID No.M03284-1A
Laboratory Name: CLINICAL LABORATORIES OF SAN BERNARDINO
Signature Lab Director: [signature]
Name of Sampler:R FULTON
Employed By:C.S.U.FULLERTON
Date/Time Sample Collected: 00/05/10/0810
Date/Time Sample Received @ Lab: 00/05/11/1700
Date Analyses Completed: 00/05/23

System Name: ZZYZX DESERT STUDIES CENTER - NPS
System Number: 3600323
Name or Number of Sample Source: WELL 01

User ID: TAN
Date/Time of Sample: |00|05|10|0810|
YY MM DD TTTT
Station Number: 3600323-001
Laboratory Code: 3761
Date Analysis Completed: |00|05|23|
YY MM DD
Phone #:
Submitted by:

MCL	REPORTING UNITS	CHEMICAL	ENTRY #	ANALYSES RESULTS	DLR
	mg/L	Hardness, (Total) as CaCO3	00900	59.2	2.0
	mg/L	Calcium (Ca)	00916	16.3	1.0
	mg/L	Magnesium (Mg)	00927	3.40	1.0
	mg/L	Sodium (Na)	00929	702	1.0
	mg/L	Potassium (K)	00937	14.2	1.0
Total Cations	Meq/L	Value: 32.0			
	mg/L	Alkalinity, (Total) as CaCO3	00410	202	1.0
	mg/L	Hydroxide (OH)	71830	< 1.0	1.0
	mg/L	Carbonate (CO3)	00445	< 1.0	1.0
	mg/L	Bicarbonate (HCO3)	00440	247	1.0
*	mg/L+	Sulfate (SO4)	00945	320	0.5
*	mg/L+	Chloride (Cl)	00940	697	1.0
45	mg/L	Nitrate (as NO3)	71850	7.50	2.0
**	mg/L	Fluoride (F) Temp. Depend.	00951	7.95	0.1
Total Anions	Meq/L	Value: 30.9			
	Std.Units+	pH, Laboratory	00403	8.10	
***	uS +	Specific Conductance (E.C.)	00095	3200	10
****	mg/L+	Total Filterable Residue at 180C (TDS)	70300	1890	1.0
	Units	Color, Apparent (Unfiltered)	00081	< 3	3
	TON	Odor Threshold at 60 C	00086	1	1
	NTU	Turbidity, Laboratory	82079	0.1	0.1
0.5	mg/L+	MBAS	38260	< 0.020	0.02

* 250-500-600 ** 1.4-2.4 *** 900-1600-2200 **** 500-1000-1500

Page 1 of 2

INORGANIC CHEMICALS

M03284-1A

MCL	REPORTING UNITS	CHEMICAL	ENTRY #	ANALYSES RESULTS		DLR
1000	ug/L	Aluminum (Al)	01105	<	50	50
6	ug/L	Antimony	01097	<	6.0	6.0
50	ug/L	Arsenic (As)	01002		13.2	2.0
1000	ug/L	Barium (Ba)	01007	<	100	100
4	ug/L	Beryllium	01012	<	1.0	1.0
5	ug/L	Cadmium (Cd)	01027	<	1.0	1.0
50	ug/L	Chromium (Total Cr)	01034	<	10	10
1000	ug/L+	Copper (Cu)	01042	<	50	50
300	ug/L+	Iron (Fe)	01045	<	100	100
	ug/L	Lead (Pb)	01051	<	5.0	5.0
50	ug/L+	Manganese (Mn)	01055	<	20	20
2	ug/L	Mercury (Hg)	71900	<	1.0	1.0
100	ug/L	Nickel	01067	<	10	10
50	ug/L	Selenium (Se)	01147	<	5.0	5.0
100	ug/L+	Silver (Ag)	01077	<	10	10
2	ug/L	Thallium	01059	<	1.0	1.0
5000	ug/L	Zinc (Zn)	01092	<	50	50

ADDITIONAL ANALYSES

	C	Source Temperature C	00010		23.3	
10000	ug/L	Nitrate + Nitrite as Nitrogen(N)	A-029		1690	400
1000	ug/L	Nitrite as Nitrogen(N)	00620	<	400	400
200	ug/L	Cyanide	01291	<	100	100

+ Indicates Secondary Drinking Water Standards

Laboratory comments and description of any additional compounds found:

SAMPLED AFTER 12 HOURS OF PUMPING

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USGS 350943116014501 012N009E04B001S

San Bernardino County, California
Hydrologic Unit Code 18090208
Latitude 35°09'44", Longitude 116°01'45" NAD27

Sample Datetime	Time datum	Time datum reliability code	Sample Medium Code	Agency Collecting Sample, Code	Temperature, water, deg C -10	Agency analyzing sample, code -28	Specific conductance, wat unf uS/cm @ 25 degC -95	ANC, wat unf fixed end pt, field, mg/L as CaCO3 -410	Nitrate + nitrite water fltrd, mg/L as N	Hardness, water, mg/L as CaCO3 -900	Noncarb hardness, wat unf field, mg/L as CaCO3 -902	Calcium water, fltrd, mg/L -915	Magnesium, water, fltrd, mg/L -925	Sodium, water, fltrd, mg/L -930	Sodium adsorption ratio -931	Sodium fraction of cations percent -932	Potassium, water, fltrd, mg/L -935	Chloride, water, fltrd, mg/L -940	Sulfate water, fltrd, mg/L -945	Fluoride, water, fltrd, mg/L -950	Silica, water, fltrd, mg/L as SiO2 -955	Boron, water, fltrd, ug/L -1020	Iron, water, fltrd, ug/L -1046	Manganese, water, fltrd, ug/L -1056	Residue on evap. at 180deg C wat flt mg/L -70300	Residue water, fltrd, sum of constituents mg/L -70301	Residue water, fltrd, tons/acre-ft -70303
7/19/1978 8:00	PDT	T	WG	USGS-WRD	25	80020	1850	200	1.9	150		36	15	380	13	84	4.7	390	230	3.1	39	1700	320	< 10		1230	1.67
4/4/1979 12:00	PST	T	WG			80020		200		160	0	38	15	380	13	84	4.7	390	240	4.1	38				1270	1230	1.73

USGS 351345116043001 013N008E12H001S

San Bernardino County, California
Hydrologic Unit Code 18090208
Latitude 35°13'45", Longitude 116°04'30" NAD27

Sample Datetime	Time datum	Time datum reliability code	Sample Medium Code	Agency analyzing sample, code -28	ANC, wat unf fixed end pt, field, mg/L as CaCO3 -410	Hardness, water, mg/L as CaCO3 -900	Noncarb hardness, wat unf field, mg/L as CaCO3 -902	Calcium water, fltrd, mg/L -915	Magnesium, water, fltrd, mg/L -925	Sodium, water, fltrd, mg/L -930	Sodium adsorption ratio -931	Sodium fraction of cations percent -932	Potassium, water, fltrd, mg/L -935	Chloride, water, fltrd, mg/L -940	Sulfate water, fltrd, mg/L -945	Fluoride, water, fltrd, mg/L -950	Silica, water, fltrd, mg/L as SiO2 -955	Residue on evap. at 180deg C wat flt mg/L -70300	Residue water, fltrd, sum of constituents mg/L -70301	Residue water, fltrd, tons/acre-ft -70303
4/4/1979 12:00	PST	T	WG	80020	460	190	0	26	31	1200	38	93	15	1600	13	1.4	9	3230	3170	4.39

USGS 350330116103501 011N008E07C001S

San Bernardino County, California
Hydrologic Unit Code 18090208
Latitude 35°03'30", Longitude 116°10'35" NAD27

Sample Datetime	Time datum	Time datum reliability code	Sample Medium Code	Agency analyzing sample, code -28	ANC, wat unf fixed end pt, field, mg/L as CaCO3 -410	Hardness, water, mg/L as CaCO3 -900	Noncarb hardness, wat unf field, mg/L as CaCO3 -902	Calcium water, fltrd, mg/L -915	Magnesium, water, fltrd, mg/L -925	Sodium, water, fltrd, mg/L -930	Sodium adsorption ratio -931	Sodium fraction of cations percent -932	Potassium, water, fltrd, mg/L -935	Chloride, water, fltrd, mg/L -940	Sulfate water, fltrd, mg/L -945	Fluoride, water, fltrd, mg/L -950	Silica, water, fltrd, mg/L as SiO2 -955	Residue on evap. at 180deg C wat flt mg/L -70300	Residue water, fltrd, sum of constituents mg/L -70301	Residue water, fltrd, tons/acre-ft -70303
4/10/1979 12:00	PST	T	WG	80020	2600	13	0	4.7	0.3	1300	160	97	57	270	70	0.6	4.7	3200	3270	4.35

USGS 350204116130101 011N007E14N001S

San Bernardino County, California
Hydrologic Unit Code 18090208
Latitude 35°02'04", Longitude 116°13'01" NAD27

Sample Datetime	Time datum	Time datum reliability code	Sample Medium Code	Agency analyzing sample, code -28	ANC, wat unf fixed end pt, field, mg/L as CaCO3 -410	Hardness, water, mg/L as CaCO3 -900	Noncarb hardness, wat unf field, mg/L as CaCO3 -902	Calcium water, fltrd, mg/L -915	Magnesium, water, fltrd, mg/L -925	Sodium, water, fltrd, mg/L -930	Sodium adsorption ratio -931	Sodium fraction of cations percent -932	Potassium, water, fltrd, mg/L -935	Chloride, water, fltrd, mg/L -940	Sulfate water, fltrd, mg/L -945	Fluoride, water, fltrd, mg/L -950	Silica, water, fltrd, mg/L as SiO2 -955	Residue on evap. at 180deg C wat flt mg/L -70300	Residue water, fltrd, sum of constituents mg/L -70301	Residue water, fltrd, tons/acre-ft -70303
4/10/1979 12:00	PST	T	WG	80020	550	91	0	30	3.8	480	22	89	32	380	9.3	0.2	8.4	1340	1270	1.82

USGS 350215116225701 011N006E18-RASA2

San Bernardino County, California
Hydrologic Unit Code 18090208
Latitude 35°02'15", Longitude 116°22'57" NAD27
Land-surface elevation 1,400 feet above sea level NGVD29
The depth of the well is 4.5 feet below land surface.
The depth of the hole is 4.5 feet below land surface.

Sample Datetime	Time datum	Time datum reliability code	Sample Medium Code	Agency Collecting Sample, Code	Temperature, water, deg C -10	Temperature, air, deg C -20	Agency analyzing sample, code -28	Specific conductance, wat unf uS/cm @ 25 degC -95	Hydrogen ion, water, unfltrd calcd, mg/L -191	pH, water, unfltrd field, std units -400	pH, water, unfltrd lab, std units -403	Carbon dioxide water, unfltrd mg/L -405	Ammonia water, fltrd, mg/L as N -608	Nitrite water, fltrd, mg/L as N -613	Ammonia + org-N, water, fltrd, mg/L as N -623	Nitrate + nitrite water fltrd, mg/L as N -631	Orthophosphate, water, fltrd, mg/L as P -660	Phosphorus, water, fltrd, mg/L as P -666	Orthophosphate, water, fltrd, mg/L as P -671	Hardness, water, mg/L as CaCO3 -900	Calcium water, fltrd, mg/L -915	Magnesium, water, fltrd, mg/L -925	Sodium, water, fltrd, mg/L -930	Sodium adsorption ratio -931	Sodium fraction of cations percent -932	Potassium, water, fltrd, mg/L -935	Chloride, water, fltrd, mg/L -940	Sulfate water, fltrd, mg/L -945	Fluoride, water, fltrd, mg/L -950	Silica, water, fltrd, mg/L as SiO2 -955	Barium, water, fltrd, ug/L -1005	Boron, water, fltrd, ug/L -1020	Iron, water, fltrd, ug/L -1046	Manganese, water, fltrd, ug/L -1056	Depth to water level below LSD, meters -30210	Alkalinity, wat flt fxd end field, mg/L as CaCO3 -39036	Alkalinity, wat flt inf flt field, mg/L as CaCO3 -39086	Residue on evap. at 180deg C wat flt mg/L -70300	Residue water, fltrd, sum of constituents mg/L -70301	Residue water, fltrd, tons/acre-ft -70303	Ammonia water, fltrd, mg/L -71846	Iodide water, fltrd, mg/L -71865	Bromide water, fltrd, mg/L -71870	Depth to water level, feet below LSD -72019	C-13 / C-12 ratio, water, unfltrd per mil -82081	Deuterium/ Protium ratio, water, unfltrd per mil -82082	O-18 / O-16 ratio, water, unfltrd per mil -82085	C-14, percent modern -82172	Specif. conductance, wat unf lab, uS/cm @ 25 degC -90095	ANC, wat unf fixed end pt, lab, mg/L as CaCO3 -90410
2/14/1992 16:00	PST	T	WG	USGS-WRD	18.5	12	80020	2450	0.00002	7.7	7.9	20	0.04	< 0.010	< 0.20	< 0.050	1.41	0.5	0.46	130	41	6.1	470	18	87	15	320	220	6.5	59	200	3600	490	300	0.061	530	520	1490	1460	2.03	0.05	0.075	0.33	0.2	-11.4	-61	-8.2	91.7	2460	530

USGS 350233116241501 011N005E13-RASA3

San Bernardino County, California
Hydrologic Unit Code 18090208
Latitude 35°02'33", Longitude 116°24'15" NAD27
Land-surface elevation 1,440 feet above sea level NGVD29
The depth of the well is 4.5 feet below land surface.
The depth of the hole is 4.5 feet below land surface.

Sample Datetime	Time datum	Time datum reliability code	Sample Medium Code	Agency Collecting Sample, Code	Temperature, water, deg C -10	Temperature, air, deg C -20	Agency analyzing sample, code -28	Specific conductance, wat unf uS/cm @ 25 degC -95	Hydrogen ion, water, unfltrd calcd, mg/L -191	pH, water, unfltrd field, std units -400	pH, water, unfltrd lab, std units -403	Carbon dioxide water, unfltrd mg/L -405	Ammonia water, fltrd, mg/L as N -608	Nitrite water, fltrd, mg/L as N -613	Nitrate water, fltrd, mg/L as N -618	Ammonia + org-N, water, fltrd, mg/L as N -623	Nitrate + nitrite water fltrd, mg/L as N -631	Orthophosphate, water, fltrd, mg/L -660	Phosphorus, water, fltrd, mg/L as P -666	Orthophosphate, water, fltrd, mg/L as P -671	Hardness, water, mg/L as CaCO3 -900	Calcium water, fltrd, mg/L -915	Magnesium, water, fltrd, mg/L -925	Sodium, water, fltrd, mg/L -930	Sodium adsorption ratio -931	Sodium fraction of cations percent -932	Potassium, water, fltrd, mg/L -935	Chloride, water, fltrd, mg/L -940	Sulfate water, fltrd, mg/L -945	Fluoride, water, fltrd, mg/L -950	Silica, water, fltrd, mg/L as SiO2 -955	Barium, water, fltrd, ug/L -1005	Boron, water, fltrd, ug/L -1020	Iron, water, fltrd, ug/L -1046	Manganese, water, fltrd, ug/L -1056	Tritium in water molecules, TU -7012	Tritium in water molecules, cnt err TU -7013	Depth to water level below LSD, meters -30210	Residue on evap. at 180deg C wat flt mg/L -70300	Residue water, fltrd, sum of constituents mg/L -70301	Residue water, fltrd, tons/acre-ft -70303	Nitrate water, fltrd, mg/L -71851	Nitrite water, fltrd, mg/L -71856	Iodide water, fltrd, mg/L -71865	Bromide water, fltrd, mg/L -71870	Depth to water level, feet below LSD -72019	Deuterium/ Protium ratio, water, unfltrd per mil -82082	O-18 / O-16 ratio, water, unfltrd per mil -82085	Specif. conductance, wat unf lab, uS/cm @ 25 degC -90095	ANC, wat unf fixed end pt, lab, mg/L as CaCO3 -90410
2/15/1992 11:30	PST	T	WG	USGS-WRD	12	13	80020	960	0.00001	8.2	8.2	3.6	< 0.010	0.01	0.4	< 0.20	0.41	0.215	0.06	0.07	69	22	3.4	170	8.9	82	9.8	72	80	2.2	56	28	90	4	39	1.8	0.1	0.61	591	598	0.8	1.77	0.033	0.014	0.13	2	-59.5	-8.45	942	301

USGS 350212116224501 011N006E18R001S

San Bernardino County, California
Latitude 35°02'12", Longitude 116°22'45" NAD27
Land-surface elevation 1,410 feet above sea level NGVD29

Date	Time	Water level, feet below land surface	Status
11/13/1991		17.86	
3/3/1992		17.4	
11/12/1992		18.54	
3/22/1993			W

USGS 350230116264001 011N005E16J001S

San Bernardino County, California
Latitude 35°02'30", Longitude 116°26'40" NAD27
Land-surface elevation 1,638.8 feet above sea level NGVD29
The depth of the well is 219 feet below land surface.

Date	Time	Water level, feet below land surface	Status	Date	Time	Water level, feet below land surface	Status
11/1/1950		178		3/21/1994		195.17	
11/26/1954		186.82		11/14/1994		195.1	
4/18/1955		170.6		10/6/1995		194.69	
12/15/1955		188.37		3/25/1996		200.45	
4/17/1956		184.27		5/22/1996		193.65	
12/5/1956		180.22		10/7/1996		195.2	
5/3/1957		182.88		3/17/1997		195.44	
12/4/1957		187.35		10/7/1997		195.63	
3/27/1958		193.55		4/2/1998		196.03	
5/5/1959		190.15		10/5/1998		196.15	
3/24/1960		187.48		3/23/1999		196.43	
11/15/1960			P	10/11/1999		196.67	
3/7/1961		194.3		10/16/2000		196.64	
10/26/1961		195.8		3/20/2001		196.46	
3/14/1962		184.9	P	11/13/2001		196.74	
10/29/1963		184.29		4/1/2002		196.84	
3/7/1964		183.79		12/2/2002		196.68	
10/13/1964		185.52		3/20/2003		197.23	
3/15/1966		187.1	P	10/27/2003		196.89	
10/18/1966		187.4	R	3/8/2004		196.77	
3/14/1967		187.2		9/14/2004		196.99	
11/13/1968		185		2/4/2005		197.06	
4/8/1969		182.4	R	3/6/2006		195.04	
10/29/1969		182.69		3/3/2008		196.92	
3/24/1970		184.04		10/1/2008		197.17	
10/29/1970		180.35		10/15/2008		197.19	
4/22/1971		180.7		11/1/2008		197.18	
11/13/1991		195.74		11/15/2008		197.26	
3/3/1992		196.17		12/1/2008		197.27	
11/12/1992		196.8		12/15/2008		197.27	
3/22/1993		194.84		1/1/2009		197.32	
11/15/1993		193.29		1/15/2009		197.34	
				2/1/2009		197.44	
				2/15/2009		197.33	

USGS 350253116101401 011N008E07Q002S

San Bernardino County, California
Latitude 35°02'53", Longitude 116°10'14" NAD27
Land-surface elevation 1,035.00 feet above sea level NGVD29

Date	Time	Water level, feet below land surface	Status
5/26/1954		20.6	
10/27/1954		20.04	
3/7/1957		20.98	
3/8/1961		23.01	
6/10/1965		24.71	

USGS 350255116101401 011N008E07Q003S

San Bernardino County, California
Latitude 35°02'55", Longitude 116°10'14" NAD27
Land-surface elevation 1,035.00 feet above sea level NGVD29

Date	Time	Water level, feet below land surface	Status
3/17/1953		75	
5/26/1954		19.8	
3/2/1955		20.07	
3/7/1957		20.01	

USGS 350514116053501 012N008E35A001S

San Bernardino County, California
Latitude 35°05'14", Longitude 116°05'35" NAD27
Land-surface elevation 951.00 feet above sea level NGVD29

Date	Time	Water level, feet below land surface	Status	Date	Time	Water level, feet below land surface	Status
3/7/1961		7.02		6/9/1965		7.26	
11/1/1962		7.1		10/20/1965		7.95	
10/13/1964		8.1		10/18/1966		8.03	
				11/13/1968		8.57	P
				10/30/1970		7.43	

USGS 350525116073901 012N008E27N002S

San Bernardino County, California
Latitude 35°05'25", Longitude 116°07'39" NAD27
Land-surface elevation 965.00 feet above sea level NGVD29

Date	Time	Water level, feet below land surface	Status	Date	Time	Water level, feet below land surface	Status
3/7/1961		19.48		10/13/1964		23.44	P
10/26/1961		19.25		3/9/1965		20.1	

3/14/1962		19.63		6/9/1965		20.81	
11/1/1962		20.08		10/20/1965		21.5	
3/12/1963		19.68		3/15/1966		20.16	
10/29/1963		20.1		10/18/1966		20.93	
3/7/1964		19.77		3/14/1967		20.61	
				11/13/1968		22.37	P
				10/30/1970		20.63	

USGS 350600116161901 012N007E30J001S

San Bernardino County, California
Latitude 35°06'00", Longitude 116°16'19" NAD27
Land-surface elevation 1,100.00 feet above sea level NGVD29

Date	Time	Water level, feet below land surface	Status	Date	Time	Water level, feet below land surface	Status
3/7/1961		48.8		10/13/1964		50.38	
10/26/1961		49.14		3/9/1965		49.83	
3/14/1962		49.75		10/20/1965		50.69	
11/1/1962		49.64		3/15/1966		50.4	
3/12/1963		49.76		10/18/1966		52.69	
10/29/1963		50.05		3/14/1967		50.35	
3/7/1964		49.74		11/13/1968		52.65	
				10/29/1970		52.04	

USGS 350627116152401 012N007E29A001S

San Bernardino County, California
Latitude 35°06'27", Longitude 116°15'24" NAD27
Land-surface elevation 1,100.00 feet above sea level NGVD29
The depth of the well is 46.3 feet below land surface.
The depth of the hole is 134 feet below land surface.

Date	Time	Water level, feet below land surface	Status	Date	Time	Water level, feet below land surface	Status
12/5/1919		31.1		1/16/1981		37.03	
5/25/1954		31.19		10/6/1981		36.65	
7/15/1965		37.13		5/20/1982		36.63	
8/8/1979		39.88		10/29/1982		36.89	
7/30/1980		38.02		7/31/1983		36.15	
				3/22/1984		36.06	

USGS 350656116160201 012N007E20M001S

San Bernardino County, California
Latitude 35°06'56", Longitude 116°16'02" NAD27
Land-surface elevation 1,100.00 feet above sea level NGVD29
The depth of the well is 37.0 feet below land surface.

Date	Time	Water level, feet below land surface	Status
7/14/1965		33.61	
8/8/1979		34.65	

USGS 350705116163701 012N007E19H001S

San Bernardino County, California
Latitude 35°07'05", Longitude 116°16'37" NAD27
Land-surface elevation 1,080.00 feet above sea level NGVD29
The depth of the well is 220 feet below land surface

Date	Time	Water level, feet below land surface	Status
2/17/1954		26.33	
7/7/1965		28.19	
8/8/1979			D

USGS 350730116161601 012N007E18R001S

San Bernardino County, California
Latitude 35°07'30", Longitude 116°16'16" NAD27
Land-surface elevation 1,075.00 feet above sea level NGVD29

Date	Time	Water level, feet below land surface	Status	Date	Time	Water level, feet below land surface	Status
2/19/1954		15.36		11/1/1962		19.56	
3/7/1961		18.81		3/12/1963		19.61	
10/26/1961		18.89		3/7/1964		19.98	
3/14/1962		19.09		10/12/1964		20.3	
				3/9/1965		20.45	
				10/20/1965		20.64	

USGS 350730116161602 012N007E18R002S

San Bernardino County, California
Latitude 35°07'30", Longitude 116°16'16" NAD27
Land-surface elevation 1,075.00 feet above sea level NGVD29

Date	Time	Water level, feet below land surface	Status	Date	Time	Water level, feet below land surface	Status
3/7/1961		15.82		3/12/1963		16.73	
10/26/1961		15.87		3/7/1964		17.19	
3/14/1962		16.32		10/13/1964		17.26	
11/1/1962		16.32		3/9/1965		17.57	
				10/20/1965		18.05	

USGS 350834116063101 012N008E11E001S

San Bernardino County, California
Latitude 35°08'34", Longitude 116°06'31" NAD27
Land-surface elevation 950.00 feet above sea level NGVD29
The depth of the well is 22.0 feet below land surface.
The depth of the hole is 22.0 feet below land surface.

Date	Time	Water level, feet below land surface	Status
3/30/1985		3.51	

USGS 351148116022101 013N009E20J001S

San Bernardino County, California
Latitude 35°11'48", Longitude 116°02'21" NAD27
Land-surface elevation 980.00 feet above sea level NGVD29
The depth of the well is 400 feet below land surface.

Date	Time	Water level, feet below land surface	Status	Date	Time	Water level, feet below land surface	Status
2/18/1954		65.82		10/13/1964		65.57	
10/27/1954		65.89		3/8/1965		65.46	
2/3/1955		65.71		6/8/1965		65.49	
11/3/1955		65.83		10/20/1965		65.56	
3/22/1956		65.7		3/15/1966		65.52	
11/6/1958		65.74		10/18/1966		65.72	
3/11/1959		65.55		3/14/1967		65.81	
12/2/1959		65.35		11/13/1968		65.84	
3/3/1960		65.56		10/30/1970		65.92	
11/16/1960		65.65		6/30/1978		64.69	
3/8/1961		65.53		4/16/1979		65.62	
10/26/1961		65.65		6/19/1980		65.64	
3/14/1962		66.57		1/15/1981		65.68	
11/1/1962		65.6		10/6/1981		65.78	
3/12/1963		65.53		5/19/1982		65.73	
10/29/1963		65.5		10/29/1982		65.9	
3/7/1964		65.48		7/31/1983		65.86	
				3/22/1984		65.87	

USGS 351437116043601 013N008E01H001S

San Bernardino County, California
Latitude 35°14'37", Longitude 116°04'36" NAD27
Land-surface elevation 922.00 feet above sea level NGVD29

Date	Time	Water level, feet below land surface	Status	Date	Time	Water level, feet below land surface	Status
3/8/1961		24.27		10/13/1964		25.53	
10/26/1961		24.4		3/9/1965		25.51	
3/14/1962		24.22		10/20/1965		25.85	
11/1/1962		24.34		3/15/1966		25.06	
3/12/1963		24.19		10/18/1966		23.04	
10/29/1963		24.16		3/14/1967		24.82	
3/7/1964		24.08		11/13/1968		24.7	
				10/30/1970		24.92	

USGS 351610116035401 014N009E30K001S

San Bernardino County, California
Latitude 35°16'10", Longitude 116°03'54" NAD27
Land-surface elevation 965.00 feet above sea level NGVD29
The depth of the well is 95.3 feet below land surface.

Date	Time	Water level, feet below land surface	Status	Date	Time	Water level, feet below land surface	Status
2/17/1954		75.61		10/29/1963		75.88	
10/27/1954		75.54		3/7/1964		75.57	

3/3/1955		75.32		10/13/1964		76.09	
11/3/1955		75.98		3/9/1965		75.84	
3/22/1956		75.59		6/23/1965		76.1	
10/31/1956		76.93		10/20/1965		76.19	
3/7/1957		75.33		3/15/1966		75.73	
11/7/1957		75.56		10/18/1966		76.35	
3/12/1958		75.38		3/14/1967		75.91	
11/6/1958		75.71		11/13/1968		76.39	
3/11/1959		75.5		10/30/1970		76.53	
11/20/1959		75.8		6/30/1978		76.39	
3/3/1960		75.56		4/16/1979		76.1	
11/16/1960		75.83		6/19/1980		76.4	
3/8/1961		75.62		1/15/1981		76.37	
10/26/1961		75.89		10/6/1981		76.75	
3/14/1962		76.12		5/20/1982		76.39	
11/1/1962		75.9		10/29/1982		76.76	
3/12/1963		75.63		7/31/1983		76.78	
				3/22/1984		76.5	

USGS 352040116050301 015N008E36F001S

San Bernardino County, California
Latitude 35°20'40", Longitude 116°05'03" NAD27
Land-surface elevation 920.00 feet above sea level NGVD29

Date	Time	Water level, feet below land surface	Status
2/15/1953		29	Z
2/18/1954		36.44	
3/3/1955		36.34	
3/7/1957		36.32	
3/8/1961		36.42	

USGS 352209116065201 015N008E22R001S

San Bernardino County, California
Latitude 35°22'09", Longitude 116°06'52" NAD27
Land-surface elevation 930.00 feet above sea level NGVD29

Date	Time	Water level, feet below land surface	Status	Date	Time	Water level, feet below land surface	Status
3/12/1958		55.84		11/1/1962		56.14	
3/8/1961		56.01		3/12/1963		55.94	
10/26/1961		56.1		10/29/1963		56.08	
3/14/1962		55.99		3/7/1964		56.01	
				10/13/1964		56.13	
				3/15/1966		56.58	

APPENDIX C
GROUNDWATER WELL TEST PLAN

Groundwater Well Test Plan

Soda Mountain Solar Project

San Bernardino County, California
BLM Case No. CACA 49584

July 2014

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L.10-226

PANORAMA
ENVIRONMENTAL, INC.

Groundwater Well Test Plan

Soda Mountain Solar Project

San Bernardino County, California
BLM Case No. CACA 49584

July 30, 2014

Submitted to:

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San Bernardino, CA 92415

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List of Acronyms and Abbreviations

AFY	acre-feet per year
ARCH	air rotary casing hammer
ASTM	ASTM International
bgs	below ground surface
BLM	Bureau of Land Management
BMP	best management practice
BRTR	Biological Resources Technical Report
CAM	California Assessment Manual
CRPR	California Rare Plant Rank
DO	dissolved oxygen
DSC	Desert Studies Center
DWR	Department of Water Resources
EPA	U.S. Environmental Protection Agency
gpm	gallons per minute
ID	inside diameter
LRWQCB	Lahontan Regional Water Quality Control Board
NAD 83	North American Datum of 1983
NAVD 88	North American Vertical Datum of 1988
NEPA	National Environmental Policy Act
OD	outside diameter
OHV	off-highway vehicle
ORP	oxidation-reduction potential
SMS	Soda Mountain Solar, LLC
SP	spontaneous potential
TDS	total dissolved solids

TEM	transient electromagnetic resistivity
Test Plan	Groundwater Well Test Plan
TUP	Temporary Use Permit
U.S.	United States
USA	Underground Service Alert
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Department of Fish and Wildlife

1 INTRODUCTION

1.1 OVERVIEW

This Groundwater Well Test Plan (Test Plan) has been prepared to describe procedures for installing, testing, and analyzing data from a test well at the Soda Mountain Solar Project (project) site. Details of the well installation and aquifer testing program are presented in the sections that follow.

1.1.1 Purpose of Aquifer Test

Soda Mountain Solar, LLC (SMS), is requesting U.S. Department of the Interior, Bureau of Land Management (BLM), approval to authorize construction and testing of a groundwater test well, groundwater observation well, and groundwater monitoring well in the Soda Mountain Valley, San Bernardino County, California (Figure 1.1-1). SMS proposes to perform an aquifer test within the Soda Mountain Valley to obtain additional scientific data on the Soda Mountain Valley aquifer and test the existing groundwater flow model. The goals of the aquifer test are to:

1. Determine whether there is adequate groundwater capacity within the Soda Mountain Valley to meet the construction and operational water supply needs of the project.
2. Determine the likely impacts, if any, on sensitive receptors such as the Mohave tui chub at MC Spring at Zzyzx, located more than 4 miles east of the east project boundary along the western shore of Soda Lake, and the Town of Baker groundwater supply.
3. Determine the number of wells that will be required to supply water for the project.
4. Determine total dissolved solids (TDS) concentrations in Soda Mountain Valley groundwater to evaluate the need for reverse osmosis water treatment during project operation.
5. Define the geochemistry of groundwater in the Soda Mountain Valley to evaluate the potential connectivity with MC Spring.
6. Test the assumptions of the groundwater model including hydraulic conductivity and specific yield.
7. Describe the geologic composition of the uppermost bedrock beneath the alluvial aquifer.
8. Re-run the groundwater model (if necessary) to further analyze potential effects of groundwater withdrawal to springs in the Mojave National Preserve and the Mohave tui chub.

SMS will obtain permits from the San Bernardino County Department of Environmental Health prior to drilling and testing the wells.

Figure 1.1-1: Project Location

SOURCE: ESRI 2014 and Panorama Environmental, Inc. 2014

Scale: 1:750,000

LEGEND

Test Well Location

Miles
0 5 10 20

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1.1.2 Groundwater Model

SMS prepared a groundwater flow model in 2011 (RMT 2011) and an addendum to the groundwater flow model in 2013 (TRC 2013). The model was constructed using the results of geologic mapping (WGI 2011), geotechnical borehole drilling (DYA 2010), and transient electromagnetic resistivity (TEM) soundings (TerraPhysics 2010) performed at the project site, as well as the results of well-reviewed groundwater flow model simulations from similar areas.

The groundwater flow model indicated that at least two production wells would be required to supply water for project construction, estimated at 192 acre-feet per year (AFY). The model predicted that groundwater pumping during construction would cause minimal drawdown in the Soda Mountain Valley (i.e., a few feet) under all simulated conditions. The maximum simulated drawdown at the eastern edge of the valley (western edge of the South Soda Mountains) was predicted to be 2.2 feet and the maximum reduction in outflow from the valley via the northeast outlet was estimated at 1 percent (i.e., 4.6 AFY or less) under all modeled scenarios. The minimal drawdown at the edge of the valley would attenuate to negligible levels over the 3 miles of bedrock separating the valley from the MC Spring area at Zzyzx. Drawdown at the valley outlets within sedimentary material was predicted to be less than 1 foot, and would attenuate further to negligible measurements over the approximately 5 miles from the outlets to MC Spring at Zzyzx and the more than 6 miles to the water supply wells in the Town of Baker.

The proposed operational water use of approximately 33 AFY is equivalent to the current annual water use at the Desert Studies Center (DSC), located approximately 800 feet from MC Spring. Current DSC groundwater use has no impact on water levels in the spring according to DSC data (Barthel 2008). Project operational water use would be unlikely to have an impact on MC Spring because it will be approximately 25 to 50 times farther away from MC Spring than DSC's commensurate water use.

1.1.3 Preferred Well Sites

The preferred test well and observation well site is PW-1 on the south side of Blue Bell Mine Road, shown on Figure 1.1-2. Data from TEM soundings (TerraPhysics 2010) indicate that well site PW-1 is the best location to construct and test a test well. The interpreted depth to water at PW-1 on Blue Bell Mine Road is approximately 182 feet below ground surface (bgs), with an estimated 150 feet of saturated alluvium overlying bedrock. Locations further south in the valley (i.e., near alternate well sites PW-2 and PW-3; Figure 1.1-2) have a much deeper water table (i.e., 354 feet bgs at PW-2, based on TEM-09 data, and greater than 386 feet bgs at PW-3, based on TEM-11 data), making these sites less desirable. Site PW-1 was selected as the preferred location for drilling the test and observation wells because it is expected to yield a thicker layer of saturated sediments and also to have shallower groundwater than the other sites that were considered. The observation well will be located within 200 feet of the test well. The preferred monitoring well site associated with site PW-1 is MW-1 on Blue Bell Mine Road (Figure 1.1-2). Coordinates for the preferred well sites are provided in Table 1.1-1.

Figure 1.1-2: Proposed Test Well, Observation Well, and Monitoring Well Locations

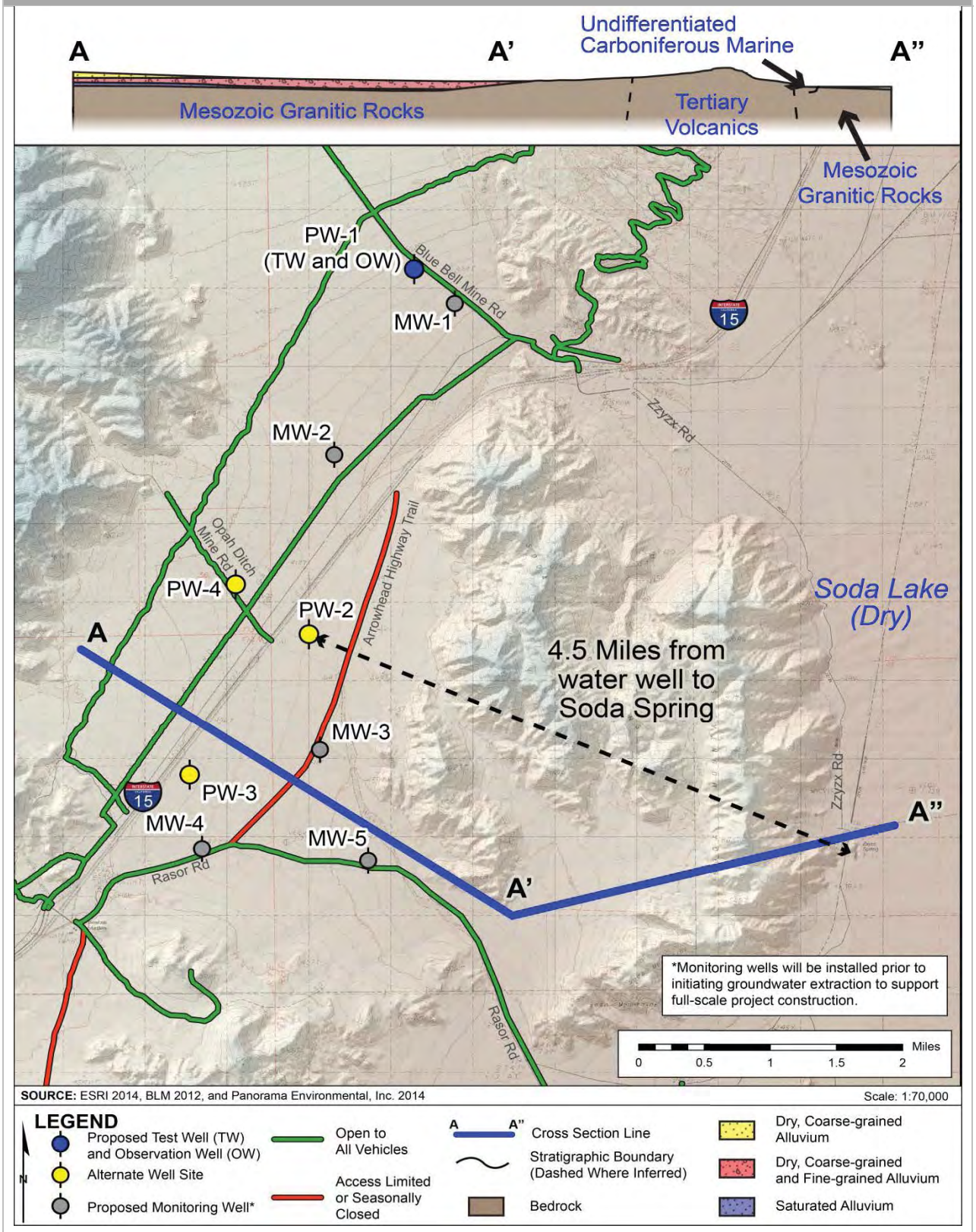


Table 1.1-1: Well Site Coordinates		
Well Site	Latitude	Longitude
Preferred Site PW-1		
PW-1 (preferred TW and OW location)	35.20805841190	-116.16191428700
MW-1 (preferred MW location)	35.20356729610	-116.15741033800
Alternate Site PW-2		
PW-2 (alternate TW and OW location)	35.16675106160	-116.17758074100
MW-3 (alternate MW location)	35.15234627820	-116.17592443300
Alternate Site PW-3		
PW-3 (alternate TW and OW location)	35.15032930110	-116.19320932200
MW-4 (alternate MW location)	35.14109573690	-116.19176186900
MW-5 (supplemental MW location)	35.13966628700	-116.16972660900
Alternate Site PW-4		
PW-4 (alternate TW and OW location)	35.17039630950	-116.18667433200
MW-2 (alternate MW location)	35.18638395180	-116.17368215200
Notes: OW = observation well; TW = test well		

1.1.4 Alternate Well Sites

Three alternate well sites have been considered for the proposed aquifer test. The potential alternate well sites are:

1. PW-2 north of the Opah Ditch culvert on the east side of I-15
2. PW-3 south of the Opah Ditch culvert on the east side of I-15
3. PW-4 on Opah Ditch Mine Road on the west side of I-15

The alternate well sites are shown on Figure 1.1-2. Each alternate well site will include a test well and observation well, and also will be associated with an alternate monitoring well location some distance away from the main well site (see Table 1.1-1 and Figure 1.1-2). The attributes of each test well/observation well site are described in Table 1.1-2. These sites may be considered as alternative or supplemental well sites depending on conditions observed in the test well or observation well bores. Work at any of the well sites will adhere to the work scope as described herein. An alternate site will be used if insufficient groundwater is encountered during drilling of the observation well, which will be constructed first (see Section 2.1.2 for details). The observation well will be constructed within approximately 200 feet of the selected test well location. An observation well within 200 feet of the test well will be close enough to the pumping well (test well) to monitor groundwater drawdown during the aquifer test. The monitoring well (MW-1), which is currently proposed as a location to monitor water levels

during full-scale project construction (the larger project action), will be drilled, constructed, and tested prior to initiating construction and groundwater extraction for the larger project. Coordinates for the alternate well sites are provided in Table 1.1-1.

1.2 TEST WELL PROJECT DESCRIPTION

The proposed project includes:

- Constructing one groundwater test well
- Constructing one groundwater observation well
- Constructing one groundwater monitoring well
- Performing an aquifer test
- Analyzing the results of the aquifer test
- Collecting samples and analyzing groundwater quality
- Reporting results and recommendations to BLM

The results of the aquifer test will be used to update the groundwater flow model for the project, if deemed necessary (see Section 4.2.4). The aquifer test results and recommendations related to project water supply will be summarized in a separate report of results included as an Addendum to the *Hydrogeologic Conditions and Groundwater Modeling Report* (RMT 2011).

The test well, observation well, and monitoring well proposed to be installed and tested herein are anticipated to be left in place if the proposed project is approved and constructed. The wells will be destroyed if the proposed project does not go forward. Additional information on well destruction is provided in Section 2.8.

Table 1.1-2: Attributes of Potential SMS Test Well Sites

Advantages	Disadvantages
Preferred Site: Blue Bell Mine Road (PW-1)	
Geophysical data at site indicate best place for a well due to presence of thicker saturated alluvium	Distance from East and South Arrays
Located adjacent to a BLM-designated Open Route	Long pipeline or trucking distance to East and South Arrays (pipeline is contemplated in Draft Environmental Impact Statement/Environmental Impact Report [EIS/EIR])
Observation well can be located to east or south along BLM-designated Open Route	
Good place to test drawdown upstream of hypothesized flow path along east side of Soda Mountains	
Groundwater at shallowest level	

Table 1.1-2: Attributes of Potential SMS Test Well Sites	
Advantages	Disadvantages
Alternate Site: East Array (PW-2)	
Central location	0.4 miles of new access route to location; access on Arrowhead Trail – Limited Access Route
	Closer to bedrock outcrops
	Saturated sediment layer thinner
Alternate Site: South Array (PW-3)	
Central location	0.6 miles of new access route to location from Rasor Road
Closest to Rasor Road	Saturated sediment layer thinner
	Deepest groundwater location
	Geophysical data less definitive
Alternate Site: Opah Ditch Mine Road (PW-4)	
Center of valley; therefore, may have deepest saturated layer	Bedrock and saturated sediments are expected to be deeper
Shorter pipeline than at Blue Bell Mine Road location	Thickness of saturated layer less certain
Located adjacent to a BLM-designated Open Route	

1.3 PURPOSE AND SCOPE OF PLAN

Agencies and the public are concerned that there may be groundwater pumping effects on the water supply in Baker and on the wells and springs supporting the endangered Mohave tui chub near Zzyzx. The aquifer testing program will collect information that may be used to address agency and public concerns, as described in Table 1.3-1.

The purpose of the Test Plan is to describe the activities and methodology for:

- Constructing and completing a test well
- Constructing and completing an observation well
- Constructing and completing a monitoring well
- Performing aquifer testing using the test well, observation well, and monitoring well
- Analyzing the results of aquifer testing

The Test Plan consists of the following sections:

1. Introduction
2. Well Construction Activities

3. Aquifer Testing Program
4. Data Analysis Approach
5. Environmental Design Features

Table 1.3-1: Groundwater Concerns and Issue Resolutions

Comment	Resolution
Concern about groundwater availability	Conduct aquifer test to determine adequate water availability
Potential effects to water resources at Lake Tuendae (manmade lake adjacent to DSC), MC Spring, and other springs	Drill well, test well, and reevaluate groundwater model (as required) to inform the impact analysis; modify the project Groundwater Monitoring and Mitigation Plan if necessary
Groundwater pumping may have an effect on the Mohave tui chub	Analyze the aquifer test results and update the model (as required) to provide additional information related to the potential for groundwater pumping to affect the Mohave tui chub
Soda Mountain Valley groundwater may be source of MC Spring at Zzyzx	Analyze groundwater chemistry of test well and compare to chemical composition of MC Spring at Zzyzx, production well at Zzyzx, and Town of Baker wells
Study the potential for effects to Baker wells	Further analyze effects outside of the valley using the updated groundwater model (as required) and newly collected water quality data
The groundwater model should be revised	Update the model with data from the aquifer test, as required
Request for additional groundwater analysis	Analyze groundwater samples collected during the aquifer testing program for TDS, alkalinity, major cations, major anions, and select isotopes

2 WELL CONSTRUCTION ACTIVITIES

2.1 APPROACH

2.1.1 General Information

Well construction will involve installation of one test well, one observation well, and one monitoring well. Geologic data collected during well construction will provide detailed data on subsurface stratigraphy in the project area and information on the saturated thickness of alluvium. Aquifer testing, which is described in Section 3, will be performed using the newly installed wells to provide aquifer data for updating the groundwater flow model and determining the total number of production wells needed for project construction water supply needs. Wells will be constructed in general accordance with:

- California Department of Water Resources (DWR) Bulletin 74-81, Water Well Standards – State of California
- DWR Bulletin 74-90, California Well Standards
- County of San Bernardino Desert Groundwater Management Ordinance

Specific well construction procedures and details are provided in the sections that follow.

2.1.2 Installation Sequence

The observation well will be installed before the test well. The monitoring well is currently proposed as a location to monitor water levels during full-scale project construction (the larger project action), and will be drilled, constructed, and tested prior to initiating groundwater extraction to provide water supply for the larger project action. The monitoring well likely will not be drilled until after the solar project is approved.

The observation well and monitoring well will be smaller in diameter than the test well and, therefore, will take less time to drill and construct and also will generate fewer drill cuttings. Observation well and monitoring well drilling will be performed using air rotary casing hammer (ARCH)/mud rotary drilling technology. The test well will be installed immediately after the observation well using a larger rotary drill.

