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APPENDIX H-1
Water Supply Assessment

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Water Supply Assessment

Soda Mountain Solar Project
San Bernardino County, CA

January 2013

PANORAMA
ENVIRONMENTAL, INC.

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Water Supply Assessment

Soda Mountain Solar Project
San Bernardino County, California

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January 2013

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1 INTRODUCTION

This Water Supply Assessment (WSA) has been prepared for the proposed Soda Mountain Solar Project (Project) in accordance with the requirements for a WSA provided in the California Water Code §10910. The WSA has been prepared by Soda Mountain Solar, LLC for consideration by San Bernardino County. Soda Mountain Solar, LLC submitted an application for a groundwater well permit to the County in September 2012. The groundwater well permit application was prepared in accordance with §33.06554 of the County Code of Ordinances. The groundwater well permit is a discretionary permit under the California Environmental Quality Act (CEQA).

Table 1 identifies the location of this required information in the WSA. The WSA includes specific groundwater information because the Project will obtain all of its water supply from groundwater. The WSA also addresses:

- Projected water availability for the Project under normal water years, dry water years, and multiple-dry water years (i.e., during droughts)
- Projected water demand for the Project over a 20-year period
- Adequacy of projected supplies to serve existing demand, demand from the project, and demand from planned future uses

Table 1: Guide to Water Supply Assessment

Water Code Section 10910	Page No.
Documenting Groundwater Supply	
(f) If a water supply for a proposed project includes groundwater, the following additional information shall be included in the water supply assessment: (1) Review any information contained in the urban water management plan relevant to the identified water supply for the proposed project.	14
(2) Describe any groundwater basin or basins from which the proposed project will be supplied. For those basins for which a court or the board has adjudicated the rights to pump groundwater, a copy of the order or decree adopted by the court or the board and a description of the amount of groundwater the public water system, or the city or county if either is required to comply with this part pursuant to subdivision (b), has the legal right to pump under the order or decree. For basins that have not been adjudicated, information as to whether the department has identified the basin or basins as overdrafted or has projected that the basin will become overdrafted if present management conditions continue, in the most current bulletin of the department that characterizes the condition of the groundwater basin, and a detailed description by the public water system, or the city or county if either is required to comply with this part pursuant to subdivision (b), of the efforts being undertaken in the basin or basins to eliminate the long-term overdraft condition.	8 to 13

Table 1 (*Continued*): Guide to Water Supply Assessment	
Water Code Section 10910	**Page No.**
Documenting Groundwater Supply	
(3) Provide a detailed description and analysis of the amount and location of groundwater pumped by the public water system, or the city or county if either is required to comply with this part pursuant to subdivision (b), for the past five years from any groundwater basin from which the proposed project will be supplied. The description and analysis shall be based on information that is reasonably available, including, but not limited to, historic use records.	N/A
(4) Provide a detailed description and analysis of the amount and location of groundwater that is projected to be pumped by the public water system, or the city or county if either is required to comply with this part pursuant to subdivision (b), from any basin from which the proposed project will be supplied. The description and analysis shall be based on information that is reasonably available, including, but not limited to, historic use records.	17 to 18
(5) Analyze the sufficiency of the groundwater from the basin or basins from which the proposed project will be supplied to meet the projected water demand associated with the proposed project. A water assessment shall not be required to include the information required by this paragraph if the public water system determines, as part of the review required by paragraph (1), that the sufficiency of groundwater necessary to meet the initial and projected water demand associated with the project was addressed in the description and analysis required by paragraph (4) of subdivision (b) of Section 10631.	24
Documenting Existing Entitlements	
(e) If no water has been received in prior years by the public water system, or the city or county if either is required to comply with this part pursuant to subdivision (b), under the existing water supply entitlements, water rights, or water service contracts, the public water system, or the city or county if either is required to comply with this part pursuant to subdivision (b), shall also include in its water supply assessment pursuant to subdivision (c), an identification of the other public water systems or water service contract holders that receive a water supply or have existing water supply entitlements, water rights, or water service contracts, to the same source of water as the public water system, or the city or county if either is required to comply with this part pursuant to subdivision (b), has identified as a source of water supply within its water supply assessments.	10 and 12
Documenting Capacity to Meet Demand During Normal and Dry Water Years and Cumulative Uses	
(c)(3) If the projected water demand associated with the proposed project was not accounted for in the most recently adopted urban water management plan, or the public water system has no urban water management plan, the water supply assessment for the project shall include a discussion with regard to whether the public water system's total projected water supplies available during normal, single-dry, and multiple-dry water years during a 20-year projection will meet the projected water demand associated with the proposed project, in addition to the public water system's existing and planned future uses, including agricultural and manufacturing uses.	17 to 23
Documenting Normal, Dry Year(s), and 20-Year Supply	
(c)(4) If the projected water demand associated with the proposed project was not accounted for in the most recently adopted urban water management plan, or the public water system has no urban water management plan, the water assessment for the project shall include a discussion with regard to whether the public water system’s total projected water supplies available during normal, single-dry, and multiple-dry water years during a 20-year projection will meet the projected water demand associated with the proposed project, in addition to the public water system’s existing and planned future uses, including agricultural and manufacturing uses.	23