The information collected during drilling of the borehole for the observation well will be used to evaluate the location and potential success of the test well. If the observation well borehole is successful and indicates that adequate groundwater and/or saturated alluvium are available in the general vicinity, the test well borehole will be drilled following completion of observation well installation activities. If little groundwater or little saturated alluvium is encountered in the observation well pilot hole, the boring will be reevaluated prior to expending additional

resources on drilling the test well nearby. If the observation well pilot hole indicates no or inadequate saturated alluvium, the test well and associated observation well will be relocated to one of the alternate well sites; the associated monitoring well also will be relocated to an alternate monitoring well location (see Section 1.1-4, Figure 1.1-2, and Table 1.1-1). If the observation well bore contains a thin layer of saturated alluvium, drilling will be extended into bedrock, as appropriate, based on subsurface geological observations. If unfavorable conditions are encountered in the observation well bore necessitating relocation of the test well site to an alternate site, the observation well at location PW-1 will still be completed and will be tested using "single-well drawdown test" methodology. Aquifer testing will be performed in general accordance with the procedures outlined in Section 3, with the exception that only one well will be used and the testing will occur over a shorter period (i.e., 8 to 24 hours).

2.1.3 Summary of Activities and Area of Disturbance

The areas of disturbance (for preferred well sites PW-1 and MW-1 along Blue Bell Mine Road) associated with all of the activities described in the Test Plan are summarized in Table 2.1-1. The temporary disturbance area associated with the test well and observation well work area is shown on Figure 2.1-1. The temporary disturbance area associated with the monitoring well work area would be comparable to that shown on Figure 2.1-1 but would include one well pad only. The temporary disturbance area for surface discharge of water produced during well development and the aquifer tests is shown on Figure 2.1-2.

Table 2.1-1: Summary of Activities and Disturbance Areas

Task Name	Task-specific Fieldwork Activities	Potential Work Effort In Disturbed Areas (e.g., Existing Roads)	Potential Work Effort In Undisturbed Areas (e.g., Off Existing Roads)	Estimated Area Of New Ground Disturbance (square feet)
Observation Well (OW) Installation	a. Mark location for USA. b. Perform subsurface utility survey. c. Mobilize equipment to work site. d. Drill one 10- inch-diameter borehole 20 feet into bedrock. Log soil and collect soil samples from cuttings. e. Run geophysical logs for stratigraphic delineation. f. Submit cutting samples to laboratory for grain size and moisture content analysis. g. Install 4- inch-diameter observation well. h. Develop well.	Travel to work area will be on Blue Bell Mine Road (CL8847), a BLM Open Route.	Work for installation of the observation well including vehicle access, drilling, geophysical logging, and development, will be conducted within a 200-foot by 200-foot temporary work area located directly off of Blue Bell Mine Road (a BLM Open Route).	Total disturbance will be up to 40,075 square feet or 0.92 acres.
Test Well (TW)	a. Mark location for USA.	Travel to work area will be on	The test well and all temporary	The area of new ground

Table 2.1-1: Summary of Activities and Disturbance Areas				
Task Name	Task-specific Fieldwork Activities	Potential Work Effort In Disturbed Areas (e.g., Existing Roads)	Potential Work Effort In Undisturbed Areas (e.g., Off Existing Roads)	Estimated Area Of New Ground Disturbance (square feet)
Installation	b. Perform subsurface utility survey. c. Mobilize equipment to work site. d. Drill 26- inch-diameter borehole to 30 feet bgs. Install 22-inch-diameter conductor casing and cement in place. e. Drill one 12- inch-diameter pilot hole 20 feet into bedrock. Log soil and collect soil samples from cuttings. f. Run geophysical logs for stratigraphic delineation. g. Submit cutting samples to laboratory for grain size and moisture content analysis. h. Ream pilot hole to 20 inches diameter and install 10.75- inch-diameter test well. i. Develop well. j. Make preliminary estimate of well yield.	Blue Bell Mine Road (CL8847), a BLM Open Route.	disturbance will be located within the same temporary work area defined for the observation well above.	disturbance for the test well is included within the disturbance area for the observation well.
Aquifer Test of TW	a. Collect background water levels. b. Set up leach field piping system. c. Conduct step-drawdown aquifer test. d. Conduct 72-hour constant-rate aquifer test. e. Collect water quality samples. f. Discharge water to Baker tanks (50-200 gpm for 72 hours; total water produced: 216,000 to 864,000 gallons) and to land surface using piping system. g. Monitor water level recovery.	Travel to work area will be on Blue Bell Mine Road (CL8847), a BLM Open Route.	500-foot length of non-perforated pipe by 3-foot width (1,500 square feet). 100-foot by 100-foot discharge area (10,000 square feet).	500-foot length of non-perforated pipe by 10-foot width (5,000 square feet). 100-foot by 100-foot discharge area (10,000 square feet). Total disturbance: 15,000 square feet or 0.34 acres.
Monitoring Well (MW) Installation	Same as for Observation Well Installation.	Same as for Observation Well Installation.	Same as for Observation Well Installation.	Total disturbance will be up to 40,075 square feet or 0.92 acres.
Aquifer Test	a. Collect background water	Same as for	The area of new	The area of new

Table 2.1-1: Summary of Activities and Disturbance Areas				
Task Name	Task-specific Fieldwork Activities	Potential Work Effort In Disturbed Areas (e.g., Existing Roads)	Potential Work Effort In Undisturbed Areas (e.g., Off Existing Roads)	Estimated Area Of New Ground Disturbance (square feet)
of MW	levels. b. Set up leach field piping system. c. Conduct step-drawdown aquifer test. d. Conduct 24-hour constant-rate aquifer test. e. Collect water quality samples. f. Discharge water to Baker tanks (20-50 gpm for 24 hours; total water produced: 28,800 to72,000 gallons) and to land surface using piping system. g. Monitor water level recovery.	Aquifer Test of TW.	ground disturbance for monitoring well testing is included within the disturbance area for monitoring well installation.	ground disturbance for monitoring well testing is included within the disturbance area for monitoring well installation.
			Total Disturbance	2.18 acres

Figure 2.1-1: Test Well and Observation Well Work Area

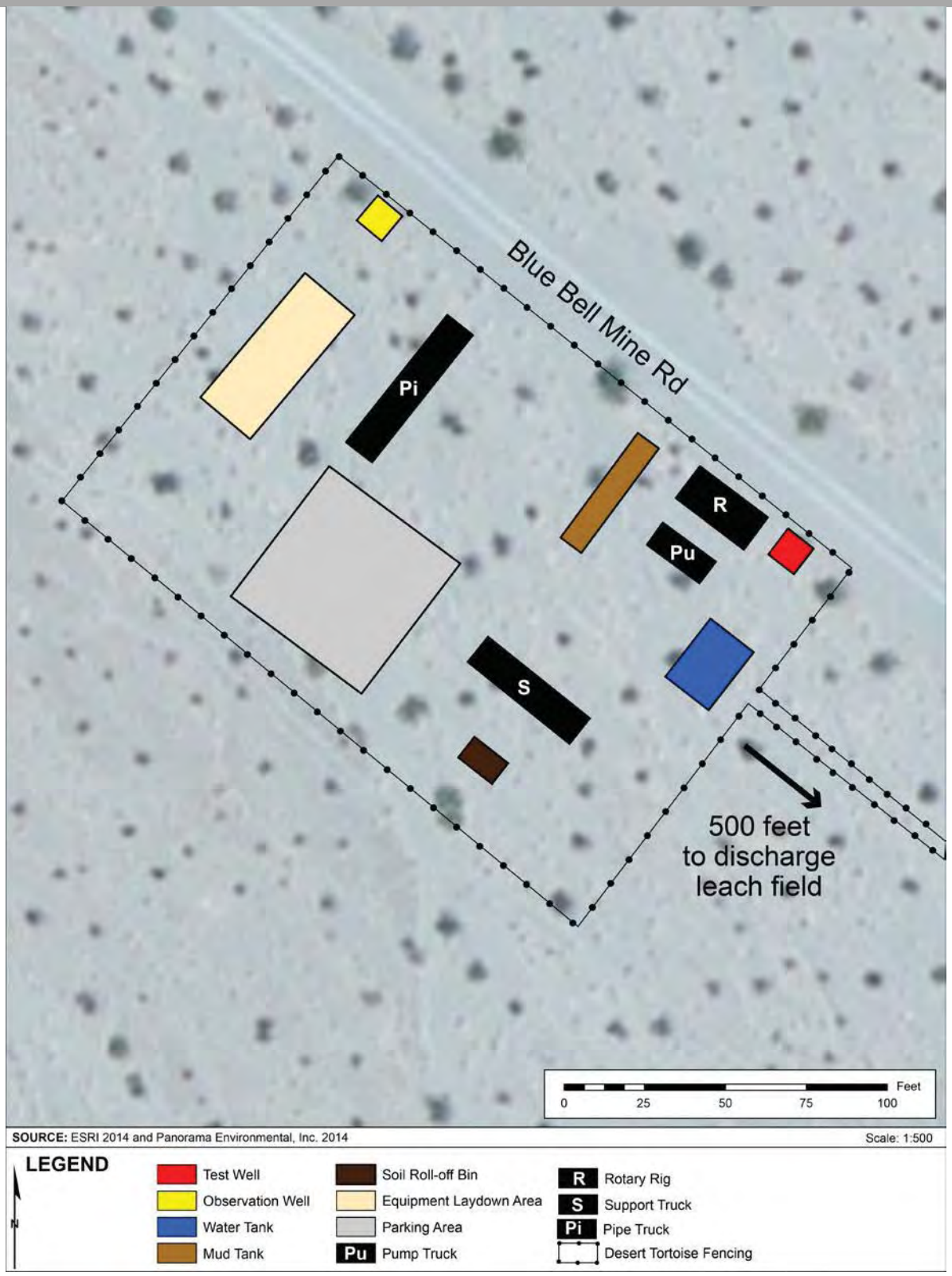
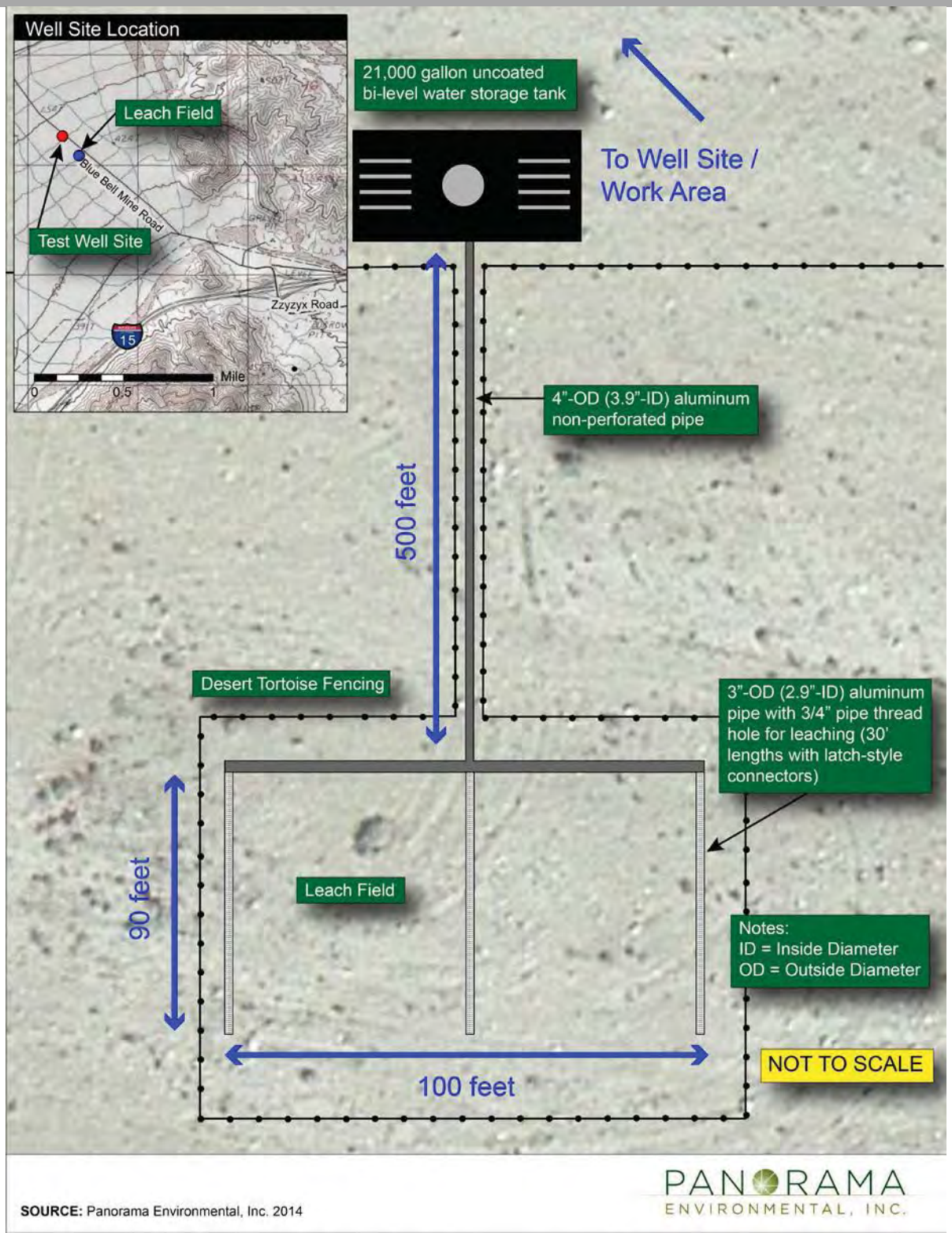


Figure 2.1-2: Surface Discharge Schematic



SOURCE: Panorama Environmental, Inc. 2014

2.1.4 Site Access

The preferred well site will be accessed via a BLM-designated West Mojave Plan open route (i.e., CL8847). The access for alternate well sites is provided in Table 2.1-2.

As described in Section 1.1.4, if the PW-1 site is not successful, the field program will be moved to an alternate well site (including the associated monitoring well location; see Table 1.1-1). The total amount of surface disturbance at each alternate site will vary depending on the site selected because the alternate well sites are located at various distances from the closest access routes. Table 2.1-2 identifies the surface disturbance required for each of the three alternate well sites. The locations of the proposed and alternate well sites (i.e., latitude and longitude) are provided in Table 1.1-1.

Table 2.1-2: Acreage Disturbance for Alternate Well Sites

Well SIte	Drilling Task[1]	Aquifer Testing Task[2]	Access		Total Impact (acres)	Closest Access Route
			Road Distance (feet)[3]	Road Impact in sq. feet (acres)[4]		
PW-2 (East Array)	1.84	0.34	1,894 (TW) 200 (OW) 10 (MW-3)	25,248 (0.58)	2.76	Remnant of Arrowhead Trail (BLM Limited Access Route)
PW-3 (South Array)	1.84	0.34	3,425 (TW) 200 (OW) 10 (MW-4) 10 (MW-5)	43,620 (1.00)	3.18	AC8828 (Rasor Road; BLM Open Route)
PW-4 (Opah Ditch Mine Road)	1.84	0.34	10 (TW) 200 (OW) 10 (MW-2)	2,640 (0.061)	2.24	CL8837 and CL8845 (Opah Ditch Mine Road; BLM Open Route)

Notes:

1 Drilling task disturbance area is identical for all well sites and corresponds to sum of values included in Table 2.1-1 under *Observation Well Installation* and *Monitoring Well Installation*.

2 Aquifer testing disturbance area is identical for all well locations and corresponds to value included in Table 2.1-1 under *Aquifer Test of TW*.

3 First value refers to distance required to access test well (TW) location on main access road to alternate well site. Second value refers to maximum 200-foot distance between test well and observation well (OW) locations. Third value refers to distance to monitoring well (MW) location on main access road to alternate monitoring well site. Fourth value under PW-3 refers to distance to supplemental monitoring well location for PW-3 well site. The second MW site (MW-5) was not used in the impact calculation.

4 Assumes 12-foot-wide road.

2.1.5 On-site Equipment

Equipment proposed to be used to complete the test well program is listed in Table 2.1-3.

Table 2.1-3: Equipment

Task	Equipment Type	Use	Number
Utility locating	Van	Subsurface utility locator subcontractor – travel to and from site	1
	Personal vehicle	Geologist oversight of utility locator and marking for Underground Service Alert (USA) – travel to and from site	1
Observation well drilling and installation	ARCH/mud rotary drill rig	Drilling and installation of observation well	1
	Pick-up trucks	Transport of drilling personnel to and from work site	2
	Personal vehicle	Transport of geologist to and from work site	1[1]
	Water truck	Supply water for drilling	1
	Bobcat or forklift	Movement of soil cuttings on site	1
	Soil roll-off bin	Temporary storage of soil cuttings on site	1
	Support trucks	Geophysical logging subcontractor – travel to and from site and transport of logging equipment; transport of well materials to work site	2
	Water storage tank	Temporary storage of groundwater extracted during well development	1
	Well development rig	Truck-mounted development rig	1
Test well drilling and installation	Rotary drill rig	Drilling and installation of test well	1
	Pick-up trucks	Transport of drilling personnel to and from work site	2[1]
	Bobcat or forklift	Movement of soil cuttings on site	1[1]
	Soil roll-off bin	Temporary storage of soil cuttings on site	1[1]
	Support trucks	Geophysical logging subcontractor – travel to and from site and transport of logging equipment; transport of well materials to work site	2[1]
	Water storage tank	Temporary storage of groundwater extracted during well development	1[1]
	Mud tank	Mixing and storage of mud used for drilling	1
	Well development rig	Truck-mounted development rig	1[1]
Test well aquifer testing	Pump and hose/pipe	Installed in test well; used to extract groundwater for test	1
	Pump truck	Pump truck for pump installation	1
	Pick-up truck	Transport of pump operation personnel to and	1[1]

Table 2.1-3: Equipment

Task	Equipment Type	Use	Number
		from work site	
	Personal vehicle	Transport of geologist to and from work site	1[1]
	Water storage tank	Temporary storage of extracted groundwater	1[1]
	Leach field piping system	Discharge of extracted groundwater	1
	Flat-bed truck	Transport of leach field piping to and from work site	1
Monitoring well drilling and installation[2]	ARCH/mud rotary drill rig	Drilling and installation of monitoring well	1
	Pick-up trucks	Transport of drilling personnel to and from work site	2
	Personal vehicle	Transport of geologist to and from work site	1
	Water truck	Supply water for drilling	1
	Bobcat or forklift	Movement of soil cuttings on site	1
	Soil roll-off bin	Temporary storage of soil cuttings on site	1
	Support trucks	Geophysical logging subcontractor – travel to and from site and transport of logging equipment; transport of well materials to work site	2
	Water storage tank	Temporary storage of groundwater extracted during well development	1
	Well development rig	Truck-mounted development rig	1
Monitoring well aquifer testing[2]	Pump and hose/pipe	Installed in monitoring well; used to extract groundwater for test	1
	Pump truck	Pump truck for pump installation	1
	Pick-up truck	Transport of pump operation personnel to and from work site	1[1]
	Personal vehicle	Transport of geologist to and from work site	1[1]
	Water storage tank	Temporary storage of extracted groundwater	1[1]
	Leach field piping system	Discharge of extracted groundwater	1
	Flat-bed truck	Transport of leach field piping to and from work site	1

Notes:

[1] This equipment was listed previously and is not additional equipment being introduced to the site. For example, up to two water storage tanks will be delivered to the site for observation well drilling and will remain on site for the remaining work phases. No additional water storage tanks will be delivered for

Table 2.1-3: Equipment			
Task	Equipment Type	Use	Number
subsequent work phases.			
[2] The monitoring well will be installed during a later phase of work and therefore much of the equipment used for well drilling, installation, and testing will be remobilized to the site and will not be the same equipment used for the observation and test well work.			

2.1.6 Hazardous Materials

The transport, use, storage, and disposal of hazardous materials during on-site work will be minimal. A list of hazardous materials that will potentially be used during on-site work is presented in Table 2.1-4. These materials are considered hazardous because they are flammable and/or contain toxic compounds, such as volatile organic compounds and heavy metals. Wastes classified as hazardous either by the State of California or federally will be transported, stored, and disposed of according to applicable federal, state, and local regulations. Fueling and routine maintenance of equipment and vehicles will be performed off site. MSDS for these compounds are included in Appendix A.

Construction vehicles and equipment contain materials such as gasoline, diesel, antifreeze, and lubricants that, if accidentally released to the environment, could be hazardous to humans and the environment. However, the quantities of hazardous materials to be used during the field program will generally be small and the area affected by a release will be limited in size. The construction vehicles to be used for the field program will be monitored to ensure they are properly maintained and do not leak any hazardous fluids to the environment. Any observed leak or spill will be immediately cleaned up using an on-site spill kit to be maintained by the drilling contractor. All leaks or spills will be reported to BLM immediately.

Table 2.1-4: Potential Hazardous Materials	
ABC fire extinguisher	Diesel fuel additive
Air tool oil	Gasoline
Antifreeze	Hydraulic fluid
Automatic transmission fluid	Lubricating grease
Battery acid	Motor oil
Brake fluid	Starter fluid
Diesel	WD-40

2.2 PRE-FIELD PREPARATION

The following pre-field activities will be performed prior to initiation of subsurface work:

- Approval of the Groundwater Well Test Plan will be provided by BLM.

- A work plan for biological surveys will be prepared and submitted to BLM and the U.S. Fish and Wildlife Service (USFWS) for approval.
- A Site Safety Plan will be prepared for use in the field and submitted to BLM for review and approval. The plan will include information on the roles and responsibilities of project personnel, hazard identification and analysis, required personal protective equipment, site access and control, standard operating procedures, and an Emergency Action Plan.
- A Categorical Exclusion or other National Environmental Policy Act (NEPA) document, along with a Temporary Use Permit (TUP), will be approved by BLM.
- Drilling and well installation permits (ministerial permits) will be obtained for all wells from the County of San Bernardino Division of Environmental Health Services. The constant-rate well test, in conjunction with all planned tests, will produce much less than 30 AFY (proposed use is 50 to 200 gpm for 72 hours, depending on flow) and therefore the wells will be exempt from the County Groundwater Ordinance.
- A discharge permit is not required by the Lahontan Regional Water Quality Control Board (LRWQCB) under State Water Resources Control Board Order No. 2003-0003-DWQ – *General Waste Discharge Requirements for Discharges to Land with a Low Threat to Water Quality* because the discharge will be adequately distributed using sewer leach field piping and there has been limited activity in the valley; therefore, the groundwater is not suspected to be contaminated (Cass 2014). A map showing the test well location and a diagram showing the piping network and the anticipated discharge distribution will be submitted to LRWQCB prior to initiation of the aquifer testing program.
- A permit from the U.S. Army Corps of Engineers (USACE) is not required because the area does not drain to waters of the U.S. (Appendix B).
- Drilling locations and the area of maximum disturbance will be identified and marked in conjunction with BLM.
- Underground Service Alert (USA), a regional subsurface utility notification service, will be contacted at least 48 hours prior to any subsurface activities to notify local utility companies of the upcoming subsurface work and allow them time to mark the locations of their subsurface lines.
- A private utility locator will be contracted to perform a subsurface utility survey to screen the drilling locations for belowground utilities.
- A BLM-approved (prior to construction) biologist trained and certified to handle desert tortoise will survey work areas for sensitive species, including desert tortoise, immediately before any work is performed in the area, including equipment mobilization.
- Desert tortoise exclusion fence will be installed around the drilling work area, as directed by the BLM-approved biologist and corresponding with the previously approved and delineated area of maximum disturbance for the observation and test well work areas.

2.3 FIELD PROGRAM

The steps involved in well construction will be similar for the test well, observation well, and monitoring well. Drilling methods for the test well will differ slightly from those of the observation well and monitoring well (see Section 2.3.1 for details). Well dimensions, well

materials, and screened interval will be finalized through discussions between the geologist and the well driller and will be based on observations during drilling and required accommodations for pumping equipment. The well construction details and screened intervals will be chosen based on water table depth, geophysical logs, the soil logs generated during drilling of the pilot holes, and geotechnical testing results (i.e., sieve testing).

2.3.1 Pilot Hole Drilling

Conductor Casing Installation

A California-licensed well driller (C-57 licensed) will drill a large-diameter borehole (26 inches for the test well) to a depth of approximately 30 feet bgs under the oversight of a field geologist (either a California-licensed Professional Geologist or an experienced geologist under direct supervision of a Professional Geologist). Conductor casing (22-inch-diameter for the test well) will be installed in the borehole to a depth of approximately 30 feet bgs and sealed in place with a 10-sack sand-cement slurry (or equivalent). The observation well and monitoring well will be installed using ARCH technology to the water table (approximately 182 feet bgs) and the casing will serve as a temporary conductor casing. No separate conductor casing will be installed for the observation well and monitoring well.

Drilling

ARCH methods will be used for the observation well and monitoring well boreholes to the water table, and then mud rotary techniques will be used for the remaining footage to the total depth of the wells, as discussed in Section 2.1.2. The steel casing is advanced into the hole during the ARCH drilling process and, because no mud is used with this technique, the presence of the water table is readily observed. Once the water table is reached, the driller will switch to mud rotary methods, which will allow for the borehole to remain open in the presence of saturated sands and gravels. A mud rotary rig will be used to drill the test well pilot hole. For all wells, a California-licensed well driller (C-57 licensed) will drill the boring to the top of bedrock and up to 20 feet into the bedrock, which is estimated to be 332 feet bgs at PW-1, based on geophysical data (TerraPhysics 2010). All drilling fluids, including mud, will be stored in a portable mud tank placed adjacent to the drill rig. The on-site geologist will evaluate the bedrock geology and provide recommendations on additional investigation work, as appropriate. If a carbonate aquifer is encountered under the alluvium, SMS may elect to conduct a separate aquifer test on the carbonate zone to determine the aquifer properties of this unit. The test likely would require the use of a packer to seal off the carbonate unit from the overlying alluvium. If a different bedrock unit is encountered under the alluvium (e.g., granite), which likely does not have the qualities of a productive aquifer, additional testing will not occur.

For all well bores, a field geologist will log the soil cuttings in general accordance with ASTM International (ASTM) Standard D2488-09: *Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)* using the Unified Soil Classification System for guidance. Soil descriptions and the depth to first water will be noted on boring logs. The field geologist will collect soil samples every 10 feet and also from depths where lithological changes are observed

(if lithological changes are not captured within the 10-foot sampling intervals). Samples will be labeled with the boring number and the depth interval over which they were collected. A chip tray will be prepared for each borehole consisting of soil samples from each 10-foot sampling interval. The field geologist will evaluate the stratigraphy after the completion of the pilot hole by reviewing the boring log and the samples collected, and select representative samples to submit for grain size and moisture content analysis by a geotechnical laboratory.

Geophysical Logging

Following attainment of total depth, drilling will be halted, the drill stem will be removed, and the well bore will be logged by a subcontracted geophysical logging contractor from ground surface to total depth. Natural gamma ray, spontaneous potential (SP), short-normal resistivity, long-normal resistivity, and caliper logs will be generated. All geophysical logging will be performed in general accordance with American Petroleum Institute standards.

Gamma logs and SP logs will provide data on stratigraphy and clay content (e.g., permeable zones such as sand and impermeable zones such as clay). Resistivity logs are electric logs used to determine presence of permeable zones. The short-normal resistivity log measures resistivity at a shallow depth of investigation (i.e., a short distance from the borehole wall). The long-normal resistivity log measures resistivity at a greater distance from the borehole wall. Separation between the short-normal and long-normal curves is indicative of fluid movement (permeability). Caliper logs will be used to measure the borehole diameter and also can be use to identify permeable zones where the borehole diameter is larger due to washout.

Investigation-derived Waste Characterization

A soil sample will be collected to characterize soil cuttings for disposal at each well site (PW site and MW site). The samples will be collected by placing soil cuttings in four to six new, clean, stainless steel sleeves, which will be sealed with Teflon sheets, plastic end caps, and silicone tape; labeled; sealed in plastic bags; and placed in an ice-chilled cooler. The sample containers will be submitted to a state-certified analytical laboratory under chain-of-custody protocols for compositing and analysis for California Assessment Manual (CAM) 17 metals using U.S. Environmental Protection Agency (EPA) Methods 6010B/7471A.

Sieve Analyses

Samples collected during pilot hole drilling will be submitted to a geotechnical laboratory for sieve analysis in accordance with ASTM Standards D6913-04 (2009), *Standard Test Methods for Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis*, and D2216-10, *Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass*. Grain size analysis curves and summary tables will be generated and summarized.

2.3.2 Well Construction

Well Design

Each well will be designed independently and will be based on borehole- and location-specific data collected during pilot hole drilling. The results of the sieve analyses, the geologic log, the geophysical logs, observations recorded during drilling, and driller input will be used to

develop a well design, following the method described in *Groundwater and Wells* (Johnson 1975), or similar. The information will be used to select a filter pack grade, casing depth, screen slot size, and screen interval. General well schematics are presented as Figures 2.3-1 and 2.3-2 for the test well and observation well/monitoring well, respectively.

Borehole Reaming

The test well pilot hole will be reamed to a larger diameter (20 inches) to the selected total depth. An additional 5 to 10 feet of borehole may be drilled beyond the selected casing depth to provide space for slough (i.e., a sump). A large-diameter borehole is require for placement of a 3.5-inch-outside-diamater (OD) fill tube (to replace filter pack material as needed for well maintenance) and a 2-inch-diameter sounding tube for water measurements, adjacent to the well casing. The larger-diameter casing is required for the test well to accommodate the down-hole pump equipment and to minimize well loss effects on hydraulic head. Well reaming will not be required for the observation well and monitoring well.

A caliper log will be generated for the reamed borehole. Well casing sizes will be 4 inches for the observation well and monitoring well, and 10.75 inches OD for the test well. Well materials (i.e., screen, riser, and sand/gravel pack) will be installed by the driller with oversight of the field geologist. Water displaced during sand/gravel pack installation will be pumped into a holding tank, if necessary. Well materials are described in Section 2.4.

2.3.3 Well Development and Sanitary Seal Installation

Initial Development Following Filter Pack Installation

Wells will be surged and pumped with oversight of the field geologist following installation of the filter pack to settle the filter pack material around the well screen. The process will involve swabbing the screen, followed by bailing with a large steel bailer or air-lift pumping. Surging and pumping will progress in intervals from the bottom to the top of the well. Discharge water will be visually monitored for sand content; the process will continue in each interval until the majority of the fine sediments are removed. Following initial surging and pumping the depth of the filter pack will be tagged to determine its position in the well annulus and additional filter pack material will be installed, as needed, to bring it to the required depth in the annular space.

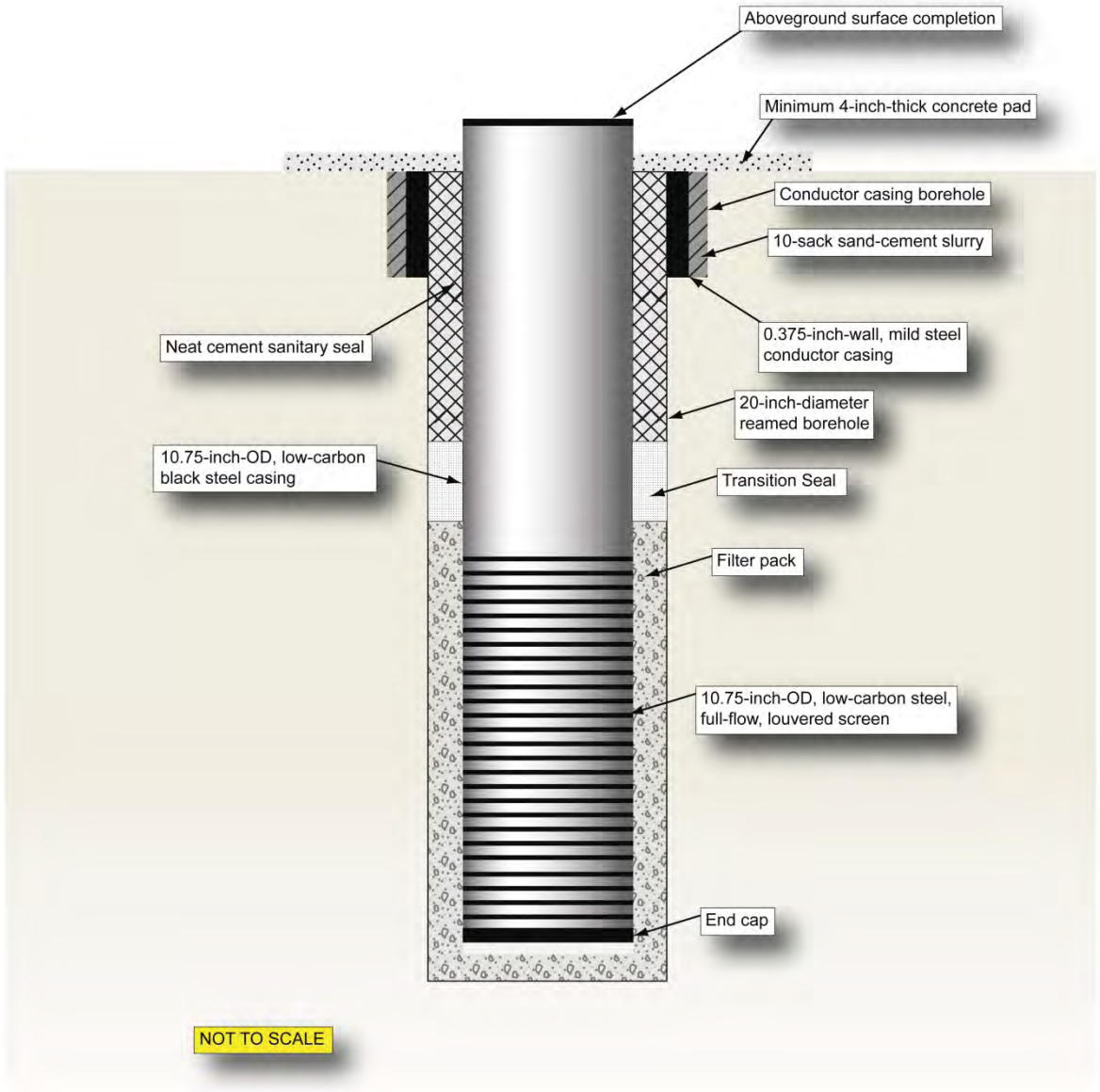
Transition Seal Installation

A minimum 5-foot-thick transition seal consisting of transition sand (e.g., Lapis Lustre #0/30 sand or equivalent) will be installed above the sand pack to provide a seal between the sand pack and the sanitary seal to be installed above. The transition seal will be emplaced with a tremie pipe to ensure proper placement.

Sanitary Seal Installation

A sanitary seal composed of neat cement will be installed from above the top of the transition seal to ground surface under oversight of the field geologist and in accordance with County requirements. Each well will have a minimum of 20 feet of annular surface seal per California Water Well Standards.

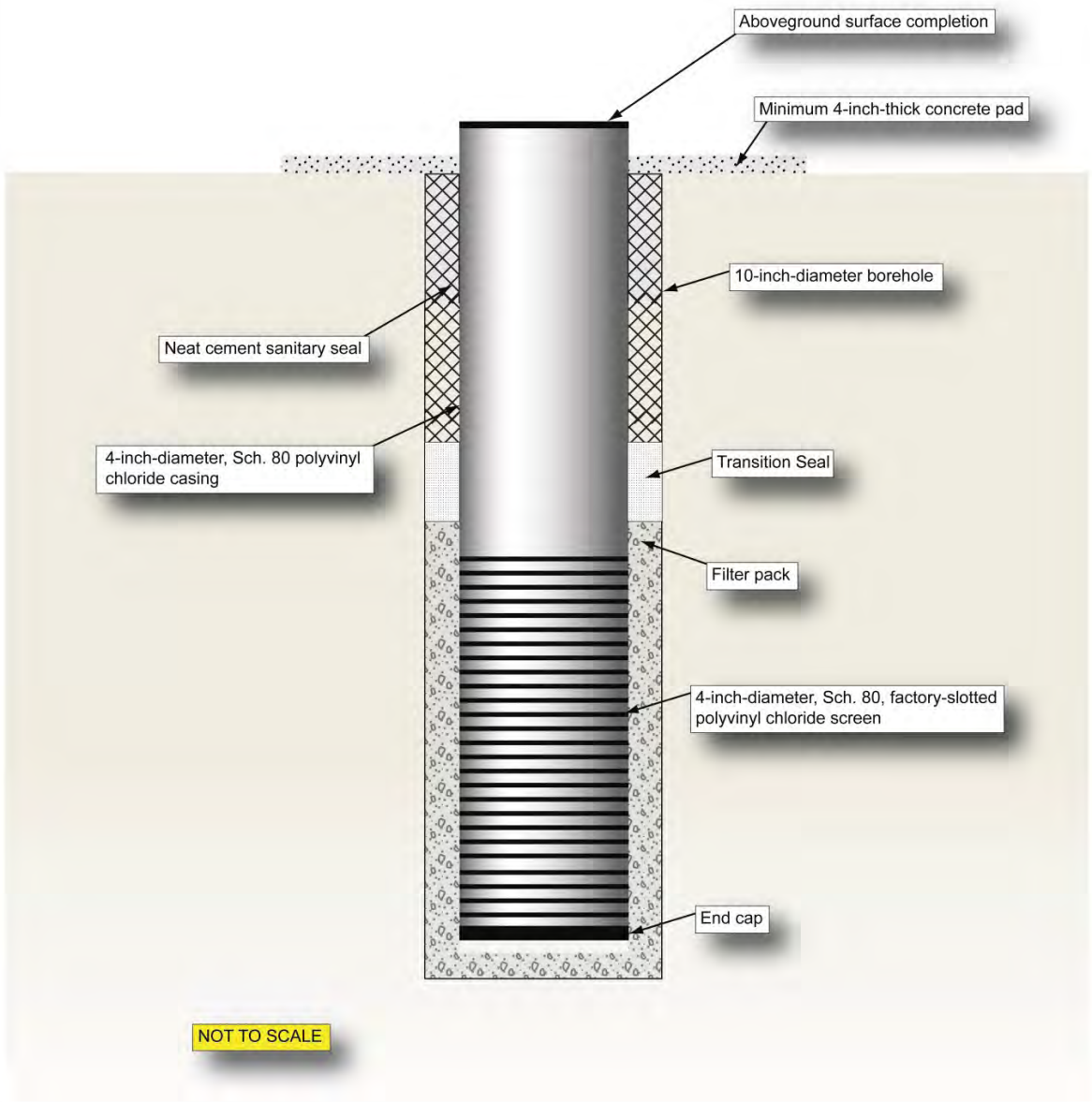
Figure 2.3-1: Proposed Test Well Schematic



SOURCE: Panorama Environmental, Inc. 2014

PANORAMA ENVIRONMENTAL, INC.

Figure 2.3-2: Proposed Observation Well/Monitoring Well Schematic



SOURCE: Panorama Environmental, Inc. 2014

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Well Development

Following completion of well construction activities, wells will be further developed by pumping. Discharge water will be monitored for sand content using a sand content kit provided by the well development contractor. The field geologist will periodically collect groundwater samples to measure water quality parameters (e.g., pH, temperature, specific conductance, oxidation-reduction potential [ORP], turbidity, and dissolved oxygen [DO]) using field instrumentation. Results of field parameter testing will be recorded on field data sheets. Well development will continue until no sand is produced, per the sand content measured using the sand content kit, and water quality parameters have stabilized for three successive readings. The three successive readings should be within the following ranges:

- ± 0.1 standard unit for pH
- ± 3 percent for temperature
- ± 3 percent for specific conductance
- ± 10 millivolts for ORP
- ± 10 percent for turbidity
- ± 0.3 milligrams per liter for DO

2.3.4 Surface Completion

Wells will extend approximately 2 feet above ground surface and will be secured aboveground with a locking, hinged well cap that will be welded onto the well casing stick-up. A water-tight well cap will be placed on top of casing and secured with a lock. A concrete pad measuring approximately 4 feet by 4 feet (approximately 4 inches thick) will be installed around the casing and yellow bollards will be installed at four corners around the pad to ensure maximum visibility and protection of the well.

2.3.5 Surveying

The wells will be surveyed for horizontal and vertical positions by a state-licensed land surveyor. Horizontal positions will be measured to an accuracy of 1.0 foot and will be referenced to the California State Coordinate System and the North American Datum of 1983 (NAD 83). Vertical positions will be measured to an accuracy of 0.01 foot and will be referenced to North American Vertical Datum of 1988 (NAVD 88). Vertical positions will be measured at the top of well casing (north side) and at the top of the concrete pad at each well location.

2.4 WELL SPECIFICATIONS

2.4.1 Well Dimensions and Materials

Each well will be drilled into the top of bedrock. The wells generally will be drilled to comparable depths; total depths may differ slightly based on variations in subsurface geology. The test well will be expected to screen the full thickness of saturated alluvium, except for an interval within approximately 20 feet of the water table. The unscreened portion near the water table will avoid the buildup of mineral encrustation due to evaporation of water cascading

down the well screen during pumping. The observation well and monitoring well screen intervals generally will target the same interval as the test well, but will include the entire saturated interval that is screened, including the portion near the water table. This will ensure that any drawdown near the water table is accurately accounted for. The depth of the static water table at each well location will be determined during pilot well drilling. TEM-02 (in the area of preferred well sire PW-1 on Blue Bell Mine Road) indicated that the depth to water was 182 feet bgs. The alternate well site on Opah Mine Ditch Road is estimated to have water at greater than 300 feet bgs. Groundwater at alternate well site PW-3 is estimated at greater than 386 bgs. Actual total depths and screen intervals in the constructed wells will depend on the depth to the water table and the depth to bedrock as observed during pilot hole drilling. Table 2.4-1 provides well construction information for the test, observation, and monitoring wells.

Table 2.4-1: Proposed Well Dimensions and Construction Materials

Parameter	Dimension or Material	
	Test Well	Observation Well/Monitoring Well
Borehole		
Pilot borehole diameter (inches)	12	10
Pilot borehole depth (feet bgs)	352 (estimated); to be finalized based on geology	352 (estimated); to be finalized based on geology
Reamed borehole diameter (inches)	20	N/A
Reamed borehole depth (approximate feet bgs)	352 (estimated); to be finalized based on geology	N/A
Conductor Casing		
Conductor casing borehole diameter (inches)	26	N/A
Conductor casing diameter (inches)	22	N/A
Conductor casing borehole depth (feet bgs)	30	N/A
Conductor casing depth (feet bgs)	30	N/A
Conductor casing type	0.375-inch wall, mild steel	N/A
Well Casing		
Well casing depth (feet bgs)	352 (estimated); to be finalized based on geology	352 (estimated); to be finalized based on geology
Well casing diameter (inches)	10.75 OD	4
Screen interval (feet bgs)	202 to 352 (estimated); to be finalized based on geology	182 to 352 (estimated); to be finalized based on geology

Table 2.4-1: Proposed Well Dimensions and Construction Materials

Parameter	Dimension or Material	
	Test Well	Observation Well/Monitoring Well
Well casing type	Low-carbon black steel	Sch. 80 polyvinyl chloride (PVC)
Well screen type	Low-carbon steel, full-flow, louvered (slot size to be finalized in the field based on geologic log and sieve analyses)	Sch. 80 PVC, factory-slotted (slot size to be finalized in the field based on geologic log and sieve analyses)
Annular Materials		
Sanitary seal interval	Ground surface to 7 feet above top of screen interval and more than 20 feet deep	Ground surface to 7 feet above top of screen interval and more than 20 feet deep
Sanitary seal type	Neat cement grout	Neat cement grout
Transition seal interval (feet bgs)	From 2 feet above top of screen interval to 7 feet above top of screen interval (5 feet long)	From 2 feet above top of screen interval to 7 feet above top of screen interval (5 feet long)
Transition seal type	Transition sand (e.g., Lapis Lustre #0/30 or equivalent)	Transition sand (e.g., Lapis Lustre #0/30 or equivalent)
Filter pack interval (feet bgs)	200 to 352 (estimated); from 2 feet above top of screen interval to total depth (variable)	180 to 352 (estimated); from 2 feet above top of screen interval to total depth (variable)
Filter pack type	Sand pack mesh size of 8 to 12 (filter pack grade to be finalized based on geologic log and sieve analyses)	Sand pack mesh size of 8 to 12 (filter pack grade to be finalized based on geologic log and sieve analyses)

2.5 DOCUMENTATION

Well completion reports (DWR Form 188) will be completed for each well and submitted to DWR, BLM, and the County.

2.6 WATER MANAGEMENT

A water truck will be used to provide water for drilling the observation well. Water from the observation well will be used to provide water for drilling the test well. Water from the observation well or the test well will be used to provide water for drilling the monitoring well.

Extracted groundwater from the aquifer test of the test well will be temporarily stored on site in a 20,000-gallon temporary storage tank. The water storage tank will be located within the drilling work area. The surface discharge system is shown on Figure 2.1-2. Groundwater will be discharged to the surface at least 500 feet from the test well through the water distribution

system/sewer leach field. The discharge location will be shifted to one of three discharge pipes, approximately every 15 to 20 hours, depending on observed ponding or runoff. Discharge will be managed to reduce potential subsidies for ravens (i.e., reduce potential ponding of water). A similar set-up will be used to manage water generated from the aquifer test of the monitoring well. However, depending on when the monitoring well is constructed and tested, pumped groundwater may be able to be temporarily stored on site to be used in site preparation activities for the solar project. The monitoring well will be completed prior to extracting groundwater for full-scale project use. See Section 3.3 for further details on water discharge activities.

2.7 WASTE MANAGEMENT

Soil cuttings will be temporarily stored in a soil roll-off bin located next to the drilling locations. Analytical results for a soil samples collected as described in Section 2.3.1 will be used to characterize the cuttings for disposal. The results will be compared to appropriate screening criteria. The cuttings will be transported to a federally licensed landfill that accepts hazardous and nonhazardous wastes, for disposal.

2.8 WELL DESTRUCTION

The wells will be destroyed after the useful life of the wells. Well destruction will be performed in general accordance with:

- DWR Bulletin 74-81, Water Well Standards – State of California
- DWR Bulletin 74-90, California Well Standards

The upper 20 feet of the wells will be sealed with suitable sealing material and the remainder of the well will be filled with suitable fill, or sealing material, per DWR requirements. The concrete well pad, bollards, and surface completion will be removed. Well destruction activities will be performed in the same work area that would have been disturbed during well installation activities.

3 AQUIFER TESTING PROGRAM

3.1 OVERVIEW

3.1.1 Test Well Testing

The main purpose of the aquifer testing program is to evaluate the ability of the test well to provide water at the desired rate of production for the project without causing excessive drawdown of water levels in the valley and in adjacent valleys, or in sensitive areas, such as springs near Soda Lake. Additionally, the results of water quality sampling and analysis will be used to determine whether water treatment will be required for extracted groundwater prior to use for panel washing and to evaluate recharge source, groundwater age, deep rock-water interaction, and possibly recharge pathways.

The aquifer testing program includes the following components:

- Baseline water level monitoring
- Step-drawdown aquifer test
- Constant-rate aquifer test
- Water quality sampling and analysis
- Recovery water level monitoring

3.1.2 Monitoring Well Testing

Aquifer testing also will be performed on the monitoring well. Data collected during this test will be used to further characterize the alluvial aquifer at the monitoring well location. The procedures to be used for monitoring well testing will generally follow those for the test well aquifer test and are described in the sections that follow. The monitoring well test will be a single-well test because there will not be an observation well available near the monitoring well location. Testing also will occur over a shorter period (i.e., 24 hours). The monitoring well likely will not be installed until after the solar project has been approved and therefore the leach field described in Section 3.3 likely will not be required to accommodate discharge of pumped groundwater. Moreover, pumped volumes from the monitoring well will likely be much less (20 gpm to 50 gpm) than the pumped volume from the test well (50 gpm to 200 gpm, and the designated monitoring well drilling site should be capable of accommodating the discharge, negating the need for a separate leach field if water discharge is to occur using a leach field system.

3.1.3 Optional Observation Well Testing

As described in Section 2.1.2, if unfavorable conditions are encountered in the observation well bore necessitating relocation of the test well site to an alternate site, the observation well at

location PW-1 will still be completed and will be tested using "single-well drawdown test" methodology. The procedures to be used for observation well testing would generally follow those for the test well aquifer test and are described in the sections that follow. The observation well test, if necessary, would be a single-well test because there would not be a supplemental observation well available near the pumped well location (OW). Testing also would occur over a shorter period (i.e., 8 to 24 hours).

3.2 BASELINE WATER LEVEL MONITORING

SMS will monitor water levels in the wells to establish baseline conditions and water level trends prior to performing the aquifer test. Data collected from the test well and observation well will be used for the test well aquifer test. Data collected from the monitoring well will be used for the monitoring well aquifer test, which will be performed at a later date.

The baseline dataset will allow for identification and quantification of drawdown that results from groundwater pumping during the aquifer test. The baseline dataset will record natural water level variations resulting from diurnal and earth tide effects and atmospheric effects (e.g., changes in atmospheric pressure resulting from storms and other climate occurrences). The natural variations recorded in the baseline dataset will assist in the identification of similar patterns that will be superimposed on the drawdown effects during the aquifer test. The drawdown effects will be easily differentiated from the natural variations, due to a large difference in magnitude (drawdown effects will be much larger), allowing for filtering out of the non-drawdown effects. The drawdown dataset will allow for calculation of aquifer parameters in the vicinity of the pumped well. Baseline monitoring will be conducted for 3 days prior to starting the aquifer test.

Depth to groundwater will be monitored automatically using pressure transducers and manually using hand-held water level meters. Pressure transducers connected to vented cables (to correct for barometric pressure fluctuations) will be installed in the wells. Transducers will collect water level data at regular intervals (e.g., every 15 minutes). Data will be downloaded daily by trained personnel.

Manual depth-to-water measurements will be collected during data downloads to compare to transducer data and verify proper transducer operation. Manual measurements will be collected using an electronic water level meter and will be recorded from the surveyed north side of the well casing to an accuracy of 0.01 foot. Depth to static water levels in wells will be converted to groundwater elevations by subtracting depth to water from the surveyed well casing elevation and expressed as feet above mean sea level.

3.3 STEP-DRAWDOWN AQUIFER TEST

A step-drawdown aquifer test consisting of four 90-minute steps will be performed in the test well and the monitoring well. Data obtained from the step-drawdown test will be used to select

a sustainable pumping rate for the constant-rate test and to estimate the specific capacity of each well.

A submersible test pump will be installed in the test well and the monitoring well within the screen interval. A discharge pipe will be connected to the pump to convey extracted groundwater from the pumped well to a temporary storage tank installed adjacent to the well. A pressure transducer will be installed above the pump within the water column of the pumped well to continually monitor water levels.

Each 90-minute step will be performed sequentially at progressively higher pumping rates. The pumping rates for the test well are currently anticipated to be 50 gallons per minute (gpm), 100 gpm, 150 gpm, and 200 gpm; however, the rates may be altered based on actual well performance observed during the initial stages of the test. Pumping rates for the monitoring well likely will be much lower (likely 50 gpm maximum) because the monitoring well location likely will be less productive and the monitoring well casing will only be 4 inches, which will not accommodate a large pump. Water levels will be monitored during the test using pressure transducers. Manual water level measurements also will be recorded periodically. Pumping rates will be measured by taking instantaneous readings of a flow meter and by using a flow totalizer.

The test will be initiated by turning on the pump to the lowest anticipated pumping rate. The pumping rate will be monitored to ensure it is relatively constant during the 90-minute step. A flow totalizer and stop watch will be used to measure and verify pumping rates. The totalizer readings will also be used to calculate average pumping rates during each step. Flow rates will be recorded on field forms. Water levels will be automatically and manually measured in the pumped well and the observation well (if applicable; no observation well will be located close enough to the monitoring well for use during the monitoring well aquifer test) using pressure transducers and a water level meter. Manual water level measurements will be recorded on field forms. After 90 minutes have passed and the water level in the pumped well has largely stabilized, the pumping rate will be increased to the next higher rate. The same procedure will be followed for this 90-minute step as was followed for the first step, as well as for the final two steps of the test.

Following completion of the last of the four 90-minute steps, the pump will be turned off and the water level in the pumped well will be allowed to return to equilibrium. Water levels in the pumped well and the observation well (if applicable) will be monitored during the recovery process to provide additional data to be used in the hydraulic analysis. Water levels will be monitored until they return to at least 95 percent of pre-test water levels or, if recovery is taking an extended period of time (i.e., greater than 16 hours), until they have recovered to at least 80 percent of the pre-test water levels, before starting the constant-rate test.

Discharge of extracted groundwater was discussed with LRWQCB (Cass 2014). Extracted groundwater will be discharged to the land surface over a broad area using a sewer leach field distribution system. SMS investigated transport of the water to the Town of Baker, but there is

no water user with adequate storage capacity near the project area that could take the water and put it to beneficial use. The discharge will be alternated between three perforated leach field distribution pipes about every 15 to 20 hours during the test to redistribute discharge and avoid overwatering any one area or causing erosion. Once the water leaves the irrigation pipe at a radius of 1.5 inches, it will migrate away from the pipe at a velocity equal to the volumetric flow rate of the discharge divided by the area surrounding the pipe. At the maximum discharge rate of 200 gpm (26.8 cubic feet/minute), divided by 90 feet of discharge pipe (per leg), and with an area of 0.785 square feet/foot surrounding the 3-inch-OD pipe, the discharge velocity will be approximately 0.4 feet/minute. Lower rates of discharge would have a lower velocity. These flow rates are not expected to cause significant erosion of soils. Storage tanks will be used to temporarily store extracted groundwater to manage the discharge. Discharge will be transferred from the storage tanks to conveyance pipes and the valves will be opened to direct flow away from the site to multiple dispersal areas.

The 3-inch-OD leach field pipes will distribute the discharge across a wide area and reduce the potential for erosion or ponding of water in any one area. The system will be monitored and manually operated, and the flow to the sewer leach field pipes will be regularly alternated among the three pipe legs (e.g., every 15 to 20 hours or as appropriate) throughout the duration of the test to reduce runoff, ponding of water, and attraction to wildlife such as ravens. Water will be discharged downslope from the well sites, approximately 500 feet from the pumped well, to reduce the potential for groundwater infiltration to affect the aquifer test results.

The pipe connecting the water storage tank to the leach field will be 4-inch-OD (3.9-inch-inside diameter [ID]) aluminum, non-perforated pipe. The non-perforated pipe will extend for 500 feet from the water tank, at which point it will connect using aluminum elbow joints to 3-inch-OD (2.9-inch ID) aluminum, lateral latch pipe (in 30-foot lengths) with ¾-inch-diameter pipe thread holes, through which the water will discharge. The system will be powered by a DV-80 pump, which is a 12-volt, self-priming, trailer-mounted pump. Figure 2.1-2 provides a schematic of the proposed discharge system. A leach field likely will not be required for discharge of water extracted during the monitoring well test.

3.4 CONSTANT-RATE AQUIFER TEST

Data from the step-drawdown test will be used to select an appropriate pumping rate for the constant-rate test. The goal of the constant-rate test will be to:

- Test the performance of the test well and monitoring well at as high a rate as is sustainable (up to a maximum of 200 gpm for the test well and a maximum of 50 gpm for the monitoring well [to be determined])
- Calculate aquifer parameter values of hydraulic conductivity, transmissivity, and storage coefficient using measured drawdown data

The constant-rate test will be performed over a continuous 72-hour period in the test well and a continuous 24-hour period in the monitoring well.

Prior to initiating the test the water levels in the pumped well and the observation well (if applicable) will be monitored to ensure they have recovered sufficiently following completion of the step-drawdown test.

The test will be initiated by turning on the pump to the selected pumping rate. The pumping rate will be continually monitored by on-site personnel during the entire test duration to ensure it is as constant as feasible during the test. A flow totalizer and stop watch will be used to measure and verify pumping rates. The totalizer readings will also be used to calculate average pumping rates for the entire duration of the constant-rate test. Flow rates will be recorded on field forms. The pumping rate will be adjusted as needed to maintain a relatively constant rate of discharge as water levels drop in the well.

Water levels will be automatically and manually measured in the pumped well and the observation well (if applicable) using pressure transducers and a water level meter. Manual water level measurements will be recorded on field forms. Water levels will be plotted in real-time on graph paper to allow for identification of boundary conditions. Boundary conditions also will be assessed during data processing using both drawdown and recovery data (see Section 4).

Water quality parameters (i.e., temperature, pH, ORP, DO, turbidity, and specific conductance) will be periodically measured in the pumped well (e.g., every 2 to 3 hours) by collecting a small-volume sample from a sample spigot and using calibrated field probes and a flow-through cell to measure the parameter values. Field-measured water quality parameter measurements will be recorded on field forms. See Section 3.5 for information on collection of samples that will be submitted to a state-certified laboratory for chemical analysis.

Water discharge will be performed as described for the step-drawdown test (Section 3.3).

3.5 WATER QUALITY SAMPLING AND ANALYSIS

Groundwater samples will be collected from a spigot connected to the discharge pipe of the pumped well during the following intervals of the constant-rate aquifer test:

- Approximately 3 to 5 hours following test start-up (one sample)
- At approximately 24, 48, and 72 hours following test start-up (three samples total)

The samples will be decanted into laboratory-provided sample containers, labeled, sealed in plastic bags, and placed in an ice-chilled cooler. The samples will be submitted to a state-certified analytical laboratory under chain-of-custody protocols for analysis. Baseline water quality data will be analyzed for the constituents identified in Table 3.5-1. Only the final samples collected at 72 hours (for the test well) or 24 hours (for the monitoring well) following test start-up will be analyzed for isotopes.

3.6 RECOVERY WATER LEVEL MONITORING

After cessation of pumping, water level recovery will be measured in the pumped well and the observation well (if applicable) for up to 72 hours. Recovery monitoring data constitute an independent dataset for estimation of aquifer properties and identification of boundary conditions, and will enhance the hydraulic analysis to be performed. Data from recovery monitoring in test wells commonly are considered more reliable than data collected during constant-rate tests because water level turbulence associated with pumping does not occur.

Table 3.5-1: Water Sampling Analytical Program

Analyte	Analytical Method (EPA unless specified)
Field parameters (pH, specific conductance, ORP, temperature, DO, and turbidity)	Field meter/flow-through cell with pH, specific conductance, ORP, temperature, and DO probes; turbidimeter
TDS	160.1
Total Nitrate/Nitrite (as N)	300.0
Carbonate/Bicarbonate alkalinity	SM 2320B[1]
Sulfate	300.0
Chloride	300.0
Calcium	6010B
Magnesium	6010B
Sodium	6010B
Potassium	6010B
Isotopes (δ^2H, $\delta^{18}O$, ^{34}S, ^{13}C, ^{14}C, δ^3H)	Various[2]

Note:

1 SM = standard method

2 Only the final samples collected after 72 hours of pumping the test well and 24 hours of pumping the monitoring well during the constant-rate aquifer tests will be analyzed for isotopes.

4 DATA ANALYSIS APPROACH

4.1 GEOLOGIC ANALYSIS

The geologic logs, geophysical logs, driller's logs, and results of the sieve and moisture content analysis will be evaluated to assess:

- Aquifer character (geologic composition, permeability, stratigraphy, and degree of heterogeneity)
- Depth to the water table
- Depth to bedrock
- Bedrock geology

All of the geologic factors listed above will be initially evaluated during the well boring process to assist in well design, as discussed in Section 2.3.2. The geologic logs for the test well, observation well, and monitoring well, including depth to water and depth to bedrock, will allow for calibration of the geophysical data measured at TEM-02. Depth to water and depth to bedrock from the wells will be compared to the corresponding depths for these features as interpreted from TEM-02 data. Once this calibration has been made, similar extrapolations can be made for depth to water and depth to bedrock at the other two geophysical data locations (i.e., TEM-09 and TEM-11), which will provide additional information on aquifer geology in the southern portion of the project site. Data on bedrock geology will be used to test the model assumption that the bedrock underlying the alluvial aquifer is low-permeability granitic rock. If high-permeability bedrock is encountered, a packer test may be performed as discussed in Section 2.3.1 and the model will be re-run as discussed in Section 4.2.4.

4.2 HYDRAULIC ANALYSIS

4.2.1 Initial Data Processing and Analysis

Manually collected data (i.e., manually collected water levels, flow rates, and flow volumes) will be hand-entered into a spreadsheet file from field records. Automatically collected data (i.e., water levels collected by transducers) will be uploaded into a spreadsheet file. All data will be tabulated, organized, and labeled appropriately.

Water level data, flow rates, and other aquifer data collected from the constant-rate tests will be post-processed using Win-Situ (or an equivalent software program) and Excel and imported into the aquifer test analysis software program AQTESOLV version 4.5 (Hydrosolve 2014) for analysis. Plots of drawdown and recovery water level data (hand-drawn from the field and also generated using Excel) will be evaluated to identify important hydraulic parameters such as hydraulic conductivity and storage coefficient, as well as boundary conditions.

4.2.2 Drawdown Limit Calculation

Drawdown data from the test well, observation well, and monitoring well collected during the pumping portion of the constant-rate tests will likely be analyzed using the Cooper-Jacob method (Cooper and Jacob 1946), corrected for unconfined conditions, if the data support use of this analytical method. Recovery data will be analyzed using the Theis method (1935). These methods will predict the lateral distance that drawdown is expected to extend from the pumped wells, and are not restricted by the conditions in the groundwater flow model such as the model domain or presence of bedrock wall boundaries. Thus these methods can be used to predict the drawdown effects if there were no bedrock boundaries. The impacts to groundwater resources inside and outside of the Soda Mountain Valley can be estimated using analytical methods and without expanding the three-dimensional groundwater model outside of the valley.

4.2.3 Hydraulic Parameter Calculation

Hydraulic conductivity and storage coefficient will be calculated and used to verify and enhance the groundwater modeling analysis conducted for the project. The storage coefficient derived from the aquifer test will be compared to the value used in the model (0.1). It is expected that different estimates of hydraulic conductivity will be obtained from the different segments of the test performed and from the various wells monitored. Recovery monitoring data generally are considered more reliable in pumped wells (compared to data collected during pumping) and will be weighted more heavily in the assessment of hydraulic conductivity values. Observation well data generally are assessed to be of higher quality for analysis because there is no interference from turbulence inside the well caused by pumping, which typically results in more accurate data. The storage coefficient will be calculated using drawdown and recovery data from the observation well, if possible (i.e., will not be possible for evaluation of monitoring well test results).

4.2.4 Modeling

Criteria for Model Recalibration

SMS will recalibrate/re-run the three-dimensional groundwater model with refined parameter values if any of the following conditions are observed:

1. The thickness of saturated alluvium at the test well location differs by 20 percent or more from the thickness used in the model at that location.
2. Hydraulic conductivity is calculated outside the range of values used in the groundwater flow model (i.e., less than 0.86 feet/day or greater than 3.2 feet/day).
3. The geology of the bedrock indicates much greater permeability than assumed in the model (i.e., within a factor of 10 of the hydraulic conductivity of the sand and gravel aquifer).

Model recalibration will include the Zzyzx area in the model domain and will use a modified recharge value of 100 AFY.

SMS will also perform one-dimensional analytical flow modeling using the observed aquifer parameters from the well test to calculate drawdown at the Zzyzx area.

Additional Analysis
SMS will conduct additional analysis of the following items if the model is recalibrated/re-run:

- Potential impacts to springs in the Mojave National Preserve, the Mohave tui chub, and groundwater supply wells in Baker. Model boundaries would be expanded to ensure potential impacts to these features would be included within the model domain, if refined aquifer parameter values change the model results and the analytical model indicates there is a potential for impacts to extend to these sensitive groundwater resources.
- Depth to water and depth to bedrock. The current groundwater model is calibrated to the depth to groundwater and depth to bedrock at three locations in the valley based on geophysical data. The geologic logs for the test well and observation well drilled at PW-1 (near location TEM-02) and the monitoring well drilled at MW-1 would be used to calibrate and evaluate the existing geophysical interpretations at the two other locations and potentially to recalibrate the model at these other locations as well.
- Model-predicted radius of influence and decline in outflow from the valley. Radius of influence and outflow decline would be recalculated using the revised model results.
- Number of wells required for full-scale water supply during project construction. The results of groundwater flow modeling showed that three wells could provide enough water for the project even at the low estimate of hydraulic conductivity (0.86 feet/day). If the aquifer conductivity is calculated to be less than 0.86 feet/day, SMS would recalibrate the model with the observed conductivity to determine the number of wells that are anticipated to be required to supply water for the project, and will model groundwater extraction using the additional well location(s).

4.3 WATER CHEMISTRY ANALYSIS

Analytical data from the groundwater samples collected during the constant-rate aquifer tests will be evaluated to provide information on the following:

- ***Need for Water Treatment.*** TDS concentrations will be compared to the maximum TDS concentration that would be acceptable for use of untreated water for panel washing during project operation. If TDS concentrations indicate water quality is very good (i.e., low TDS), SMS may remove the option to construct a reverse osmosis water treatment facility at the project site. Additional water quality data will be obtained during project construction to make a final determination on the need for water treatment.
- ***Boundary Conditions and Aquifer Heterogeneity.*** Water quality analytical results for the four groundwater samples will be evaluated to identify the age of the water and the general geochemistry and mineralogy of the aquifer that the water has migrated through. The samples will be collected at regular intervals over the course of the constant-rate aquifer tests and will provide an indication of changes in groundwater chemistry over

time, which can be used to infer changes, if any, in the portion of the aquifer that is being accessed by the extraction system. Major changes in water chemistry, in combination with hydraulic analysis (see Section 4.2.1), may also be indicative of boundary conditions.

- ***Common Water Source.*** The groundwater sample collected after 72 hours (test well) or 24 hours (monitoring well) of pumping for the constant-rate aquifer tests will be analyzed for the same constituents that were previously analyzed in groundwater samples collected at the DSC (Vargas 2012). SMS will compare the geochemistry in the 72-hour and 24-hour samples to that of groundwater at the DSC to determine if the geochemistry is sufficiently similar to indicate a common source of water.

4.4 REPORTING

4.4.1 Preliminary Report

The initial results of the tests (i.e., raw data) will be submitted to BLM and the County within 5 days of the completion of the tests. SMS may also present the preliminary results of the data analysis to BLM in a meeting.

4.4.2 Report of Results

A report of results will be prepared that summarizes the results of the aquifer test and analysis for the test well. Monitoring well installation and testing will occur at a later date and will be reported under separate cover. The report will be submitted to the County and BLM for review. A Professional Geologist or Certified Hydrogeologist will prepare and sign the report. The report will provide the following information:

- Summary of well construction methodology
- Summary of aquifer testing methodology
- Well logs, including driller's logs, soil logs, geophysical logs, and well construction diagrams
- Well development records
- Maps showing surveyed locations of newly installed wells
- Tables summarizing baseline water level conditions, maximum drawdowns observed, total groundwater extracted, and other data, as appropriate
- Tables summarizing analytical data for soil cuttings characterization
- Tables summarizing field measurements of groundwater quality during well development and aquifer testing
- Tables summarizing analytical data for groundwater samples collected during the aquifer tests
- Hydrographs of hydraulic head versus time measured in each well during aquifer testing
- Groundwater elevation contour maps illustrating groundwater conditions at select times during the aquifer tests
- Analysis and evaluation of aquifer testing results

- Updated groundwater modeling results, as necessary, using the newly derived aquifer parameters (e.g., hydraulic conductivity, depth to groundwater, and depth to bedrock)
- Discussion of the implications of the test results in the context of the installation of groundwater supply wells for the proposed project (e.g., number of supply wells needed and potential locations for supply wells)
- Preliminary verification of anticipated impacts of groundwater development on surface and groundwater resources

5 ENVIRONMENTAL DESIGN FEATURES

Design features have been developed to avoid impacts to and protect vegetation, wildlife, cultural and paleontological resources, recreational uses, utilities, and water resources.

5.1 BIOLOGICAL RESOURCES

5.1.1 Previous Biological Resources Surveys

SMS has conducted several biological surveys in the project area, as listed below:

1. Panorama Environmental, Inc. 2013. Biological Resources Technical Report (BRTR), Soda Mountain Solar, San Bernardino County, CA, BLM Case Number CACA 49584, March 2013.
2. URS Corporation. 2009. Draft Jurisdictional Determination Report, Soda Mountain Solar Project, San Bernardino, California (November 3).
3. Caithness Soda Mountain, LLC. 2010. Final 2009 Focused Special-status Plant Survey Report, Soda Mountain Solar Project, San Bernardino County, CA. October.
4. Caithness Soda Mountain, LLC. 2010. Final 2009 Biological Resources Technical Report, Soda Mountain Solar Project, San Bernardino County, CA. October.
5. C.S. Ecological Surveys and Assessments. 2013. Integrated Weed Management Plan, Soda Mountain Solar, San Bernardino County, CA, BLM Case Number CACA 49584. August 2013.
6. C.S. Ecological Surveys and Assessments. 2013. Spring Rare Plant Survey Soda Mountain Solar Project, BLM Case #CACA 49584 San Bernardino County, California, May 2013.
7. California Natural Diversity Database. 2013.
8. California Native Plant Society Inventory of Rare and Endangered Plants. 2013.
9. Kiva Biological Consulting. 2013. Protocol Desert Tortoise Survey for Soda Mountain Solar Project, Spring 2013, BLM Case Number – CACA 49584, prepared for Bureau of Land Management. June 12, 2013.
10. Kiva Biological Consulting. 2013. Preliminary raw burrowing owl survey data, provided to BLM on July 1, 2013.
11. Kiva Biological Consulting. 2012. Protocol Desert Tortoise Survey for Soda Mountain Solar Project, Fall 2012, BLM Case Number CACA 49584. Prepared for BLM, November 28, 2012.

The results of the surveys are shown on the figures in Appendix C. One desert tortoise was found near the eastern edge of the Soda Mountain Valley, and limited sign were found east and west of I-15. Other wildlife in the area include burrowing owl, desert kit fox, and bighorn sheep. The sensitive plant species in the region include Emory's crucifixion-thorn (*Castela emoryi,*

California Rare Plant Rank [CRPR] 2.3) and Utah vine milkweed (*Funastrum utahense*, CRPR 4.2). These species do not occur at the proposed well sites (see Appendix C).

5.1.2 Design Features

The proposed field work will avoid all sensitive biological resources by minimizing site and surface disturbance as much as possible. A biologist will be contracted to survey work areas for sensitive species immediately before any work is performed in the area. The survey area will cover the test well and observation well locations and a 100-foot-buffer. At least 1 acre will be surveyed at each well site. The work plan for biological surveys will be submitted to BLM and USFWS. Work areas or locations will be adjusted as needed to provide a minimum 100-foot buffer between burrows and work areas, including access routes. Well locations will avoid impacts to waters of the state and waters of the U.S. The measures listed below will be implemented to avoid effects to sensitive species.

Biological 1: Worker Education Program

Field personnel will be trained prior to the field investigation, drilling, and aquifer testing activities. The purpose of the training will be to acquaint workers with the sensitive resources (e.g., wildlife, cactus, cultural resources, and paleontological resources) in the work area, the workers' responsibilities, and BLM's management objectives, and to define the steps to be taken should unanticipated resources be identified in the field. Worker training associated with biological resources will include the following components:

- Descriptions of sensitive species within the project area
- Conservation measures that have been identified to minimize impacts to sensitive species (e.g., speed limits, no pets on site)
- Information on the presence, life history, and habitat of sensitive species
- Information on federal and state laws protecting migratory birds

Worker training associated with cultural and paleontological resources will include the following components:

- A review of archaeology, history, prehistory, and Native American cultures associated with historical resources in the project area
- A review of photographs and figures of potential historical resources and unique archaeological properties in the project area
- A review of applicable local, state, and federal ordinances, laws, and regulations pertaining to cultural resource preservation
- A discussion of procedures to be followed in the event that unanticipated paleontological or cultural resources are discovered during site work
- A discussion of disciplinary and other actions that could be taken against persons violating historical preservation laws

- Information on the protection of paleontological resources and procedures to be implemented in the event that fossil remains are encountered during ground-disturbing activities

Documentation of worker training will be maintained on site.

Biological 2: Biological Surveys
Protocol surveys for desert tortoise have been conducted over the entire project site. Additional surveys will be conducted immediately prior to any ground disturbance. The survey area will extend a minimum of 20 feet from the edge of the roadway and 100 feet from the work areas. The results of the biological surveys will be provided to BLM prior to initiating ground-disturbing activities. Work areas will be located a minimum of 100 feet from burrows that could potentially be used by desert tortoise, kit fox, or burrowing owl.

Biological 3: Biological Monitor
A qualified biological monitor will survey the work area prior to ground disturbance (Biological 2) and exclusion fence installation (Biological 4). The biological monitor shall be pre-approved by BLM. The monitor will ensure that the project complies with desert tortoise avoidance measures and will have the authority and responsibility to halt activities that are in violation. Following exclusion fence installation (Biological 4), the biological monitor will inspect the work areas weekly for the presence of desert tortoise, burrowing owl, and kit fox during work within the desert tortoise exclusion fence. The biological monitor will perform daily inspections of the work area for any work conducted outside of desert tortoise exclusion fencing (i.e., installation of discharge pipe, temporary discharge, and removal of discharge pipe). The monitor will also work with the drilling supervisor to take steps to avoid disturbing desert tortoise. The biological monitor will keep a record of all sightings of desert tortoise and sign of desert tortoise.

Biological 4: Exclusion Fencing
Well drilling areas and all other drilling work areas will be delineated with temporary desert tortoise fencing. All drilling work will be restricted to these areas. The fences will be installed after the biologist completes the pre-activity surveys for each work area.

Biological 5: Vegetation Management
Clearing or damage to vegetation will be avoided or minimized to the extent possible. When possible, equipment and vehicles will use previously disturbed areas. Vehicles and equipment will use areas within the defined work area enclosed within desert tortoise exclusion fence. The discharge piping will be installed and removed by hand, without the use of heavy equipment. Invasive species control strategies are defined in Appendix D.

Biological 6: Trash Removal
All on-site trash (including organic waste such as apple cores and orange peels) will be kept in covered trash receptacles with lids that can be fastened securely. No trash receptacles will be left without lids on site other than when trash is being deposited or transferred into another

secure receptacle. No littering will be allowed on site. Trash will be controlled until it is placed in a trash container so that it is at no time accessible to wildlife. All trash on site will be collected and removed from the site on a daily basis. Any carcasses or road kill will be disposed of in accordance with state and federal regulations.

Biological 7: Vehicle Speed Limit
Vehicle speeds will be limited to 15 miles per hour on Blue Bell Mine Road and the project site.

Biological 8: Reclamation
Upon completion of decommissioning, the work area will be reclaimed. The goals of site reclamation are to restore the land to pre-project conditions; establish quality habitat for desert tortoise and other fauna; and minimize potential erosion through proper restoration activities and implementation of appropriate best management practices (BMPs). Reclamation will include decompaction of work areas, as appropriate, placement of removed rocks to mimic surrounding ground conditions, and destruction of the well and pad, as described previously. Temporary work areas will be allowed to reseed/revegetate naturally.

5.2 CULTURAL AND PALEONTOLOGICAL RESOURCES

5.2.1 Previous Cultural Resources Surveys

SMS has conducted cultural resource surveys of the project area. The surveys are documented in the following reports:

1. Duke, Daron, and Brandon Patterson. Cultural Resources Inventory of 6,775 Acres for the Soda Mountain Solar Project, San Bernardino County, California. BLM Report No. 680-09-24. November 2009.
2. McCabe, Allen. Cultural Resources Inventory of an Additional 335 Acres for the Soda Mountain Solar Project. BLM Report No. 680-09-24. February 2013.
3. Daub, Lindsay, and Daron Duke. Cultural Resources Inventory of a Segment of the Blue Bell Mine Road, Soda Mountain Solar Project, San Bernardino County, California. BLM Report No. 6800924. July 2013.

5.2.2 Previous Paleontological Resource Survey

The Soda Mountain Valley was surveyed in 2009 by PaleoResource Consultants. No previously recorded fossil localities are located within the areas that may be disturbed by the wells or access routes (PaleoResource Consultants 2009 as cited in BLM and San Bernardino County 2013).

5.2.3 Design Features

There are no cultural resource sites eligible for listing on the National Register of Historic Places within the proposed project area and no cultural resource surveys are required for the proposed work (Appendix E). Subsurface resources have a low probability of occurrence because of the

active erosional environment and the lack of perennial water sources in the area. The design features listed below will be followed to avoid impacts to cultural resources.

Cultural 1: Cultural Resource Discoveries
If any unanticipated cultural or paleontological resources are identified during excavation, all project activities will cease in the immediate area of the discovery and the information shall be reported to BLM. Work will not resume in the area until BLM issues written authorization to proceed. SMS will be responsible for the cost of the evaluation and appropriate resource management.

Cultural 2: Human Remains
SMS will contact BLM if there is an inadvertent discovery of human remains. SMS will notify the Native American Heritage Commission and the most likely affected tribes, if requested by BLM. BLM will notify the appropriate San Bernardino County official per BLM standard procedures.

Paleontological 1: Paleontological Resource Monitor
Soil cuttings will be stockpiled on site. A qualified Paleontologist will examine the soil cuttings generated from the well bores for paleontological resources.

5.3 UTILITIES

SMS is aware that there are underground utilities in the project region, including fuel pipelines and fiber optic lines.

5.3.1 Design Features

Utilities 1: Avoidance of Buried Utilities
SMS will contact Underground Service Alert to establish the location of any underground utilities in the vicinity of the proposed surface disturbance. Subsurface utilities will be avoided.

5.4 RECREATION

Off-highway vehicle (OHV) activity occurs in the project region.

5.4.1 Design Features

Recreation 1: Avoidance of Conflicts
SMS will take every means feasible to avoid conflicts with recreational OHV use of the project area and to prevent accidents or incidents involving its employees, contractors, and the general public.

5.5 WATER RESOURCES

There are no surface water bodies within the well work area and well drilling and testing will avoid impacts to waters of the state and waters on the site are considered isolated by USACE and no permit is required (USACE 2013). The proposed aquifer test will include surface discharge of groundwater. Per discussions with LRWQCB (Cass 2014), a discharge permit will not be required prior to surface discharge.

5.5.1 Design Features

Water 1: Sanitary Facility Maintenance

Sanitary facilities for workers will be provided and cared for in an appropriate fashion to avoid impacts to water resources.

6 REFERENCES

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Appendix A:
Material Safety Data Sheets

MATERIAL SAFETY DATA SHEET

Pyro-Chem
by Tyco Fire Suppression & Building Products

ABC Fire Extinguisher

Issue Date: 04-13-2011

1. Product and Company Identification

Material name	**ABC Fire Extinguisher**
Version #	02
Revision date	04-13-2011
CAS #	Mixture
Product use	Fire Extinguisher
Manufacturer / Importer / Supplier	
Name	Tyco Fire Protection Products
Address	One Stanton Street Marinette, WI 54143-2542
Phone	715-732-3465
Internet	http://www.pyrochem.com
Emergency Phone Number	CHEMTREC 800-424-9300 or 703-527-3887

2. Hazards Identification

Emergency overview	WARNING Irritating to eyes and skin. Prolonged exposure may cause chronic effects.
Potential health effects	
Routes of exposure	Eye contact. Skin contact. Inhalation. Ingestion.
Eyes	Contact with eyes may cause irritation.
Skin	Avoid contact with the skin. May cause skin irritation.
Inhalation	Inhalation of dusts may cause respiratory irritation.
Ingestion	Not a likely route of entry.
Target organs	Eyes. Respiratory system. Skin.
Signs and symptoms	Irritation of eyes and mucous membranes.

3. Composition / Information on Ingredients

Non-hazardous components	CAS #	Percent
AMMONIUM HYDROGEN SULFATE	7783-20-2	10 - 30
Other components below reportable levels		> 60

4. First Aid Measures

First aid procedures	
Eye contact	Immediately flush eyes with plenty of water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if irritation persists after washing.
Skin contact	Wash off with warm water and soap. Get medical attention if irritation develops and persists.
Inhalation	Move to fresh air.
Ingestion	Rinse mouth. Do not induce vomiting without advice from poison control center. If vomiting occurs, keep head low so that stomach content doesn't get into the lungs.
General advice	If you feel unwell, seek medical advice (show the label where possible). Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves. Show this safety data sheet to the doctor in attendance.

5. Fire Fighting Measures

Extinguishing media	
Suitable extinguishing media	This product is not flammable. Use extinguishing agent suitable for type of surrounding fire.
Protection of firefighters	
Specific hazards arising from the chemical	None known.
Protective equipment for firefighters	None known.
Special protective equipment for fire-fighters	None known.
Explosion data	
Sensitivity to mechanical impact	Not available.
Sensitivity to static discharge	Not available.
Hazardous combustion products	Carbon monoxide and carbon dioxide.

6. Accidental Release Measures

Personal precautions	Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Avoid inhalation of dust from the spilled material. Wear a dust mask if dust is generated above exposure limits.
Environmental precautions	Do not contaminate water.
Methods for containment	If sweeping of a contaminated area is necessary use a dust suppressant agent which does not react with the product. Prevent entry into waterways, sewer, basements or confined areas.
Methods for cleaning up	Should not be released into the environment. Sweep up or vacuum up spillage and collect in suitable container for disposal. Collect dust using a vacuum cleaner equipped with HEPA filter. Avoid the generation of dusts during clean-up. Clean up in accordance with all applicable regulations. Following product recovery, flush area with water.
Other information	Clean up in accordance with all applicable regulations.

7. Handling and Storage

Handling	Minimize dust generation and accumulation. Provide appropriate exhaust ventilation at places where dust is formed. Do not breathe dust. Avoid contact with eyes. Wash thoroughly after handling. Wear personal protective equipment.
Storage	Guard against dust accumulation of this material. Use care in handling/storage.

8. Exposure Controls / Personal Protection

Personal protective equipment	
Eye / face protection	Wear safety glasses with side shields (or goggles).
Skin protection	Wear chemical protective equipment that is specifically recommended by the manufacturer. It may provide little or no thermal protection.
Respiratory protection	In the case of respirable dust and/or fumes, use self-contained breathing apparatus.

9. Physical & Chemical Properties

Appearance	
Form	Powder.
Color	Yellow.
Odor	Odorless.
Physical state	Solid.
pH	Not available.
Melting point	Not available.
Freezing point	Not available.
Boiling point	Not available.
Flash point	Not available.

Evaporation rate	Not available.
Flammability limits in air, upper, % by volume	Not available.
Flammability limits in air, lower, % by volume	Not available.
Vapor pressure	Not available.
Vapor density	Not available.
Specific gravity	Not available.
Relative density	Not available.
Solubility (water)	Not available.
Partition coefficient (n-octanol/water)	Not available
Auto-ignition temperature	Not available.
Decomposition temperature	Not available.

10. Chemical Stability & Reactivity Information

Chemical stability	Material is stable under normal conditions.
Incompatible materials	Strong acids.
Hazardous decomposition products	Carbon oxides.

11. Toxicological Information

Toxicological information	The toxicity of this product has not been tested.
Chronic effects	Prolonged inhalation may be harmful. Not expected to be hazardous by WHMIS criteria.

12. Ecological Information

Ecotoxicological data

Components	Test Results
AMMONIUM HYDROGEN SULFATE (7783-20-2)	EC50 Water flea (Ceriodaphnia dubia): 52 - 67 mg/l 48.00 hours LC50 Pink salmon (Oncorhynchus gorbuscha): 0.068 mg/l 96.00 hours

Ecotoxicity	This material is not expected to be harmful to aquatic life.
Environmental effects	An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Persistence and degradability	Not available.
Partition coefficient (n-octanol/water)	Not available

13. Disposal Considerations

Disposal instructions	Dispose of contents/container in accordance with local/regional/national/international regulations. Dispose of waste material according to Local, State, Federal, and Provincial Environmental Regulations.
Waste from residues / unused products	Dispose of in accordance with local regulations.

14. Transport Information

TDG

Not regulated as dangerous goods.

15. Regulatory Information

Canadian regulations	This product has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR.
WHMIS status	Controlled
WHMIS classification	A - Compressed Gas

WHMIS labeling

Inventory status

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	Yes
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	No
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	Yes
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

*A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)

16. Other Information

Further information

HMIS® is a registered trade and service mark of the NPCA.

HMIS® ratings

Health: 1*
Flammability: 0
Physical hazard: 0

NFPA ratings

Health: 1
Flammability: 0
Instability: 0

Disclaimer

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

Issue date

04-13-2011

MATERIAL SAFETY DATA SHEET

Section 1: Product & Company Identification

Product Name: **Air Tool Oil**

Product Number (s): **SL2531, SL2533, 74095**

Product Use: lubricant for pneumatic equipment

Manufacturer / Supplier Contact Information:

In United States:
CRC Industries, Inc.
885 Louis Drive
Warminster, PA 18974
www.crcindustries.com
1-215-674-4300(General)
(800) 521-3168 (Technical)
(800) 272-4620 (Customer Service)

In Canada:
CRC Canada Co.
2-1246 Lorimar Drive
Mississauga, Ontario L5S 1R2
www.crc-canada.ca
1-905-670-2291

In Mexico:
CRC Industries Mexico
Av. Benito Juárez 4055 G
Colonia Orquídea
San Luís Potosí, SLP CP 78394
www.crc-mexico.com
52-444-824-1666

24-Hr Emergency – CHEMTREC: (800) 424-9300 or (703) 527-3887

Section 2: Hazards Identification

Emergency Overview

As defined by OSHA's Hazard Communication Standard, this product is non-hazardous.
Appearance & Odor: Amber viscous liquid, faint petroleum odor

Potential Health Effects:

ACUTE EFFECTS:

EYE: Direct contact irritates slightly with redness and swelling.

SKIN: Slightly irritating. Repeated or prolonged contact can result in drying of the skin.

INHALATION: Inhalation hazard at room temperature is unlikely due to the low volatility of this product. Heating can generate vapors that may cause respiratory irritation, nausea and headaches.

INGESTION: May cause stomach pain or vomiting. Main hazard, if ingested, is aspiration into the lungs and subsequent pneumonitis.

CHRONIC EFFECTS: Unknown

TARGET ORGANS: Unknown

Medical Conditions Aggravated by Exposure: Unknown

See Section 11 for toxicology and carcinogenicity information on product ingredients.

Section 3: Composition/Information on Ingredients

COMPONENT	CAS NUMBER	% by Wt.
Hydrotreated light naphthenic distillates	64742-53-6	93 – 97
Solvent-refined heavy naphthenic distillates	64741-96-4	1 – 5
Zinc, dithiophosphate di-C1-14-alkyl esters	68649-42-3	< 1

Section 4: First Aid Measures

Eye Contact: Immediately flush with plenty of water for 15 minutes. Call a physician if irritation persists.

Skin Contact: Remove contaminated clothing and wash affected area with soap and water. Call a physician if irritation persists. Wash contaminated clothing prior to re-use.

Inhalation: Remove person to fresh air. Keep person calm. If not breathing, give artificial respiration. If breathing is difficult give oxygen. Call a physician.

Ingestion: Do NOT induce vomiting. Get medical attention immediately. Never give anything by mouth to an unconscious person.

Note to Physicians: If product is injected into or under the skin, or into any part of the body, the individual should be evaluated immediately as a surgical emergency. Even though symptoms from high pressure injection may be minimal or absent, early surgical treatment within the first few hours may significantly reduce the ultimate extent of injury.

Section 5: Fire-Fighting Measures

Flammable Properties: As defined by OSHA, this product is a nonflammable.

Flash Point: > 300°F (COC) Upper Explosive Limit: ND

Autoignition Temperature: ND Lower Explosive Limit: ND

Fire and Explosion Data:

Suitable Extinguishing Media: Foam, dry chemicals, sand, dolomite, carbon dioxide

Products of Combustion: Acrid smoke/fumes; oxides of carbon

Explosion Hazards: Containers, when exposed to heat from fire, may build pressure and rupture.

Protection of Fire-Fighters: Firefighters should wear self-contained, NIOSH-approved breathing apparatus for protection against suffocation and possible toxic decomposition products. Proper eye and skin protection should be provided. Use water spray to keep fire-exposed containers cool and to knock down vapors which may result from product decomposition.

Section 6: Accidental Release Measures

Personal Precautions: Use personal protection recommended in Section 8. Minimize skin contact

Environmental Precautions: Take precautions to prevent contamination of ground and surface waters. Do not flush into sewers or storm drains.

Methods for Containment & Clean-up: Dike area to contain spill. Ventilate the area with fresh air. If in confined space or limited air circulation area, clean-up workers should wear appropriate

respiratory protection. Recover or absorb spilled material using an absorbent designed for chemical spills. Place used absorbents into proper waste containers.

Section 7: Handling and Storage

Handling Procedures: Do not reuse container. Keep container closed when not in use. Ventilate well and avoid breathing vapors. Do not store or mix with strong oxidizers. Avoid strong heating. For product use instructions, please see the product label.

Storage Procedures: Store in a cool dry area out of direct sunlight. Containers should be tightly closed while in storage. Keep away from sources of ignition. Store away from strong acids and oxidizers.

Aerosol Storage Level: NA

Section 8: Exposure Controls/Personal Protection

Exposure Guidelines:

	OSHA		ACGIH		OTHER		
COMPONENT	TWA	STEL	TWA	STEL	TWA	SOURCE	UNIT
Hydrotreated light naphthenic distillates	5	NE	0.2	NE	NE		mg/m^3
Solvent-refined heavy naphthenic distillates	5	NE	0.2	NE	NE		mg/m^3
Zinc, dithiophosphate di-C1-14-alkyl esters	NE	NE	NE	NE	NE		
N.E. – Not Established (c) – ceiling (s) – skin (v) – vacated							

Controls and Protection:

Engineering Controls: Area should have ventilation to provide fresh air. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at the source, preventing dispersion into the general work area. Use mechanical means if necessary to maintain vapor levels below the exposure guidelines. If working in a confined space, follow applicable OSHA regulations.

Respiratory Protection: None required for normal work where adequate ventilation is provided. If engineering controls are not feasible or if exposure exceeds the applicable exposure limits, use a NIOSH-approved cartridge respirator with organic vapor cartridge. Air monitoring is needed to determine actual employee exposure levels. Use a self-contained breathing apparatus in confined spaces and for emergencies.

Eye/face Protection: For normal conditions, wear safety glasses. Where there is reasonable probability of liquid contact, wear splash-proof goggles.

Skin Protection: Use protective gloves such as nitrile or PVC. Also, use full protective clothing if there is prolonged or repeated contact of liquid with skin.

Section 9: Physical and Chemical Properties

Physical State: liquid (viscous)
Color: amber
Odor: mild petroleum
Odor Threshold: ND
Specific Gravity: 0.91

Initial Boiling Point: > 360°F
Freezing Point: ND
Vapor Pressure: ND
Vapor Density: > 1 (air = 1)
Evaporation Rate: slow
Solubility: insoluble in water
Coefficient of water/oil distribution: ND
pH: NA
Volatile Organic Compounds: wt %: 0 g/L: 0 lbs./gal: 0

Section 10: Stability and Reactivity

Stability: Stable

Conditions to Avoid: Sources of ignition

Incompatible Materials: Strong acids and oxidizers

Hazardous Decomposition Products: Oxides of carbon, sulfur and phosphorus

Possibility of Hazardous Reactions: No

Section 11: Toxicological Information

Long-term toxicological studies have not been conducted for this product. The following information is available for components of this product.

Acute Toxicity:

Component	Oral LD50 (rat)	Dermal LD50 (rabbit)	Inhalation LC50 (rat)
Hydrotreated light naphthenic distillates	> 5000 mg/kg	> 2000 mg/kg	2.18 mg/L/4H
Solvent-refined heavy naphthenic distillates	No data	No data	No data
Zinc, dithiophosphate di-C1-14-alkyl esters	No data	No data	No data

Chronic Toxicity:

Component	OSHA Carcinogen	IARC Carcinogen	NTP Carcinogen	Irritant	Sensitizer
Hydrotreated light naphthenic distillates	No	No	No	E (mild) / S (mild)	Unknown
Solvent-refined heavy naphthenic distillates	No	No	No	Unknown	Unknown
Zinc, dithiophosphate di-C1-14-alkyl esters	No	No	No	Unknown	Unknown

E – Eye S – Skin R - Respiratory

Reproductive Toxicity: No information available
Teratogenicity: No information available
Mutagenicity: No information available
Synergistic Effects: No information available
Other: IARC has determined in reviewing cancer prevalence of exposed workers that the carcinogenic activity of refined oils is related to the severity of processing of the base oil. The base oils in this product contain < 3% DMSO Extractable total polycyclic aromatic compound (PAC) per IP 346.

Section 12: Ecological Information

Ecological studies have not been conducted for this product. The following information is available for components of this product.

Ecotoxicity: No information available
Persistence / Degradability: No information available
Bioaccumulation / Accumulation: No information available
Mobility in Environment: No information available

Section 13: Disposal Considerations

Waste Classification: This product is not a RCRA hazardous waste as packaged. (See 40 CFR Part 261.20 – 261.33) Used oil should be collected and handled in accordance with 40 CFR Part 279. Used oil that is mixed with hazardous waste may be subject to regulation as hazardous waste. Empty containers may be recycled.

All disposal activities must comply with federal, state, provincial and local regulations. Local regulations may be more stringent than state, provincial or national requirements.

Section 14: Transport Information

US DOT (ground): Not Regulated

ICAO/IATA (air): Not Regulated

IMO/IMDG (water): Not Regulated

Special Provisions: None

Section 15: Regulatory Information

U.S. Federal Regulations:

Toxic Substances Control Act (TSCA):
All ingredients are either listed on the TSCA inventory or are exempt.

Comprehensive Environmental Response, Compensation and Liability Act (CERCLA):
Reportable Quantities (RQ's) exist for the following ingredients: None

Spills or releases resulting in the loss of any ingredient at or above its RQ require immediate notification to the National Response Center (800-424-8802) and to your Local Emergency Planning Committee.