Table 1 (*Continued*): Guide to Water Supply Assessment	
Water Code Section 10910	**Page No.**
Is the Projected Water Supply Sufficient or Insufficient for the Proposed Project and Cumulative Uses?	
(c)(5) If the projected water demand associated with the proposed project was not accounted for in the most recently adopted urban water management plan, or the public water system has no urban water management plan, the water assessment for the project shall include a discussion with regard to whether the public water system's total projected water supplies available during normal, single-dry, and multiple-dry water years during a 20-year projection will meet the projected water demand associated with the proposed project, in addition to the public water system's existing and planned future uses, including agricultural and manufacturing uses.	24

2 REGULATORY BACKGROUND

2.1 STATE OF CALIFORNIA

California groundwater law provides an overlying landowner or groundwater appropriator the right to pump and use local groundwater for reasonable and beneficial uses. The State of California does not have a permit process for regulation of groundwater use; however groundwater rights may be adjudicated by court decree. The groundwater rights within the groundwater basin underlying the Project area have not been adjudicated, and are considered available for use. Groundwater use is considered an overlying use if pumped for use on the parcel where the water is pumped. Groundwater use is appropriative if the appropriator pumps and delivers water for use off of the parcel where the water is pumped. Generally, overlying landowners have priority. An appropriative user, however, may put "surplus" groundwater to beneficial use. "Surplus" groundwater is water available under natural conditions on an average annual basis in an amount greater than average annual demand. Use of groundwater for the proposed Project would be considered overlying, and available for use on the parcels above the aquifer. The Project would pump water for reasonable and beneficial uses, including construction and operation uses.

Senate Bill (SB) 901 was enacted in 1995 to ensure that cities and counties assess the adequacy of available water supplies to meet projected water demand prior to approving certain types of new land development projects. SB 901, also known as the WSA law, requires that before a project is granted approval, the city or county must request preparation of a WSA by the public water supplier that will serve the proposed project. The provisions of SB 901 were codified in Water Code §10910 through §10915.

SB 610 was enacted in 2001 to improve the WSA process and expand the scope of development projects triggering the WSA procedure. The primary goal of SB 610 was to improve the linkage between water use and land use planning to ensure that land use decisions for specific large development projects have adequate information to assess whether sufficient water supplies are available to meet project demands. The 2001 bill also required additional information with respect to groundwater supplies. In 2011, SB 267 was enacted to revise the definition of a project to include new renewable energy projects. Section 10912(a)(7)(B) of the Water Code specifies that a proposed photovoltaic generation facility is not a “project” subject to the provisions of SB 610 if the facility would demand no more than 75 acre-feet of water annually.