Superfund Amendments Reauthorization Act (SARA) Title III:
Section 302 Extremely Hazardous Substances (EHS): None

Section 311/312 Hazard Categories:	Fire Hazard	No
	Reactive Hazard	No
	Release of Pressure	No
	Acute Health Hazard	No
	Chronic Health Hazard	No

Section 313 Toxic Chemicals: This product contains the following substances subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372:
Zinc, dithiophosphate di-C1-14-alkyl esters (zinc compounds): < 1%

Clean Air Act:
Section 112 Hazardous Air Pollutants (HAPs): None

U.S. State Regulations:

California Safe Drinking Water and Toxic Enforcement Act (Prop 65):
This product may contain the following chemicals known to the state of California to cause cancer, birth defects or other reproductive harm: N-Methylpyrrolidone (< 35 ppm)

Consumer Products VOC Regulations: This product is not regulated.

State Right to Know:
New Jersey: Petroleum Oil
Pennsylvania: None
Massachusetts: 64742-53-6
Rhode Island : None

Canadian Regulations:

Controlled Products Regulations:
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all the information required by the Controlled Products Regulations.

WHMIS Hazard Class: Not Regulated

Canadian DSL Inventory: All ingredients are either listed on the DSL Inventory or are exempt.

European Union Regulations:

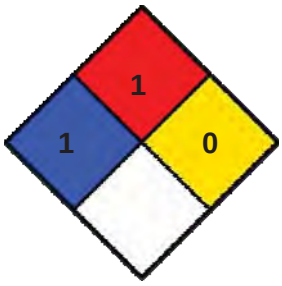
RoHS Compliance: This product is compliant with Directive 2002/95/EC of the European Parliament and of the Council of 27 January 2003. This product does not contain any of the restricted substances as listed in Article 4(1) of the RoHS Directive.

Additional Regulatory Information: None

Section 16: Other Information

HMIS® (II)	
Health:	1
Flammability:	1
Reactivity:	0
PPE:	B

NFPA



Ratings range from 0 (no hazard) to 4 (severe hazard)

Prepared By: Michelle Rudnick
CRC #: 720090
Revision Date: 08/02/2012

Changes since last revision: Revision Date

The information contained in this document applies to this specific material as supplied. It may not be valid for this material if it is used in combination with any other materials. This information is accurate to the best of CRC Industries' knowledge or obtained from sources believed by CRC to be accurate. Before using any product, read all warnings and directions on the label. For further clarification of any information contained on this MSDS consult your supervisor, a health & safety professional, or CRC Industries.

ACGIH: American Conference of Governmental Industrial Hygienists
CAS: Chemical Abstract Service
CFR: Code of Federal Regulations
DOT: Department of Transportation
DSL: Domestic Substance List
g/L: grams per Liter
HMIS: Hazardous Materials Identification System
IARC: International Agency for Research on Cancer
IATA: International Air Transport Association
ICAO: International Civil Aviation Organization
IMDG: International Maritime Dangerous Goods
IMO: International Maritime Organization
lbs./gal: pounds per gallon
LC: Lethal Concentration
LD: Lethal Dose
NA: Not Applicable
ND: Not Determined
NIOSH: National Institute of Occupational Safety & Health
NFPA: National Fire Protection Association
NTP: National Toxicology Program
OSHA: Occupational Safety and Health Administration
PMCC: Pensky-Martens Closed Cup
PPE: Personal Protection Equipment
ppm: Parts per Million
RoHS: Restriction of Hazardous Substances
STEL: Short Term Exposure Limit
TCC: Tag Closed Cup
TWA: Time Weighted Average
WHMIS: Workplace Hazardous Materials Information System

ANTIFREEZE

MSDS No. MI205

Date of Preparation: 5/07

Revision: 3

Section 1 - Chemical Product and Company Identification

Product/Chemical Name: ANTIFREEZE
Product Brand Name: PAR, Coolant Plus, PAR 50/50, Coolant Plus 50/50, Coolant Plus 70/30
Chemical Formula: C2H6O2
CAS Number: 107-21-1
Synonyms: MEG, EG, ethylene glycol, 1,2-ethanediol, glycol, glycol alcohol
General Use: Freezing point depressant
Manufacturer: KMCO, LP., 16503 Ramsey Road, Crosby, Texas 77532, Phone (281)328-3501, FAX (281)328-9528

24 HOUR EMERGENCY NUMBER: CHEMTREC 1-800-424-9300

Section 2 - Composition / Information on Hazardous Ingredients

Ingredient Name	CAS Number	% wt *or* % vol
Ethylene Glycol	107-21-1	94
Proprietary Ingredients		6

	OSHA PEL		ACGIH TLV		NIOSH REL		NIOSH
Ingredient	TWA	STEL	TWA	STEL	TWA	STEL	IDLH
Ethylene Glycol	none estab.	none estab.	100 mg/m3	none estab.	none estab.	none estab.	none estab.

Section 3 - Hazards Identification

☆☆☆☆☆ **Emergency Overview** ☆☆☆☆☆

WARNING! HARMFUL OR FATAL IF SWALLOWED. HARMFUL IF INHALED OR ABSORBED THROUGH SKIN. MAY CAUSE ALLERGIC SKIN REACTION. MAY CAUSE IRRITATION TO SKIN, EYES, AND RESPIRATORY TRACT. AFFECTS CENTRAL NERVOUS SYSTEM.

H 1
F 1
R 0

Potential Health Effects

Acute Effects

Inhalation: Vapor inhalation is generally not a problem unless heated or misted. Exposure to vapors over an extended time period has caused throat irritation and headache. May cause nausea, vomiting, dizziness and drowsiness. Pulmonary edema and central nervous system depression may also develop. When heated or misted, has produced rapid, involuntary eye movement and coma.

Eye: Splashes may cause irritation, pain, and eye damage.

Skin: Minor skin irritation and penetration may occur.

Ingestion: Initial symptoms in massive dosage parallel alcohol intoxication, progressing to CNS depression, vomiting, headache, rapid respiratory and heart rate, lowered blood pressure, stupor, collapse, and unconsciousness with convulsions. Death from respiratory arrest or cardiovascular collapse may follow. Lethal dose in humans: 100 ml (3-4 ounces).

Carcinogenicity: Not Classifiable as a Human Carcinogen

Medical Conditions Aggravated by Long-Term Exposure: Persons with pre-existing skin disorders, eye problems, or impaired liver, kidney, or respiratory function may be more susceptible to the effects of this substance.

Chronic Effects: Repeated small exposures by any route can cause severe kidney problems, brain damage may also occur. Skin allergy can develop. May damage the developing fetus.

Section 4 - First Aid Measures

Inhalation: Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.
Eye Contact: Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.
Skin Contact: Remove any contaminated clothing. Wash skin with soap and water for at least 15 minutes. Get medical attention.
Ingestion: Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: Give sodium bicarbonate intravenously to treat acidosis. Urinalysis may show low specific gravity, proteinuria, pyuria, cylindruia, hematuria, calcium oxide, aud hippuric acid crystals. Ethanol can be used in antidotal treatment but monitor blood glucose when administering ethanol because it can cause hypoglycemia. Consider infusion of a diuretic such as mannitol to help prevent or control brain edema and hemodialysis to remove ethylene glycol from circulation.

Section 5 - Fire-Fighting Measures

NFPA

Flash Point: 232 °F (111 °C)
Flash Point Method: CC
Burning Rate: not available
Autoignition Temperature: 748 °F (398 °C)
LEL: 3.2% v/v
UEL: 15.3% v/v
Flammability Classification: Slight to moderate fire hazard when exposed to heat or flame.
Extinguishing Media: Dry chemical, foam or carbon dioxide. Water or foam may cause frothing. Water spray may be used to extinguish surrounding fire and cool exposed containers. Water spray will also reduce fume and irritant gases.
Unusual Fire or Explosion Hazards: Above flash point, vapor-air mixtures are explosive within flammable limits noted above. Containers may explode when involved in a fire.
Hazardous Combustion Products: Carbon dioxide and carbon monoxide may form when heated to decomposition. May produce acrid smoke and irritating fumes when heated to decomposition.
Fire-Fighting Instructions: Do not release runoff from fire control methods to sewers or waterways.
Fire-Fighting Equipment: Wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

Section 6 - Accidental Release Measures

Spill /Leak Procedures: Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Use non-sparking tools and equipment. Do not flush to sewer.
Small Spills: Contain and recover liquid when possible. Collect liquid in an appropriate container or absorb with an inert material (e.g., vermiculite, dry sand), and place in a chemical waste container. Do not use combustible materials, such as saw dust.
Large Spills
Containment: Wear respirator and protective clothing as appropriate. Shut off source of leak if safe to do so. For large spills, dike far ahead of liquid spill for later disposal. Do not release into sewers or waterways.
Cleanup: Contain and recover liquid when possible. Collect liquid in appropriate container. Absorb residue with an inert material. Consult with your environmental department for detailed clean up instructions.
Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120). CERCLA requires reporting spills and release to soil, water and air in excess of reportable quantities.

Section 7 - Handling and Storage

Handling Precautions: May be harmful or fatal if swallowed.
Storage Requirements: Store in a cool, dry, ventilated area. Separate from acids and oxidizing materials.
Regulatory Requirements: This product contains the following chemical(s) subject to the reporting requirements of SARA Title III Section 311,312, and 313: Ethylene Glycol (Reportable Quantity = 5000 lb.).

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Controls should be such that adequate ventilation is provided.
Ventilation: Provide general or local exhaust ventilation systems to maintain airborne concentrations below OSHA PELs (Sec. 2). Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source.
Respiratory Protection: Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a MSHA/NIOSH-approved respirator. Select respirator based on its suitability to provide adequate worker protection for given working conditions, level of airborne contamination, and presence of sufficient oxygen. For emergency or non-routine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.* If respirators are used, OSHA requires a written respiratory protection program that includes at least: medical certification, training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas.
Protective Clothing/Equipment: Wear chemically protective gloves, boots, aprons, and gauntlets to prevent prolonged or repeated skin contact. Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Contact lenses are not eye protective devices. Appropriate eye protection must be worn instead of, or in conjunction with contact lenses.
Safety Stations: Make emergency eyewash stations, safety/quick-drench showers, and washing facilities available in work area.
Contaminated Equipment: Separate contaminated work clothes from street clothes. Launder before reuse. Remove this material from your shoes and clean personal protective equipment.
Comments: Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9 - Physical and Chemical Properties

Physical State: Liquid
Appearance and Odor: Clear, blue-green, odorless
Odor Threshold: not available
Vapor Pressure: 0.06 mm Hg @ 20 C
Vapor Density (Air=1): 2.1
Formula Weight: 62.07
Density: 9.28 lbs/gal @ 20°C
Specific Gravity (H_2O=1, at 4 °C): 1.115
pH: 7 – 11.5
Water Solubility: soluble
Other Solubilities: alcohols, methyl isosbutyl carbitol
Boiling Point: 197.6C (388F)
Freezing/Melting Point: -13C(9F)
Viscosity: 21cP @ 20C
Refractive Index: 1.4316 @ 20C
Surface Tension: 48.4 dyne/cm @ 20C
% Volatile: 100 @ 21C
Evaporation Rate: not available

Section 10 - Stability and Reactivity

Stability: Antifreeze is stable at room temperature in closed containers under normal storage and handling conditions.
Polymerization: Hazardous polymerization will not occur.
Chemical Incompatibilities: Strong oxidizing agents, strong bases
Conditions to Avoid: Heat, flames, ignition sources, and incompatibles.
Hazardous Decomposition Products: Carbon dioxide and carbon monoxide may form when heated to decomposition.

Section 11- Toxicological Information

Toxicity Data:*

Eye and Skin Effects: Negligible degree of irritation upon eye or skin contact. A slight macerating action comparable to that caused by glycerin may result from very severe prolonged exposures to ethylene glycol. There is no evidence to indicate that ethylene glycol is absorbed through the skin in quantities sufficient to produce systemic injury in normal industrial handling.

Acute Inhalation Effects:
Human, inhalation, LD_{Lo}: 786 mg/kg

Acute Oral Effects:
Rat, oral, LD_{50}: 4700 mg/kg

Chronic Effects: Repeated small exposures by any route can cause severe kidney problems. Brain damage may also occur. Skin allergy can develop.

Carcinogenicity: Not Classifiable as a Human Carcinogen

Teratogenicity: Has shown teratogenic effects in laboratory animals

* See NIOSH, *RTECS* for additional toxicity data.

Section 12 - Ecological Information

Ecotoxicity: LC50/96-hour values for fish are over 100mg/l

Environmental Fate: When released into the soil, this material is expected to readily biodegrade, is expected to leach into groundwater and is not expected to evaporate significantly. When released into the water, this material is expected to readily biodegrade, and is expected to have a half-life between 1 and 10 days. When released into the air, this material is expected to be readily degraded, and is expected to have a half-life between 1 and 10 days.

Environmental Degradation: This material is not expected to bioaccumulate.

Section 13 - Disposal Considerations

Disposal: Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

Disposal Regulatory Requirements: Consult current Federal, state and local regulations.

Container Cleaning and Disposal: Dispose of container and unused contents in accordance with federal, state, and local requirements.

Section 14 - Transport Information

DOT Transportation Data (49 CFR 172.101):

Shipping Name (>5,250 lbs):
Other Regulated Substances, liquid, N.O.S., 9, NA3082, PG III, RQ (Ethylene Glycol)

Shipping Name (<5,250 lbs):
Antifreeze

Hazard Class (>5,250 lbs): 9

Hazard Class (<5,250 lbs):
Non-hazardous Liquid

ID No.: NA3082

Packing Group: III

Label: Class 9, NA3082

Special Provisions (172.102):
none

Packaging Authorizations
a) Exceptions: 173.155
b) Non-bulk Packaging: 173.203
c) Bulk Packaging: 173.241

Quantity Limitations
a) Passenger, Aircraft, or Railcar: none
b) Cargo Aircraft Only: none

Vessel Stowage Requirements
a) Vessel Stowage: Category A
b) Other: none

Section 15 - Regulatory Information

EPA SARA 311/312 HAZARD CLASSIFICATION: Acute Health, chronic health

EPA SARA 313: This product contains the following chemicals subject to Annual Release Reporting Requirements under SARA Title III, Section 313 (40 CFR 372); Ethylene Glycol 107-22-1 80 - 96%

PROTECTION OF STRATOSPHERIC OZONE: This product is not known to contain or to have been manufactured with ozone depleting substances as defined in 40 CFR Part 82, appendix A to Subpart A.

CERCLA SECTION 103: Spills of this product over the RQ (reportable quantity) must be reported to the National Response Center. The RQ for this product, based on the RQ for Ethylene Glycol (96% maximum) of 5,000 pounds, is 5,208 pounds. Many states have more stringent release reporting requirements. Report spills required under federal, state and local regulation.

CALIFORNIA PROPOSITION 65: This product may contain the following substances known to the State of California to cause cancer and/or reproductive harm: 1,4-Dioxane (trace amount).

EPA TSCA INVENTORY: All of the components of this material are listed on the Toxic Substances Control Act (TSCA) Chemical Substances Inventory.

CANADIAN ENVIRONMENTAL PROTECTION ACT: All of the ingredients are listed on the Canadian Domestic Substances list..

CANADIAN WHMIS CLASSIFICATION: Class D - Division 2 - Subdivision B - (a toxic material causing other chronic effects).

EUROPEAN INVENTORY OF EXISTING COMMERCIAL CHEMICAL SUBSTANCES (EINECS): All of the ingredients are listed on the EINECS inventory.

EPA TSCA INVENTORY: All of the components of this material are listed on the Toxic Substances Control Act (TSCA) Chemical Substances Inventory.

AUSTRALIA: All of the ingredients of this product are listed on the Australian Inventory of Chemical Substances.

Section 16 - Other Information

Prepared By: KMCO, LP.
Revision Notes: All sections revised as part of conversion to 16 Section format.

Additional Hazard Rating Systems: none

Disclaimer: This product is FOR INDUSTRIAL USE ONLY. KEEP OUT OF REACH OF CHILDREN. DO NOT TAKE INTERNALLY.

KMCO, LP. believes that the information and recommendations contained herein (including data and statements) are accurate as of the date hereof. No warranty of fitness for any particular purpose, warranty of merchantability, or any other warranty expressed or implied, is made concerning the information provided herein. The information provided herein relates only to the specific product designated and may not be valid where such product is used in combination with any other materials or in any process. Further, since the conditions and methods of use of the product and of the information referred to herein are beyond the control of KMCO, LP., KMCO, LP expressly disclaims any and all liability as to any results obtained or arising from any use of the product or reliance on such information.

For additional product information, please contact the KMCO, LP. Sales Office at 281-272-4100.

Material Safety Data Sheet

MSDS ID NO.: 0130SPE012
Revision date: 05/25/2011

1. CHEMICAL PRODUCT AND COMPANY INFORMATION

Product name: Speedway Dexron III/Mercon Automatic Transmission Fluid
Synonym: Dexron-III/Mercon Automatic Transmission Fluid, Speedway; Speedway Dexron ATF; Speedway Mercon ATF
Chemical Family: Motor/Lube Oil
Formula: Mixture

Manufacturer:
Marathon Petroleum Company LP
539 South Main Street
Findlay OH 45840

Other information: 419-421-3070
Emergency telephone number: 877-627-5463

2. COMPOSITION/INFORMATION ON INGREDIENTS

Lube oil is a complex mixture of highly refined lubricating base stocks and additives.

Product information:

Name	CAS Number	Weight %	ACGIH Exposure Limits:	OSHA - Vacated PELs - Time Weighted Ave	Other:
Speedway Dexron III/Mercon ATF	Mixture	100			

Component Information:

Name	CAS Number	Weight %	ACGIH Exposure Limits:	OSHA - Vacated PELs - Time Weighted Ave	Other:
Solvent Refined, Hydrotreated Heavy Paraffinic Distillate	64742-54-7	93-95			Mineral Oil Mist (MOM) =5 mg/m^3 TWA = 10 mg/m^3 STEL
Additives	Not specified	5-7			

Notes: The manufacturer has voluntarily elected to reflect exposure limits contained in OSHA's 1989 air contaminants standard in its MSDS's, even though certain of those exposure limits were vacated in 1992.

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

THIS LUBRICANT IS A NON-VOLATILE AND NON-COMBUSTIBLE, AMBER COLORED LIQUID, BUT WILL IGNITE AND BURN AT ELEVATED TEMPERATURES.

Inhalation:

No acute effects expected from routine operations. Overheating of product may produce vapors which can cause respiratory irritation, dizziness and nausea.

Ingestion:

Product has a low order of acute toxicity. This is based on data from components or similar products.

Skin contact:

Prolonged or repeated liquid contact can cause dermatitis, folliculitis or oil acne.

Eye contact:

Liquid or vapor contact may result in slight eye irritation.

Carcinogenic Evaluation:

Product information:

Name	IARC Carcinogens:	NTP Carcinogens:	ACGIH - Carcinogens:	OSHA - Select Carcinogens:
Speedway Dexron III/Mercon ATF Mixture	NE			

Notes: The International Agency for Research on Cancer (IARC) has determined that there is no evidence that severely solvent-refined oils are carcinogenic to experimental animals.

Component Information:

Name	IARC Carcinogens:	NTP Carcinogens:	ACGIH - Carcinogens:	OSHA - Select Carcinogens:
Solvent Refined, Hydrotreated Heavy Paraffinic Distillate 64742-54-7	Supplement 7 [1987], Monograph 33 [1984]			Present

4. FIRST AID MEASURES

Eye Contact:

Flush eyes with large amounts of tepid water for at least 15 minutes. If symptoms or irritation occur, call a physician.

Skin Contact:

Wash with soap and large amounts of water. Remove contaminated clothing. If symptoms or irritation occur, call a physician.

If product is accidentally injected into or under the skin, regardless of wound size or initial absence of symptoms, the individual should be evaluated immediately by a physician as a surgical emergency.

Ingestion:

Not expected to be acutely toxic. If large amounts are swallowed, immediately call a physician.

Inhalation:

If affected, move person to fresh air. If breathing is difficult, administer oxygen. If not breathing or if no heartbeat, give artificial respiration or cardiopulmonary resuscitation (CPR). Immediately call a physician. If symptoms or irritation occur with any exposure, call a physician.

NOTES TO PHYSICIAN:

No data available.

Medical Conditions Aggravated By Exposure:

Skin contact could aggravate an existing skin disorder or dermatitis condition.

5. FIRE FIGHTING MEASURES

Suitable extinguishing media: For small fires, Class B fire extinguishing media such as CO2, dry chemical, foam (AFFF/ATC) or water spray can be used. For large fires, water spray, fog or foam (AFFF/ATC) can be used. Fire fighting should be attempted only by those who are adequately trained and equipped with proper protective equipment.

Specific hazards: This material is not combustible per the OSHA Hazard Communication Standard, but will ignite and burn at elevated temperatures.

Special protective equipment for firefighters: Avoid using straight water streams. Water spray and foam (AFFF/ATC) must be applied carefully to avoid frothing and from as far a distance as possible. Avoid excessive water spray application. Use water spray to cool exposed surfaces from as far a distance as possible. Keep run-off water out of sewers and water sources.

Flash point: 400 F, 204.4 C (COC)
Autoignition temperature: No data available.
Flammable limits in air - lower (%): No data available.
Flammable limits in air - upper (%): No data available.

NFPA rating:
Health: 1
Flammability: 1
Instability: 0
Other: -

6. ACCIDENTAL RELEASE MEASURES

Personal precautions: Keep public away. Isolate and evacuate area. Shut off source if safe to do so. Advise authorities and National Response Center (800-424-8802) if the product has entered a water course or sewer. Advise local and state emergency services agencies, if appropriate. Contain liquid with sand or soil. Recover and return free product to proper containers. Use suitable absorbent materials such as vermiculite, sand, or clay to clean up residual liquids.

7. HANDLING AND STORAGE

Handling:

Comply with all applicable EPA, OSHA, NFPA and consistent state and local requirements. Use appropriate grounding and bonding practices. Store in properly closed containers that are appropriately labeled and in a cool well-ventilated area. Do not cut, drill, grind or weld on empty containers since they may contain explosive residues. Do not pressurize or expose to heat, open flames, strong oxidizers or other sources of ignition.

Avoid repeated and prolonged skin contact. Exercise good personal hygiene including removal of soiled clothing and prompt washing with soap and water.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

PERSONAL PROTECTIVE EQUIPMENT

Engineering measures: Local or general exhaust required when using at elevated temperatures that generate vapors or mists.

Respiratory protection: Not required under normal conditions and adequate ventilation. Approved organic vapor chemical cartridge or supplied air respirators should be worn when significant vapors are generated. Observe respirator assigned protection factors (APFs) criteria cited in federal OSHA 1910.134. Self-contained breathing apparatus should be used for fire fighting.

Skin and body protection: Use chemical resistant gloves such as neoprene, nitrile, or PVA to prevent prolonged or repeated skin contact.

Eye protection: No special eye protection is normally required.

9. PHYSICAL AND CHEMICAL PROPERTIES:

Appearance:	Amber Liquid
Physical state (Solid/Liquid/Gas):	Liquid
Substance type (Pure/Mixture):	Mixture
Color:	Amber
Odor:	Hydrocarbon
Molecular weight:	Not determined.
pH:	Neutral
Boiling point/range (5-95%):	686-966 F

9. PHYSICAL AND CHEMICAL PROPERTIES:

Melting point/range:	Not determined.
Decomposition temperature:	Not applicable.
Specific gravity:	0.880 @ 60 F
Density:	7.32 lbs/gal @ 60 F
Bulk density:	No data available.
Vapor density:	No data available.
Vapor pressure:	<1 mm Hg @ 100 F
Evaporation rate:	No data available.
Solubility:	<1%
Solubility in other solvents:	No data available.
Partition coefficient (n-octanol/water):	>4.9
VOC content(%):	No data available.
Viscosity:	60.0 cSt @ 40 C 9.5 cSt @ 100 C

10. STABILITY AND REACTIVITY

Stability: The material is stable at 70 F, 760 mm pressure.

Polymerization: Will not occur.

Hazardous decomposition products: Carbon monoxide, carbon dioxide, hydrogen sulfide, oxides of sulfur, oxides of nitrogen, oxides of zinc, aldehydes and hydrocarbons., Thermal decomposition may produce hydrogen sulfide and other sulfur-containing gases at temperatures greater than 150 F.

Materials to avoid: Strong oxidizers such as nitrates, chlorates, peroxides.

Conditions to avoid: Heat and open flames.

11. TOXICOLOGICAL INFORMATION

Acute toxicity:

Product information:

Name	CAS Number	Inhalation:	Dermal:	Oral:
Speedway Dexron III/Mercon ATF	Mixture	LD50 = 2.18 to > 4 mg/l [Rat]	LD50 > 2 gm/kg [Rabbit]	LD50 > 5 ml/kg [Rat]

Toxicology Information:

Based on data from components this product is considered to have a low order of acute oral and dermal toxicity. Chronic skin painting studies with severely solvent refined neutral oils did not produce evidence of skin cancer in mice.

This product contains approximately 0-1.5% of a zinc alkyl dithiophosphate (ZDDP) additive. ZDDP has been found to have weak mutagenic activity in cultured cells. Repeated dermal exposures of ZDDP produced severe skin irritation, significant weight loss and testicular atrophy in male rabbits but not male rats at high concentrations. Subsequent research showed that the testicular effect was due to the severe stress and weight loss as seen with other caustic materials and not a direct effect of ZDDP. The concentration of ZDDP in this product is significantly lower than exposure levels that produced these effects in rabbits.

12. ECOTOXICOLOGICAL INFORMATION

Mobility:

No data available.

Ecotoxicity:

No data available.

Bioaccummulation:

No data available.

Persistance/Biodegradation:

Water accomated fractions (WAF) of highly refined base oils did not produce acute toxicity in fish (100-1000 mg/l), fresh water algae (500 mg/l) or daphnia (10,000 mg/l) in 48-96 hour LC50 studies.

Used motor and/or lube oils can be toxic to birds and fish.

13. DISPOSAL CONSIDERATIONS

Cleanup Considerations:

This material as supplied and by itself, when discarded or disposed of, is not an EPA RCRA hazardous waste according to federal regulations. This material could become a hazardous waste if mixed or contaminated with a hazardous waste or other substance(s). It is the responsibility of the user to determine if disposal material is hazardous according to federal, state and local regulations.

Don't pollute. Conserve resources. Send used product to recycling center. Dispose of cleanup materials in accordance with applicable local, state and federal regulations.

14. TRANSPORT INFORMATION

49 CFR 172.101:

DOT:

Transport Information: This material when transported via US commerce is NOT REGULATED by DOT regulations.

Packing group: Not applicable.

DOT reportable quantity (lbs): Not applicable.

15. REGULATORY INFORMATION

US Federal Regulatory Information:

MSDS ID NO.: 0130SPE012

US TSCA Chemical Inventory Section 8(b): This product and/or its components are listed on the TSCA Chemical Inventory.

OSHA Hazard Communication Standard: This product has been evaluated and determined not to be hazardous as defined in OSHA's Hazard Communication Standard.

EPA Superfund Amendment & Reauthorization Act (SARA):

SARA Section 302: This product contains the following component(s) that have been listed on EPA's Extremely Hazardous Substance (EHS) List:

Name	CERCLA/SARA - Section 302 Extremely Hazardous Substances and TPQs
Solvent Refined, Hydrotreated Heavy Paraffinic Distillate	NA
Additives	NA

SARA Section 304: This product contains the following component(s) identified either as an EHS or a CERCLA Hazardous substance which in case of a spill or release may be subject to SARA reporting requirements:

Name	CERCLA/SARA - Hazardous Substances and their Reportable Quantities
Solvent Refined, Hydrotreated Heavy Paraffinic Distillate	NA
Additives	NA

SARA Section 311/312 The following EPA hazard categories apply to this product:

None

SARA Section 313: This product contains the following component(s) that may be subject to reporting on the Toxic Release Inventory (TRI) From R:

Name	CERCLA/SARA 313 Emission reporting:
Solvent Refined, Hydrotreated Heavy Paraffinic Distillate	None
Additives	None

State and Community Right-To-Know Regulations:
The following component(s) of this material are identified on the regulatory lists below:

Solvent Refined, Hydrotreated Heavy Paraffinic Distillate

Louisiana Right-To-Know:	Not Listed
California Proposition 65:	Not Listed
New Jersey Right-To-Know:	Not Listed.
Pennsylvania Right-To-Know:	Not Listed.
Massachusetts Right-To Know:	Not Listed.
Florida substance List:	Not Listed.
Rhode Island Right-To-Know:	Not Listed
Michigan critical materials register list:	Not Listed.
Massachusetts Extraordinarily Hazardous Substances:	Not Listed
California - Regulated Carcinogens:	Not Listed
Pennsylvania RTK - Special Hazardous Substances:	Not Listed
New Jersey - Special Hazardous Substances:	carcinogen

Solvent Refined, Hydrotreated Heavy Paraffinic Distillate	
New Jersey - Environmental Hazardous Substances List:	Not Listed
Illinois - Toxic Air Contaminants	Not Listed
New York - Reporting of Releases Part 597 - List of Hazardous Substances:	Not Listed
Additives	
Louisiana Right-To-Know:	Not Listed
California Proposition 65:	Not Listed
New Jersey Right-To-Know:	Not Listed.
Pennsylvania Right-To-Know:	Not Listed.
Massachusetts Right-To Know:	Not Listed.
Florida substance List:	Not Listed.
Rhode Island Right-To-Know:	Not Listed
Michigan critical materials register list:	Not Listed.
Massachusetts Extraordinarily Hazardous Substances:	Not Listed
California - Regulated Carcinogens:	Not Listed
Pennsylvania RTK - Special Hazardous Substances:	Not Listed
New Jersey - Special Hazardous Substances:	Not Listed
New Jersey - Environmental Hazardous Substances List:	Not Listed
Illinois - Toxic Air Contaminants	Not Listed
New York - Reporting of Releases Part 597 - List of Hazardous Substances:	Not Listed

Canadian Regulatory Information:

Canada DSL/NDSL Inventory:	This product and/or its components are listed either on the Domestic Substances List (DSL) or are exempt.
NOTE:	Not Applicable.

16. OTHER INFORMATION

Additional Information: No data available.

Prepared by: Mark S. Swanson, Manager, Toxicology and Product Safety

The information and recommendations contained herein are based upon tests believed to be reliable. However, Speedway LLC does not guarantee their accuracy or completeness nor shall any of this information constitute a warranty, whether expressed or implied, as to the safety of goods, the merchantability of the goods, or the fitness of the goods for a particular purpose. Adjustment to conform to actual conditions of usage maybe required. Speedway assumes no responsibility for results obtained or for incidental or consequential damages, including lost profits arising from the use of these data. No warranty against infringement of any patent, copyright or trademark is made or implied.

End of Safety Data Sheet

MATERIAL SAFETY DATA SHEET

BATTERY FLUID ACID

(US, CN, EU Version for International Trade)

SECTION 1: PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: **Battery Fluid Acid**
OTHER PRODUCT NAMES: Battery Electrolyte, UN2796

MANUFACTURER: East Penn Manufacturing Company, Inc.
DIVISION: Deka Road
ADDRESS: Lyon Station, PA 19536 USA

EMERGENCY TELEPHONE NUMBERS:
US: CHEMTREC 1-800-424-9300
CN: CHEMTREC 1-800-424-9300
Outside US: 1-703-527-3887

NON-EMERGENCY HEALTH/SAFETY INFORMATION: 1-610-682-6361

CHEMICAL FAMILY: Sulfuric acid solution.

PRODUCT USE: Electrolyte for Industrial/Commercial electric storage batteries.

This product is considered a Hazardous Substance, Preparation or Article that is regulated under US-OSHA; CAN-WHMIS; IOSH; ISO; UK-CHIP; or EU Directives (67/548/EEC-Dangerous Substance Labeling, 98/24/EC-Chemical Agents at Work, 99/45/EC-Preparation Labeling, 2001/58/EC-MSDS Content, and 1907/2006/EC-REACH), and an MSDS/SDS is required for this product considering that when used as recommended or intended, or under ordinary conditions, it may present a health and safety exposure or other hazard.

Additional Information
This product may not be compatible with all environments, such as those containing liquid solvents or extreme temperature or pressure. Please request information if considering use under extreme conditions or use beyond current product labeling.

SECTION 2: HAZARDS IDENTIFICATION

GHS Classification:

Health	Environmental	Physical
Acute Toxicity – Not listed (NL) Eye Corrosion – Corrosive Skin Corrosion – Corrosive Skin Sensitization – NL Mutagenicity/Carcinogenicity – NL Reproductive/Developmental – NL Target Organ Toxicity (Repeated) – NL	Aquatic Toxicity – NL	NFPA – Flammable gas, hydrogen (during charging of batteries or contact with finely-divided metals) CN - NL EU - NL

GHS Label: Battery Fluid, Acid

Symbols: C (Corrosive)

Hazard Statements	Precautionary Statements
Contact may cause irritation or severe burns. Irritating to eyes, respiratory system, and skin.	Keep out of reach of children. Keep containers tightly closed.

EMERGENCY OVERVIEW: Causes severe burns. Acid mist is irritating to eyes, respiratory system, and skin. Prolonged inhalation or ingestion may result in serious damage to health.

MATERIAL SAFETY DATA SHEET
BATTERY FLUID ACID
(US, CN, EU Version for International Trade)

POTENTIAL HEALTH EFFECTS:

EYES: Direct contact with liquid may cause severe burns or blindness.
SKIN: Direct contact with battery fluid may cause skin irritation or damaging burns.
INGESTION: Swallowing this product may cause severe burns to the esophagus and digestive tract and may be harmful or fatal.
INHALATION: Respiratory tract irritation and possible long term effects.

ACUTE HEALTH HAZARDS:
Repeated or prolonged contact may cause skin irritation and/or chemical burns.
CHRONIC HEALTH HAZARDS:
Chronic inhalation of strong mineral acid mists containing sulfuric acid may increase the risk of lung cancer. IARC has listed strong mineral acid mists containing sulfuric acid as a Category 1 carcinogen (carcinogenic in humans).
MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE:
Pulmonary edema and bronchitis. Skin diseases may also predispose one to acute and chronic effects of sulfuric acid.

Additional Information
None known.

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

INGREDIENTS (Chemical/Common Names):	CAS No.:	% by Wt:	EC No.:
Sulfuric acid	7664-93-9	30-43 (average: 36.5)	231-639-5

Additional Information
None known.

SECTION 4: FIRST AID MEASURES

EYE CONTACT: An eye wash/emergency shower should be provided wherever battery acid exposure is possible. Flush eyes with large amounts of water for at least 15 minutes. Remove contaminated clothing and seek immediate medical attention if eyes have been exposed directly to acid.
SKIN CONTACT: Flush affected area(s) with large amounts of water using deluge emergency shower, if available, shower for at least 15 minutes. Remove contaminated clothing. If symptoms persist, seek medical attention.
INGESTION: If swallowed, give large amounts of water. Do NOT induce vomiting or aspiration into the lungs may occur and can cause permanent injury or death.
INHALATION: If inhaled, remove person to fresh air. If breathing difficulties develop, obtain medical treatment.

SECTION 5: FIRE-FIGHTING MEASURES

SUITABLE/UNSUITABLE EXTINGUISHING MEDIA:
Dry chemical, carbon dioxide, foam. Trained fire fighters may use water spray under certain conditions.
SPECIAL FIRE FIGHTING PROCEDURES & PROTECTIVE EQUIPMENT:
Sulfuric acid will not burn, but is capable of igniting finely divided combustible materials on contact. Use dry chemical agents to smother combustible materials. Avoid breathing mists and vapors. Use full protective equipment (acid-resistant bunker gear) and self-contained breathing apparatus.
UNUSUAL FIRE AND EXPLOSION HAZARDS:
Battery fluid can evolve flammable hydrogen gas when exposed to metals (such as during charging of lead acid batteries) and may increase the fire risk near sparks, excessive heat or open flames. See Section 10 for list of fire by-products.
SPECIFIC HAZARDS IN CASE OF FIRE:
Battery Electrolyte (Sulfuric Acid) is Corrosive.

Additional Information
Firefighting water runoff and dilution water may be toxic and corrosive and may cause adverse environmental impacts.

MATERIAL SAFETY DATA SHEET
BATTERY FLUID ACID
(US, CN, EU Version for International Trade)

SECTION 6: ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONS:
Electrolyte material contains sulfuric acids and is corrosive. Wear appropriate protective clothing. If toxic vapors are produced at unknown concentrations, wear a NIOSH-approved respirator or SCBA.
ENVIRONMENTAL PRECATIONS:
Prevent spilled material from entering sewers and waterways.
SPILL CONTAINMENT & CLEANUP METHODS/MATERIALS:
Stop flow of leaking liquid. Small spills: Use clay, sand, or diatomaceous earth. Dike large spills. Neutralize any spilled electrolyte with neutralizing agents, such as soda ash, sodium carbonate/bicarbonate, or lime. Sweep or shovel spilled material and absorbent and place in approved container. Dispose of any non-recyclable materials in accordance with local, state, provincial or federal regulations.

Additional Information
None known.

SECTION 7: HANDLING AND STORAGE

PRECAUTIONS FOR SAFE HANDLING AND STORAGE:
- Keep containers tightly closed when not in use.
- Do not handle near heat, sparks, or open flames.
- Protect containers from physical damage to avoid leaks and spills.
- Wear appropriate PPE.

OTHER PRECAUTIONS (e.g.; Incompatibilities):
Keep away from combustible materials, organic chemicals, reducing substances, metals, strong oxidizers and water.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

ENGINEERING CONTROLS/SYSTEM DESIGN INFORMATION:
Use in areas with adequate ventilation.
VENTILATION:
General dilution ventilation is acceptable. Use local exhaust ventilation if occupational exposure limits are exceeded.
RESPIRATORY PROTECTION:
Not required for normal conditions of use. See also special firefighting procedures (Section 5).
EYE PROTECTION:
Wear protective glasses with side shields or goggles. Use a full face shield when pouring acid or when splashing may occur.
SKIN PROTECTION:
Wear acid resistant gloves as a standard procedure to prevent skin contact.
OTHER PROTECTIVE CLOTHING OR EQUIPMENT: Acid resistant apron and face shield recommended when adding water or electrolyte to batteries.

EXPOSURE GUIDELINES & LIMITS:

OSHA	Permissible Exposure Limit (PEL/TWA)	Sulfuric acid	1.0 mg/m^3
ACGIH	2007 Threshold Limit Value (TLV)	Sulfuric acid	0.2 mg/m^3
Quebec	Permissible Exposure Value (PEV)	Sulfuric acid	1.0 mg/m^3 TWA
			3.0 mg/m^3 STEV
Ontario	Occupational Exposure Level (OEL)	Sulfuric acid	1.0 mg/m^3 TWAEV
			3.0 mg/m^3 STEV
Netherlands	Maximaal Aanvaarde Concentratie (MAC)	Sulfuric acid	1.0 mg/m^3
		Sulfuric acid	1.0 mg/m^3
Germany	Maximale Arbeitsplatzkonzentrationen (MAK)	Sulfuric acid	1.0 mg/m^3 TWA
			2.0 mg/m^3 STEL

TWA: 8-Hour Time-Weighted Average; STE: Short-Term Exposure; mg/m^3: milligrams per cubic meter of air; NE: Not Established; STEV: Short-Term Exposure Value; TWAEV: Time-Weighted Average Exposure Value; STEL: Short-Term Exposure Limit

Additional Information
None known.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE:	Clear, colorless liquid
ODOR:	Odorless
ODOR THRESHOLD:	NA
PHYSICAL STATE:	Sulfuric Acid: Liquid
pH:	<1
BOILING POINT:	235-240° F (113-116° C)
MELTING POINT:	NA
FREEZING POINT:	NA
VAPOR PRESSURE:	13 mmHg
VAPOR DENSITY (AIR = 1):	NA
SPECIFIC GRAVITY (H2O = 1):	1.2–1.3
EVAPORATION RATE (n-BuAc=1):	< 1
SOLUBILITY IN WATER:	100%
FLASH POINT:	NA
AUTO-IGNITION TEMPERATURE:	932° F (as hydrogen gas)
LOWER EXPLOSIVE LIMIT (LEL):	4% (as hydrogen gas)
UPPER EXPLOSIVE LIMIT (UEL):	74% (as hydrogen gas)
PARTITION COEFFICIENT:	NA
VISCOSITY (poise @ 25° C):	Not Available
DECOMPOSITION TEMPERATURE:	Not Available

FLAMMABILITY/HMIS HAZARD CLASSIFICATIONS (US/CN/EU): As sulfuric acid

HEALTH: 3 FLAMMABILITY: 0 REACTIVITY: 2

SECTION 10: STABILITY AND REACTIVITY

STABILITY:	This product is stable under normal conditions at ambient temperature.
INCOMPATIBILITY (MATERIAL TO AVOID):	Strong bases, finely divided combustible materials, reducing agents, finely divided metals, and strong oxidizers.
HAZARDOUS DECOMPOSITION BY-PRODUCTS:	Thermal decomposition will produce sulfur dioxide, sulfur trioxide, sulfuric acid mist, and hydrogen.
HAZARDOUS POLYMERIZATION:	Will not occur
CONDITIONS TO AVOID:	Finely divided metals. Concentrated acid may react with water.

SECTION 11: TOXICOLOGICAL INFORMATION

ACUTE TOXICITY (Test Results Basis and Comments):
LD_{50}, Rat: 2140 mg/kg
LC_{50}, Guinea pig: 510 mg/m^3
SUBCHRONIC/CHRONIC TOXICITY (Test Results and Comments):
IARC listed strong mineral acid mists containing sulfuric acid as a Category 1 carcinogen (Carcinogenic to humans).

Additional Information
None known.

SECTION 12: ECOLOGICAL INFORMATION

PERSISTENCE & DEGRADABILITY:
Sulfuric acid is reactive and not very persistent in the ecosystem.
BIO-ACCUMULATIVE POTENTIAL (Including Mobility):
Very high mobility and solubility indicate very low risk of bioaccumulation.
AQUATIC TOXICITY (Test Results & Comments):

24-hour LC_{50}, fresh water fish (*Brachydanio rerio*): 82 mg/l
96-hour LOEC, fresh water fish (*Cyprinus carpio*): 22 mg/l (lowest observable effect concentration)

Additional Information
- No known effects on stratospheric ozone depletion.
- Volatile organic compounds: 0% (by Volume)
- Water Endangering Class (WGK): NA

SECTION 13: DISPOSAL CONSIDERATIONS

WASTE DISPOSAL METHOD:	Neutralize acid and follow local, State/Provincial, and Federal/National regulations applicable to as-used, end-of-life characteristics to be determined by end-user.
HAZARDOUS WASTE CLASS/CODE:	US – Spilled sulfuric acid is a characteristic hazardous waste, U.S. EPA hazardous waste code D002. CN – Not applicable to finished product as manufactured for distribution into commerce. EWC – Not applicable to finished product as manufactured for distribution into commerce.

Additional Information
Battery Electrolyte (Sulfuric Acid) is Corrosive. Dispose as allowed by local jurisdiction for the end-of-life characteristics.

SECTION 14: TRANSPORT INFORMATION

GROUND – US-DOT/CAN-TDG/EU-ADR/APEC-ADR:

Proper Shipping Name	Battery Fluid, Acid		
Hazard Class	8	ID Number	UN2796
Packing Group	II	Labels	Corrosive

AIRCRAFT – ICAO-IATA:

Proper Shipping Name	Battery Fluid, Acid		
Hazard Class	8	ID Number	UN2796
Packing Group	II	Labels	Corrosive

Reference IATA packing instructions Y840, 851, 855

VESSEL – IMO-IMDG:

Proper Shipping Name	Battery Fluid, Acid		
Hazard Class	8	ID Number	UN2796
Packing Group	II	Labels	Corrosive

Reference IMDG packing instructions P001.

Additional Information
Transport requires proper packaging and paperwork, including the Nature and Quantity of goods, per applicable origin/destination/customs points as-shipped.

SECTION 15: REGULATORY INFORMATION

INVENTORY STATUS:
All components are listed on the TSCA; EINECS/ELINCS; and DSL, unless noted otherwise below.

U.S. FEDERAL REGULATIONS:

TSCA Section 8b – Inventory Status: All chemicals comprising this product are either exempt or listed on the TSCA Inventory.

TSCA Section 12b – Export Notification: If the finished product contains chemicals subject to TSCA Section 12b export notification, they are listed below:

Chemical	CAS #
None	NA

CERCLA (COMPREHENSIVE RESPONSE COMPENSATION, AND LIABILITY ACT)
Chemicals present in the product which could require reporting under the statute:

Chemical	CAS #
Sulfuric acid	7664-93-9

SARA TITLE III (SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT)
The finished product contains chemicals subject to the reporting requirements of Section 313 of SARA Title III.

Chemical	CAS #	% wt
Sulfuric acid	7664-93-9	36.5

CERCLA SECTION 311/312 HAZARD CATEGORIES: Note that the finished product is exempt from these regulations, but lead and sulfuric acid above the thresholds are reportable on Tier II reports.

Fire Hazard	No
Pressure Hazard	No
Reactivity Hazard	No
Immediate Hazard	Yes (EPA lists sulfuric acid as an Extremely Hazardous Substance)
Delayed Hazard	No

Sulfuric acid is regulated as an Extremely Hazardous Substance
STATE REGULATIONS (US):

California Proposition 65
The following chemicals identified to exist in the finished product as distributed into commerce are known to the State of California to cause cancer, birth defects, or other reproductive harm:

Chemical	CAS #	% Wt
Strong inorganic acid mists including sulfuric acid	NA	36.5

California Consumer Product Volatile Organic Compound Emissions
This Product is not regulated as a Consumer Product for purposes of CARB/OTC VOC Regulations, as-sold for the intended purpose and into the industrial/Commercial supply chain.

INTERNATIONAL REGULATIONS (Non-US):

Canadian Domestic Substance List (DSL)
All ingredients remaining in the finished product as distributed into commerce are included on the Domestic Substances List.

WHMIS Classifications
Class E: Corrosive materials present at greater than 1%
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the Controlled Products Regulations.

NPRI and Ontario Regulation 127/01
This product contains the following chemicals subject to the reporting requirements of Canada NPRI +/or Ont. Reg. 127/01:

Chemical	CAS #	% Wt
None	NA	NA

European Inventory of Existing Commercial Chemical Substances (EINECS)
All ingredients remaining in the finished product as distributed into commerce are exempt from, or included on, the European Inventory of Existing Commercial Chemical Substances.

European Communities (EC) Hazard Classification according to directives 67/548/EEC and 1999/45/EC.

R-Phrases	S-Phrases
35	1/2, 26, 30, 45

Additional Information
This product may be subject to additional regulations and laws not identified above, such as for uses other than described or as-designed/as-intended by the manufacturer, or for distribution into specific domestic destinations.

SECTION 16: OTHER INFORMATION

OTHER INFORMATION:
Distribution into Quebec to follow Canadian Controlled Product Regulations (CPR) 24(1) and 24(2).
Distribution into the EU to follow applicable Directives to the Use, Import/Export of the product as-sold.

MATERIAL SAFETY DATA SHEET

BATTERY FLUID ACID

(US, CN, EU Version for International Trade)

SOURCES OF INFORMATION:

International Agency for Research on Cancer (1987), *IARC Monographs on the Evaluation of Carcinogenic Risks to Humans: Overall Evaluations of Carcinogenicity: An updating of IARC Monographs Volumes 1-42, Supplement 7, Lyon,* France.
Ontario Ministry of Labour Regulation 654/86. Regulations Respecting Exposure to Chemical or Biological Agents.
RTECS – Registry of Toxic Effects of Chemical Substances, National institute for Occupational Safety and Health.

MSDS/SDS PREPARATION INFORMATION:

DATE OF ISSUE: ***03 May 2011*** SUPERCEDES: ***29 November 2011***

DISCLAIMER:

This Material Safety Data Sheet is based upon information and sources available at the time of preparation or revision date. Information in the MSDS was obtained from sources which we believe are reliable, but are beyond our direct supervision or control. We make no Warranty of Merchantability, Fitness for any particular purpose or any other Warranty, Expressed or Implied, with respect to such information and we assume no liability resulting from its use. For this and other reasons, we do not assume responsibility and expressly disclaim liability for loss, damage or expense arising out of or in any way connected with the handling, storage, use or disposal of the product. It is the obligation of each user of this product to determine the suitability of this product and comply with the requirements of all applicable laws regarding use and disposal of this product. For additional information concerning East Penn Manufacturing Co., Inc. products or questions concerning the content of this MSDS please contact your East Penn representative.

END

MATERIAL SAFETY DATA SHEET
BRAKE FLUID (DOT 5)

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

TRADE NAME: BRAKE FLUID (DOT 5)

PART No.: 4C-5587, 4C-5588, 4C-5589

UN/NA (PIN) No.: N/A

APPLICATIONS: Brake Fluid

EMERGENCY TELEPHONE: Rocky Mountain Poison Center Denver, Colorado
(800) 458-5924 U.S. and Canada.
(303) 893-1322 Outside U.S.

SUPPLIER: Chemtool Incorporated
8200 Ridgefield Road
P.O. Box 538
Crystal Lake, IL 60039-0538
TELEPHONE: (815) 459-1250
FAX: (815) 459-1955

2. COMPOSITION, INFORMATION ON INGREDIENTS

INGREDIENT NAME:	CAS No.:	CONTENTS :	EPA RQ:	TPQ:

COMPOSITION COMMENTS:

Refer to section eight for exposure limits on ingredients.
Chemical ingredients not regulated by OSHA or SARA are treated confidentially.

3. HAZARDS IDENTIFICATION

For further information, please refer to section 11.

CHRONIC EFFECTS:
SENSITIZATION:
No known information.

REPRODUCTION/TERATOGENICITY:
No known information.

HEALTH WARNINGS:
This product has low toxicity. Only large quantities may have adverse impact on human health. INHALATION. Single exposure to vapors is not likely to be hazardous. Can irritate airways and lungs. SKIN CONTACT. Repeated or prolonged contact can result in drying of the skin. EYE CONTACT. Irritating. INGESTION. Can cause stomach ache and vomiting.

ROUTE OF ENTRY:
Skin and/or eye contact. Ingestion. Inhalation.

4. FIRST AID MEASURES

INHALATION: Remove victim immediately from source of exposure. Get medical attention if any discomfort continues. For breathing difficulties oxygen may be necessary. If breathing stops, provide artificial respiration.

INGESTION: DO NOT induce vomiting. Get medical attention immediately.

SKIN: Immediately remove contaminated clothing. Wash skin thoroughly with soap and water.

EYES: Important! Immediately rinse with water for at least 15 minutes. Get medical attention if any discomfort continues.

5. FIRE FIGHTING MEASURES

FLASH POINT (°F): 680 METHOD: PM Closed cup.
FLAMMABILITY LIMIT - LOWER(%): N/D
FLAMMABILITY LIMIT - UPPER(%): N/D

FLAMMABILITY CLASS:
No Uniform Fire Code noted.

EXTINGUISHING MEDIA:
Use: Dry chemicals, sand, dolomite etc. Foam. Carbon dioxide (CO2).

SPECIAL FIRE FIGHTING PROCEDURES:
Use water spray to keep fire exposed containers cool and disperse vapors. Water spray may be used to flush spills away from exposures. Prevent inhalation of fumes and gases.

UNUSUAL FIRE & EXPLOSION HAZARDS:
Pressure will increase in over heated, closed containers.

HAZARDOUS COMBUSTION PRODUCTS:
Acrid smoke/fumes. Oxides of: Carbon. Phosphorus. Silicon.

PROTECTIVE MEASURES IN CASE OF FIRE:
Self-contained breathing equipment and chemical resistant clothing recommended.

6. ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONS:
Minimize skin contact. Avoid breathing vapors; wear appropriate respirator.

PRECAUTIONS TO PROTECT THE ENVIRONMENT:
Keep product out of sewers and watercourses by diking or impounding. Advise authorities if product has entered or may enter sewers, watercourses or extensive land areas. Assure conformity with applicable government regulations.

SPILL CLEAN-UP PROCEDURES:
Contain spill. Neutralize and absorb small amounts. Collect and return large amounts to shipping container. Rinse spill area with water.

7. HANDLING AND STORAGE

HANDLING PRECAUTIONS:
Avoid spilling, skin and eye contact. Keep away from heat, sparks and open flame. Do not reuse container. Keep lid closed when not in use. Do not store or mix with strong oxidizers.

STORAGE PRECAUTIONS:
Keep away from heat, sparks and open flame. Store separate from strong acids and oxidizers.

STORAGE CRITERIA:
Chemical storage.

8. EXPOSURE CONTROLS, PERSONAL PROTECTION

PROTECTIVE EQUIPMENT:

ENGINEERING CONTROLS:
Use engineering controls to reduce air contamination to permissible exposure level.

VENTILATION: No specific ventilation requirements noted, but forced ventilation may still be required if air contamination exceeds acceptable level.

RESPIRATORS: No specific recommendation made, but respiratory protection may still be required under exceptional circumstances when excessive air contamination exists.

PROTECTIVE GLOVES:
For prolonged or repeated skin contact use suitable protective gloves.

EYE PROTECTION:
Wear splash-proof eye goggles to prevent any possibility of eye contact.

PROTECTIVE CLOTHING:
Wear appropriate clothing to prevent repeated or prolonged skin contact.

HYGIENIC WORK PRACTICES:
Wash at the end of each work shift and before eating, smoking and using the toilet.

9. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE/PHYSICAL STATE:	Clear. Liquid.	
COLOR:	Purple.	
ODOR:	Mild (or faint).	
SOLUBILITY DESCRIPTION:	Soluble in water.	
DENSITY/SPECIFIC GRAVITY (g/ml):	0.95	TEMPERATURE (°F): 61
VAPOR DENSITY (air=1):	>1	
VAPOR PRESSURE:	<1.0 mmHg	TEMPERATURE (°F):
EVAPORATION RATE:	<1	REFERENCE:BuAc=1
pH-VALUE, CONC. SOLUTION:	N/A	

10. STABILITY AND REACTIVITY

STABILITY: Normally stable.

HAZARDOUS POLYMERIZATION:
Will not occur.

POLYMERIZATION DESCRIPTION:
Not applicable

HAZARDOUS DECOMPOSITION PRODUCTS:
Oxides of: Carbon. Phosphorus. Silicon.

11. TOXICOLOGICAL INFORMATION

TOXICOLOGICAL INFORMATION:
No experimental toxilogical data on the preparation as such is available.

12. ECOLOGICAL INFORMATION

ECOLOGICAL INFORMATION:
There is no ecological data on the product itself.

13. DISPOSAL CONSIDERATIONS

DISPOSAL METHODS:
Spilled material, unused contents and empty containers must be disposed of in accordance with local, state and federal regulations.

14. TRANSPORT INFORMATION

PRODUCT RQ: N/A

U.S. DOT:
UN/NA No.: N/A
U.S. DOT HAZARD LABEL: No DOT label requirement noted
U.S. DOT CLASS: Not regulated.

SEA TRANSPORT:
INFORMATION ON SEA TRANSPORT: Not regulated

AIR TRANSPORT:
INFORMATION ON AIR TRANSPORT: Not regulated

15. REGULATORY INFORMATION

US FEDERAL REGULATIONS:
REGULATORY STATUS: This Product or its components, if a mixture, is subject to following regulations (Not meant to be all inclusive - selected regulations represented): SECTION 313: This product does not contain toxic chemical subject to the reporting requirements of Section 313 of Title III of the Superfund Amendment and Reauthorization Act of 1986 and 40 CFR Part 372. TSCA: The ingredients of this product are on the TSCA Inventory. CERCLA 302.4.

STATE REGULATIONS:
STATE REGULATORY STATUS: This product or its components, if a mixture, is subject to following regulations (Not meant to be all inclusive - selected regulations represented):.

CANADIAN REGULATIONS:
LABELS FOR SUPPLY:

REGULATORY STATUS: This Material Safety Data Sheet has been prepared in compilance with the Controled Product Regulations.

16. OTHER INFORMATION

NFPA HAZARD RATING:	
HEALTH:	Irritation, minor residual injury (1)
FLAMMABILITY:	Burns only if pre-heated (1).
REACTIVITY:	N/A (0).
SPECIAL HAZARD:	N/A
NPCA HMIS HEALTH:	1 Slight Hazard
PERS. PROTECT. INDEX:	B
PREPARED BY:	Heather Holich
DATE:	November 14, 2001

DISCLAIMER:
While the information and recommendations set forth herein are believed to be accurate as of the date thereof, Chemtool Incorporated makes no warranty with respect thereto and disclaims all liability from reliance therein.

MSDS
Definition of terms

Material Safety Data Sheet for #2 Diesel

1. Chemical Product

MSDS Number: U7770

MSDS Date: 01-31-99

Product Name: #2 Diesel Fuel

24 Hour Emergency Phone: (210) 979-8346
Transportation Emergencies: Call Chemtrec at 1-800-424-9300
MSDS Assistance: (210) 592-4593

Distributors Name and Address:
T.W. Brown Oil Co., Inc.
1857 Knoll Drive
Ventura, California 93003

Chemical Name:#2 Diesel Fuel **Cas Number:** 68476-34-6

Synonyms/Common Names: This Material Safety Data Sheet applies to the following product descriptions for Hazard Communication purposes only. Technical specifications vary greatly depending on the product, and are not reflected in this document. Consult specification sheets for technical information.

California Air Resources Board (Carb) Diesel Fuel- On-road, Off-Road, Tax Exempt blends
Premium Diesel Fuel- Low-Sulfur, High-sulfur, On-Road, Off-Road, Tax Exempt blends
#2 Distillate- Low-Sulfur, High-sulfur, On-Road, Off-Road, Tax Exempt blends
#2 Diesel Fuel- Low-Sulfur, High-sulfur, On-Road, Off-Road, Tax Exempt blends
#2 Fuel Oil- Low-Sulfur, High-sulfur, On-Road, Off-Road, Tax Exempt blends

2. Composition, Information On Ingredients

Product Use: This product is intended for use as a fuel in engines and heaters designed for diesel fuels, and for use in engineered processes. Use in other applicatiions may result in higher exposures and require additional controls, such as local exhaust ventilation and personal protective equipment.

Description: #2 Diesel is a complex mixture of hydrocarbons from a variety of chemical processes blended to meet standardized product specifications. Composition varies greatly and includes C9 to C20 hydrocarbons with a boiling range of about 325-675 degrees F. The following is a non-exhaustive list of common components, typical percentage ranges in product, and occupational exposure limits for each.

Component or Material Name	%	CAS Number	ACGIH Limits TLV – STEL – Units	OSHA Exposure Limits PEL – STEL – C/P – Units
Cat cracked distillate, light	0-100	64741-59-9	100 – NA – mg/m3	N/A – N/A – N/A – N/A
Hydrotreated distillate, middle	0-100	64742-46-7	100 – NA – mg/m3	N/A – N/A – N/A – N/A

Hydrotreated distillate, light	0-100	64742-47-8	100 – NA – mg/m3	N/A – N/A – N/A – N/A
Gas oil, light	0-100	64741-44-2	100 – NA – mg/m3	N/A – N/A – N/A – N/A

3. Hazards Identification

Health Hazard Data:

1. The major effect of exposure to this product is giddiness, headache, central nervous system depression; possible irritation of eyes, nose, and lungs; and dermal irritation. Signs of kidney and liver damage may be delayed. Pulmonary irritation secondary to exhalation fo solvent.

2. NIOSH recommends that whole diesel engine exhaust be regarded as a potential occupational carcinogen. Follow OSHA and NSHA rules where diesel engine exhaust fumes may be generated.

3. A life time skin painting study by the American Petroleum Institute has shown that similar naphtha products with a boiling range of 350-700 degrees F usually produce skin tumors and/ or skin cancers in laboratory mice. Only a weak to moderate response occurred. The effect to humans has not been determined.

4. Positive results at 2.0 ml/kg and 6.0 ml/kg noted in mutagenesis studies via in-vivo bone marrow cytogenetics assay in rats.

5. Kerosene is classified as a severe skin irritant. Mutation data has been reported for kerosene products. Hydrotreated kerosene is listed as being probably carcinogenic to humans with limited evidence in humans and sufficient evidence in experimental animals.

Hazards of Combustion Products: Carbon monoxide and carbon dioxide can be found in the combustion products of this product and other forms of hydrocarbon combustion. Carbon monoxide in moderate concentrations can cause symptoms of headache, nausea, vomiting, increased cardiac output, and confusion. Exposure to higher concentrations of carbon monoxide can cause loss of consciousness, heart damage, brain damage, and/or death. Exposure to high concentrations of carbon dioxide can cause simple asphyxiation by displacing available oxygen. Combustion of this and other similar materials should only be carried out in well ventilated areas.

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Material Safety Data Sheet #2 Diesel

Medical Condition Generally Aggravated By Exposure: Medical conditions which have the same symptoms and effects as those outlined under the health hazard information section can be aggraved by exposure to this product.

Medical Limitation: N/A

Routes Of Exposure

Inhalation: Irritation of the upper respiratory tract and eyes, with possible euphoria, dizziness, headache, discoordination, ringing in the ears, convulsions, coma, and respiratory arrest.

Skin Contact: Defatting of the skin may occur with continued and prolonged contact. Irritation and burning sensation may occur on exposure to the liquid or mists.

Skin Absorption: Not significant.

Eye Contact: Severe burning sensation with temporary irritation and swelling of lids.

Ingestion: Irritation of the mucous membranes of throat, esophagus and stomach which may result in nausea and vomiting; central nervous system depression may occur, if absorbed (see inhalation symptoms above). If aspirated, chemical pneumonitis may occur with potentially fatal results. Possible kidney and liver damage may be delayed. (See Notes to Physician in Section 5)

Carcinogenicity Statement: #2 Diesel is not listed as carcinogenic by NTP, OSHA, and ACGIH. IARC has listed kerosene and light catalytic cracked distillates as a probable human carcinogen. Light paraffinic hydrotreated petroleum distillates are listed as confirmed human carcinogens by IARC.

4. First Aid Measures

Eyes: Immediately flush eyes with large amount of water for at least 15 minutes holding lids apart to ensure flushing of the entire eye surface. **SEEK IMMEDIATE MEDICAL ATTENTION.**

Skin: Wash contaminated areas with plenty of soap and water. A soothing ointment may be applied to irritated skin after thoroughly cleansing. Remove contaminated clothing and footwear. **SEEK IMMEDIATE MEDICAL ATTENTION.**

Inhalation: Get person out of contaminated area to fresh air. If breathing has stopped resuscitate and administer oxygen if readily available. **SEEK MEDICAL ATTENTION IMMEDIATELY.**

INGESTION: Never give anything by mouth to an unconscious person. If swallowed, do not induce vomiting. If vomiting occurs spontaneously, keep airway clear. **SEEK MEDICAL ATTENTION IMMEDIATELY.**

Note to Physician: Do not induce vomiting, use gastric lavage only. Aspiration of liquid into the lungs could result in Chemical pneumonitis. Use of adrenaline is not advised. Treat symptomatically.

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Material Safety Data Sheet for #2 Diesel

5. Fire and Explosion Data

Flash Point: 100 degrees F PM (minimum)
Autoignition Temperature: 494 degrees F
Flammable Limits In Air: UEL: 5% - LEL: 0.7%

Extinguishing Media: Use dry chemical, carbon dioxide, foam or water spray. Water may be ineffective in fighting fires of liquids with low flash points, but water should be used to keep fire exposed containers cool. If a leak or spill has not ignited, use water spray to disperse the vapors and to protect persons attempting to stop a leak.

Special Fire Fighting Procedures: Pressure-demand, self contained, breathing apparatus should be provided for fire fighters in buildings or confined areas where product is stored.

Unusual Fire And Explosion Hazard: Vapor accumulation is possible, and flashback can occur with explosive force if vapors are ignited.

6. Accidental Release Measures

If material is spilled, steps should be taken to contain liquid and prevent discharges to streams or sewer systems and control or stop the loss of volatile materials to the atmosphere. Spills or releases should be reported, if required to the appropriate local, state and federal regulatory agencies.

Small Spills: Remove ignition sources. Absorb spilled material with non-combustible materials such as cat litter, dirt, sand, or petroleum sorbent pads/pillows. Do not use combustible materials like rags, wood chips, or saw dust. Remove contaminated materials to an appropriate disposal container.

Large Spills: Remove ignition sources. Dike spill area with sand or dirt to contain material and cover sewers/drains. Remain upwind and keep unnecessary people away. Contact trained emergency response team for cleanup. Remove liquid using grounded suction pumps, isolate hazard area and deny entry.

7. Handling and Storage Information

Store only in approved containers. Protect containers against physical damage. Outside or detached storage is preferred. Separate from oxidizing materials. Store in cool, well ventilated area of non-combustible construction away from possible sources of ignition. Keep away from incompatible materials and follow OSHA 29 CFR 1910.106 and NFPA 30 for storage requirements.

Product Use: This product is intended for use as a fuel in engines and heaters designed for kerosene or diesel fuels, and for use in engineered processes. Use in other applications may result in higher exposures and require additional controls, such as local exhaust ventilation and personal protective equipment.

8. Exposure Controls/Personal Protection

Ventilation Requirements: Work in well ventilated areas using good engineering practices to process, transfer and store. Special ventilation in not required unless

product is sprayed or heated. High volume use may require engineering controls.

Specific Personal Protective Equipment

Respiratory: Respiratory protection is not required unless product is sprayed or heated. Use NIOSH approved respiratory protection following manufacture's recommendations where spray, mists, or vapors may be generated. Supplied air respiratory protection is required for IDLH areas. See 29 CFR 1910.134 for OSHA Respirator Protection regulations.

Eye: Face shield and goggles or chemical goggles should be worn where mist or spray may be generated, and where splashing occurs. Shower and eyewash facilities should be accessible.

Gloves: Impermeable protective gloves such as nitrile gloves should be worn during routine handling of this product. Barrier creams may also be appropriate where tactile sensitivity is required.

Other Clothing and Equipment: Clothing contaminated with this product should be removed and laundered before reuse. Items which can not be laundered should be discarded. Allow contaminated items to air dry or hang in a well ventilated area. Spontaneous combustion or fire may result from contaminated materials being placed together before drying.

Exposure Monitoring

Biological: No applicable procedure, breath analysis for hydrocarbons has been suggested.

Personal/Area: Based on similarity to kerosene, both active and passive monitors employing charcoal adsorption follow by gas chromatography. An average molecular weight of 170 has been suggested as the average value to convert the determined weight of hydrocarbons to ppm. Direct reading colorimetric tubes are available to evaluate short term exposure.

9. Physical and Chemical Properties

Appearance and Odor: Colorless to straw, or red oily liquid with characteristic kerosene-like odor.
Viscosity: Specification dependent, 1.7 - 3.4 cSt @ 140 degrees F
Boiling Range @ 760 mm Hg: 302-644 degrees F
Vapor Density (Air=1): 4.5 (kerosene)
Evaporation Rate (BuAc=1): N/A
Specific Gravity (H2O=1): 0.865
Bulk Density At 60 degrees F: 6.8-7.2 lbs./gal.
Solubility in H2O % by WT.: Insoluble
Freezing Point: -51 degrees F
Vapor Pressure: 0.5 mmHg @ 20 degrees C
% Volatiles By Vol.: N/A
API Gravity: Specification dependent
pH: NA

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Material Safety Data Sheet for #2 Diesel

10. Stability and Reactivity Information

Conditions Contributing to Instability: Under normal conditions, the material is stable. Avoid sources of ignition such as flames, hot surfaces, sparks, and electrical equipment.

Incompatibility: Avoid contact with strong oxidizers such as chlorine, concentrated oxygen, and sodium hypochlorite or other hypochlorites.

Hazardous Decomposition Products: Thermal decomposition products may include carbon monoxide, carbon dioxide, oxides of sulfur and nitrogen, and other toxic gases

Hazardous Polymerization: Material is not known to polymerize.

11. Toxicological Information

For detailed information, contact MSDS Assistance at (210) 592-4593

12. Ecological Information

For detailed information, contact MSDS Assistance at (210) 592-4593

13. Disposal Considerations

Shipment, storage, disposal, and cleanup actions of waste materials are regulated under local, state and federal rules. Contact the appropriate agencies if uncertain of applicability. Waste product and contaminated material having a flash point below 140 degrees F is considered a hazardous waste. DOT Hazardous Waste Number D001 applies. Consult 40 CFR 262 for EPA disposal requirements.

14. Transport Information

DOT Proper Shipping Name	Combustible Liquid, n.o.s	Diesel Fuel
DOT Hazard Class*	Combustible Liquid	3*
DOT Packing Group (PG)	III	III
I.D. Number	UN 1993	NA 1993
Required Labeling	None	Flammable Liquid

* Since this product has a flash point >100 degrees F and no other hazard class applies, it may be reclassed as Combustible Liquid and NA 1993 substituted for the product specific I.D.

Number above. Consult 49 CFR 173.120 for specific details.

15. Regulatory Information

TSCA (Toxic Substance Control Act) Inventory

Gasoline is listed in the TSCA inventory.

SARA (Superfund Amendments and Reauthorization Act) TITLE III

This product is reportable under SARA Title III, Sections 311 & 312 as a hazardous substance.

Hazard Categories Applicable under 40 DFR 370.2 (SARA Section 311):

Acute Health	Chronic Health	Pressure	Fire	Reactive
Yes	Yes	No	Yes	No

Components Listed under 40 CFR 372.65 (SARA Section 313):

This product does not contain chemicals identified as toxic by EPA under CFR part 372 and is not subject to the reporting requirements of this section.

State Regulations:

California Proposition 65: This product does not contain chemicals known to the State of California to cause cancer, birth defects, or other reproductive harm.

16. Other Information

NFPA (National Fire Protection Association) Hazard Ratings Codes*

Fire	Health	Reactivity	Other
2	1	0	Blank

*Based on Standard System for the Identification of the Fire Hazards of Materials, NFPA No. 704 M

This material safety data sheet was prepared by T. W. Brown Oil Co., Inc. in accordance with 29 CFR 1910.1200. All information, recommendations and suggestions appearing herein concerning this product are based upon tests and data believed to be reliable, however, it is the user's responsibility to determine the safety, toxicity and suitability for his own use of the product described herein. Since the actual use by others is beyond our control, no guarantee expressed or implied is made by T. W. Brown Oil Co., Inc. as to the effects of such use, the results to be obtained or the safety and toxicity of the product nor does T. W. Brown Oil Co., Inc. assume any liability arising out of use by others of the product referred to herein. Nor is the information herein to be construed as absolutely complete since additional information may be necessary or desirable when particular or exceptional conditions or circumstances exist or because of applicable

SECTION 1: PRODUCT AND COMPANY IDENTIFICATION

Product Number: NAPA 4153

Chemical Name and Synonyms: Paraffinic Oil with Additives
Chemical Family: Mixture
Product Use: Diesel Fuel Additive
MSDS Date of Preparation: April 29, 2012

Company Identification

Supplier
NAPA Filters
PO Box 1967
Gastonia, NC 28053

Telephone Numbers
Product Information: (704) 869-3700 x2769
Emergency Phone: (800) 424-9300 Chemtrec

SECTION 2: HAZARDS IDENTIFICATION

Physical Appearance: Clear liquid. Solvent/oil odor.

EMERGENCY OVERVIEW

Hazards Identification: Combustible liquid and vapor. May cause eye and skin irritation. Repeated or prolonged skin contact may cause dryness and cracking with possible dermatitis. Inhalation of vapors or mists may cause irritation of the nose, throat and upper respiratory tract and nervous system symptoms such as drowsiness or dizziness. Possible aspiration hazard – can enter the lungs during swallowing and cause lung damage. Chronic exposure may cause damage to the blood, liver, kidneys, and nervous system. Contains naphthalene, which may cause cancer based on animal data. The risk of cancer depends on the level and duration of exposure.

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

Chemical Name	CAS Number	Amount
Distillates, petroleum, hydrotreated light	64742-47-8	70-90%
Naphtha, petroleum, heavy aromatic	64742-94-5	5-10%
Ethylene glycol monobutyl ether	111-76-2	5-10%
Trimethylbenzenes (mixed)	25551-13-7	1-3%
Naphthalene	91-20-3	0.1-0.3%

SECTION 4: FIRST AID MEASURES

Eye Contact: Flush eyes thoroughly with running water for 15 minutes while holding the eyelids open. Get immediate medical attention.

Skin Contact: Wash thoroughly with soap and water. Seek medical attention if irritation develops.

Inhaled: If mists are inhaled, remove to fresh air. Seek medical attention if symptoms persist.

Swallowed: If swallowed, DO NOT induce vomiting. Rinse mouth with water if the person is alert. Never give anything by mouth to an unconscious or drowsy person. If vomiting occurs keep head lower than hips to avoid aspiration. Seek immediate medical attention.

SECTION 5: FIRE FIGHTING MEASURES

Fire and Explosion Hazards: Combustible liquid and vapor. If heated above the flash point this product will release flammable vapors and burn vigorously. Mists and sprays may be flammable at temperatures below the flash point. Vapors are heavier than air and will flow along surfaces to remote ignition sources and flash back. Flammable vapors may collect in low areas.

Extinguishing Media: Use carbon dioxide (CO2), dry chemical, foam or water fog. Do not use straight water stream as that may spread the fire.

Special Fire Fighting Procedures: Firefighters should wear positive pressure self-contained breathing apparatus and full protective clothing. Cool fire exposed containers and structures with water.

Hazardous Combustion Products: Carbon oxides, oxides of nitrogen, and various hydrocarbons.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Eliminate ignition sources and ventilate the area. Use appropriate protective clothing and equipment during clean-up. Absorb small spills with an inert (non-combustible) absorbent and place in a container for disposal. Contain large spills with sand or earth or other absorbent. Pump liquid into holding tanks. Collect residue with an inert absorbent as described above for small spills. Prevent release to the environment.

SECTION 7: HANDLING AND STORAGE

Avoid generating and breathing mists and avoid contact with eyes, skin or clothing. Use with adequate ventilation. Wash thoroughly after handling. Remove and launder contaminated clothing before reuse. Keep product away from heat and all sources of ignition.

Empty containers retain residues and may be hazardous. Do not flame cut, weld, braze, grind etc. on or near empty containers. They may explode and cause injury or death.

Storage: Store in a cool, dry, well-ventilated area away from oxidizers.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

Chemical Name	Exposure Limits
Distillates, petroleum, hydrotreated light	5 mg/m3 (inhalable) TWA ACGIH TLV 5 mg/m3 TWA OSHA PEL
Naphtha, petroleum, heavy aromatic	None Established
Ethylene glycol monobutyl ether	50 ppm skin TWA OSHA PEL 20 ppm skin TWA ACGIH TLV
Trimethylbenzenes	25 ppm TWA ACGIH TLV
Naphthalene	10 ppm TWA OSHA PEL

	10 ppm TWA, 15 ppm STEL skin ACGIH TLV

Ventilation: Use with adequate general or local exhaust ventilation to maintain exposure concentrations below the exposure limits.

Respiratory Protection: For operations where the exposure limits are exceeded, a NIOSH approved respirator should be used. Respirator selection and use should be based on contaminant type, form and concentration. Follow OSHA 1910.134, ANSI Z88.2 and good Industrial Hygiene practice.

Skin Protection: Wear neoprene, nitrile or other impervious gloves if needed to avoid contact.

Eye Protection: Chemical safety glasses or goggles if needed to avoid eye contact.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Appearance and Odor: Clear liquid with a solvent/oil odor

Specific Gravity: 0.83
Water Solubility: Insoluble
Vapor Pressure: Not determined
Vapor Density: Greater than 1 (air =1)
pH: Not determined

Boiling Point: Not determined
Melting Point: Not determined
Flash Point: 132°F PMCC
Autoignition Point: Not determined
Flammable Limits: Not determined

SECTION 10: STABILITY AND REACTIVITY

Stability: This product is stable.

Incompatibility/Conditions to Avoid: Avoid heat, flames and other sources of ignition. Keep away from strong oxidizers.

Hazardous Decomposition Products: Thermal decomposition will generate carbon oxides, oxides of nitrogen, and various hydrocarbons.

Hazardous Polymerization: Will not occur

SECTION 11: TOXICOLOGICAL INFORMATION

Potential Health Effects:

Eye: May cause irritation with burning, tearing, redness and swelling.

Skin: May cause irritation. Repeated or prolonged skin contact may cause dryness and cracking with possible dermatitis.

Inhalation: Inhalation of vapors or mists may cause irritation of the nose, throat and upper respiratory tract. High vapor concentrations may cause nervous system symptoms such as drowsiness, sleepiness or dizziness. Prolonged exposure to high concentrations may cause unconsciousness.

Ingestion: Possible aspiration hazard – can enter the lungs during swallowing and cause lung damage.

Ingestion may cause nausea and diarrhea and damage to the blood, liver and kidneys.

Chronic/Carcinogenicity: Prolonged or repeated skin contact may cause dermatitis. Repeated overexposure may cause anemia, liver and kidney damage. Naphthalene is listed by IARC as a suspected carcinogen (group 2B) and NTP as reasonably anticipated to be a carcinogen. None of the other components of this product present at 0.1% or greater are listed as carcinogens by ACGIH, IARC, NTP or OSHA.

SECTION 12: ECOLOGICAL INFORMATION

No ecotoxicity data is available for the product. Oils are hazardous to aquatic organisms. Avoid release to the environment.

SECTION 13: DISPOSAL INFORMATION

Dispose in accordance with all local and national regulations.

SECTION 14: TRANSPORT INFORMATION

US DOT Shipping Description: Not regulated for ground transport based on the Combustible Liquid exception (49 CFR 173.150(f))

IMDG Code (Ocean): UN1268, Petroleum Distillates, n.o.s., 3, III

ICAO/IATA (AIR): UN1268, Petroleum Distillates, n.o.s., 3, III

SECTION 15: REGULATORY INFORMATION

CERCLA 103 Reportable Quantity: The Reportable Quantity for this product is 33,300 lbs. based on the RQ of naphthalene present at 0.3% maximum. In addition, oils spills to the navigable waters of the US are reportable to the national response center. Many states have more stringent reporting requirements. Report releases as required by all federal, state and local authorities.

SARA TITLE III:

Hazard Category for Section 311/312: Acute Health, Chronic Health, Fire Hazard

Section 313 Toxic Chemicals: This product contains the following chemicals subject to SARA Title III Section 313 Reporting requirements: Ethylene glycol monobutyl ether (glycol ether compound)
Naphthalene

Section 302 Extremely Hazardous Substances (TPQ): None

EPA Toxic Substances Control Act (TSCA) Status: All of the components of this product are listed on the TSCA inventory.

California Proposition 65: This product contains chemicals that are known to the State of California to cause cancer, birth defects or other reproductive harm.

SECTION 16: OTHER INFORMATION

NFPA Hazard Rating: Health: 2 Fire: 2 Instability: 0

HMIS Hazard Rating: Health: 2* Fire: 2 Physical Hazard: 0

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The information is believed to be accurate and represents the best information currently available to us. WE MAKE NO WARRANTY OF MERCHANTABILITY, OR ANY OTHER WARRANTY, EXPRESSED OR IMPLIED, WITH RESPECT TO SUCH INFORMATION. We assume no liability resulting from its use. Users should conduct their own investigations to determine the suitability of the information for their own particular application and purpose.

AMERADA HESS CORPORATION

MATERIAL SAFETY DATA SHEET

Gasoline, All Grades **MSDS No. 9950**

EMERGENCY OVERVIEW
DANGER!
EXTREMELY FLAMMABLE - EYE AND MUCOUS MEMBRANE IRRITANT - EFFECTS CENTRAL NERVOUS SYSTEM - HARMFUL OR FATAL IF SWALLOWED - ASPIRATION HAZARD

NFPA 704 (Section 16)

High fire hazard. Keep away from heat, spark, open flame, and other ignition sources.

If ingested, do NOT induce vomiting, as this may cause chemical pneumonia (fluid in the lungs). Contact may cause eye, skin and mucous membrane irritation. Harmful if absorbed through the skin. Avoid prolonged breathing of vapors or mists. Inhalation may cause irritation, anesthetic effects (dizziness, nausea, headache, intoxication), and respiratory system effects.

Long-term exposure may cause effects to specific organs, such as to the liver, kidneys, blood, nervous system, and skin. Contains benzene, which can cause blood disease, including anemia and leukemia.

1. CHEMICAL PRODUCT and COMPANY INFORMATION (rev. Jan-04)

Amerada Hess Corporation
1 Hess Plaza
Woodbridge, NJ 07095-0961

EMERGENCY TELEPHONE NUMBER (24 hrs): **CHEMTREC (800)424-9300**
COMPANY CONTACT (business hours): Corporate Safety (732)750-6000
MSDS Internet Website www.hess.com/about/environ.html

SYNONYMS: Hess Conventional (Oxygenated and Non-oxygenated) Gasoline; Reformulated Gasoline (RFG); Reformulated Gasoline Blendstock for Oxygenate Blending (RBOB); Unleaded Motor or Automotive Gasoline

See Section 16 for abbreviations and acronyms.

2. COMPOSITION and INFORMATION ON INGREDIENTS * (rev. Jan-04)

INGREDIENT NAME (CAS No.)	CONCENTRATION PERCENT BY WEIGHT
Gasoline (86290-81-5)	100
Benzene (71-43-2)	0.1 - 4.9 (0.1 - 1.3 reformulated gasoline)
n-Butane (106-97-8)	< 10
Ethyl Alcohol (Ethanol) (64-17-5)	0 - 10
Ethyl benzene (100-41-4)	< 3
n-Hexane (110-54-3)	0.5 to 4
Methyl-tertiary butyl ether (MTBE) (1634-04-4)	0 to 15.0
Tertiary-amyl methyl ether (TAME) (994-05-8)	0 to 17.2
Toluene (108-88-3)	1 - 25
1,2,4- Trimethylbenzene (95-63-6)	< 6
Xylene, mixed isomers (1330-20-7)	1 - 15

A complex blend of petroleum-derived normal and branched-chain alkane, cycloalkane, alkene, and aromatic hydrocarbons. May contain antioxidant and multifunctional additives. Non-oxygenated Conventional Gasoline and RBOB do not have oxygenates (Ethanol or MTBE and/or TAME). Oxygenated Conventional and Reformulated Gasoline will have oxygenates for octane enhancement or as legally required.

Revision Date: 01/08/04

3. HAZARDS IDENTIFICATION (rev. Dec-97)

EYES
Moderate irritant. Contact with liquid or vapor may cause irritation.

SKIN
Practically non-toxic if absorbed following acute (single) exposure. May cause skin irritation with prolonged or repeated contact. Liquid may be absorbed through the skin in toxic amounts if large areas of skin are exposed repeatedly.

INGESTION
The major health threat of ingestion occurs from the danger of aspiration (breathing) of liquid drops into the lungs, particularly from vomiting. Aspiration may result in chemical pneumonia (fluid in the lungs), severe lung damage, respiratory failure and even death.

Ingestion may cause gastrointestinal disturbances, including irritation, nausea, vomiting and diarrhea, and central nervous system (brain) effects similar to alcohol intoxication. In severe cases, tremors, convulsions, loss of consciousness, coma, respiratory arrest, and death may occur.

INHALATION
Excessive exposure may cause irritations to the nose, throat, lungs and respiratory tract. Central nervous system (brain) effects may include headache, dizziness, loss of balance and coordination, unconsciousness, coma, respiratory failure, and death.

WARNING: the burning of any hydrocarbon as a fuel in an area without adequate ventilation may result in hazardous levels of combustion products, including carbon monoxide, and inadequate oxygen levels, which may cause unconsciousness, suffocation, and death.

CHRONIC EFFECTS and CARCINOGENICITY
Contains benzene, a regulated human carcinogen. Benzene has the potential to cause anemia and other blood diseases, including leukemia, after repeated and prolonged exposure. Exposure to light hydrocarbons in the same boiling range as this product has been associated in animal studies with systemic toxicity. See also Section 11 - Toxicological Information.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE
Irritation from skin exposure may aggravate existing open wounds, skin disorders, and dermatitis (rash). Chronic respiratory disease, liver or kidney dysfunction, or pre-existing central nervous system disorders may be aggravated by exposure.

4. FIRST AID MEASURES (rev. Dec-97)

EYES
In case of contact with eyes, immediately flush with clean, low-pressure water for at least 15 min. Hold eyelids open to ensure adequate flushing. Seek medical attention.

SKIN
Remove contaminated clothing. Wash contaminated areas thoroughly with soap and water or waterless hand cleanser. Obtain medical attention if irritation or redness develops.

INGESTION
DO NOT INDUCE VOMITING. Do not give liquids. Obtain immediate medical attention. If spontaneous vomiting occurs, lean victim forward to reduce the risk of aspiration. Small amounts of material which enter the mouth should be rinsed out until the taste is dissipated.

INHALATION
Remove person to fresh air. If person is not breathing, ensure an open airway and provide artificial respiration. If necessary, provide additional oxygen once breathing is restored if trained to do so. Seek medical attention immediately.

5. FIRE FIGHTING MEASURES (rev. Dec-97)

FLAMMABLE PROPERTIES:

FLASH POINT:	-45 °F (-43°C)
AUTOIGNITION TEMPERATURE:	highly variable; > 530 °F (>280 °C)
OSHA/NFPA FLAMMABILITY CLASS:	1A (flammable liquid)
LOWER EXPLOSIVE LIMIT (%):	1.4%
UPPER EXPLOSIVE LIMIT (%):	7.6%

FIRE AND EXPLOSION HAZARDS

Vapors may be ignited rapidly when exposed to heat, spark, open flame or other source of ignition. Flowing product may be ignited by self-generated static electricity. When mixed with air and exposed to an ignition source, flammable vapors can burn in the open or explode in confined spaces. Being heavier than air, vapors may travel long distances to an ignition source and flash back. Runoff to sewer may cause fire or explosion hazard.

EXTINGUISHING MEDIA

SMALL FIRES: Any extinguisher suitable for Class B fires, dry chemical, CO2, water spray, fire fighting foam, or Halon.

LARGE FIRES: Water spray, fog or fire fighting foam. Water may be ineffective for fighting the fire, but may be used to cool fire-exposed containers.

During certain times of the year and/or in certain geographical locations, gasoline may contain MTBE and/or TAME. Firefighting foam suitable for polar solvents is recommended for fuel with greater than 10% oxygenate concentration - refer to NFPA 11 “Low Expansion Foam - 1994 Edition.”

FIRE FIGHTING INSTRUCTIONS

Small fires in the incipient (beginning) stage may typically be extinguished using handheld portable fire extinguishers and other fire fighting equipment.

Firefighting activities that may result in potential exposure to high heat, smoke or toxic by-products of combustion should require NIOSH/MSHA- approved pressure-demand self-contained breathing apparatus with full facepiece and full protective clothing.

Isolate area around container involved in fire. Cool tanks, shells, and containers exposed to fire and excessive heat with water. For massive fires the use of unmanned hose holders or monitor nozzles may be advantageous to further minimize personnel exposure. Major fires may require withdrawal, allowing the tank to burn. Large storage tank fires typically require specially trained personnel and equipment to extinguish the fire, often including the need for properly applied fire fighting foam.

See Section 16 for the NFPA 704 Hazard Rating.

6. ACCIDENTAL RELEASE MEASURES (rev. Dec-97)

ACTIVATE FACILITY SPILL CONTINGENCY or EMERGENCY PLAN.

Evacuate nonessential personnel and remove or secure all ignition sources. Consider wind direction; stay upwind and uphill, if possible. Evaluate the direction of product travel, diking, sewers, etc. to confirm spill areas. Spills may infiltrate subsurface soil and groundwater; professional assistance may be necessary to determine the extent of subsurface impact.

Carefully contain and stop the source of the spill, if safe to do so. Protect bodies of water by diking, absorbents, or absorbent boom, if possible. Do not flush down sewer or drainage systems, unless system is designed and permitted to handle such material. The use of fire fighting foam may be useful in certain situations to reduce vapors. The proper use of water spray may effectively disperse product

vapors or the liquid itself, preventing contact with ignition sources or areas/equipment that require protection.

Take up with sand or other oil absorbing materials. Carefully shovel, scoop or sweep up into a waste container for reclamation or disposal - caution, flammable vapors may accumulate in closed containers. Response and clean-up crews must be properly trained and must utilize proper protective equipment (see Section 8).

7. HANDLING and STORAGE (rev. Dec-97)

HANDLING PRECAUTIONS

******USE ONLY AS A MOTOR FUEL******
******DO NOT SIPHON BY MOUTH******

Handle as a flammable liquid. Keep away from heat, sparks, and open flame! Electrical equipment should be approved for classified area. Bond and ground containers during product transfer to reduce the possibility of static-initiated fire or explosion.

Special slow load procedures for "switch loading" must be followed to avoid the static ignition hazard that can exist when higher flash point material (such as fuel oil) is loaded into tanks previously containing low flash point products (such as this product) - see API Publication 2003, "Protection Against Ignitions Arising Out Of Static, Lightning and Stray Currents.

STORAGE PRECAUTIONS

Keep away from flame, sparks, excessive temperatures and open flame. Use approved vented containers. Keep containers closed and clearly labeled. Empty product containers or vessels may contain explosive vapors. Do not pressurize, cut, heat, weld or expose such containers to sources of ignition.

Store in a well-ventilated area. This storage area should comply with NFPA 30 "Flammable and Combustible Liquid Code". Avoid storage near incompatible materials. The cleaning of tanks previously containing this product should follow API Recommended Practice (RP) 2013 "Cleaning Mobile Tanks In Flammable and Combustible Liquid Service" and API RP 2015 "Cleaning Petroleum Storage Tanks".

WORK/HYGIENIC PRACTICES

Emergency eye wash capability should be available in the near proximity to operations presenting a potential splash exposure. Use good personal hygiene practices. Avoid repeated and/or prolonged skin exposure. Wash hands before eating, drinking, smoking, or using toilet facilities. Do not use as a cleaning solvent on the skin. Do not use solvents or harsh abrasive skin cleaners for washing this product from exposed skin areas. Waterless hand cleaners are effective. Promptly remove contaminated clothing and launder before reuse. Use care when laundering to prevent the formation of flammable vapors which could ignite via washer or dryer. Consider the need to discard contaminated leather shoes and gloves.

8. EXPOSURE CONTROLS and PERSONAL PROTECTION (rev. Jan-04)

EXPOSURE LIMITS

Component (CAS No.)	Exposure Limits			
	Source	TWA (ppm)	STEL (ppm)	Note
Gasoline (86290-81-5)	ACGIH	300	500	A3
Benzene (71-43-2)	OSHA	1	5	Carcinogen
	ACGIH	0.5	2.5	A1, skin
	USCG	1	5	
n-Butane (106-97-8)	ACGIH	800	--	2003 NOIC: 1000 ppm (TWA) Aliphatic Hydrocarbon Gases Alkane (C1-C4)
Ethyl Alcohol (ethanol) (64-17-5)	OSHA	1000	--	
	ACGIH	1000	--	A4
Ethyl benzene (100-41-4)	OSHA	100	--	
	ACGIH	100	125	A3

Component (CAS No.)	Source	TWA (ppm)	STEL (ppm)	Note
		Exposure Limits		
n-Hexane (110-54-3)	OSHA	500	--	
	ACGIH	50	--	skin
Methyl-tertiary butyl ether [MTBE] (1634-04-4)	ACGIH	50		A3
Tertiary-amyl methyl ether [TAME] (994-05-8)				None established
Toluene (108-88-3)	OSHA	200		Ceiling: 300 ppm; Peak: 500 ppm (10 min.)
	ACGIH	50	--	A4 (skin)
1,2,4- Trimethylbenzene (95-63-6)	ACGIH	25	--	
Xylene, mixed isomers (1330-20-7)	OSHA	100	--	
	ACGIH	100	150	A4

ENGINEERING CONTROLS

Use adequate ventilation to keep vapor concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces.

EYE/FACE PROTECTION

Safety glasses or goggles are recommended where there is a possibility of splashing or spraying.

SKIN PROTECTION

Gloves constructed of nitrile or neoprene are recommended. Chemical protective clothing such as that made of of E.I. DuPont Tychem ®, products or equivalent is recommended based on degree of exposure.

Note: The resistance of specific material may vary from product to product as well as with degree of exposure. Consult manufacturer specifications for further information.

RESPIRATORY PROTECTION

A NIOSH-approved air-purifying respirator with organic vapor cartridges or canister may be permissible under certain circumstances where airborne concentrations are or may be expected to exceed exposure limits or for odor or irritation. Protection provided by air-purifying respirators is limited. Refer to OSHA 29 CFR 1910.134, NIOSH Respirator Decision Logic, and the manufacturer for additional guidance on respiratory protection selection and limitations.

Use a positive pressure, air-supplied respirator if there is a potential for uncontrolled release, exposure levels are not known, in oxygen-deficient atmospheres, or any other circumstance where an air-purifying respirator may not provide adequate protection.

9. PHYSICAL and CHEMICAL PROPERTIES (rev. Jan-04)

APPEARANCE

A translucent, straw-colored or light yellow liquid

ODOR

A strong, characteristic aromatic hydrocarbon odor. Oxygenated gasoline with MTBE and/or TAME may have a sweet, ether-like odor and is detectable at a lower concentration than non-oxygenated gasoline.

ODOR THRESHOLD

	Odor Detection	Odor Recognition
Non-oxygenated gasoline:	0.5 - 0.6 ppm	0.8 - 1.1 ppm
Gasoline with 15% MTBE:	0.2 - 0.3 ppm	0.4 - 0.7 ppm
Gasoline with 15% TAME:	0.1 ppm	0.2 ppm

BASIC PHYSICAL PROPERTIES

BOILING RANGE:	85 to 437 ^{o}F (39 to 200 ^{o}C)
VAPOR PRESSURE:	6.4 - 15 RVP @ 100 ^{o}F (38 ^{o}C) (275-475 mm Hg @ 68 ^{o}F (20 ^{o}C)
VAPOR DENSITY (air = 1):	AP 3 to 4
SPECIFIC GRAVITY (H_2O = 1):	0.70 – 0.78
EVAPORATION RATE:	10-11 (n-butyl acetate = 1)
PERCENT VOLATILES:	100 %

SOLUBILITY (H_2O): Non-oxygenated gasoline - negligible (< 0.1% @ 77 ^oF). Gasoline with 15% MTBE - slight (0.1 - 3% @ 77 ^oF); ethanol is readily soluble in water

10. STABILITY and REACTIVITY (rev. Dec-94)

STABILITY: Stable. Hazardous polymerization will not occur.