The operational water demand for the Soda Mountain Solar Project is 7 acre-feet per year (AFY). The construction water demand of the Soda Mountain Solar Project is 192 AFY for three years. Because the annualized water demand of the Soda Mountain Solar Project is approximately 26 AFY over 30 years, it demands less than 75 acre-feet of water annually and is not subject to the provisions of SB 610. This WSA has nonetheless been prepared to assist the BLM and San Bernardino County in the evaluation of Project water supply impacts under the National Environmental Policy Act and the California Environmental Policy Act.

2.2 SAN BERNARDINO COUNTY

Water resources within San Bernardino County are subject to the San Bernardino County Groundwater Management Ordinance (Ordinance, Article 5, §33.06554). The County's Groundwater Management Ordinance requires a well permit application to be filed for the use of groundwater. The County has discretionary authority to issue the groundwater well permit. In issuing a permit, the County must find, "based upon the available data, the well(s) constructed and operated as proposed, would not result in exceeding the groundwater safe yield of the relevant aquifers." (*Id*.) The County may include in the permit "conditions and requirements" found to be "reasonably necessary to accomplish the purposes of [the Ordinance], including . . . conditions requiring groundwater management, mitigation and monitoring by the applicant." (*Id*.)

3 PROJECT DESCRIPTION

3.1 PROPOSED PROJECT

The Project consists of a 350-megawatt (MW) photovoltaic (PV) solar generating facility located within an approximately 4,500-acre right-of-way (ROW) on U.S. Bureau of Land Management (BLM) administered land. The majority of the ROW will be occupied by solar array fields and the remaining area will be used for stormwater control, access roads, ancillary buildings, and reserve land. One or more groundwater supply wells are proposed to supply water for the Project. Project construction is estimated to require approximately 192 acre-feet per year (AFY) of water over the 3-year construction period. Project operation is estimated to require approximately 7 AFY of water during the operation of the Project.

3.2 PROJECT LOCATION

The Project is located approximately 6 miles southwest of Baker, California, along Interstate 15 (I-15). The site location and neighboring terrain are presented on Figure 1. The north array is accessible from Zzyzx Road. The south and east arrays are accessible from Rasor Road.

The Project lies 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.

3.3 PROPOSED GROUNDWATER USE AND REQUIREMENTS

3.3.1 Project Construction

Groundwater will be used for dust control and soil compaction during Project construction. Construction will occur continuously for a period of about 3 years. Water will also be pumped and stored for fire protection. Groundwater will be extracted continuously over this 3-year period at an estimated average rate of 200,000 gallons per day (gpd) (192 AFY[1]) with periodic peak use at an estimated rate of 300,000 gpd.

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[1] Water use is estimated to be up to 6 days per week during the period of construction.

Figure 1: Project Location

SOURCE: ESRI 2012 and Panorama Environmental, Inc. 2012

Scale: 1:1,500,000

LEGEND

Proposed Project ROW

0 20 40 Miles

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3.3.2 Project Operation

Groundwater will be used primarily for PV panel washing during the Project operation phase. Panel washing will be conducted once or twice per year over an estimated 21-day period and will require 5.4 AFY (41,895 gallons per day for 42days). Other water needs during Project operation will include fire suppression and, possibly, potable water supply for the operations and maintenance building. A 22,500-gallon water tank will be maintained on site for fire suppression and will periodically be refilled as needed (i.e., at irregular intervals) during Project operation. Potable water needs are estimated at 1.5 AFY (1,339 gallons per day for 365 days). Assuming that panel washing will occur twice per year, approximately 7 AFY will be extracted from the site water supply wells during Project operation.

4 GROUNDWATER BASIN/SUPPLY

The primary source of water for the Project would be groundwater from the aquifer underlying the Project area. This section provides a description of the groundwater basin including groundwater supply and availability.

4.1 GROUNDWATER BASIN

4.1.1 Soda Lake Valley Groundwater Basin

The 381,000-acre Soda Lake Valley Groundwater Basin (Basin No. 6-33; California Department of Water Resources [DWR] 2004) is located in a valley in northeast San Bernardino County (Figure 2). The basin is bounded by the non-water-bearing 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). Annual precipitation in the valley ranges from 3 to 5 inches. The Project ROW is located in the west portion of the basin, surrounded by the Soda Mountains.

4.1.2 Soda Mountains Subbasin

The Project is located within a subbasin of the Soda Lake Valley Groundwater Basin. The subbasin is generally separated from the rest of Basin No. 6-33 by mountains to the south and east. The direction of groundwater flow within the subbasin is expected to generally mimic surface water flow. Surface water from the South Array area flows to the southeast and the North and East arrays drain to the northeast. 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 terminus of the Mojave wash to the southeast.

Geologic mapping indicates that the alluvium in the subbasin is surrounded by volcanic and granitic geologic units (Figure 3). These geologic units are impermeable, although fractures may allow some limited groundwater permeability (Dubois 2012). Because the subbasin is surrounded by mountains, groundwater is likely funneled to Basin No. 6-33 through small breaks in the mountains to the east and south. 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).

Figure 2: Groundwater Basins

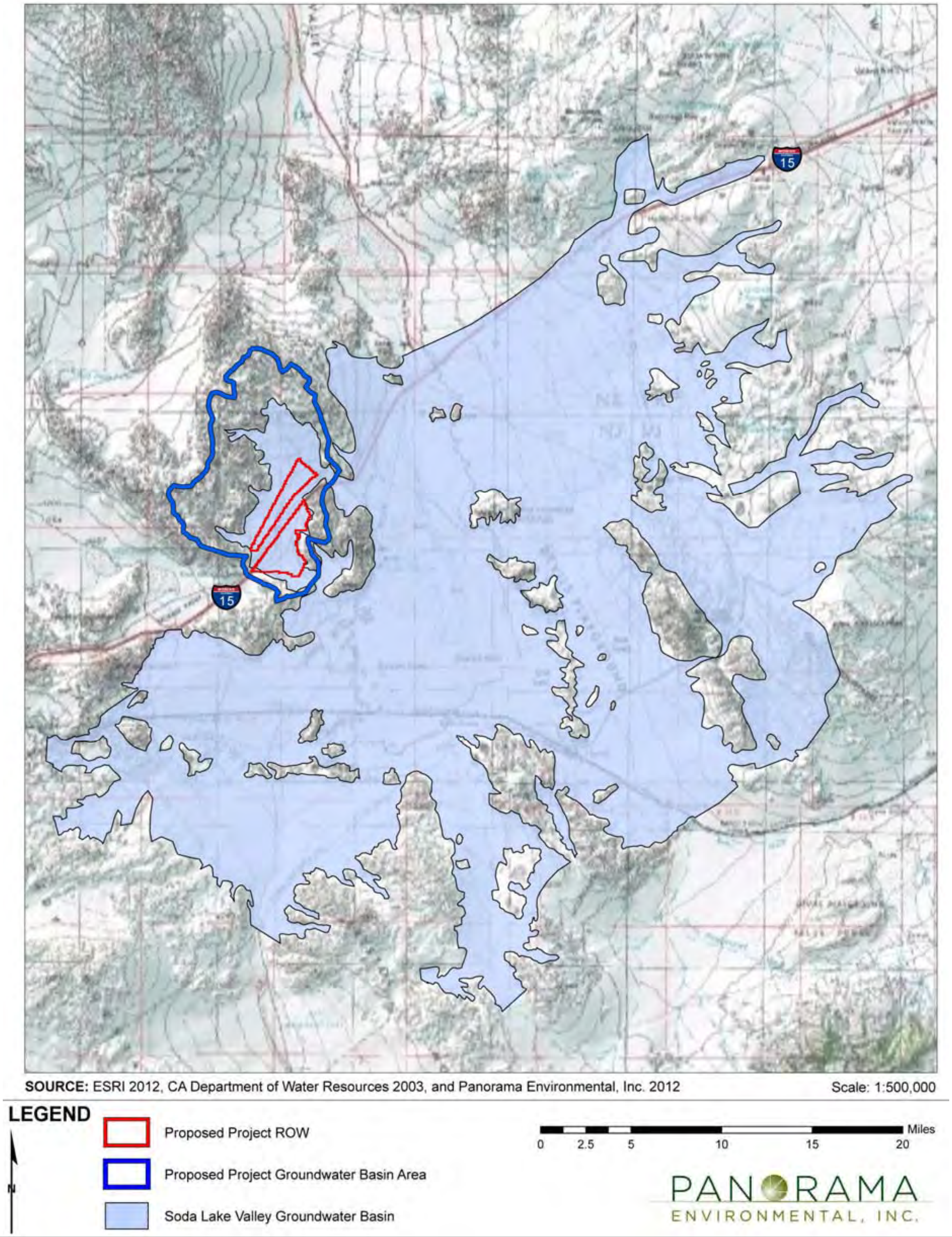
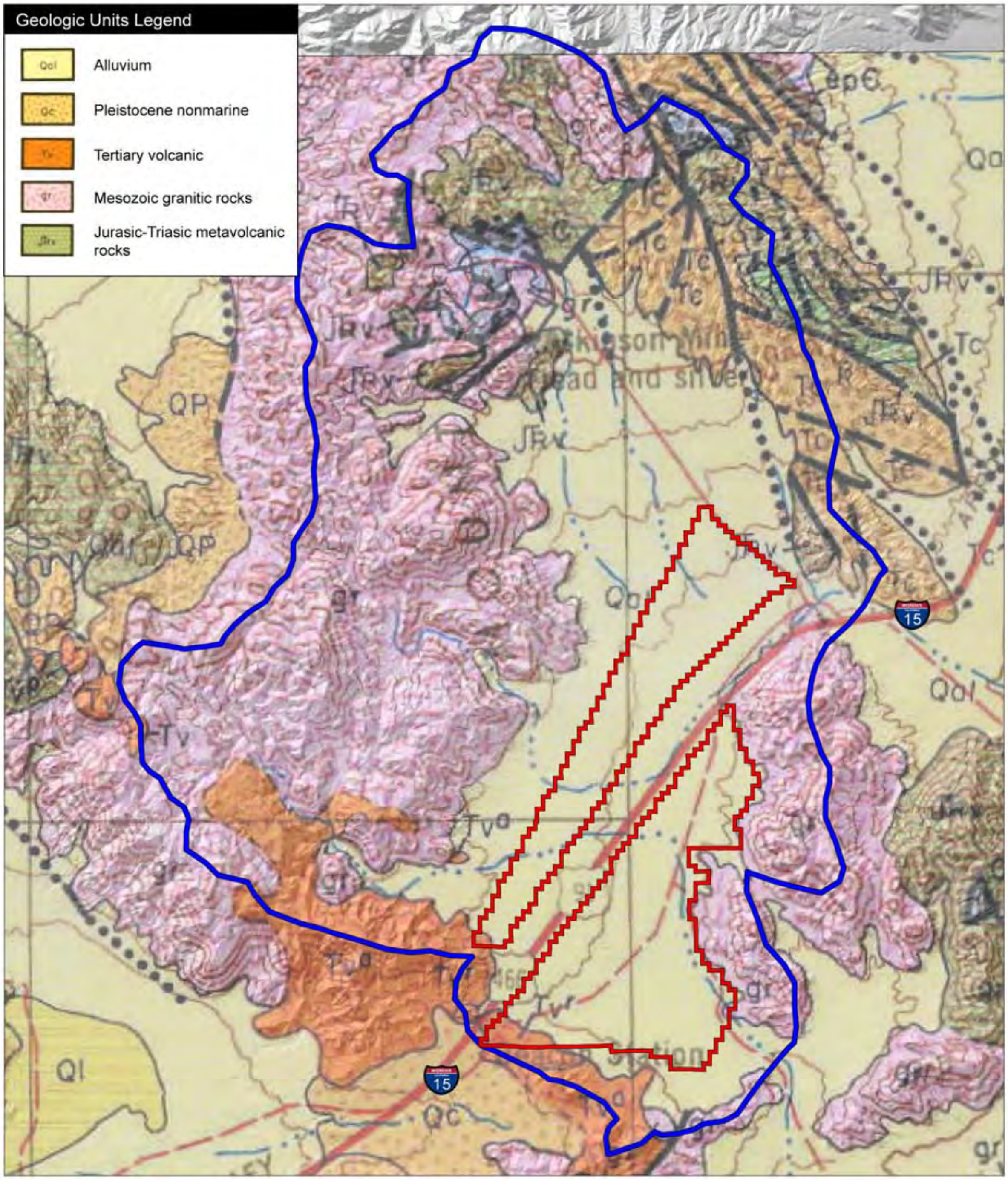