CONDITIONS TO AVOID

Avoid high temperatures, open flames, sparks, welding, smoking and other ignition sources

INCOMPATIBLE MATERIALS

Keep away from strong oxidizers.

HAZARDOUS DECOMPOSITION PRODUCTS

Carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke). Contact with nitric and sulfuric acids will form nitrocresols that can decompose violently.

11. TOXICOLOGICAL PROPERTIES (rev. Dec-97)

ACUTE TOXICITY

Acute Dermal LD50 (rabbits): > 5 ml/kg
Acute Oral LD50 (rat): 18.75 ml/kg
Primary dermal irritation (rabbits): slightly irritating
Draize eye irritation (rabbits): non-irritating
Guinea pig sensitization: negative

CHRONIC EFFECTS AND CARCINOGENICITY

Carcinogenicity: OSHA: NO IARC: YES - 2B NTP: NO ACGIH: YES (A3)

IARC has determined that gasoline and gasoline exhaust are possibly carcinogenic in humans. Inhalation exposure to completely vaporized unleaded gasoline caused kidney cancers in male rats and liver tumors in female mice. The U.S. EPA has determined that the male kidney tumors are species-specific and are irrelevant for human health risk assessment. The significance of the tumors seen in female mice is not known. Exposure to light hydrocarbons in the same boiling range as this product has been associated in animal studies with effects to the central and peripheral nervous systems, liver, and kidneys. The significance of these animal models to predict similar human response to gasoline is uncertain.

This product contains benzene. Human health studies indicate that prolonged and/or repeated overexposure to benzene may cause damage to the blood-forming system (particularly bone marrow), and serious blood disorders such as aplastic anemia and leukemia. Benzene is listed as a human carcinogen by the NTP, IARC, OSHA and ACGIH.

This product may contain methyl tertiary butyl ether (MTBE): animal and human health effects studies indicate that MTBE may cause eye, skin, and respiratory tract irritation, central nervous system depression and neurotoxicity. MTBE is classified as an animal carcinogen (A3) by the ACGIH.

12. ECOLOGICAL INFORMATION (rev. Jan-04)

Keep out of sewers, drainage areas and waterways. Report spills and releases, as applicable, under Federal and State regulations. If released, oxygenates such as ethers and alcohols will be expected to exhibit fairly high mobility in soil, and therefore may leach into groundwater. The API (www.api.org) provides a number of useful references addressing petroleum and oxygenate contamination of groundwater.

13. DISPOSAL CONSIDERATIONS (rev. Dec-97)

Consult federal, state and local waste regulations to determine appropriate disposal options.

14. TRANSPORTATION INFORMATION (rev. Jan-04)

DOT PROPER SHIPPING NAME:	Gasoline
DOT HAZARD CLASS and PACKING GROUP:	3, PG II
DOT IDENTIFICATION NUMBER:	UN 1203
DOT SHIPPING LABEL:	FLAMMABLE LIQUID

PLACARD:

15. REGULATORY INFORMATION (rev. Jan-04)

U.S. FEDERAL, STATE, and LOCAL REGULATORY INFORMATION

This product and its constituents listed herein are on the EPA TSCA Inventory. Any spill or uncontrolled release of this product, including any substantial threat of release, may be subject to federal, state and/or local reporting requirements. This product and/or its constituents may also be subject to other federal, state, or local regulations; consult those regulations applicable to your facility/operation.

CLEAN WATER ACT (OIL SPILLS)

Any spill or release of this product to "navigable waters" (essentially any surface water, including certain wetlands) or adjoining shorelines sufficient to cause a visible sheen or deposit of a sludge or emulsion must be reported immediately to the National Response Center (1-800-424-8802) or, if not practical, the U.S. Coast Guard with follow-up to the National Response Center, as required by U.S. Federal Law. Also contact appropriate state and local regulatory agencies as required.

CERCLA SECTION 103 and SARA SECTION 304 (RELEASE TO THE ENVIRONMENT)

The CERCLA definition of hazardous substances contains a “petroleum exclusion” clause which exempts crude oil, refined, and unrefined petroleum products and any indigenous components of such. However, other federal reporting requirements (e.g., SARA Section 304 as well as the Clean Water Act if the spill occurs on navigable waters) may still apply.

SARA SECTION 311/312 - HAZARD CLASSES

ACUTE HEALTH	CHRONIC HEALTH	FIRE	SUDDEN RELEASE OF PRESSURE	REACTIVE
X	X	X	--	--

SARA SECTION 313 - SUPPLIER NOTIFICATION

This product contains the following toxic chemicals subject to the reporting requirements of section 313 of the Emergency Planning and Community Right-To-Know Act (EPCRA) of 1986 and of 40 CFR 372:

INGREDIENT NAME (CAS NUMBER)	CONCENTRATION WT. PERCENT
Benzene (71-43-2)	0.1 to 4.9 (0.1 to 1.3 for reformulated gasoline)
Ethyl benzene (100-41-4)	< 3
n-Hexane (110-54-3)	0.5 to 4
Methyl-tertiary butyl ether (MTBE) (1634-04-4)	0 to 15.0
Toluene (108-88-3)	1 to 15
1,2,4- Trimethylbenzene (95-63-6)	< 6
Xylene, mixed isomers (1330-20-7)	1 to 15

US EPA guidance documents (www.epa.gov/tri) for reporting Persistent Bioaccumulating Toxics (PBTs) indicate this product may contain the following deminimis levels of toxic chemicals subject to Section 313 reporting:

INGREDIENT NAME (CAS NUMBER)	CONCENTRATION - Parts per million (ppm) by weight
Polycyclic aromatic compounds (PACs)	17
Benzo (g,h,i) perylene (191-24-2)	2.55
Lead (7439-92-1)	0.079

CANADIAN REGULATORY INFORMATION (WHMIS)

Class B, Division 2 (Flammable Liquid)
Class D, Division 2A (Very toxic by other means) and Class D, Division 2B (Toxic by other means)

16. OTHER INFORMATION (rev. Jan-04)

NFPA® HAZARD RATING	HEALTH:	1	Slight
	FIRE:	3	Serious
	REACTIVITY:	0	Minimal
HMIS® HAZARD RATING	HEALTH:	1 *	Slight
	FIRE:	3	Serious
	REACTIVITY:	0	Minimal
	* CHRONIC		

SUPERSEDES MSDS DATED: 12/30/97

ABBREVIATIONS:

AP = Approximately < = Less than > = Greater than
N/A = Not Applicable N/D = Not Determined ppm = parts per million

ACRONYMS:

ACGIH	American Conference of Governmental Industrial Hygienists
AIHA	American Industrial Hygiene Association
ANSI	American National Standards Institute (212)642-4900
API	American Petroleum Institute (202)682-8000
CERCLA	Comprehensive Emergency Response, Compensation, and Liability Act
DOT	U.S. Department of Transportation [General Info: (800)467-4922]
EPA	U.S. Environmental Protection Agency
HMIS	Hazardous Materials Information System
IARC	International Agency For Research On Cancer
MSHA	Mine Safety and Health Administration
NFPA	National Fire Protection Association (617)770-3000
NIOSH	National Institute of Occupational Safety and Health
NOIC	Notice of Intended Change (proposed change to ACGIH TLV)
NTP	National Toxicology Program
OPA	Oil Pollution Act of 1990
OSHA	U.S. Occupational Safety & Health Administration
PEL	Permissible Exposure Limit (OSHA)
RCRA	Resource Conservation and Recovery Act
REL	Recommended Exposure Limit (NIOSH)
SARA	Superfund Amendments and Reauthorization Act of 1986 Title III
SCBA	Self-Contained Breathing Apparatus
SPCC	Spill Prevention, Control, and Countermeasures
STEL	Short-Term Exposure Limit (generally 15 minutes)
TLV	Threshold Limit Value (ACGIH)
TSCA	Toxic Substances Control Act
TWA	Time Weighted Average (8 hr.)
WEEL	Workplace Environmental Exposure Level (AIHA)
WHMIS	Workplace Hazardous Materials Information System (Canada)

DISCLAIMER OF EXPRESSED AND IMPLIED WARRANTIES

Information presented herein has been compiled from sources considered to be dependable, and is accurate and reliable to the best of our knowledge and belief, but is not guaranteed to be so. Since conditions of use are beyond our control, we make no warranties, expressed or implied, except those that may be contained in our written contract of sale or acknowledgment.

Vendor assumes no responsibility for injury to vendee or third persons proximately caused by the material if reasonable safety procedures are not adhered to as stipulated in the data sheet. Additionally, vendor assumes no responsibility for injury to vendee or third persons proximately caused by abnormal use of the material, even if reasonable safety procedures are followed. Furthermore, vendee assumes the risk in their use of the material.

MATERIAL SAFETY DATA SHEET

NAME OF PRODUCT: AW Hydraulic Oil ISO 46

FILE NO. 9636, 9637, 9638, 9616, 11360
MSDS DATE: December, 2009

SECTION 1: PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: AW Hydraulic Oil ISO 46
SYNONYMS: hydraulic fluid
PRODUCT CODES: 9616,9636,9637,9637Tray,9638,11360, CG46AWBlue

MANUFACTURER: CGF INC
DIVISION: N/A
ADDRESS: 317 Peoples Avenue Rockford, IL 61104 USA

EMERGENCY PHONE: 800/424-9300
CHEMTREC PHONE: 800/424-9300
OTHER CALLS: 815-967-4400
FAX PHONE: 815-967-4404

PRODUCT USE: Hydraulic Fluid
PREPARED BY: Irena Larson/Denise Brauer

SECTION 1 NOTES:

SECTION 2: COMPOSITION/INFORMATION ON INGREDIENTS

INGREDIENT: Petroleum base oils, additive package.

CAS NO.	% WT	% VOL	SARA 313 REPORTABLE
64741-88-4	75-85		None
64742-01-4	15-25		None
Proprietary Additive(s)	0.5-1.5		None

SECTION 3: HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW: This material is not considered hazardous according to OSHA criteria.

ROUTES OF ENTRY: Skin contact or inhalation.

POTENTIAL HEALTH EFFECTS

EYES: Contact may cause mild eye irritation including stinging, watering, and redness.

SKIN: Contact may cause mild skin irritation including redness and a burning sensation. Prolonged or repeated contact can defat the skin, causing drying and cracking of the skin and possibly dermatitis (inflammation). No harmful effects from skin absorption are expected.

INGESTION: No harmful effects expected from ingestion.

INHALATION: No information available on acute toxicity.

ACUTE HEALTH HAZARDS: No

CHRONIC HEALTH HAZARDS: No

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE: Skin disorders may be aggravated by exposure.

CARCINOGENICITY

OSHA: None **ACGIH: None** **NTP:** None **IARC: None**
OTHER:

SECTION 3 NOTES:

SECTION 4: FIRST AID MEASURES

EYES: If irritation or redness develops, flush eyes with clean water. If symptoms persist, seek medical attention.

SKIN: Remove contaminated shoes and clothing and cleanse affected area(s) thoroughly by washing with a mild soap and water or a waterless hand cleaner. If irritation persists, seek medical attention.

INGESTION: First aid is not normally required; however, if swallowed and symptoms develop, seek medical attention.

INHALATION: If respiratory symptoms develop, move victim away from source of exposure and into fresh air. If symptoms persist, seek medical attention.

NOTES TO PHYSICIANS OR FIRST AID PROVIDERS: High-pressure hydrocarbon injection injuries may produce substantial necrosis of underlying tissue despite an innocuous appearing wound. Often these injuries require emergency surgical debridement and all injuries should be evaluated by a specialist in order to assess the extent of injury.

Acute aspirations of large amounts of mineral oil-laden material may produce serious aspiration pneumonia. Patients who aspirate these oils should be followed for the development of long-term sequelae. Inhalation exposure to oil mists below current workplace exposure limits is unlikely to cause pulmonary abnormalities.

SECTION 4 NOTES:

SECTION 5: FIRE-FIGHTING MEASURES

EXTINGUISHING MEDIA: Dry chemical, carbon dioxide, foam, or water spray is recommended.

SPECIAL FIRE FIGHTING PROCEDURES:
Water or foam may cause frothing of materials heated above 212 F. Carbon dioxide can displace oxygen. Use caution when applying dioxide in confined spaces.

SPECIAL PROTECTIVE EQUIPMENT: For fires in enclosed areas, fire fighters muct use self-contained breathing apparatus.

UNUSUAL FIRE AND EXPLOSION HAZARDS: This material may burn, but will not ignite readily. If container is not properly cooled, it can rupture in the heat of fire.

HAZARDOUS DECOMPOSITION PRODUCTS: No data

Flash Point: C(F) : >210(410) (ASTM D-92)
Flammable Limits (approx. % vol. in air)- LEL: 0.9%, UEL: 7.0%
NFPA HAZARD ID: Health: 1, Flammability: 1, Reactivity: 0

SECTION 6: ACCIDENTAL RELEASE MEASURES

ACCIDENTAL RELEASE MEASURES:
Personal Precautions:
This material may burn, but will not ignite readily. Keep all sources of ignition away from spill/release. The use of explosion-proof electrical equipment is recommended. Stay upwind and away from spill/release. Notify persons downwind of the spill/release, isolate immediate hazard area and keep unauthorized personnel out. Wear appropriate protective equipment, including respiratory protection, as conditions warrant.
Environmental Precautions: Stop spill/release if it can be done with minimal risk. Prevent spilled material from entering sewers, storm drains, other unauthorized drainage systems, and natural waterways. Contact appropriate agency for spills into or upon navigable waters that cause a sheen or discoloration on the water surface.

Methods for Containment and Clean Up:
Notify fire authorities and appropriate regulatory authorities. Immediate cleanup of any spill is recommended. Dike far ahead of spill for later recovery or disposal. Spilled material may be absorbed into an appropriate absorbent material.

SECTION 7: HANDLING AND STORAGE

HANDLING AND STORAGE:
Wash thoroughly after handling. Use good personal hygiene practices and wear appropriate personal protective equipment. High pressure injection of hydrocarbon fuels, hydraulic oils or greases under the skin may have serious consequences even though no symptoms or injury may be apparent. This can happen accidentally when using high pressure equipment such as high pressure grease guns, fuel injection

apparatus or from pinhole leaks in tubing of high pressure hydraulic oil equipment. Do not enter confined spaces such as tanks or pits without following proper entry procedures. Do not wear contaminated clothing or shoes. "Empty" containers retain residue and may be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, or other sources of ignition. They may explode and cause injury or death. "Empty" drums should be completely drained, properly bunged, and promptly shipped to the supplier or a drum reconditioner. All containers should be disposed of in an environmentally safe manner and in accordance with governmental regulations. Use and store this material in cool, dry, well-ventilated areas away from heat and all sources of ignition. Keep container(s) tightly closed. Store only in approved containers. Keep away from any incompatible material. Protect container(s) against physical damage.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

Componet	**ACGIH**	**OSHA**
Lubricant Base Oil-Petroleum	TWA: 5mg/m^3 STEL: 10mg/m^3 As oil mist, if generated	TWA: 5mg/m^3 as Oil mist, if generated

ENGINEERING CONTROLS: If current ventilation practices are not adequate to maintain airborne concentrations below the established exposure limits, additional engineering controls may be required.

RESPIRATORY PROTECTION: Where there is potential for airborne exposure above the exposure limit a NIOSH certified air purifying respirator equipped with R or P95 filters may be used. A respiratory protection program that meets or is equivalent to OSHA 29 CFR 1910.134 and ANSI Z88.2 should be followed whenever workplace conditions warrant a respirator's use. Air purifying respirators provide limited protection and cannot be used in atmospheres that exceed the maximum use concentration (MUC) as directed by regulation or the manufacturer's instructions, in oxygen deficient (less than 19.5 percent oxygen) situations, or other conditions that are immediately dangerous to life and health (IDLH).

EYE PROTECTION: The use of eye protection that meets or exceeds ANSI Z.87.1 is recommended to protect against potential eye contact, irritation, or injury. Depending on conditions of use, a face shield may be necessary.

SKIN PROTECTION: The use of gloves impervious to the specific material handled is advised to prevent skin contact. Users should check with manufacturers to confirm the performance of their products. Suggested protective materials: Nitrile

SECTION 8 NOTES: State, local or other agencies or advisory groups may have established more stringent limits. Consult an industrial hygienist or similar professional, or your local agencies, for further information.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE: Clear Blue Liquid

ODOR: mild petroleum

PHYSICAL STATE: Liquid

pH AS SUPPLIED: Not applicable
pH (Other):
BOILING POINT: No data
F: >600
C: >316

FLASH POINT:
F: >410
C: >210
METHOD USED: (ASTM D-92)

AUTOIGNITION TEMPERATURE:
F: 671
C: 355

MELTING POINT: No data
F:
C:
FREEZING POINT: No data
F:

C:

VAPOR PRESSURE (mmHg): <1
@ 20 C :< 0.1

VAPOR DENSITY (AIR = 1): >2
@
F: 68
C: 20
SPECIFIC GRAVITY (H2O = 1): 0.87
@
F: 60
C: 15.6
EVAPORATION RATE: n/a

BASIS (=1):

SOLUBILITY IN WATER: not soluble

PERCENT SOLIDS BY WEIGHT: n/a

PERCENT VOLATILE: Negligible
BY WT/ BY VOL @
F: 68
C: 20
VOLATILE ORGANIC COMPOUNDS (VOC): no data

WITH WATER: LBS/GAL
WITHOUT WATER: LBS/GAL

MOLECULAR WEIGHT: no data
VISCOSITY:
200-300 SUS @ 100 Degree F
@ 40 C cST 47.25

SECTION 9 NOTES: Data represents typical values and are not intended to be specifications.

SECTION 10: STABILITY AND REACTIVITY

	STABLE	UNSTABLE
STABILITY:	**YES**	

CONDITIONS TO AVOID (STABILITY): Avoid excessive heat, formations of vapors or mists.

INCOMPATIBILITY (MATERIAL TO AVOID): Strong oxidizing agents

HAZARDOUS DECOMPOSITION OR BY-PRODUCTS: None under normal storage.

HAZARDOUS POLYMERIZATION: No

CONDITIONS TO AVOID (POLYMERIZATION): n/a

SECTION 10 NOTES:

SECTION 11: TOXICOLOGICAL INFORMATION

TOXICOLOGICAL INFORMATION:
Carcinogenicity: The petroleum base oils contained in this product have been highly refined by a variety of processes including solvent extraction, hydrotreating, and/or dewaxing to remove aromatics and improve performance characteristics. No components in this formulation have been identified as a carcinogen.

Component	Oral LD50	Dermal LD50	Inhalation LC50
Lubricant Base Oil	**>5g/kg**	**>2g/kg**	**No data**

SECTION 11 NOTES:

SECTION 12: ECOLOGICAL INFORMATION

ECOLOGICAL INFORMATION: Ecotoxicological data have not been determined specifically for this product. Information given is based on knowledge of the components and the ecotoxicology of similar products.
Acute Toxicity: Poorly soluble mixture. May cause physical fouling of aquatic organisms. Expected to be practically non toxic: LL/EL/IL50 > 100 mg/l (to aquatic organisms) (LL/EL50 expressed as the nominal amount of product required to prepare aqueous test extract). Mineral oil is not expected to cause any chronic effects to aquatic organisms at concentrations less than 1 mg/l.
Mobility: Liquid under most environmental conditions. Floats on water. If it enters soil, it will adsorb to soil particles and will not be mobile.
Persistence/degradability: Expected to be not readily biodegradable. Major constituents are expected to be inherently biodegradable, but the product contains components that may persist in the environment.
Bioaccumulation : Contains components with the potential to bioaccumulate.
Other Adverse Effects: Product is a mixture of non-volatile components, which are not expected to be released to air in any significant quantities. Not expected to have ozone depletion potential, photochemical ozone creation potential or global warming potential

SECTION 12 NOTES:

SECTION 13: DISPOSAL CONSIDERATIONS

WASTE DISPOSAL METHOD:
Material Disposal: Recover or recycle if possible. It is the responsibility of the waste generator to determine the toxicity and physical properties of the material generated to determine the proper waste classification and disposal methods in compliance with applicable regulations. Do not dispose into the environment, in drains or in water courses.
Container Disposal: Dispose in accordance with prevailing regulations, preferably to a recognized collector or contractor. The competence of the collector or contractor should be established beforehand.
Local Legislation: Disposal should be in accordance with applicable regional, national, and local laws and regulations.

SECTION 14: TRANSPORT INFORMATION

U.S. DEPARTMENT OF TRANSPORTATION: Not regulated
PROPER SHIPPING NAME:
HAZARD CLASS:
ID NUMBER:
PACKING GROUP:
LABEL STATEMENT:

WATER TRANSPORTATION: Not regulated
PROPER SHIPPING NAME:
HAZARD CLASS:
ID NUMBER:
PACKING GROUP:
LABEL STATEMENTS:

AIR TRANSPORTATION: Not regulated
PROPER SHIPPING NAME:
HAZARD CLASS:
ID NUMBER:
PACKING GROUP:
LABEL STATEMENTS:

OTHER AGENCIES:

SECTION 14 NOTES:

SECTION 15: REGULATORY INFORMATION

U.S. FEDERAL REGULATIONS

TSCA (TOXIC SUBSTANCE CONTROL ACT): All components of this formulation are listed on the US EPA-TSCA inventory or not regulated under TSCA.

EU Labeling: Product is not dangerous as defined by the European Union Dangerous Substances/Preparations Directives. EU labeling is not required.

Governmental Inventory Status: All components comply with TSCA, EINECS/ELINCS, AICS, METI, DSL, KOREA, and PHILIPPINES.

CERCLA (COMPREHENSIVE RESPONSE COMPENSATION, AND LIABILITY ACT): This material does not contain any chemicals subject to the reporting requirements of SARA 302 and 40 CFR 372.

SARA TITLE III (SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT): This product contains no"EXTREMELY HAZARDOUS SUBSTANCES".

311/312 HAZARD CATEGORIES: None
Acute Health: No
Chronic Health: No
Fire Hazard: No
Pressure Hazard: No
Reactive Hazard: No

313 REPORTABLE INGREDIENTS: This material does not contain any chemicals subject to the reporting requirements of SARA 313 and 40 CFR 372.

STATE REGULATIONS: This material does not contain any chemicals with CERCLA Reportable Quantities.

California Proposition 65:
This material does not contain any chemicals which are known to the State of California to cause cancer, birth defects or other reproductive harm at concentrations that trigger the warning requirements of California Proposition 65.

INTERNATIONAL REGULATIONS:

Canadian Regulations:
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

WHMIS Hazard Class
None

SECTION 15 NOTES:

SECTION 16: OTHER INFORMATION

OTHER INFORMATION:

PREPARATION INFORMATION: Issue Date: August 2009 Rev. #1

DISCLAIMER:
The information presented herein has been compiled from sources considered to be dependable and accurate to the best of Cutting & Grinding Fluids Inc., knowledge. However, CGF INC., makes no warranty whatsoever expressed or implied of merchantability or fitness for the particular purpose, regarding the accuracy of such data or the results to be obtained from the use thereof. Cutting & Grinding Fluids, Inc. assumes no responsibility for the injury to recipient or to the third persons or for any damage to any property and recipient assumes all such risks.

Material Safety Data Sheet

HP 6040-1314 Grease **MSDS No. HP 6040-1314**

Date of Preparation: 4/4/01 Revision Date: 4/4/01

Section 1 - Chemical Product and Company Identification

Product/Chemical Name: HP 6040-1314 Grease
General Use: Lubricating Grease
Manufacturer: Nye Lubricants, Inc.
12 Howland Road
Fairhaven, MA 02719 U.S.A.
Telephone: (508) 996-6721 (8:00AM - 5:00PM ET weekdays)
Nights and weekends (Medical Emergencies ONLY): CHEMTREC (800) 424-9300

Section 2 - Composition / Information on Ingredients

Ingredient Name	CAS Number	% wt *or* % vol
Polytetrafluoroethylene, PTFE*	9002-84-0	12.0
Product formulation is Proprietary		
No ingredients are known to be hazardous under normal usage.		

*Not a hazardous material under normal usage, but PTFE can produce toxic fumes if pyrolized.

Ingredient	OSHA PEL		ACGIH TLV		NIOSH REL		NIOSH
	TWA	STEL	TWA	STEL	TWA	STEL	IDLH
Oil Mist	5 mg/m^3	NE	5 mg/m^3	NE	5 mg/m^3	10 mg/m^3	2500 mg/m^3

NE= None Established

Section 3 - Hazards Identification

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Summary of risks: May irritate eyes. Prolonged or repeated skin contact may cause irritation. Inhalation of oil mist or vapors from material at high temperatures may irritate respiratory passages. Polytetrafluoroethylene (PTFE), when thermally decomposed (over 290°C), may cause polymer fume fever. Thermal decomposition of PTFE (over 290°C) will generate hydrogen fluoride.

HMIS
H 1
F 1
R 0
PPE†
†Sec. 8

Potential Health Effects

Eye Contact: May cause irritation.
Skin Contact: Repeated or prolonged skin contact may cause irritation. Thermal decomposition of PTFE (over 290°C) will generate hydrogen fluoride, which is corrosive, causing burns on contact with skin and other tissue.
Inhalation: Oil mist and vapors at high temperatures may irritate respiratory passages. Inhalation of decomposition products of PTFE (over 290°C) may cause polymer fume fever, a temporary flu-like illness accompanied by fever, chills, and sometimes cough, of approximately 24 hours duration. Repeated episodes of polymer fume fever may cause lung damage. Inhalation of fluorine compounds as decomposition products of PTFE (over 290°C) may cause lung irritation and pulmonary edema.
Ingestion: May cause gastrointestinal irritation.
Primary Route(s) of Entry: Inhalation at high temperatures, eye contact, skin contact.
Target Organs: Respiratory passages at high temperatures, eyes, skin.
Medical Conditions Aggravated by Long-Term Exposure: Individuals with pre-existing diseases of the lungs may have increased susceptibility to the toxicity of excessive exposures from thermal decomposition products.
Carcinogenicity: IARC, NTP, and OSHA do not list HP 6040-1314 Grease or its ingredients as carcinogens.

Section 4 - First Aid Measures

Eye Contact: Flush thoroughly with water for at least 15 minutes. Get immediate medical attention.
Skin Contact: Remove contaminated clothing. Wash exposed area with soap and water. Get medical attention if symptoms persists.
Inhalation: If symptoms develop, remove affected person from source of exposure into fresh air. Get immediate medical attention. If person is not breathing, give artificial respiration. If breathing is difficult, administer oxygen if available.
Ingestion: Get immediate medical attention. Do not induce vomiting unless instructed to do so by a physician.

Section 5 - Fire-Fighting Measures

Flash Point: over 400°F (204°C)
Flash Point Method: CC, ASTM D93
Lower Flammable Limit (LFL): N/A
Upper Flammable Limit (UFL): N/A
Extinguishing Media: CO_2, Foam, Dry Chemical, Water Spray
Unusual Fire or Explosion Hazards: None
Hazardous Combustion Products: Hydrogen fluoride, carbonyl fluoride, carbon monoxide and small amount of other toxic fumes.
Fire-Fighting Instructions: Wear a NIOSH approved positive pressure self-contained breathing apparatus with full protective clothing. Do not release runoff from fire control methods to sewers or waterways.

Section 6 - Accidental Release Measures

Spill Response: Observe precautions from other sections. Contain any spill with dikes or absorbents to prevent migration and entry into drains, sewers or bodies of water. Wipe or scrape up grease and place it in a proper container for disposal. Wash walking surfaces thoroughly to reduce slipping hazard. Follow applicable OSHA (29 CFR 1910.120), state and local regulations.

Section 7 - Handling and Storage

Handling Precautions: Exercise ordinary care in handling industrial lubricants. Avoid contamination of cigarettes or other tobacco products. Wash hands thoroughly before eating or smoking. Remove contaminated clothing and clean before reuse. Users should be alert to the possibility that very small percentages of the population may display unexpected allergic reactions to otherwise innocuous industrial lubricants and raw materials.
Storage Requirements: Do not store in open or unlabeled containers. Store away from incompatibles.

Section 8 - Exposure Controls / Personal Protection

Eye Protection: Avoid eye contact. Wear safety glasses or chemical goggles in accordance with OSHA 29 CFR 1910.133.
Skin Protection: Avoid skin contact. Wear chemical protective gloves. Depending upon conditions of use, additional protection may be necessary such as a face shield, apron, etc.
Ventilation: Local ventilation is generally not necessary under normal conditions of use with adequate general ventilation. Ventilation and other forms of engineering controls are the preferred means for controlling chemical exposures.
Respiratory Protection: Avoid breathing oil mist. Respiratory protection is generally not necessary under normal conditions of use with adequate general ventilation.
Safety Stations: Make emergency eyewash stations, safety/quick-drench showers, and washing facilities available in work area.
Other Precautionary Information: Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9 - Physical and Chemical Properties

Appearance and Odor: Smooth, blue grease with slight odor
Vapor Pressure: Negligible
Vapor Density: Not Determined
Formula Weight: Not Calculated
Specific Gravity (H_2O=1, at 4 °C): Not Determined
pH: Not Determined
Water Solubility: Insoluble
Boiling Point: Not volatile
Dropping Point: Non-melting
% Volatile: None
Evaporation Rate: Not Determined

Section 10 - Stability and Reactivity

Stability: HP 6040-1314 Grease is stable at room temperature in closed containers under normal storage and handling conditions.
Polymerization: This product will not undergo hazardous polymerization.
Chemical Incompatibilities: Strong oxidizing materials
Conditions to Avoid: Pyrolysis
Hazardous Decomposition Products: Thermal oxidative decomposition of HP 6040-1314 Grease can produce hydrogen fluoride, carbonyl fluoride, carbon monoxide as well as small amounts of other toxic fumes.

Section 11- Toxicological Information

Toxicity Data: None available.

Section 12 - Ecological Information

Environmental Fate and Effects: No data has been established for this product.

Section 13 - Disposal Considerations

Disposal: Contact a licensed waste-disposal contractor for detailed recommendations.
Disposal Regulatory Requirements: Many states classify waste lubricants as "hazardous", which means disposal only by a licensed firm. Follow applicable Federal, state, and local regulations.

Section 14 - Transport Information

DOT Transportation Data (49 CFR 172.101): Not Regulated

Section 15 - Regulatory Information

TSCA:
All components of this product are listed on the TSCA inventory.

EPA Regulations:
SARA 311/312 Hazard Class (40 CFR 370)

Immediate (Acute) Health Hazard	No	Sudden Release of Pressure Hazard	No	Reactive Hazard	No
Delayed (Chronic) Health Hazard	No	Fire Hazard	No		

SARA 313 Toxic Chemicals (40 CFR 372)	CAS Number	%
No ingredients listed		

SARA Extremely Hazardous Substances (40 CFR 355)	CAS Number	%	Threshold Planning Quantity (TPQ)
No ingredients listed			

CERCLA Hazardous Substances (40 CFR 302)	CAS Number	%	Reportable Quantity (RQ)
No ingredients listed			

Section 16 - Other Information

Prepared By: WMM
Disclaimer: While the information and recommendations set forth herein are believed to be accurate as of the date hereof, Nye Lubricants, Inc. makes no warranty with respect thereto and disclaims all liability with respect thereon.

MATERIAL SAFETY DATA SHEET

MATERIAL SAFETY DATA SHEET - Complies with ANSI Z400.1 Draft Standard for the Preparation of Material Safety Data Sheets, Copyright 1991, Chemical Manufacturers Association. May be used to comply with U.S. Department of Labor OSHA's Hazard Communication Standard, 29 CFR 1910.1200. Standards must be consulted for specific requirements.

Date : 02/13/2002

Unocal '76'
Guardol 15W/40 Motor Oil

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: Unocal Guardol 15W/40

GENERIC NAME: Crankcase Oil

CHEMICAL FAMILY: Petroleum Hydrocarbon

COMPANY IDENTIFICATION

Unocal Refining & Marketing Division
1201 West 5th Street
Los Angeles, CA 90017

EMERGENCY / TECHNICAL NUMBERS

213) 977-7589

CHEMTREC:
(800) 424-9300 (continental U.S.)
(202) 483-7616 (collect in Hawaii & Alaska)

PRODUCT INFORMATION: MSDS Requests and Product Information: (213) 977-7589

SPECIAL NOTES:

2. COMPOSITION / INFORMATION INGREDIENTS

COMPONENTS	CAS No.	OSHA Exposure Limits (PEL)	ACGIH Recommended Limits (TLV)	Percent by Weight
Oil Mist (if generated)	8012-95-1	5 mg/m^3	5 mg/m^3	n/a
Proprietary Zinc Compound	Proprietary	n/a	n/a	1.000-2.000
Hydrotreated Distillate, Heavy Paraffin	64742-54-7	5 mg/m^3	5 mg/m^3	0.0-86.000
Solvent Dewaxed Distillate, Heavy Paraffin	64742-65-0	5 mg/m^3	5 mg/m^3	0.0-86.000
Solvent Refined Distillate, Heavy Paraffin	64742-65-0	5 mg/m^3	5 mg/m^3	0.0-3.000
Trade Secret	Proprietary	n/a	n/a	9.000-13.000

COMPOSITION COMMENTS:
None.

3. HAZARDS IDENTIFICATION

PRECAUTIONARY WARNING: Used motor oil is a possible skin cancer hazard based on animal data. Liquid or vapor may ignite. Keep away from all sources of ignition. **DO NOT** pressurize, cut, weld, braze, solder, grind, or drill on or near container. "Empty" container retains residue (liquid and/or vapor) and may explode in the heat of a fire.

POTENTIAL HEALTH EFFECTS

PRIMARY ROUTE OF ENTRY: Nasal or oral

EYE: This material may cause mild eye irritation. Direct contact with the liquid or exposure to vapors or mists may cause stinging, tearing or redness.

SKIN: This material may cause mild skin irritation. Prolonged or repeated contact or exposure to vapors or mists may cause redness and burning, and drying and cracking of the skin. No harmful effects are expected from skin absorption of this material. Persons with pre-existing skin disorders may be more suceptible to the effects of this material.

INGESTION: While this material has a low degree of toxicity, ingestion of excessive quantities may cause irritation of the digestive tract.

INHALATION: While this material has a low degree of toxicity, breathing high concenttrations of vapors or mists may cause irritation of the nose and throat.

CHRONIC EFFECTS: Used motor oil is a possible skin cancer hazard based on tests in laboratory animals and has been identified as a possible carcinogen by IARC.

OTHER NOTES: It is suggested that a source of clean water be available in the work area for flushing eyes and skin. Impervious clothing should be worn as needed.

4. FIRST AID MEASURES

SIGNS AND SYMPTOMS OF EXPOSURE

EYE: Irritation, redness, watering

SKIN: Mild irritation, redness

INGESTION: Irritation to the digestive tract

INHALATION: Irritation to nose and/or throat

FIRST AID PROCEDURES In an emergency, have physician call Los Angeles Poison Control Center (24 hrs.) 1-800-356-3129

EYE: If irritation or redness develops, move victim away from exposure and into fresh air. Flush eyes with clean water. If symptoms persist, seek medical attention.

SKIN: Wipe material from skin and remove contaminated shoes and clothing. Cleanse affected area(s) thoroughly by washing with mild soap and water and, if necessary, a waterless skin cleanser. If irritation or redness develops and persists, seek medical attention.

INGESTION: No first aid is normally required; however, if swallowed, and symptoms develop, seek medical attention.

INHALATION: If respiratory symptoms develop, move victim away from source of exposure and into fresh air. If symptoms persist, seek medical attention. If victim is not breathing, immediately begin artificial respiration. If breathing difficulties develop, oxygen should be administered by qualified personnel. Seek immediate medical attention.

5. FIRE FIGHTING MEASURES

FLAMMABLE PROPERTIES: Flammable

FLASH POINT / METHOD USED: 419 ºF (215 ºC)

AUTOIGNITION: N/A

FLAMMABILITY LIMITS (% by volume in air): LEL: N/A UEL: N/A

EXTINGUISHING MEDIA: Dry chemical, carbon dioxide (CO_2), halon, foam or water spray is recommended

NFPA RATINGS: Health 1; Flammability 1; Reactivity 0.

FIRE FIGHTING INSTRUCTIONS: This material will burn although it is not easily ignited.

UNUSUAL FIRE AND EXPLOSIVE HAZARDS: This material may burn, but will not ignite readily. If container is not properly cooled, it may explode in the heat of a fire. Vapors are heavier than air and may accumulate in low areas.

SPECIAL FIRE FIGHTING PROCEDURES: Wear appropriate protective equipment including respiratory protection as conditions warrant. Stop spill/release if it can be done without risk. Move undamaged containers from fire area if it can be done without risk. Water spray may be useful in minimizing or dispersing vapors and cooling equipment exposed to heat and flame. Avoid spreading burning liquid with water used for cooling purposes.

COMBUSTION PRODUCTS: Combustion may yeild major amounts of oxides of carbon and minor amounts of oxides of nitrogen, phosphorous, sulfur and zinc.

6. ACCIDENTAL RELEASE MEASURES

PRECAUTIONS: May ignite. Keep all sources of ignition away from spill/release. Stay upwind and away from spill/release. Isolate hazard area and limit entry to authorized personnel. Stop spill/release if it can be done without risk. Wear appropriate protective including respiratory protection as conditions warrant (see Section 3). Prevent spilled material from entering sewers, storm drains, other unauthorized treatment drainage systemsand natural waterways. Dike far ahead of spill for later recovery or disposal. Spilled material may be absorbed into an appropriate absorbent material. Notify fire authorities and appropriate federal, state and local agencies. Immediate cleanup of any spill is recommended. If spill of any amount is made into or upon U.S. navigable waters, the Contiguous Zone, or adjoining shorelines, notify the National Response Center (1-800-424-8802). For highway or railway spills, contact CHEMTREC (1-800-424-9300 ConUS, or 1-202-483-7616 collect in Alaska & Hawaii).

CLEANUP MEASURES: Immediate cleanup of any spill is recommended. Spilled material may be absorbed into an appropriate absorbent material. Dispose of product in accordance with local, county, state, and federal regulations.

7. HANDLING AND STORAGE

NORMAL STORAGE: Use and store this material in cool, dry, well ventillated areas away from heat and all sources of ignition. Keep container(s) closed. Store only in approved containers. Keep away from any incompatible materials (see Section 10). Protect container(s) against physical damage. Do not enter confined spaces such as tanks or pits without following proper entry procedures such as ASTM D-4276. The use of respiratory protection is advised when concentrations exceed any established exposure limits (see Sections 2, 3, & 4).

HANDLING: Wash thoroughly after handling. Do not wear contaminated clothing or shoes. Use good personal hygiene practice. “Empty” containers retain residue (liquid and/or vapor) and can be dangerous. Do not pressurized, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, or other sources of ignition; they may explode and cause injury or death. “Empty” drums should be completely drained, properly bunged and promptly shipped to the supplier or a drum reconditioner. All other containers should be disposed of in an environmentally safe manner and in accordance with governmental regulations. Before working on or in tanks which contain or have contained this product, refer to occupational safety and health administration regulations, ANSI Z49.1, and other governmental and industrial references pertaining to cleaning, repairing, welding, or other contemplated operations.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

ENGINEERING CONTROLS: If current ventillation practices are not adequate to maintain airborne concentrations below the established exposure limits (see Section 2), additional ventilation or exhaust systems may be required. Where explosive mixtures may be present, electrical systems safe for such locations must be used.

RESPIRATORY PROTECTION: The use of respiratory protection is advised when concentrations exceed the established exposure limits (see Section 2). Depending on the airborne concentration, use a respirator or gas mask with appropriate cartridges and canisters (NIOSH approved, if available) or supplied air equipment.

EYE AND FACE PROTECTION: Approved eye protection to safeguard against potential eye contact, irritation or injury is recommended.

SKIN AND HAND PROTECTION: The use of gloves impermeable to the specific material handled is advised to prevent skin contact and possible irritation. Impervious clothing should be worn as needed. It is recommended that a source of clean water be available in the work area for flushing eyes and skin.

9. PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL DESCRIPTION: Clear brown liquid

ODOR: Characteristic petroleum

VAPOR PRESSURE (mm Hg): Not determined

BOILING POINT: >555ºF / 291ºC

VISCOSITY: 109 cSt @ 40ºC

SPECIFIC GRAVITY (H_2O = 1): 0.89 @ 15ºC

FLASH POINT: 419ºF / 215ºC

VAPOR DENSITY (AIR = 1): >1

EVAPORATION RATE (BUTYL ACETATE = 1): <1

SOLUBILITY: Negligible

% VOLATILE: Negligible

10. STABILITY AND REACTIVITY

CHEMICAL STABILITY: Stable.

CONDITIONS TO AVOID: Extended exposure to high temperatures may cause decomposition.

INCOMPATIBILITY WITH OTHER MATERIALS: Avoid contact with strong oxidizing agents.

HAZARDOUS DECOMPOSITION PRODUCTS: Combustion may yield major amounts of oxides of carbon and minor amounts of oxides of nitrogen, phosphorous, sulfur and zinc.

HAZARDOUS POLYMERIZATION: Polymerization will not occur.

11. TOXICOLOGICAL INFORMATION

CARCINOGENICITY: Used motor oil is a possible skin cancer hazard based on tests in laboratory animals and has been identified as a possible carcinogen by IARC.

NTP: NDA

IARC MONOGRAPHS: NDA

OSHA REGULATED: NDA

TERATOGENIC: NDA

MUTAGENIC: NDA

12. ECOLOGICAL INFORMATION

No Data Available.

13. DISPOSAL CONSIDERATIONS

Material may be absorbed into an appropriate absorbent material. Dispose of in accordance with all local, county, state, and federal regulations. “Empty” containers retain residue (liquid and/or vapor) and can be dangerous. Do not pressurized, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, or other sources of ignition; they may explode and cause injury or death. “Empty” drums should be completely drained, properly bunged and promptly shipped to the supplier or a drum reconditioner. All other containers should be disposed of in an environmentally safe manner and in accordance with governmental regulations.

14. TRANSPORTATION INFORMATION

NAME OF CONTENTS: N/A

REPORTABLE QUANTITY: NDA

CONSTITUENTS: No hazardous substances at regulated levels

HAZARD CLASS: Not regulated.

UN/NA NUMBER: NDA

POISON INHALATION HAZARD: NDA

EMERGENCY RESPONSE NUMBER: (800) 424-9300 ConUS or (202) 483-7616 collect in Hawaii & Alaska.

15. REGULATORY INFORMATION

This product contains a proprietary zinc compound, which is subject to the reporting requirements of SARA 313 and 40 CFR 372.

Originally prepared by: Unocal Refining & Marketing Division, MSDS Coordinator, 7 May 1991.

The information in this document is believed to be correct as of the date issued. However, no warranty of merchantability, fitness for any particular purpose, or any other warranty is expressed or is to be implied regarding the accuracy or completeness of this information, the results to be obtained from the use of this information or the product, the safety of this product, or the hazards related to its use. This information and product are furnished on the condition that the person receiving them shall make his own determination as to the suitability of the product for his particular purpose and on the condition that he assume the risk of his use thereof.

MATERIAL SAFETY DATA SHEET

Section 1: Product & Company Identification

Product Name: **Jump Start® Starting Fluid with Lubricity**

Product Number (s): **05671, 75671**

Product Use: Starting Fluid

Manufacturer / Supplier Contact Information:

In United States:
CRC Industries, Inc.
885 Louis Drive
Warminster, PA 18974
www.crcindustries.com
1-215-674-4300(General)
(800) 521-3168 (Technical)
(800) 272-4620 (Customer Service)

In Canada:
CRC Canada Co.
2-1246 Lorimar Drive
Mississauga, Ontario L5S 1R2
www.crc-canada.ca
1-905-670-2291

In Mexico:
CRC Industries Mexico
Av. Benito Juárez 4055 G
Colonia Orquídea
San Luís Potosí, SLP CP 78394
www.crc-mexico.com
52-444-824-1666

24-Hr Emergency – CHEMTREC: (800) 424-9300 or (703) 527-3887

Section 2: Hazards Identification

Emergency Overview

DANGER: Extremely Flammable. Harmful or Fatal if Swallowed. Vapor Harmful.
Contents Under Pressure.
Appearance & Odor: Clear liquid, ether odor

Potential Health Effects:

ACUTE EFFECTS:

EYE: May cause moderate eye irritation and moderate corneal injury.

SKIN: Prolonged contact may cause irritation, defatting of the skin.

INHALATION: May cause nose and throat irritation. May cause nervous system depression characterized by the following progressive steps: headache, dizziness, nausea, staggering gait, confusion, unconsciousness. Intentional misuse by deliberately concentrating and inhaling the contents may be harmful or fatal.

INGESTION: If aspirated into lungs, it may be rapidly absorbed through the lungs and result in injury to other body systems; gastro-intestinal distress.

CHRONIC EFFECTS: Reports have associated repeated and prolonged overexposure to solvents with permanent brain and nervous system damage.

TARGET ORGANS: Nervous system

Medical Conditions Aggravated by Exposure: Unknown

See Section 11 for toxicology and carcinogenicity information on product ingredients.

Section 3: Composition/Information on Ingredients

COMPONENT	CAS NUMBER	% by Wt.
Diethyl ether	60-29-7	20 – 25
Heptane	142-82-5	75 – 80
Carbon dioxide	124-38-9	< 10
Upper cylinder lubricant	64741-89-5	< 1

Section 4: First Aid Measures

Eye Contact: Immediately flush with plenty of water for 15 minutes. Call a physician if irritation persists.

Skin Contact: Remove contaminated clothing and wash affected area with soap and water. Call a physician if irritation persists. Wash contaminated clothing prior to re-use.

Inhalation: Remove person to fresh air. Keep person calm. If not breathing, give artificial respiration. If breathing is difficult give oxygen. Call a physician.

Ingestion: Do NOT induce vomiting. Call a physician immediately.

Note to Physicians: Aspiration hazard. Treat symptomatically.

Section 5: Fire-Fighting Measures

Flammable Properties: This product is extremely flammable in accordance with aerosol flammability definitions. (See 16 CFR 1500.3(c)(6)).

Flash Point: < 20°F / -7°C (TCC) Upper Explosive Limit: 48.0
Autoignition Temperature: ND Lower Explosive Limit: 1.2

Fire and Explosion Data:

Suitable Extinguishing Media: Carbon dioxide, foam, dry chemical, Class B extinguishers

Products of Combustion: Oxides of carbon

Explosion Hazards: Aerosol containers, when exposed to heat from fire, may build pressure and explode. Vapors may accumulate in a confined space and create a flammable atmosphere.