Figure 3: Geologic Map of Soda Mountain Subbasin



SOURCE: ESRI 2012, Jenkins, O. P., 1962, and Panorama Environmental, Inc. 2012 Scale: 1:100,000

LEGEND

Proposed Project ROW

Groundwater Basin Area

0 0.5 1 2 3 4 Miles

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The subbasin is topographically higher than areas to the east (RMT 2011). Groundwater elevations within the subbasin estimated from geophysical data (Terraphysics 2010 in Wilson Geosciences 2011) are approximately 150 to 300 feet higher than those measured by the U.S. Geological Survey (USGS) in Basin No. 6-33. Specifically, the estimated depth to groundwater for the project area is 1,232 to 1,170 feet amsl in the subbasin while groundwater levels outside the subbasin measured by USGS at wells located on Rasor Road in Basin No. 6-33 range from 945 feet to 958 feet (USGS wells #012N008E35A; 012N008E27N). Similarly, Zzyzx spring is located on the bank of Soda Lake within Basin No. 6-33 at an elevation of approximately 948 feet.

The largely impermeable volcanic and granitic geologic mountains surrounding the subbasin and its higher topographic and groundwater elevations indicate that the Soda Mountains subbasin is a physically distinct basin within the larger Basin No. 6-33. The outer boundaries of the two watersheds identified in the project area further support this conclusion because they mirror the subbasin boundary, consistent with the principle that surface water drainage divides generally represent groundwater divides (*see,* Soda Mountain Solar Project Plan of Development 2011).This separation indicates that the groundwater resources within the subbasin should be analyzed separately from those within Basin No. 6-33. Working from the smaller subbasin also yields a more conservative safe-yield estimate, particularly since the project would not be able to draw groundwater resources from the larger Soda Lake Basin (Basin No. 6-33) due to its lower elevation and separation by impermeable rocks.

Aquifer Geology

The subbasin is approximately 32,946 acres. Geologic mapping from the State of California indicates that the Project area overlies alluvium, which is the primary water-bearing geologic unit in the subbasin (Gutierrez 2010). This finding was confirmed by geophysical and geotechnical data collected in the Project area (Wilson Geosciences Inc. 2011; TerraPhysics 2010). The alluvium within the subbasin is located within the valley and covers an area of approximately 12,632 acres. The average thickness of the alluvium, as estimated from site-specific geophysical data, is approximately 423 feet (Terraphysics 2010). The remaining 20,314 acres within the subbasin consist of the mountains surrounding the valley (Gutierrez 2010). There is an existing groundwater well at the Rasor Road service station that is located within the bedrock. This well has low yield and is located within volcanic rock formations (Young 2012).

Storage

Subsurface geologic conditions within the subbasin were evaluated using the results of geophysical study performed in the Project area (Terraphysics 2010). The results indicate that the depth to bedrock in the northern portion of the aquifer is approximately 332 feet below ground surface (bgs) ±26 feet and the water table is present within alluvium at approximately 182 feet bgs ±13 feet. In the southern portion of the aquifer, 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 geophysical data (DYA 2010 and Terraphysics 2010).

The storage volume of the subbasin was estimated by multiplying the total volume of the aquifer by the specific yield for the basin. The acreage of the alluvium is 12,632 acres, the average thickness of the saturated alluvium (as estimated from the geophysical sounding results) is approximately 99 feet, and the specific yield of the aquifer is estimated at 0.1 (RMT 2011). The storage of the subbasin is thereby estimated to be approximately 125,000 acre-feet.

Recharge

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 systems similar to the project area and 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 was used in this analysis and is conservative based on the results of these studies.

Precipitation data for the Project area were obtained from PRISM (PRISM Climate Group 2012) and overlain on the bedrock portions of the subbasin (Figure 4). Only bedrock areas were considered for recharge because valley floor precipitation does not contribute consistently to recharge (Danskin 1998). It is possible that valley recharge in the project area is greater than zero, however no valley recharge was assumed to be conservative. Acreages for each data cell were calculated and the precipitation values were weighted by area to determine a weighted precipitation value for the subbasin. The 20,314-acre mountainous portion of the subbasin receives approximately 4.855 inches (0.405 foot) of rain annually (weighted average), which equates to 8,219 AFY of precipitation.

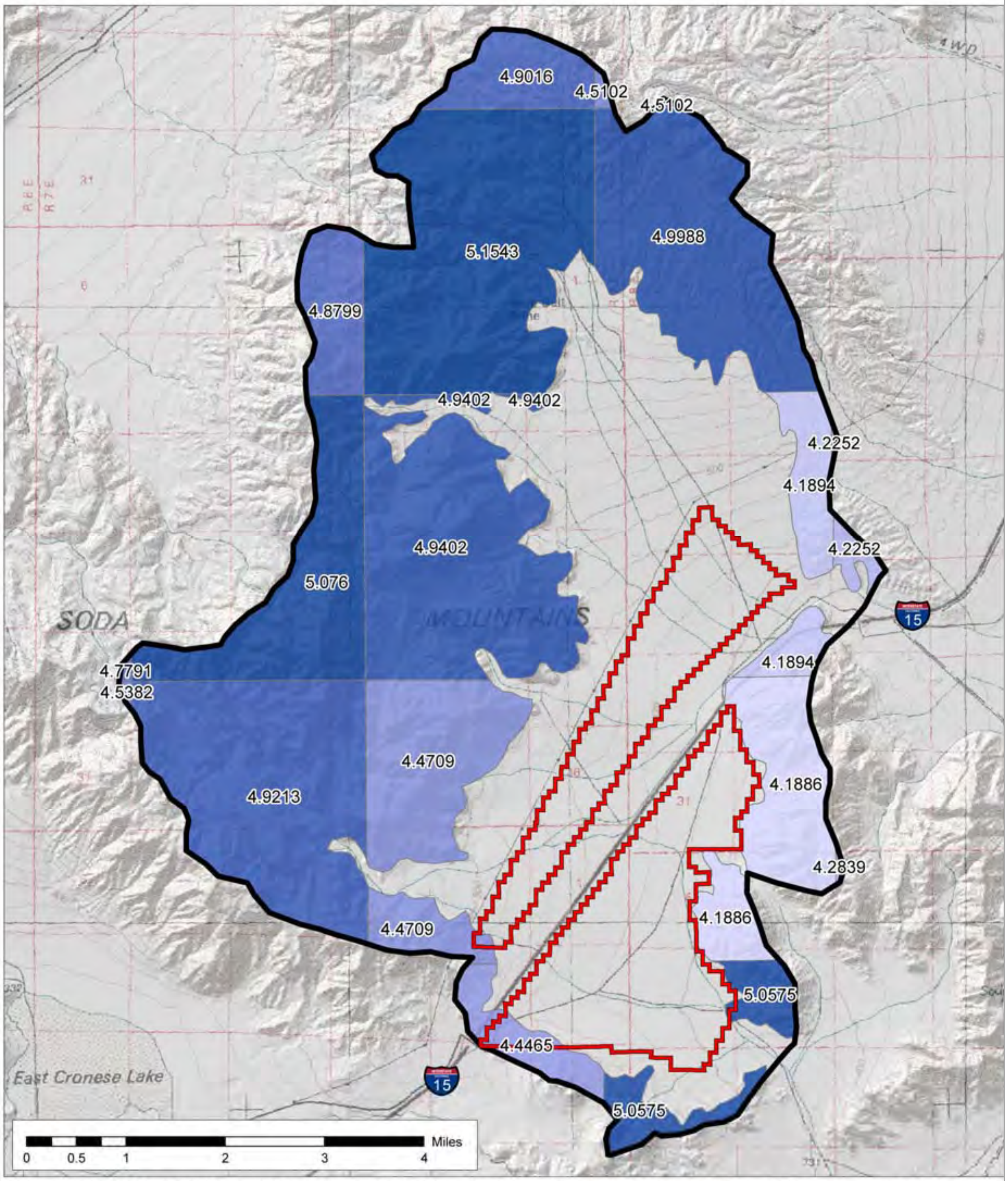
Data analysis for arid basins in the U.S. southwest indicates that approximately 7.8 percent or more of mountain precipitation becomes mountain-front recharge, as stated above. Mountain-front recharge is estimated at 641 AFY using a recharge rate of 7.8 percent.