Protection of Fire-Fighters: Firefighters should wear self-contained, NIOSH-approved breathing apparatus for protection against suffocation and possible toxic decomposition products. Proper eye and skin protection should be provided. Use water spray to keep fire-exposed containers cool and to knock down vapors which may result from product decomposition.

Section 6: Accidental Release Measures

Personal Precautions: Use personal protection recommended in Section 8.

Environmental Precautions: Take precautions to prevent contamination of ground and surface waters. Do not flush into sewers or storm drains.

Methods for Containment & Clean-up: Dike area to contain spill. Ventilate the area with fresh air. If in confined space or limited air circulation area, clean-up workers should wear appropriate

respiratory protection. Recover or absorb spilled material using an absorbent designed for chemical spills. Place used absorbents into proper waste containers.

Section 7: Handling and Storage

Handling Procedures: Do not use near open flames, heat or any sources of ignition. Vapors are heavier than air and will collect in low areas. Use proper ventilation that will remove vapors from low areas. Avoid prolonged or repeated contact with skin. Use caution around energized equipment. The metal container will conduct electricity if it contacts a live source. This may result in injury to the user from electrical shock and/or flash fire. For product use instructions, please see the product label.

Storage Procedures: Store in a cool dry area out of direct sunlight. Aerosol cans must be maintained below 120°F / 49°C to prevent cans from rupturing. Do not store near sources of ignition.

Aerosol Storage Level: III

Section 8: Exposure Controls/Personal Protection

Exposure Guidelines:

	OSHA		ACGIH		OTHER		
COMPONENT	TWA	STEL	TWA	STEL	TWA	SOURCE	UNIT
Diethyl ether	400	NE	400	500	NE		ppm
Heptane	500	NE	400	500	NE		ppm
Carbon dioxide	5000	NE	5000	30000	NE		ppm
Upper cylinder lubricant	NE	NE	NE	NE	NE		
N.E. – Not Established (c) – ceiling (s) – skin (v) – vacated							

Controls and Protection:

Engineering Controls: Area should have ventilation to provide fresh air. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at the source, preventing dispersion into the general work area. Use mechanical means if necessary to maintain vapor levels below the exposure guidelines. If working in a confined space, follow applicable OSHA regulations.

Respiratory Protection: None required for normal work where adequate ventilation is provided. If engineering controls are not feasible or if exposure exceeds the applicable exposure limits, use a NIOSH-approved cartridge respirator with organic vapor cartridge. Air monitoring is needed to determine actual employee exposure levels. Use a self-contained breathing apparatus in confined spaces and for emergencies.

Eye/face Protection: For normal conditions, wear safety glasses. Where there is reasonable probability of liquid contact, wear splash-proof goggles.

Skin Protection: Use protective gloves such as nitrile or neoprene. Also, use full protective clothing if there is prolonged or repeated contact of liquid with skin.

Section 9: Physical and Chemical Properties

Physical State: liquid

Color: clear, colorless
Odor: ether
Odor Threshold: ND
Specific Gravity: 0.7
Initial Boiling Point: 95°F / 35°C
Freezing Point: ND
Vapor Pressure: ND
Vapor Density: > 1 (air = 1)
Evaporation Rate: fast
Solubility: slight in water
Coefficient of water/oil distribution: ND
pH: NA
Volatile Organic Compounds: wt %: 97.0 g/L: 679 lbs./gal: 5.66

Section 10: Stability and Reactivity

Stability: Stable

Conditions to Avoid: Sources of ignition; excessive heat

Incompatible Materials: Strong oxidizers; amines; nitric plus acetic acids; nitric plus sulfuric acid

Hazardous Decomposition Products: Oxides of carbon

Possibility of Hazardous Reactions: No

Section 11: Toxicological Information

Long-term toxicological studies have not been conducted for this product. The following information is available for components of this product.

Acute Toxicity:

Component	Oral LD50 (rat)	Dermal LD50 (rabbit)	Inhalation LC50 (rat)
Diethyl ether	1215 mg/kg	> 20 mL/kg	No data
Heptane	No data	No data	103 g/m^3/4H
Carbon dioxide	No data	No data	470,000 ppm/30M
Upper cylinder lubricant	> 15 mg/kg	> 5 mg/kg	No data

Chronic Toxicity:

Component	OSHA Carcinogen	IARC Carcinogen	NTP Carcinogen	Irritant	Sensitizer
Diethyl ether	No	No	No	Unknown	Unknown
Heptane	No	No	No	E (mild) / S (moderate) / R (mild)	No
Carbon dioxide	No	No	No	No	Unknown
Upper cylinder lubricant	No	No	No	Unknown	Unknown

E – Eye S – Skin R - Respiratory

Reproductive Toxicity: No information available
Teratogenicity: No information available
Mutagenicity: No information available
Synergistic Effects: No information available

Section 12: Ecological Information

Ecological studies have not been conducted for this product. The following information is available for components of this product.

Ecotoxicity: Heptane – 24 Hr EC50 Daphnia magna: > 10 mg/L
Persistence / Degradability: No information available
Bioaccumulation / Accumulation: No information available
Mobility in Environment: No information available

Section 13: Disposal Considerations

Waste Classification: The dispensed liquid product is a RCRA hazardous waste for the characteristic of ignitability with a waste code of D001. (See 40 CFR Part 261.20 – 261.33)
Empty aerosol containers may be recycled.

All disposal activities must comply with federal, state, provincial and local regulations. Local regulations may be more stringent than state, provincial or national requirements.

Section 14: Transport Information

US DOT (ground): UN1950, Aerosols, flammable, 2.1, Limited Quantity**

ICAO/IATA (air): UN1950, Aerosols, flammable (engine starting fluid), 2.1

IMO/IMDG (water): UN1950, Aerosols, 2.1, Limited Quantity

Special Provisions: IATA: Forbidden on passenger aircraft
**This product can be classified and labeled as 'Consumer Commodity, ORM-D' for domestic ground shipping until January 1, 2014.
If shipping as limited quantity by ground, note that shipping papers are not required.

Section 15: Regulatory Information

U.S. Federal Regulations:

Toxic Substances Control Act (TSCA):
All ingredients are either listed on the TSCA inventory or are exempt.

Comprehensive Environmental Response, Compensation and Liability Act (CERCLA):
Reportable Quantities (RQ's) exist for the following ingredients: diethyl ether (100 lbs)

Spills or releases resulting in the loss of any ingredient at or above its RQ require immediate notification to the National Response Center (800-424-8802) and to your Local Emergency Planning Committee.

Superfund Amendments Reauthorization Act (SARA) Title III:
Section 302 Extremely Hazardous Substances (EHS): None

Section 311/312 Hazard Categories:		
	Fire Hazard	Yes
	Reactive Hazard	No
	Release of Pressure	Yes
	Acute Health Hazard	Yes
	Chronic Health Hazard	No

Section 313 Toxic Chemicals: This product contains the following substances subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372:
None

Clean Air Act:
Section 112 Hazardous Air Pollutants (HAPs): None

Occupational Safety and Health Administration (OSHA):
This product is regulated under the Hazard Communication Standard.

U.S. State Regulations:

California Safe Drinking Water and Toxic Enforcement Act (Prop 65):
This product may contain the following chemicals known to the state of California to cause cancer, birth defects or other reproductive harm: None

Consumer Products VOC Regulations: This product is not regulated.

State Right to Know:

New Jersey:	60-29-7, 142-82-5
Pennsylvania:	60-29-7, 142-82-5
Massachusetts:	60-29-7, 142-82-5
Rhode Island :	60-29-7, 142-82-5

Canadian Regulations:

Controlled Products Regulations:
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all the information required by the Controlled Products Regulations.

WHMIS Hazard Class: A, B5, D2B

Canadian DSL Inventory: All ingredients are either listed on the DSL Inventory or are exempt.

European Union Regulations:

RoHS Compliance: This product is compliant with Directive 2002/95/EC of the European Parliament and of the Council of 27 January 2003. This product does not contain any of the restricted substances as listed in Article 4(1) of the RoHS Directive.

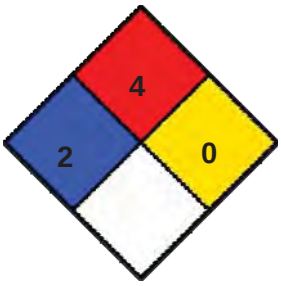
Additional Regulatory Information: None

Section 16: Other Information

HMIS® (II)	
Health:	2
Flammability:	4
Reactivity:	0
PPE:	B

Ratings range from 0 (no hazard) to 4 (severe hazard)

NFPA



Material Safety Data Sheet

Prepared By: Michelle Rudnick
CRC #: 05671
Revision Date: 02/05/2013

Changes since last revision: Section 14: Transport Information

The information contained in this document applies to this specific material as supplied. It may not be valid for this material if it is used in combination with any other materials. This information is accurate to the best of CRC Industries' knowledge or obtained from sources believed by CRC to be accurate. Before using any product, read all warnings and directions on the label. For further clarification of any information contained on this MSDS consult your supervisor, a health & safety professional, or CRC Industries.

ACGIH: American Conference of Governmental Industrial Hygienists
CAS: Chemical Abstract Service
CFR: Code of Federal Regulations
DOT: Department of Transportation
DSL: Domestic Substance List
g/L: grams per Liter
HMIS: Hazardous Materials Identification System
IARC: International Agency for Research on Cancer
IATA: International Air Transport Association
ICAO: International Civil Aviation Organization
IMDG: International Maritime Dangerous Goods
IMO: International Maritime Organization
lbs./gal: pounds per gallon
LC: Lethal Concentration
LD: Lethal Dose
NA: Not Applicable
ND: Not Determined
NIOSH: National Institute of Occupational Safety & Health
NFPA: National Fire Protection Association
NTP: National Toxicology Program
OSHA: Occupational Safety and Health Administration
PMCC: Pensky-Martens Closed Cup
PPE: Personal Protection Equipment
ppm: Parts per Million
RoHS: Restriction of Hazardous Substances
STEL: Short Term Exposure Limit
TCC: Tag Closed Cup
TWA: Time Weighted Average
WHMIS: Workplace Hazardous Materials Information System

Material Safety Data Sheet

1 - Chemical Product and Company Identification

Manufacturer: WD-40 Company **Address: 1061 Cudahy Place (92110)** **P.O. Box 80607** **San Diego, California, USA** **92138 –0607** **Telephone:** **Emergency only: 1-888-324-7596 (PROSAR)** **Information: 1-888-324-7596** **Chemical Spills: 1-800-424-9300 (Chemtrec)** **1-703-527-3887 (International Calls)**	**Chemical Name: Organic Mixture** **Trade Name: WD-40 Aerosol** **Product Use: Lubricant, Penetrant, Drives Out Moisture, Removes and Protects Surfaces From Corrosion** **MSDS Date Of Preparation: 6/8/12**

2 – Hazards Identification

Emergency Overview:
DANGER! Flammable aerosol. Contents under pressure. Harmful or fatal if swallowed. If swallowed, may be aspirated and cause lung damage. May cause eye irritation. Avoid eye contact. Use with adequate ventilation. Keep away from heat, sparks and all other sources of ignition.

Symptoms of Overexposure:
Inhalation: High concentrations may cause nasal and respiratory irritation and central nervous system effects such as headache, dizziness and nausea. Intentional abuse may be harmful or fatal.
Skin Contact: Prolonged and/or repeated contact may produce mild irritation and defatting with possible dermatitis.
Eye Contact: Contact may be irritating to eyes. May cause redness and tearing.
Ingestion: This product has low oral toxicity. Swallowing may cause gastrointestinal irritation, nausea, vomiting and diarrhea. This product is an aspiration hazard. If swallowed, can enter the lungs and may cause chemical pneumonitis, severe lung damage and death.
Chronic Effects: None expected.
Medical Conditions Aggravated by Exposure: Preexisting eye, skin and respiratory conditions may be aggravated by exposure.

Suspected Cancer Agent:
Yes No X

3 - Composition/Information on Ingredients

Ingredient	CAS #	Weight Percent
Aliphatic Hydrocarbon	64742-47-8	45-50
Petroleum Base Oil	64742-58-1 64742-53-6 64742-56-9 64742-65-0	<25
LVP Aliphatic Hydrocarbon	64742-47-8	12-18
Carbon Dioxide	124-38-9	2-3
Non-Hazardous Ingredients	Mixture	<10

4 – First Aid Measures

Ingestion (Swallowed): Aspiration Hazard. DO NOT induce vomiting. Call physician, poison control center or the WD-40 Safety Hotline at 1-888-324-7596 immediately.
Eye Contact: Flush thoroughly with water. Remove contact lenses if present after the first 5 minutes and continue flushing for several more minutes. Get medical attention if irritation persists.
Skin Contact: Wash with soap and water. If irritation develops and persists, get medical attention.

Inhalation (Breathing): If irritation is experienced, move to fresh air. Get medical attention if irritation or other symptoms develop and persist.

5 – Fire Fighting Measures

Extinguishing Media: Use water fog, dry chemical, carbon dioxide or foam. Do not use water jet or flooding amounts of water. Burning product will float on the surface and spread fire.
Special Fire Fighting Procedures: Firefighters should always wear positive pressure self-contained breathing apparatus and full protective clothing. Cool fire-exposed containers with water. Use shielding to protect against bursting containers.
Unusual Fire and Explosion Hazards: Contents under pressure. Keep away from ignition sources and open flames. Exposure of containers to extreme heat and flames can cause them to rupture often with violent force. Vapors are heavier than air and may travel along surfaces to remote ignition sources and flash back.

6 – Accidental Release Measures

Wear appropriate protective clothing (see Section 8). Eliminate all sources of ignition and ventilate area. Leaking cans should be placed in a plastic bag or open pail until the pressure has dissipated. Contain and collect liquid with an inert absorbent and place in a container for disposal. Clean spill area thoroughly. Report spills to authorities as required.

7 – Handling and Storage

Handling: Avoid contact with eyes. Avoid prolonged contact with skin. Avoid breathing vapors or aerosols. Use only with adequate ventilation. Keep away from heat, sparks, pilot lights, hot surfaces and open flames. Unplug electrical tools, motors and appliances before spraying or bringing the can near any source of electricity. Electricity can burn a hole in the can and cause contents to burst into flames. To avoid serious burn injury, do not let the can touch battery terminals, electrical connections on motors or appliances or any other source of electricity. Wash thoroughly with soap and water after handling. Keep containers closed when not in use. Keep out of the reach of children. Do not puncture, crush or incinerate containers, even when empty.
Storage: Store in a cool, well-ventilated area, away from incompatible materials. Do not store above 120°F or in direct sunlight. U.F.C (NFPA 30B) Level 3 Aerosol.

8 – Exposure Controls/Personal Protection

Chemical	Occupational Exposure Limits
Aliphatic Hydrocarbon	1200 mg/m3 TWA (manufacturer recommended)
Petroleum Base Oil	5 mg/m3 TWA, 10 mg/m3 STEL ACGIH TLV 5 mg/m3 TWA OSHA PEL
LVP Aliphatic Hydrocarbon	1200 mg/m3 TWA (manufacturer recommended)
Carbon Dioxide	5000 ppm TWA (OSHA/ACGIH), 30,000 ppm STEL (ACGIH)
Non-Hazardous Ingredients	None Established

The Following Controls are Recommended for Normal Consumer Use of this Product
Engineering Controls: Use in a well-ventilated area.
Personal Protection:
Eye Protection: Avoid eye contact. Always spray away from your face.
Skin Protection: Avoid prolonged skin contact. Chemical resistant gloves recommended for operations where skin contact is likely.
Respiratory Protection: None needed for normal use with adequate ventilation.

For Bulk Processing or Workplace Use the Following Controls are Recommended
Engineering Controls: Use adequate general and local exhaust ventilation to maintain exposure levels below that occupational exposure limits.
Personal Protection:
Eye Protection: Safety goggles recommended where eye contact is possible.

Skin Protection: Wear chemical resistant gloves.
Respiratory Protection: None required if ventilation is adequate. If the occupational exposure limits are exceeded, wear a NIOSH approved respirator. Respirator selection and use should be based on contaminant type, form and concentration. Follow OSHA 1910.134, ANSI Z88.2 and good Industrial Hygiene practice.
Work/Hygiene Practices: Wash with soap and water after handling.

9 – Physical and Chemical Properties

Boiling Point:	361 - 369°F (183 - 187°C)	Specific Gravity:	0.8 – 0.82 @ 60°F
Solubility in Water:	Insoluble	pH:	Not Applicable
Vapor Pressure:	95-115 PSI @ 70°F	Vapor Density:	Greater than 1
Percent Volatile:	70-75%	VOC:	412 grams/liter (49.5%)
Coefficient of Water/Oil Distribution:	Not Determined	Appearance/Odor	Light amber liquid/mild odor
Flash Point:	122°F (49°C) Tag Open Cup (concentrate)	Flammable Limits: (Solvent Portion)	LEL: 0.6% UEL: 8.0%
Pour Point:	-63°C (-81.4°F) ASTM D-97	Kinematic Viscosity:	2.79-2.96cSt @ 100°F

10 – Stability and Reactivity

Stability: Stable
Hazardous Polymerization: Will not occur.
Conditions to Avoid: Avoid heat, sparks, flames and other sources of ignition. Do not puncture or incinerate containers.
Incompatibilities: Strong oxidizing agents.
Hazardous Decomposition Products: Carbon monoxide and carbon dioxide.

11 – Toxicological Information

The oral toxicity of this product is estimated to be greater than 5,000 mg/kg based on an assessment of the ingredients. This product is not classified as toxic by established criteria. It is an aspiration hazard.
None of the components of this product is listed as a carcinogen or suspected carcinogen or is considered a reproductive hazard.

12 – Ecological Information

No data is currently available.

13 - Disposal Considerations

If this product becomes a waste, it would be expected to meet the criteria of a RCRA ignitable hazardous waste (D001). However, it is the responsibility of the generator to determine at the time of disposal the proper classification and method of disposal. Dispose in accordance with federal, state, and local regulations.

14 – Transportation Information_

DOT Surface Shipping Description: Consumer Commodity, ORM-D
After 1/1/2014 UN1950, Aerosols, 2.1 Ltd. Qty (Note: Shipping Papers are not required for Limited Quantities unless transported by air or vessel – each package must be marked with the Limited Quantity Mark)
IMDG Shipping Description: UN1950, Aerosols, 2.1, LTD QTY
ICAO Shipping Description: UN1950, Aerosols, flammable, 2.1 NOTE: WD-40 does not test aerosol cans to assure that they meet the pressure and other requirements for transport by air. We do not recommend that our aerosol products be transported by air.

15 – Regulatory Information

U.S. Federal Regulations:
CERCLA 103 Reportable Quantity: This product is not subject to CERCLA reporting requirements, however, oil spills are reportable to the National Response Center under the Clean Water Act and many states have more stringent release reporting requirements. Report spills required under federal, state and local regulations.
SARA TITLE III:
Hazard Category For Section 311/312: Acute Health, Fire Hazard, Sudden Release of Pressure
Section 313 Toxic Chemicals: This product contains the following chemicals subject to SARA Title III Section 313 Reporting requirements: None
Section 302 Extremely Hazardous Substances (TPQ): None
EPA Toxic Substances Control Act (TSCA) Status: All of the components of this product are listed on the TSCA inventory.
California Safe Drinking Water and Toxic Enforcement Act (Proposition 65): This product does not contain chemicals regulated under California Proposition 65.
VOC Regulations: This product complies with the consumer product VOC limits of CARB, the US EPA and states adopting the OTC VOC rules.
Canadian Environmental Protection Act: One of the components is listed on the NDSL. All of the other ingredients are listed on the Canadian Domestic Substances List or exempt from notification.
Canadian WHMIS Classification: Class B-5 (Flammable Aerosol)
This MSDS has been prepared according to the criteria of the Controlled Products Regulation (CPR) and the MSDS contains all of the information required by the CPR.

16 – Other Information:

HMIS Hazard Rating:
Health – 1 (slight hazard), Fire Hazard – 4 (severe hazard), Reactivity – 0 (minimal hazard)

SIGNATURE:_____ TITLE: Adm. Scientific Manager

REVISION DATE: June 2012 SUPERSEDES: March 2010

Appendix B: USACE Jurisdictional Determination

DEPARTMENT OF THE ARMY
LOS ANGELES DISTRICT CORPS OF ENGINEERS
P.O. BOX 532711
LOS ANGELES, CALIFORNIA 90053-2325

August 21, 2013

REPLY TO
ATTENTION OF
Regulatory Division

Tom Grace
Caithness Soda Mountain, LLC
565 Fifth Avenue, 29th Floor
New York, New York 10017

SUBJECT: Approved Jurisdictional Determination regarding presence/absence of geographic jurisdiction

Dear Mr. Grace:

Reference is made to your request (File No. SPL-2010-01042-SLP) dated January 29, 2013, for an approved Department of the Army jurisdictional determination (JD) for the Soda Mountain Solar Project site, located near the city of Baker, San Bernardino County, California (Figures 1-2 enclosed).

As you may know, the Corps' evaluation process for determining whether or not a Department of the Army permit is needed involves two tests. If both tests are met, then a permit is required. The first test determines whether or not the proposed project is located in a water of the United States (i.e., it is within the Corps' geographic jurisdiction). The second test determines whether or not the proposed project is a regulated activity under Section 10 of the River and Harbor Act or Section 404 of the Clean Water Act. As part of the evaluation process, pertaining to the first test only, we have made the jurisdictional determination below.

Based on available information, we have determined there are no waters of the United States on the project site, in the locations depicted on the enclosed Figure 2. The basis for our determination can be found in the enclosed JD form.

The aquatic resources identified as "unnamed subject drainages within the areas designated as North Array, East Array, South Array, North Wash, East Wash, and South Wash", within the project boundaries on Figure 2, are intrastate isolated waters with no apparent interstate or foreign commerce connection. As such, these waters are not currently regulated by the Corps of Engineers. This disclaimer of jurisdiction is only for Section 404 of the Clean Water Act. Other Federal, State, and local laws may apply to your activities. In particular, you may need authorization from the California State Water Resources Control Board and/or the U.S. Fish and Wildlife Service.

This letter contains an approved jurisdictional determination for the Soda Mountain Solar Project site. If you object to this decision, you may request an administrative appeal under Corps regulations at 33 CFR Part 331. Enclosed you will find a Notification of Appeal Process (NAP) fact sheet (Appendix A) and Request for Appeal (RFA) form. If you request to appeal this decision you must submit a completed RFA form to the Corps South Pacific Division Office at the following address:

Tom Cavanaugh
Administrative Appeal Review Officer,
U.S. Army Corps of Engineers
South Pacific Division, CESPD-PDS-O, 2042B
1455 Market Street, San Francisco, California 94103-1399

In order for an RFA to be accepted by the Corps, the Corps must determine that it is complete, that it meets the criteria for appeal under 33 C.F.R. Part 331.5, and that it has been received by the Division Office within 60 days of the date on the NAP. Should you decide to submit an RFA form, it must be received at the above address by October 20, 2013. It is not necessary to submit an RFA form to the Division office if you do not object to the decision in this letter.

This verification is valid for five years from the date of this letter, unless new information warrants revision of the determination before the expiration date. If you wish to submit new information regarding the approved jurisdictional determination for this site, please submit this information to Shannon Pankratz at the letterhead address by October 20, 2013. The Corps will consider any new information so submitted and respond within 60 days by either revising the prior determination, if appropriate, or reissuing the prior determination. A revised or reissued jurisdictional determination can be appealed as described above.

This determination has been conducted to identify the extent of the Corps' Clean Water Act jurisdiction on the particular project site identified in your request. This determination may not be valid for the wetland conservation provisions of the Food Security Act of 1985. If you or your tenant are USDA program participants, or anticipate participation in USDA programs, you should request a certified wetland determination from the local office of the Natural Resources Conservation Service, prior to starting work.

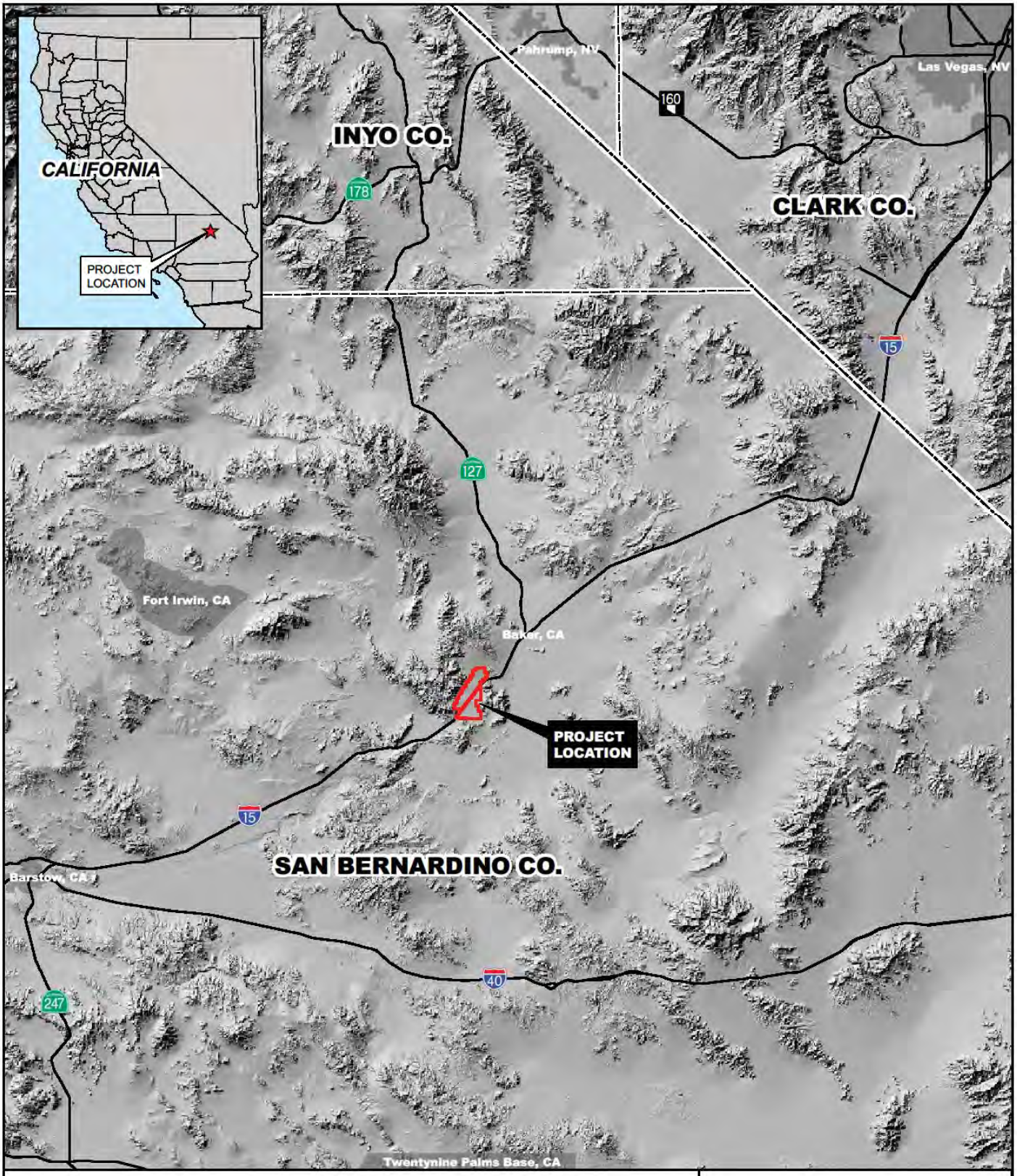
If you have any questions, please contact Shannon Pankratz of my staff at 213-452-3412 or via e-mail at Shannon.L.Pankratz@usace.army.mil.

Please be advised that you can now comment on your experience with Regulatory Division by accessing the Corps web-based customer survey form at: http://per2.nwp.usace.army.mil/survey.html.

Sincerely,

Daniel P. Swenson, D. Env
Chief, L.A. & San Bernardino Section
North Coast Branch
Regulatory Division

Enclosures



N

0 10 20

Miles

FIGURE 1

REGIONAL LOCATION

SODA MOUNTAIN SOLAR PROJECT

Project No.: 29405302

Date: October 2009

URS

APPROVED JURISDICTIONAL DETERMINATION FORM
U.S. Army Corps of Engineers

This form should be completed by following the instructions provided in Section IV of the JD Form Instructional Guidebook.

SECTION I: BACKGROUND INFORMATION

A. REPORT COMPLETION DATE FOR APPROVED JURISDICTIONAL DETERMINATION (JD): June 5, 2013

B. DISTRICT OFFICE, FILE NAME, AND NUMBER: Los Angeles District, Soda Mountain Solar Project, SPL-2010-01042-SLP

C. PROJECT LOCATION AND BACKGROUND INFORMATION:

State: California County/parish/borough: San Bernardino City: near Baker
Center coordinates of site (lat/long in degree decimal format): Lat. 35.156433° N, Long. -116.180909° W.
Name of nearest waterbody: unnamed tributaries to Soda dry lake
Name of nearest Traditional Navigable Water (TNW) into which the aquatic resource flows: N/A
Name of watershed or Hydrologic Unit Code (HUC): Soda dry lake subwatershed

- ☒ Check if map/diagram of review area and/or potential jurisdictional areas is/are available upon request.
- ☐ Check if other sites (e.g., offsite mitigation sites, disposal sites, etc…) are associated with this action and are recorded on a different JD form.

D. REVIEW PERFORMED FOR SITE EVALUATION (CHECK ALL THAT APPLY):

- ☒ Office (Desk) Determination. Date: June 5, 2013
- ☐ Field Determination. Date(s):

SECTION II: SUMMARY OF FINDINGS

A. RHA SECTION 10 DETERMINATION OF JURISDICTION.

There **Are no** "*navigable waters of the U.S.*" within Rivers and Harbors Act (RHA) jurisdiction (as defined by 33 CFR part 329) in the review area. [*Required*]

- ☐ Waters subject to the ebb and flow of the tide.
- ☐ Waters are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce. Explain: .

B. CWA SECTION 404 DETERMINATION OF JURISDICTION.

There **Are no** "*waters of the U.S.*" within Clean Water Act (CWA) jurisdiction (as defined by 33 CFR part 328) in the review area. [*Required*]

1. **Waters of the U.S.**
   a. **Indicate presence of waters of U.S. in review area (check all that apply):**

   - ☐ TNWs, including territorial seas
   - ☐ Wetlands adjacent to TNWs
   - ☐ Relatively permanent waters[1] (RPWs) that flow directly or indirectly into TNWs
   - ☐ Non-RPWs that flow directly or indirectly into TNWs (no adjacent wetlands)
   - ☐ Wetlands directly abutting RPWs that flow directly or indirectly into TNWs
   - ☐ Wetlands adjacent to but not directly abutting RPWs (with a surface connection) that flow directlyor indirectly into TNWs
   - ☐ Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs
   - ☐ Impoundments of jurisdictional waters
   - ☐ Isolated (interstate or intrastate) waters, including isolated wetlands

   b. **Identify (estimate) size of waters of the U.S. in the review area:**
   Non-wetland waters: linear feet: width (ft) and/or acres.
   Wetlands: acres.

   c. **Limits (boundaries) of jurisdiction** based on: **Pick List**
   Elevation of established OHWM (if known): .

2. **Non-regulated waters/wetlands (check if applicable):**[2]
   - ☒ **Potentially jurisdictional waters and/or wetlands were assessed within the review area and determined to be not jurisdictional. Explain:** The subject project drainages (North Array, East Array, South Array, North Wash, East Wash, and South Wash areas) are situated within the Mojave desert, surrounded by the Soda Mountains. Drainage flows in this area extend both northeast (Basin A, consisting of North Array, East Array, North Wash, East Wash) and southeast (Basin B, consisting of South Array, South Wash) into Soda dry lake. The width of the ephemeral washes generally range 16-29 feet in width, with the total linear feet of drainages within the three Array drainage areas ranging 53,858-248,045 linear feet. Acreages of the drainage areas (active floodplain) within the Wash and Arrary areas were more accurately calculated using GIS data and polygons. The subject project drainages flow only in response to storm events, with average regional annual

[1] For purposes of this form, an RPW is defined as a tributary that is not a TNW and that typically flows year-round or has continuous flow at least "seasonally" (e.g., typically 3 months).
[2] Supporting documentation is presented in Section III.F.

precipitation ranging 3-5 inches. Within the project site the OHWM is identified by bed and banks and changes in soil character and vegetation. Onsite total acreage of the Array and Wash area drainages consist of approximately 411 acres. Drainages situated within the Basin B area join approximately 1,200 feet south of the project site, where surface drainage would have to flow approximately 3.7 miles southeast, ending at Soda dry lake. Similarly, flows from the project drainages situated within the Basin A area would have to flow approximately 5 miles northeast, also ending at Soda dry lake. The downstream hydrological terminus of all project drainages is Soda dry lake, an intrastate dry lake.

Soda dry lake is the elevation low point for drainages that fall within the Soda Lake Valley Groundwater Basin. It serves as the terminus for unnamed project drainages, as well as for all other waters within this isolated intermontane area. All surface flows that enter Soda dry lake either primarily evaporate or percolate into the groundwater table. Soda dry lake is located past the terminus of the Mojave River. Currently, there are no published commercial uses of the project drainages surface waters. Published uses for Soda Dry Lake are limited to few non-surface water uses, including (historic) salt mining and hiking. During record rainfall events, rare flows have been document to extend from Soda dry lake further northward to Silver dry lake (intrastate, isolated dry lake with no distributaries). Nonetheless, published uses for Silver Dry Lake are also limited to few non-surface water uses, including (historic) landing strips.

Soda dry lake, as the essential terminus for all project drainages, is NOT a TNW. Moreover, Soda dry lake is NOT an (a)(3) water as defined by 33 CFR 328.3. Soda dry lake does NOT meet criteria (a)(3)(i-iii), as it: i) DOES NOT have use for surface water recreation or other purposes by foreign or interstate travelers, ii) DOES NOT have harvesting activities of fish or shellfish that may be sold in interstate or foreign commerce, and iii) DOES NOT have surface water industrial usage by industries in interstate commerce. Lastly, the subject project drainages are NOT a (a)(3) waters as defined by 33 CFR 328.3. The above is based upon the URS jurisdictional delineation report submitted by Panorama Environmental Inc. (dated November 2009), the URS hydrology study report report submitted by Panorama Environmental Inc. (dated November 2009), additional jurisdictional delineation information submitted by Panorama Environmental Inc. (dated April 2012 and January 2013), the California Groundwater Bulletin 118: Soda Lake Valley Groundwater Basin (last updated February 27, 2004), the *Summary of the Evolution of the Mojave River* (David Miller, USGS 2005), and the review of aerial photographs (Google Earth) that also did not show surface water usage of the project drainages or the dry lake terminus. Therefore, since Soda dry lake is an intrastate isolated water without a surface water connection to commerce, the subject project drainages as part of the same overall watershed system are also isolated and additionally have no nexus to commerce.

Based on the above information, the Corps concludes the unnamed drainages within the six project areas designated as North Array, East Array, South Array, North Wash, East Wash, and South Wash (isolated non-RPWs) are NONJURISDICTIONAL waters of the United States, since the waters are NOT tributary to either a TNW or an (a)(3) water and are NOT (a)(3) waters themselves. The Corps makes such a conclusion since the waters are tributary to an isolated, intrastate dry lake.

SECTION III: CWA ANALYSIS

A. TNWs AND WETLANDS ADJACENT TO TNWs

The agencies will assert jurisdiction over TNWs and wetlands adjacent to TNWs. If the aquatic resource is a TNW, complete Section III.A.1 and Section III.D.1. only; if the aquatic resource is a wetland adjacent to a TNW, complete Sections III.A.1 and 2 and Section III.D.1.; otherwise, see Section III.B below.

1. **TNW**
   Identify TNW: .

   Summarize rationale supporting determination: .

2. **Wetland adjacent to TNW**
   Summarize rationale supporting conclusion that wetland is "adjacent": .

B. CHARACTERISTICS OF TRIBUTARY (THAT IS NOT A TNW) AND ITS ADJACENT WETLANDS (IF ANY):

This section summarizes information regarding characteristics of the tributary and its adjacent wetlands, if any, and it helps determine whether or not the standards for jurisdiction established under *Rapanos* have been met.

The agencies will assert jurisdiction over non-navigable tributaries of TNWs where the tributaries are "relatively permanent waters" (RPWs), i.e. tributaries that typically flow year-round or have continuous flow at least seasonally (e.g., typically 3 months). A wetland that directly abuts an RPW is also jurisdictional. If the aquatic resource is not a TNW, but has year-round (perennial) flow, skip to Section III.D.2. If the aquatic resource is a wetland directly abutting a tributary with perennial flow, skip to Section III.D.4.

A wetland that is adjacent to but that does not directly abut an RPW requires a significant nexus evaluation. Corps districts and EPA regions will include in the record any available information that documents the existence of a significant nexus between a relatively permanent tributary that is not perennial (and its adjacent wetlands if any) and a traditional navigable water, even though a significant nexus finding is not required as a matter of law.

If the waterbody[3] is not an RPW, or a wetland directly abutting an RPW, a JD will require additional data to determine if the waterbody has a significant nexus with a TNW. If the tributary has adjacent wetlands, the significant nexus evaluation must consider the tributary in combination with all of its adjacent wetlands. This significant nexus evaluation that combines, for analytical purposes, the tributary and all of its adjacent wetlands is used whether the review area identified in the JD request is the tributary, or its adjacent wetlands, or both. If the JD covers a tributary with adjacent wetlands, complete Section III.B.1 for the tributary, Section III.B.2 for any onsite wetlands, and Section III.B.3 for all wetlands adjacent to that tributary, both onsite and offsite. The determination whether a significant nexus exists is determined in Section III.C below.

1. **Characteristics of non-TNWs that flow directly or indirectly into TNW**

   (i) General Area Conditions:
   Watershed size: **Pick List**
   Drainage area: **Pick List**
   Average annual rainfall: inches
   Average annual snowfall: inches

   (ii) Physical Characteristics:
   (a) Relationship with TNW:
   ☐ Tributary flows directly into TNW.
   ☐ Tributary flows through **Pick List** tributaries before entering TNW.

   Project waters are **Pick List** river miles from TNW.
   Project waters are **Pick List** river miles from RPW.
   Project waters are **Pick List** aerial (straight) miles from TNW.
   Project waters are **Pick List** aerial (straight) miles from RPW.

[3] Note that the Instructional Guidebook contains additional information regarding swales, ditches, washes, and erosional features generally and in the arid West.

Project waters cross or serve as state boundaries. Explain: .

Identify flow route to TNW[4]: .
Tributary stream order, if known: .

(b) General Tributary Characteristics (check all that apply):
Tributary is: ☐ Natural
☐ Artificial (man-made). Explain: .
☐ Manipulated (man-altered). Explain: .

Tributary properties with respect to top of bank (estimate):
Average width: feet
Average depth: feet
Average side slopes: **Pick List.**

Primary tributary substrate composition (check all that apply):
☐ Silts ☐ Sands ☐ Concrete
☐ Cobbles ☐ Gravel ☐ Muck
☐ Bedrock ☐ Vegetation. Type/% cover:
☐ Other. Explain: .

Tributary condition/stability [e.g., highly eroding, sloughing banks]. Explain: .
Presence of run/riffle/pool complexes. Explain: .
Tributary geometry: **Pick List**
Tributary gradient (approximate average slope): %

(c) Flow:
Tributary provides for: **Pick List**
Estimate average number of flow events in review area/year: **Pick List**
Describe flow regime: .
Other information on duration and volume: .

Surface flow is: **Pick List.** Characteristics: .

Subsurface flow: **Pick List**. Explain findings: .
☐ Dye (or other) test performed: .

Tributary has (check all that apply):
☐ Bed and banks
☐ OHWM[5] (check all indicators that apply):
☐ clear, natural line impressed on the bank
☐ changes in the character of soil
☐ shelving
☐ vegetation matted down, bent, or absent
☐ leaf litter disturbed or washed away
☐ sediment deposition
☐ water staining
☐ other (list):
☐ the presence of litter and debris
☐ destruction of terrestrial vegetation
☐ the presence of wrack line
☐ sediment sorting
☐ scour
☐ multiple observed or predicted flow events
☐ abrupt change in plant community
☐ Discontinuous OHWM.[6] Explain: .

If factors other than the OHWM were used to determine lateral extent of CWA jurisdiction (check all that apply):
☐ High Tide Line indicated by:
☐ oil or scum line along shore objects
☐ fine shell or debris deposits (foreshore)
☐ physical markings/characteristics
☐ tidal gauges
☐ other (list):
☐ Mean High Water Mark indicated by:
☐ survey to available datum;
☐ physical markings;
☐ vegetation lines/changes in vegetation types.

(iii) Chemical Characteristics:

[4] Flow route can be described by identifying, e.g., tributary a, which flows through the review area, to flow into tributary b, which then flows into TNW.
[5] A natural or man-made discontinuity in the OHWM does not necessarily sever jurisdiction (e.g., where the stream temporarily flows underground, or where the OHWM has been removed by development or agricultural practices). Where there is a break in the OHWM that is unrelated to the waterbody's flow regime (e.g., flow over a rock outcrop or through a culvert), the agencies will look for indicators of flow above and below the break.
[6] Ibid.

Characterize tributary (e.g., water color is clear, discolored, oily film; water quality; general watershed characteristics, etc.).
Explain: .
Identify specific pollutants, if known: .

(iv) Biological Characteristics. Channel supports (check all that apply):

☐ Riparian corridor. Characteristics (type, average width): .
☐ Wetland fringe. Characteristics: .
☐ Habitat for:
  ☐ Federally Listed species. Explain findings: .
  ☐ Fish/spawn areas. Explain findings: .
  ☐ Other environmentally-sensitive species. Explain findings: .
  ☐ Aquatic/wildlife diversity. Explain findings: .

2. Characteristics of wetlands adjacent to non-TNW that flow directly or indirectly into TNW

(i) Physical Characteristics:

(a) General Wetland Characteristics:
Properties:
Wetland size: acres
Wetland type. Explain: .
Wetland quality. Explain: .
Project wetlands cross or serve as state boundaries. Explain: .

(b) General Flow Relationship with Non-TNW:
Flow is: **Pick List**. Explain: .

Surface flow is**: Pick List**
Characteristics: .

Subsurface flow: **Pick List**. Explain findings: .
☐ Dye (or other) test performed: .

(c) Wetland Adjacency Determination with Non-TNW:
☐ Directly abutting
☐ Not directly abutting
  ☐ Discrete wetland hydrologic connection. Explain: .
  ☐ Ecological connection. Explain: .
  ☐ Separated by berm/barrier. Explain: .

(d) Proximity (Relationship) to TNW
Project wetlands are **Pick List** river miles from TNW.
Project waters are **Pick List** aerial (straight) miles from TNW.
Flow is from: **Pick List.**
Estimate approximate location of wetland as within the **Pick List** floodplain.

(ii) Chemical Characteristics:

Characterize wetland system (e.g., water color is clear, brown, oil film on surface; water quality; general watershed characteristics; etc.). Explain: .
Identify specific pollutants, if known: .

(iii) Biological Characteristics. Wetland supports (check all that apply):

☐ Riparian buffer. Characteristics (type, average width): .
☐ Vegetation type/percent cover. Explain: .
☐ Habitat for:
  ☐ Federally Listed species. Explain findings: .
  ☐ Fish/spawn areas. Explain findings: .
  ☐ Other environmentally-sensitive species. Explain findings: .
  ☐ Aquatic/wildlife diversity. Explain findings: .

3. Characteristics of all wetlands adjacent to the tributary (if any)

All wetland(s) being considered in the cumulative analysis: **Pick List**
Approximately ( ) acres in total are being considered in the cumulative analysis.

For each wetland, specify the following:

Directly abuts? (Y/N)	Size (in acres)	Directly abuts? (Y/N)	Size (in acres)

Summarize overall biological, chemical and physical functions being performed: .

C. SIGNIFICANT NEXUS DETERMINATION

A significant nexus analysis will assess the flow characteristics and functions of the tributary itself and the functions performed by any wetlands adjacent to the tributary to determine if they significantly affect the chemical, physical, and biological integrity of a TNW. For each of the following situations, a significant nexus exists if the tributary, in combination with all of its adjacent wetlands, has more than a speculative or insubstantial effect on the chemical, physical and/or biological integrity of a TNW. Considerations when evaluating significant nexus include, but are not limited to the volume, duration, and frequency of the flow of water in the tributary and its proximity to a TNW, and the functions performed by the tributary and all its adjacent wetlands. It is not appropriate to determine significant nexus based solely on any specific threshold of distance (e.g. between a tributary and its adjacent wetland or between a tributary and the TNW). Similarly, the fact an adjacent wetland lies within or outside of a floodplain is not solely determinative of significant nexus.

Draw connections between the features documented and the effects on the TNW, as identified in the *Rapanos* Guidance and discussed in the Instructional Guidebook. Factors to consider include, for example:

- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to carry pollutants or flood waters to TNWs, or to reduce the amount of pollutants or flood waters reaching a TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), provide habitat and lifecycle support functions for fish and other species, such as feeding, nesting, spawning, or rearing young for species that are present in the TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to transfer nutrients and organic carbon that support downstream foodwebs?
- Does the tributary, in combination with its adjacent wetlands (if any), have other relationships to the physical, chemical, or biological integrity of the TNW?

Note: the above list of considerations is not inclusive and other functions observed or known to occur should be documented below:

1. **Significant nexus findings for non-RPW that has no adjacent wetlands and flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary itself, then go to Section III.D: .

2. **Significant nexus findings for non-RPW and its adjacent wetlands, where the non-RPW flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: .

3. **Significant nexus findings for wetlands adjacent to an RPW but that do not directly abut the RPW.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: .

D. DETERMINATIONS OF JURISDICTIONAL FINDINGS. THE SUBJECT WATERS/WETLANDS ARE (CHECK ALL THAT APPLY):

1. **TNWs and Adjacent Wetlands.** Check all that apply and provide size estimates in review area:
   ☐ TNWs: linear feet width (ft), Or, acres.
   ☐ Wetlands adjacent to TNWs: acres.

2. **RPWs that flow directly or indirectly into TNWs.**
   ☐ Tributaries of TNWs where tributaries typically flow year-round are jurisdictional. Provide data and rationale indicating that tributary is perennial: .
   ☐ Tributaries of TNW where tributaries have continuous flow "seasonally" (e.g., typically three months each year) are jurisdictional. Data supporting this conclusion is provided at Section III.B. Provide rationale indicating that tributary flows seasonally

   Provide estimates for jurisdictional waters in the review area (check all that apply):
   ☐ Tributary waters: linear feet width (ft).
   ☐ Other non-wetland waters: acres.
   Identify type(s) of waters: .

3. **Non-RPWs[7] that flow directly or indirectly into TNWs.**
   ☐ Waterbody that is not a TNW or an RPW, but flows directly or indirectly into a TNW, and it has a significant nexus with a TNW is jurisdictional. Data supporting this conclusion is provided at Section III.C.

   Provide estimates for jurisdictional waters within the review area (check all that apply):
   ☐ Tributary waters: linear feet width (ft).
   ☐ Other non-wetland waters: acres.
   Identify type(s) of waters: .

4. **Wetlands directly abutting an RPW that flow directly or indirectly into TNWs.**
   ☐ Wetlands directly abut RPW and thus are jurisdictional as adjacent wetlands.
   ☐ Wetlands directly abutting an RPW where tributaries typically flow year-round. Provide data and rationale indicating that tributary is perennial in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: .

   ☐ Wetlands directly abutting an RPW where tributaries typically flow "seasonally." Provide data indicating that tributary is seasonal in Section III.B and rationale in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW:

   Provide acreage estimates for jurisdictional wetlands in the review area: acres.

5. **Wetlands adjacent to but not directly abutting an RPW that flow directly or indirectly into TNWs.**
   ☐ Wetlands that do not directly abut an RPW, but when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisidictional. Data supporting this conclusion is provided at Section III.C.

   Provide acreage estimates for jurisdictional wetlands in the review area: acres.

6. **Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs.**
   ☐ Wetlands adjacent to such waters, and have when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisdictional. Data supporting this conclusion is provided at Section III.C.

   Provide estimates for jurisdictional wetlands in the review area: acres.

7. **Impoundments of jurisdictional waters.[8]**
   As a general rule, the impoundment of a jurisdictional tributary remains jurisdictional.
   ☐ Demonstrate that impoundment was created from "waters of the U.S.," or
   ☐ Demonstrate that water meets the criteria for one of the categories presented above (1-6), or
   ☐ Demonstrate that water is isolated with a nexus to commerce (see E below).

E. ISOLATED [INTERSTATE OR INTRA-STATE] WATERS, INCLUDING ISOLATED WETLANDS, THE USE, DEGRADATION OR DESTRUCTION OF WHICH COULD AFFECT INTERSTATE COMMERCE, INCLUDING ANY SUCH WATERS (CHECK ALL THAT APPLY):[9]

☐ which are or could be used by interstate or foreign travelers for recreational or other purposes.
☐ from which fish or shellfish are or could be taken and sold in interstate or foreign commerce.
☐ which are or could be used for industrial purposes by industries in interstate commerce.
☐ Interstate isolated waters. Explain: .
☐ Other factors. Explain: .

Identify water body and summarize rationale supporting determination: .

Provide estimates for jurisdictional waters in the review area (check all that apply):
☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: .

---

[7] See Footnote # 3.
[8] To complete the analysis refer to the key in Section III.D.6 of the Instructional Guidebook.
[9] **Prior to asserting or declining CWA jurisdiction based solely on this category, Corps Districts will elevate the action to Corps and EPA HQ for review consistent with the process described in the Corps/EPA *Memorandum Regarding CWA Act Jurisdiction Following Rapanos.***

☐ Wetlands: acres.

F. NON-JURISDICTIONAL WATERS, INCLUDING WETLANDS (CHECK ALL THAT APPLY):

☐ If potential wetlands were assessed within the review area, these areas did not meet the criteria in the 1987 Corps of Engineers Wetland Delineation Manual and/or appropriate Regional Supplements.

☒ Review area included isolated waters with no substantial nexus to interstate (or foreign) commerce.

- ☐ Prior to the Jan 2001 Supreme Court decision in "*SWANCC*," the review area would have been regulated based solely on the "Migratory Bird Rule" (MBR).

☐ Waters do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction. Explain: .

☐ Other: (explain, if not covered above): .

Provide acreage estimates for non-jurisdictional waters in the review area, where the sole potential basis of jurisdiction is the MBR factors (i.e., presence of migratory birds, presence of endangered species, use of water for irrigated agriculture), using best professional judgment (check all that apply):

☐ Non-wetland waters (i.e., rivers, streams): linear feet width (ft).
☐ Lakes/ponds: acres.
☐ Other non-wetland waters: acres. List type of aquatic resource: .
☐ Wetlands: acres.

Provide acreage estimates for non-jurisdictional waters in the review area that do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction (check all that apply):

☐ Non-wetland waters (i.e., rivers, streams): linear feet, width (ft).
☐ Lakes/ponds: acres.
☐ Other non-wetland waters: acres. List type of aquatic resource: .
☐ Wetlands: acres.

SECTION IV: DATA SOURCES.

A. SUPPORTING DATA. Data reviewed for JD (check all that apply - checked items shall be included in case file and, where checked and requested, appropriately reference sources below):

☒ Maps, plans, plots or plat submitted by or on behalf of the applicant/consultant: URS jurisdictional delineation report submitted by Panorama Environmental Inc. (dated November 2009); URS hydrology study report report submitted by Panorama Environmental Inc. (dated November 2009); additional jurisdictional delineation information submitted by Panorama Environmental Inc. (dated April 2012 and January 2013)

☐ Data sheets prepared/submitted by or on behalf of the applicant/consultant.
- ☐ Office concurs with data sheets/delineation report.
- ☐ Office does not concur with data sheets/delineation report.

☐ Data sheets prepared by the Corps: .
☐ Corps navigable waters' study: .
☐ U.S. Geological Survey Hydrologic Atlas: .
- ☐ USGS NHD data.
- ☐ USGS 8 and 12 digit HUC maps.

☒ U.S. Geological Survey map(s). Cite scale & quad name: .
☐ USDA Natural Resources Conservation Service Soil Survey. Citation: .
☐ National wetlands inventory map(s). Cite name: .
☐ State/Local wetland inventory map(s): .
☐ FEMA/FIRM maps: .
☐ 100-year Floodplain Elevation is: (National Geodectic Vertical Datum of 1929)
☒ Photographs: ☒ Aerial (Name & Date): .
or ☒ Other (Name & Date): .
☒ Previous determination(s). File no. and date of response letter: SPL-200600242-WJC, dated 2/9/2006.
☐ Applicable/supporting case law: .
☐ Applicable/supporting scientific literature: .
☒ Other information (please specify): California Groundwater Bulletin 118: Soda Lake Valley Groundwater Basin (last updated February 27, 2004), the *Summary of the Evolution of the Mojave River* (David Miller, USGS 2005), and the review of aerial photographs (Google Earth)

B. ADDITIONAL COMMENTS TO SUPPORT JD:

Regional Site Map: SPL-2010-01042-SLP

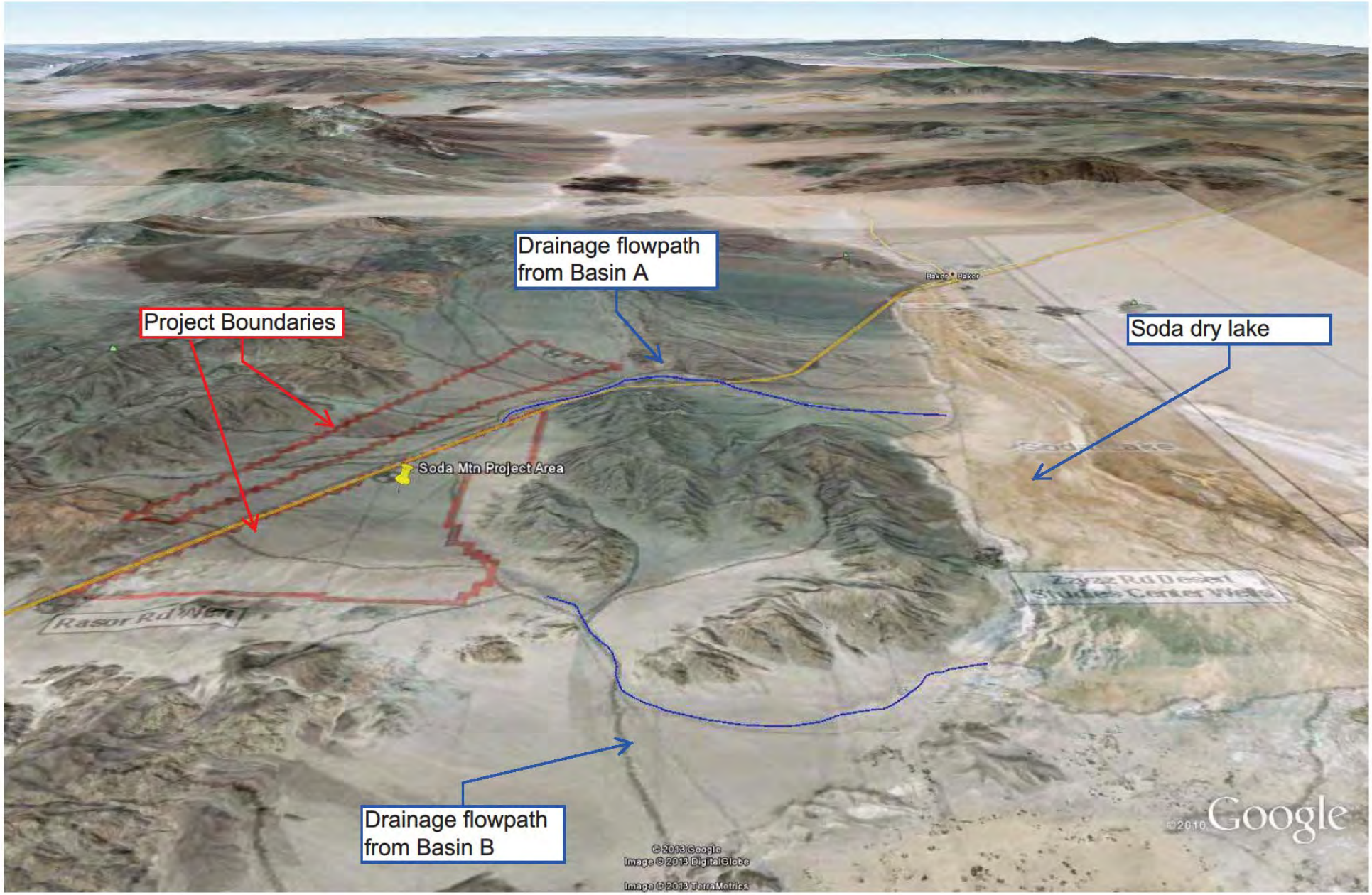


Figure 2

NOTIFICATION OF ADMINISTRATIVE APPEAL OPTIONS AND PROCESS AND REQUEST FOR APPEAL

Applicant: Caithness Soda Mountain LCC, Tom Grace	File Number: SPL-2010-01042-SLP	Date: 8/21/2013
Attached is:		See Section below

	INITIAL PROFFERED PERMIT (Standard Permit or Letter of permission)	A
	PROFFERED PERMIT (Standard Permit or Letter of permission)	B
	PERMIT DENIAL	C
X	APPROVED JURISDICTIONAL DETERMINATION	D
	PRELIMINARY JURISDICTIONAL DETERMINATION	E

SECTION I - The following identifies your rights and options regarding an administrative appeal of the above decision. Additional information may be found at http://www.usace.army.mil/cecw/pages/reg_materials.aspx or Corps regulations at 33 CFR Part 331.

A: INITIAL PROFFERED PERMIT: You may accept or object to the permit.

- ACCEPT: If you received a Standard Permit, you may sign the permit document and return it to the district engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.
- OBJECT: If you object to the permit (Standard or LOP) because of certain terms and conditions therein, you may request that the permit be modified accordingly. You must complete Section II of this form and return the form to the district engineer. Your objections must be received by the district engineer within 60 days of the date of this notice, or you will forfeit your right to appeal the permit in the future. Upon receipt of your letter, the district engineer will evaluate your objections and may: (a) modify the permit to address all of your concerns, (b) modify the permit to address some of your objections, or (c) not modify the permit having determined that the permit should be issued as previously written. After evaluating your objections, the district engineer will send you a proffered permit for your reconsideration, as indicated in Section B below.

B: PROFFERED PERMIT: You may accept or appeal the permit

- ACCEPT: If you received a Standard Permit, you may sign the permit document and return it to the district engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.
- APPEAL: If you choose to decline the proffered permit (Standard or LOP) because of certain terms and conditions therein, you may appeal the declined permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

C: PERMIT DENIAL: You may appeal the denial of a permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

D: APPROVED JURISDICTIONAL DETERMINATION: You may accept or appeal the approved JD or provide new information.

- ACCEPT: You do not need to notify the Corps to accept an approved JD. Failure to notify the Corps within 60 days of the date of this notice, means that you accept the approved JD in its entirety, and waive all rights to appeal the approved JD.
- APPEAL: If you disagree with the approved JD, you may appeal the approved JD under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

E: PRELIMINARY JURISDICTIONAL DETERMINATION: You do not need to respond to the Corps regarding the preliminary JD. The Preliminary JD is not appealable. If you wish, you may request an approved JD (which may be appealed), by contacting the Corps district for further instruction. Also you may provide new information for further consideration by the Corps to reevaluate the JD.

SECTION II - REQUEST FOR APPEAL or OBJECTIONS TO AN INITIAL PROFFERED PERMIT

REASONS FOR APPEAL OR OBJECTIONS: (Describe your reasons for appealing the decision or your objections to an initial proffered permit in clear concise statements. You may attach additional information to this form to clarify where your reasons or objections are addressed in the administrative record.)

ADDITIONAL INFORMATION: The appeal is limited to a review of the administrative record, the Corps memorandum for the record of the appeal conference or meeting, and any supplemental information that the review officer has determined is needed to clarify the administrative record. Neither the appellant nor the Corps may add new information or analyses to the record. However, you may provide additional information to clarify the location of information that is already in the administrative record.

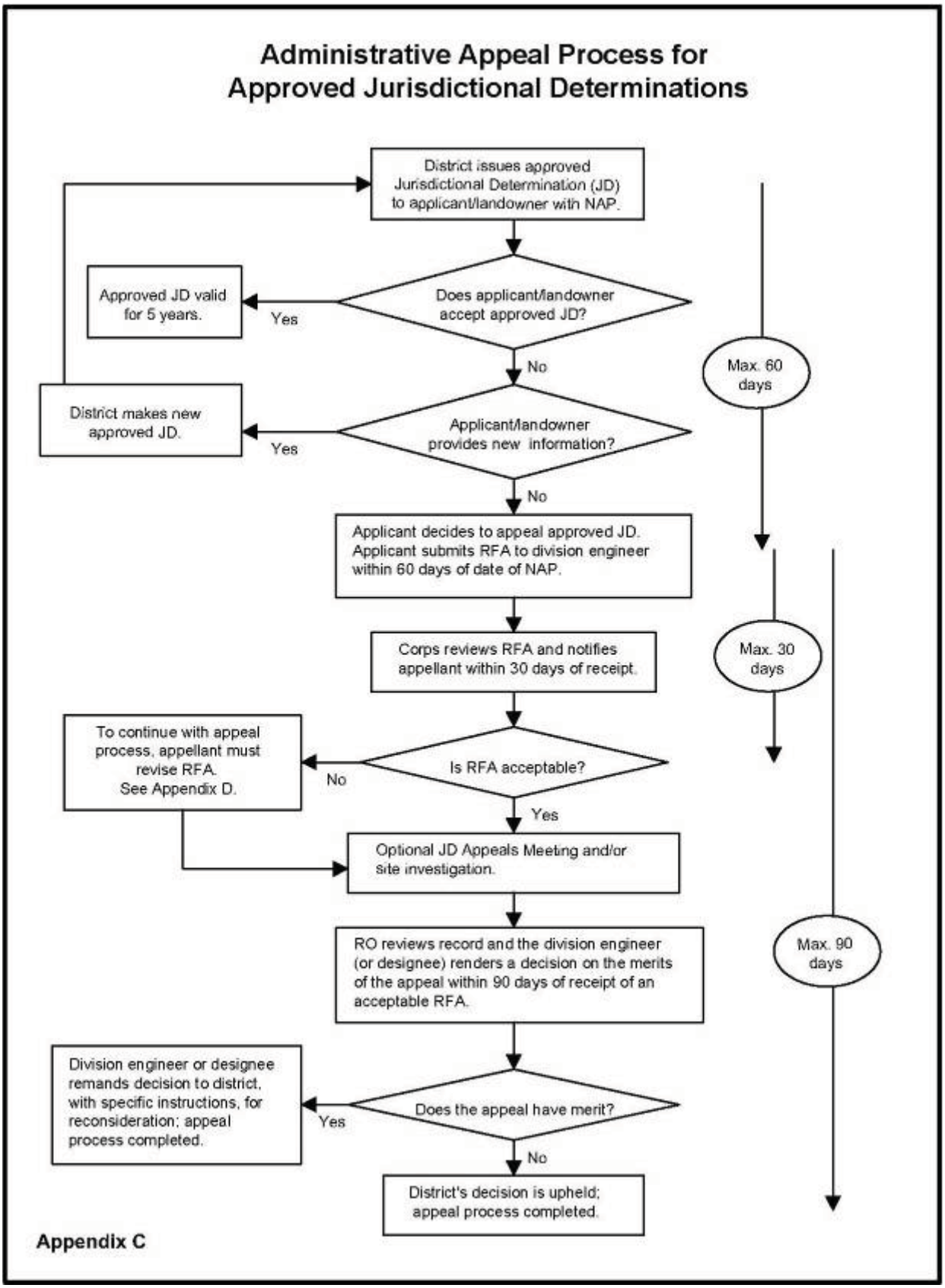
POINT OF CONTACT FOR QUESTIONS OR INFORMATION:

If you have questions regarding this decision and/or the appeal process you may contact:	If you only have questions regarding the appeal process you may also contact:
Shannon Pankratz U.S. Army Corps of Engineers Regulatory Division 915 Wilshire Boulevard Los Angeles, California 90017 213.452.3412 Shannon.l.pankratz@usace.army.mil	Thomas J. Cavanaugh Administrative Appeal Review Officer, U.S. Army Corps of Engineers South Pacific Division 1455 Market Street, 2052B San Francisco, California 94103-1399 Phone: (415) 503-6574 Fax: (415) 503-6646 Email: thomas.j.cavanaugh@usace.army.mil

RIGHT OF ENTRY: Your signature below grants the right of entry to Corps of Engineers personnel, and any government consultants, to conduct investigations of the project site during the course of the appeal process. You will be provided a 15 day notice of any site investigation, and will have the opportunity to participate in all site investigations.

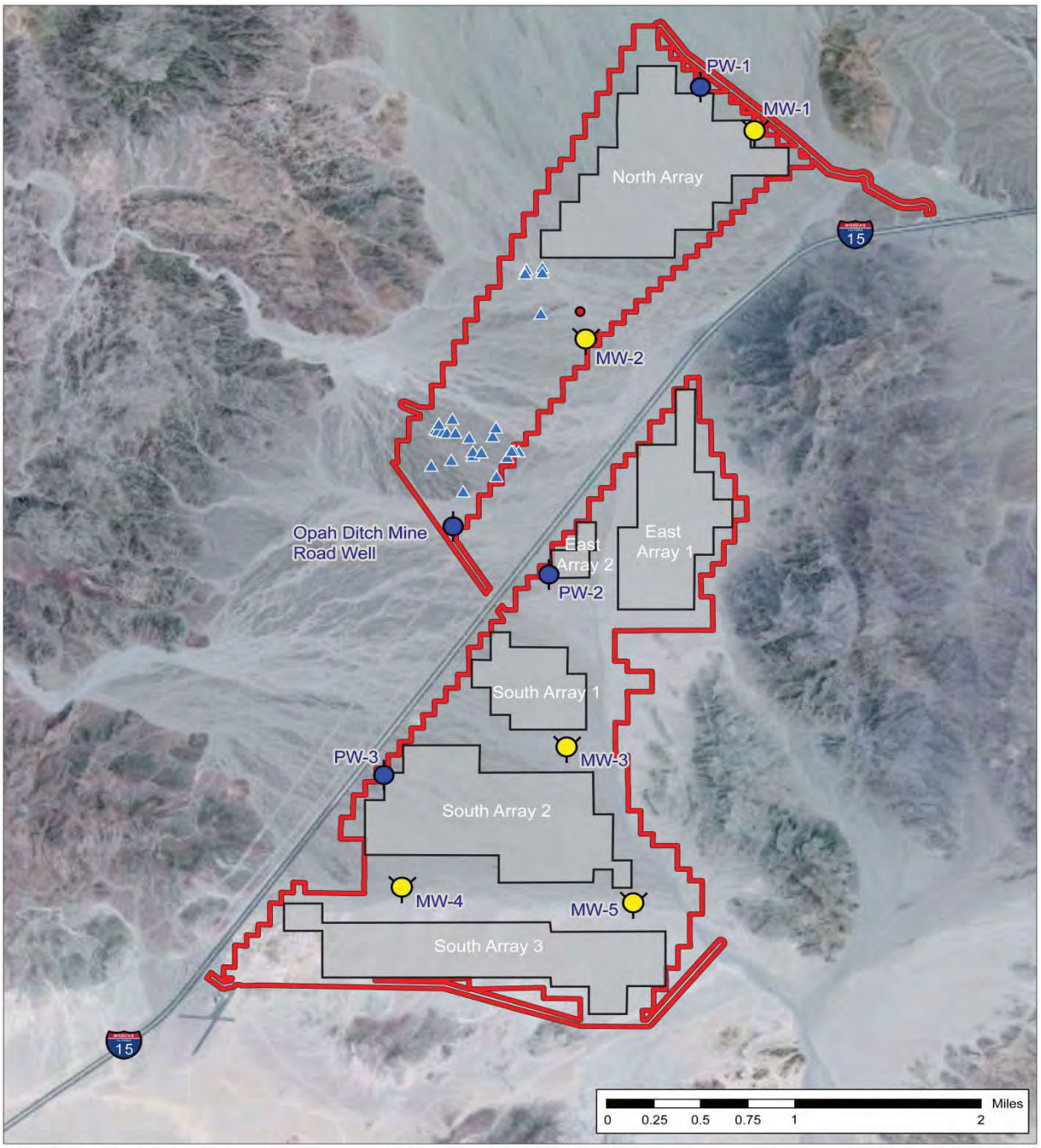
_____ Signature of appellant or agent.	Date:	Telephone number:

SPD version revised December 17, 2010


Administrative Appeal Process for
Approved Jurisdictional Determinations
District issues approved Jurisdictional Determination (JD) to applicant/landowner with NAP.
Does applicant/landowner accept approved JD?
Yes
Approved JD valid for 5 years.
No
Applicant/landowner provides new information?
Yes
District makes new approved JD.
No
Applicant decides to appeal approved JD. Applicant submits RFA to division engineer within 60 days of date of NAP.
Max. 60 days
Corps reviews RFA and notifies appellant within 30 days of receipt.
Max. 30 days
Is RFA acceptable?
No
To continue with appeal process, appellant must revise RFA. See Appendix D.
Yes
Optional JD Appeals Meeting and/or site investigation.
RO reviews record and the division engineer (or designee) renders a decision on the merits of the appeal within 90 days of receipt of an acceptable RFA.
Max. 90 days
Does the appeal have merit?
Yes
Division engineer or designee remands decision to district, with specific instructions, for reconsideration; appeal process completed.
No
District's decision is upheld; appeal process completed.
Appendix C

Appendix C: Biological Resources in the Project Area

Figure C-1: Special-status Plant Locations



SOURCE: C.S. Ecological Surveys and Assessments 2012 and 2013, URS 2009, ESRI 2012, and Panorama Environmental, Inc. 2014 Scale: 1:55,000

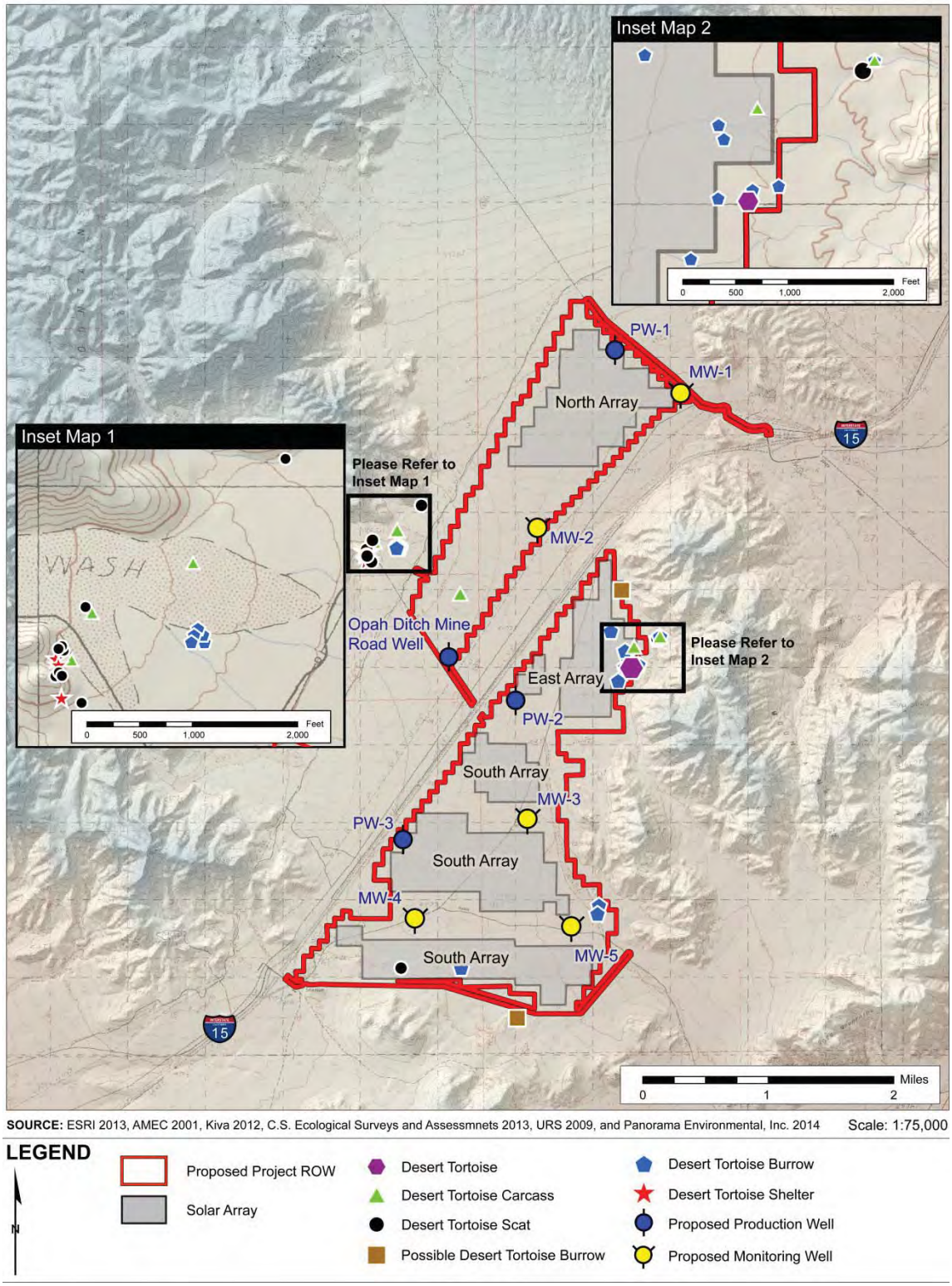
LEGEND

- Proposed Project ROW
- Solar Array
- Emory's Crucifixion-thorn
- Utah Vine Milkweed

PANORAMA ENVIRONMENTAL, INC.

Source: Panorama Environmental, Inc. 2013

Figure C-2: Desert Tortoise Spring 2013 Survey Points



Source: Kiva Biological Consulting 2013

Appendix D: Invasive Species Control Strategies

INVASIVE SPECIES CONTROL PREVENTATIVE MEASURES

Overview of Preventative Measures

Preventing invasive plants from colonizing new areas is far more cost-effective than eradication and control (Davies and Sheley 2007). Preventative measures taken to curb the spread of weed propagules and inhibit their germination should, therefore, include all the measures listed in Appendix A, Table B-1, "Preventative Measures," or the BLM Field Office's best management practices (BMPs) for weed control.

Preventative measures during construction would include:

- Worker environmental training
- Wash stations
- Removal and disposal of weed seed and pieces from worker clothing and equipment
- Infestation containment and control
- Site soil management
- Weed-free products and seed
- Site reclamation

Worker Environmental Training

Mandatory site environmental training for contractors or related personnel entering the site during construction will include weed management awareness training. Personnel affected will include contractors, subcontractors, inspection personnel, construction managers, construction personnel, and individuals bringing vehicles or equipment onto the site. Training will include weed identification and training on the impacts of weeds on agriculture, livestock, wildlife, desert ecosystems, and fire hazard. Impacts of weeds on native vegetation, wildlife, and fire activity will be discussed including an explanation of how invasive grasses provide a fine fuel understory that can spread fire from shrub to shrub and how this has historically been absent in the native desert ecosystem. Proposed measures to prevent the spread of weeds in areas currently not infested and controls on their proliferation when already present will also be explained.

Wash Stations

A wash station will be set up to remove mud and dirt from construction vehicles. This will aid in preventing the spread of weed seeds into new habitats, as trucks with mud and dirt containing seeds or propagules are one of the most common ways weeds are spread to new

environments. Non-construction vehicles not travelling outside paved parking areas will not be required to stop at wash stations.

Vehicles or heavy equipment will be required to remove caked-on mud and debris before entering the site. Vehicles entering from off-site locations will be required to stop for cleaning. Heavy equipment entering the site on trailers will also require cleaning. The wash-down will concentrate on tracks, feet, or tires and on the undercarriage, with special emphasis on axles, frame, cross members, motor mounts, and on and underneath steps, running boards, and front bumper/brush guard assemblies. The contractor will ensure that vehicles and equipment are free of soil and debris capable of transporting weed seeds, roots, or rhizomes before the vehicles and equipment are allowed to use access roads. Vehicle cabs will be swept out and refuse will be disposed of in covered waste receptacles. Vehicles will be reasonably dry (i.e., runoff water has slowed substantially) before leaving the wash station.

Sediment accumulated from the washing will be shoveled out daily and placed in a sealed container for disposal in an approved landfill. If removed materials exceed the capability of the wash stations, equipment will be washed elsewhere before being allowed on the site.

When vehicles and equipment are washed, a log will be kept stating the location, date and time, serial number and type of equipment, and methods used. The crewmember that washed the vehicle will sign the log. Written logs will be included in the monitoring reports.

Wash stations will be located to avoid sensitive biological resources, and will be constructed with either a concrete wash pad or a gravel pad. Silt fencing, weed-free certified hay bales, preferably of rice straw, or other means of trapping wash water sediment and seeds will be installed around the perimeter of wash stations.

Worker Clothing, Personal Effects, and Equipment

Project workers will also inspect, remove, and dispose of weed seed and plant parts found on their clothing, personal effects, and equipment. These items will be bagged and disposed of in a dumpster for deposit in an approved landfill.

Infestation Containment and Control

Areas of concern will be identified and flagged in the field by biological monitors prior to construction. Flags will remain in place during construction. The flagging will alert construction personnel that weeds are present and access into these areas will be prevented until weed management control measures have been implemented. Contractors will avoid or minimize travel through these weed-infested areas. Control measures will be implemented immediately as described in the sections below. The contractor will begin project operations in weed-free areas whenever feasible before operating in weed-infested areas. Project work in weed-infested areas will not begin until the ECA has assessed the effectiveness of weed treatments within weed-infested areas such that viable weed material is not present at the infested area.

Site Soil Management

The contractor will limit the size of ground disturbance to the minimum necessary to perform the activity safely and as designed. The contractor will also avoid creating soil conditions that promote weed germination and establishment to the greatest extent practicable. Soil conditions that promote weed germination and establishment include soil excavation/disturbance, vegetation removal, soil compaction, loss or removal of topsoil, introduction of chemical compounds, including fertilizer, and soil stockpiling.

During grading or excavation activities, the contractor will minimize transporting soil within the site to limit the potential spread of weed seeds on site. In areas where weed infestations are identified, the contractor will stockpile cleared vegetation and salvaged topsoil adjacent to the area from which they are stripped to eliminate the transport of soil-borne weed seeds, roots, or rhizomes. Such stockpiles will be covered with plastic or sprayed regularly with a dust suppressant to reduce the risk of airborne spread of weed seed and propagules.

Weed-free Products and Seed

Straw or hay bales used for sediment barrier installations, gravel mulch, and soil may carry weed seeds. The contractor will ensure that straw or hay bales used for sediment barrier installations are obtained from certified sources that are free of weed seeds. Rice straw, which contains fewer weed species adapted to desert conditions, should be used when possible for erosion control.

Gravel, mulch, and soil will be obtained from suppliers who can certify these materials are weed-free. To the greatest extent feasible, mulch will be generated from native vegetation cleared from the site. At no time will soil be imported onto the site.

Seed purchased from commercial vendors for site revegetation will be labeled in compliance with the relevant provisions of the California Agriculture Code (CDFA 2010). In addition to having the correct label, the seed should be required to be free of weeds and the label should so state.

Site Reclamation

Should the well site be closed, SMS would adhere to the Decommissioning and Site Reclamation Plan. Measures would be followed to reduce the extent of weeds that persist on the site following closure.

Appendix E: Cultural Resource Recommendations

July 15, 2014

Ms. Laurie Hietter
Panorama Environmental, Inc.
One Embarcadero Center, Suite 740
San Francisco, CA 94111

RE: Cultural Resource Recommendations for Well and Groundwater Discharge Areas, Soda Mountain Solar Project

Dear Ms. Hietter:

This letter serves to state that there are no potential impacts to cultural resources for newly proposed well (PW-1, MW-1) and groundwater discharge facilities on the Soda Mountain Solar project. These are shown in the attached map relative to prior cultural resources inventory by Far Western. Upon reviewing your locations and design specifications for the areas, I confirm this based on:

1) Far Western's original cultural resources inventory includes the area of interest (Duke and Patterson 2009).
    a. The inventory took place May 26-June 13, 2009, under BLM Fieldwork Authorization FA-680-09-24, issued under Far Western's State of California BLM Cultural Resource Use Permit, CA-09-20.
    b. The inventory was conducted as a pedestrian survey following BLM protocols of 15-m transect intervals. Surveyors were organized into four-person crews, following survey lines using GPS technology. Sites were defined as a cluster of three or more artifacts found within a 5-x-5-m area. Single features were also considered sites. Any cultural items that did not meet these criteria were recorded as isolated finds. Per California standards, all sites were recorded on California Department of Parks and Recreation (DPR) 523 site forms. No collections were made.
    c. There are no additional inventories conducted or sites recorded since the 2009 work overlapping the areas of interest.
2) Lack of sensitive cultural resources in the vicinity:
    a. While the specified areas are adjacent to the historic-period Blue Bell Mine road (CA-SBR-13352H), the road is a currently well-traveled dirt access road which contains no integrity of past construction or use. No artifacts were found in association upon our field examination, and is not eligible for the National Register, per the recommendations in our 2009 inventory report and subsequent SHPO concurrence.
    b. The only other cultural resources in the area are two isolated bottles recorded together as an isolated find (IA-03). These glass bottles date between 1945 and 1960, and are also not eligible for the National Register.
    c. There is no evidence, geomorphologically or based on archaeological sites in the area, for subsurface archaeological deposits. The geologic setting of the area is Quaternary

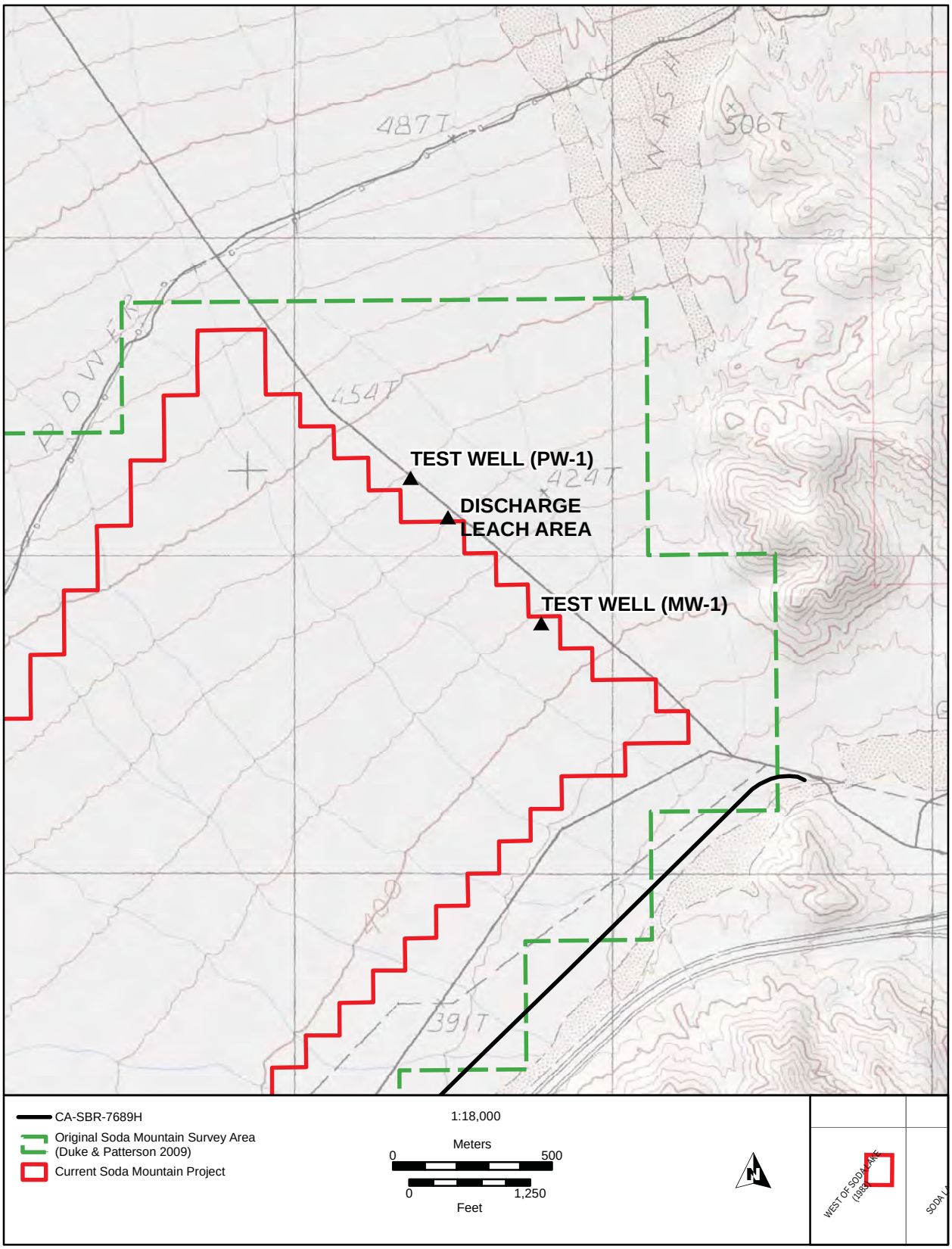
alluvium possessing no sediment development; thus, cultural resources are found on the ground surface.

In sum, there is no reason to require an archaeological monitor or additional survey to conduct the proposed work. If you have any questions or need further information, please feel free to contact me.

Sincerely,

Daron Duke, Ph.D., RPA
Director
Desert Branch

2009 Duke, Daron, and Brandon Patterson. *Cultural Resources Inventory of 6,775 Acres for the Soda Mountain Solar Project, San Bernardino County, California*. Far Western Anthropological Research Group, Henderson, NV. BLM Report No. 680-09-24. Submitted to BLM, Barstow Field Office.


TEST WELL (PW-1)
DISCHARGE
LEACH AREA
TEST WELL (MW-1)
487T
506T
454T
424T
391T
CA-SBR-7689H
Original Soda Mountain Survey Area
(Duke & Patterson 2009)
Current Soda Mountain Project
1:18,000
Meters
0
500
0
1,250
Feet
N

APPENDIX M

Evaluation of Proposed Soda Mountain Valley ACEC in California

General Location:	Central San Bernardino County
General Description:	Portions of the North and South Soda Mountains, including valley between
Nominated By:	National Parks Conservation Association
Nominated Acreage:	Not Specified in Nomination Letter, estimated 20,650 acres from drawing
Values Considered:	Biological Resources

A. Relevance

In accordance with the Bureau of Land Management (BLM) Area of Critical Environmental Concern (ACEC) Manual 1613, an area meets the "relevance" criterion if it contains one or more of the following:

Relevance Value	Yes/No	Rationale for Determination
1. A significant historic, cultural, or scenic value (including rare or sensitive archeological resources and religious or cultural resources important to Native Americans).	No	Not nominated for this value.
2. A fish and wildlife resource (including habitat for endangered, sensitive or threatened species, or habitat essential for maintaining species diversity).	Yes	Desert bighorn sheep (*Ovis canadensis nelsoni*)—BLM sensitive. Present in the South Soda Mountains, a portion of which is within the nomination area. Present intermittently in portions of the Soda Mountains Valley for foraging. Cameras installed in existing underpasses below the Interstate 15 freeway (I-15) in the Soda Mountains Valley since 2012 have not detected bighorn sheep crossing the freeway using these underpasses.
3. A natural process or system (including endangered, sensitive, or threatened plant species; rare, endemic, or relic plants or plant communities that are terrestrial, aquatic, or riparian; or rare geological features).	No	Not nominated for this value.
4. Natural hazards (including areas of avalanche, dangerous flooding, landslides, unstable soils, seismic activity, or dangerous if it is determined through the resource management planning process that it has become part of a natural process).	No	Not nominated for this value.

B. Importance

In accordance with BLM ACEC Manual 1613, the value, resource, system, process, or hazard described above must have substantial significance and values to satisfy the "importance" criteria. This generally means that the value, resource, system, process, or hazard is characterized by one or more of the following:

Importance Value	Yes/No	Rationale for Determination
1. Has more than locally significant qualities that give it special worth, consequence, meaning, distinctiveness, or cause for concern, especially compared with any similar resource.	Yes (based on potential future conditions)	Desert bighorn sheep—Since its construction in the late 1950s, the I-15 highway has presented a barrier to the general connectivity of bighorn sheep between the south Soda Mountains and the Avawatz Mountains. However, the Soda Mountains have been identified as one of four corridors for the potential restoration of genetic connectivity for bighorn sheep across I-15. There is no known existing migration or connectivity between populations of bighorn sheep in the south Soda Mountains and the Avawatz Mountains, approximately 15 miles north of the Project area. Connectivity across I-15 could potentially be reestablished by enhancing existing oversized culverts and/or by building a wildlife overpass. A potential future connection to the Avawatz Mountains would improve genetic diversity by connecting the central metapopulation with the northern metapopulation. The most likely location for potential restoration of connectivity is at the northern end of the nomination area where the mountains on both sides of I-15 are closest to the freeway. As a 2013 report on the proposed Soda Mountain Solar Project's potential effects on bighorn sheep notes, in this location, there is steep habitat preferred by sheep present where a proposed wildlife overpass would begin, and there is clear sign of current bighorn sheep use here, as observed in February 2013. Further, "at this site there remain decades-old bighorn sheep trails from many sheep crossing at this location prior to the construction of Interstate Highway 15. The abundant water on the east edge of the South Soda Mountains readily explains the historic high use of this crossing point. Sheep would have moved between this water and the North Soda Mountains frequently in summer." (Epps et al., 2013) This is in contrast to a second location where a wildlife overcrossing has been proposed, at Rasor Road, where an existing service station and access point to the nearby OHV area are located, and where steep slopes do not come as close to the freeway. Thus, only the northernmost portion of the nomination area where a potential wildlife crossing could be established in the future has special worth or distinctiveness for its potential to provide enhanced connectivity.
2. Has qualities or circumstances that make it fragile, sensitive, rare, irreplaceable, exemplary, unique, endangered, threatened, or vulnerable to adverse change.	No	Desert bighorn sheep—There is no known existing migration or connectivity between populations of bighorn sheep in the south Soda Mountains and the Avawatz Mountains, approximately 15 miles north of the Project area. The area does not currently have qualities or circumstances related to bighorn sheep (such as providing connectivity) that make it fragile, sensitive, rare, irreplaceable, exemplary, unique, endangered, threatened, or vulnerable to adverse change. However, there is some potential to restore this connectivity across I-15 in the future, most likely using an existing underpass or through the construction of a new overpass at the north end of the nomination area. The foraging habitat within the valley (below 10 to 20 percent slope) is not rare or exemplary within the region.

Importance Value	Yes/No	Rationale for Determination
3. Has been recognized as warranting protection to satisfy national priority concerns or to carry out the mandates of FLPMA.	No	Desert bighorn sheep—BLM sensitive species for the State of California, not a national priority. This population of desert bighorn sheep is not federally listed or proposed for listing as threatened or endangered under the Endangered Species Act. Designation as a BLM Sensitive Species does not indicate national significance (BLM Manual 6840).
	No	Designated Section 368 Corridor—Much of the nomination area was designated in 2009 as an energy corridor per Section 368 of the Energy Policy Act of 2005, which directed the Secretary of Interior to designate corridors for oil, gas, and hydrogen pipelines and electricity transmission and distribution facilities to enhance the capability of the national grid to deliver energy. Designation of a portion of this corridor (including the entire width through the Soda Mountains Valley) as an ACEC would be inconsistent with this previous management decision made to satisfy national priority concerns.
4. Has qualities that warrant highlighting to satisfy public or management concerns about safety and public welfare.	No	Area was not nominated for this value. None known to be present.
5. Poses a significant threat to human life and safety or to property.	No	Area was not nominated for this value. None known to be present.

C. Nominated Area to Potential ACEC

This area was nominated to include approximately 20,650 acres of public land in California. The National Parks Conservation Association identified this area as being important for Nelson's bighorn sheep, a BLM Sensitive Species and California Fully Protected and State Game Species. The nomination states, "The intermountain habitat on both sides of Interstate 15 has been identified as "the most important restorable corridor for long-term demographic potential (i.e., population recolonization by ewes) across the entire southeastern Mojave Desert of California, as it would provide the best *and only* opportunity for movement between bighorn populations in the Mojave National Preserve and the large complex of populations to the north of Interstate 15," according to a biological study." BLM acknowledges the value the bighorn sheep for which the area is nominated. The BLM interdisciplinary team determined that only the northernmost portion of the nomination area that includes the intersection of I-15 and Blue Bell Mine Road/Zzyzx Road and portions of the north and south Soda Mountains close to the highway meets both the criteria of relevance and importance for the preservation of potential future bighorn sheep connectivity opportunities. This area already is under consideration as a proposed ACEC as part of the Preferred Alternative of the draft Desert Renewable Energy Conservation Plan (DRECP), for which a Draft Environmental Impact Statement and Environmental Impact Report was issued in September 2014 (California Energy Commission et al., 2014). Therefore, no separate consideration of the ACEC Nomination from the National Parks Conservation Association is needed.

References

California Energy Commission, California Department of Fish and Wildlife, U.S. Bureau of Land Management, and U.S. Fish and Wildlife Service, 2014. Desert Renewable Energy Conservation Plan (DRECP) and Environmental Impact Report/Environmental Impact Statement. September. Available online at http://www.drecp.org/draftdrecp/.

Epps, C.W., J.D. Wehausen, R.J. Monello, and T.G. Creech, 2013. Potential impacts of proposed solar energy development near the South Soda Mountains on desert bighorn sheep connectivity, Report to the California Department of Fish and Wildlife, National Park Service, and Bureau of Land Management, 25, February.