The Soda Mountains 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). It is likely that there is some permeability to the Soda Mountains and that the area is part of a regional groundwater flow system. This groundwater input is not included in estimates of groundwater available for use by the project because regional interbasin flow into the basin is likely similar to regional interbasin flow out of the basin.

Safe Yield

Safe yield is defined in San Bernardino County’s Desert Groundwater Management Ordinance as “(t)he maximum quantity of water that can be annually withdrawn from a groundwater aquifer (i) without resulting in overdraft (ii) without adversely affecting aquifer health and (iii) without adversely affecting the health of associated lakes, streams, springs and seeps or their biological resources." (Ordinance, Art. 5, § 33.06553.) "Overdraft" is defined in the Ordinance as

Figure 4: Soda Mountain Precipitation



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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"(t)he condition of a groundwater supply in which the average annual amount of water withdrawn by pumping exceeds the average annual amount of water replenishing the aquifer in any ten year period, considering all sources of recharge and withdrawal." (*Id.*) "Aquifer health" is defined as the "geologic integrity of the affected aquifer, its storage capacity and the quality of water within the aquifer." (*Id.*)

Groundwater inflows to the subbasin through precipitation recharge as described above. Groundwater leaves the subbasin through groundwater flow to Basin No. 6-33 through gaps or lower elevations in the bedrock (Figure 3). The only existing groundwater use in the subbasin is the pumping of a groundwater well installed at the Rasor Road service station (southwest corner of South Array on Figure 1), 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 = estimated to be used at the Rasor Road service station over the past five years is approximately 10 to 12 gallons per minute (gpm) (16 to 19 AFY) (pers. comm. Terry Young, August 23, 2012). There are no other uses of groundwater within the subbasin and no existing uses within the aquifer.

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 it assumes:

- No recharge from precipitation on the valley floor,
- No input from regional groundwater flow
- 19 AFY is extracted from bedrock and is considered to be isolated from the alluvial aquifer

4.2 GROUNDWATER MANAGEMENT/ADJUDICATION

Basin No. 6-33 has not been adjudicated by the State of California and there is no evidence of current or projected overdraft conditions within the Basin (DWR 1980). . The existing service station well is the only current user of water from the subbasin and the subbasin aquifer is not currently in a state of overdraft, nor is it projected to be. No Urban Water Management Plan or other groundwater management plan has been adopted for Basin No. 6-33 or the subbasin.

San Bernardino County manages water resources within the County under the Desert Groundwater Management Ordinance. Under the Ordinance, "no person, district or other entity . . . shall locate, construct, operate or maintain any new groundwater well within the desert region of San Bernardino County . . . without first filing a written application to do so with the enforcement agency and receiving and retaining a valid permit as provided herein." (Groundwater Management Ord. § 33.06554(a). A groundwater well permit application was filed for the proposed project in September 2012. The groundwater well permit application provides information specified in the Ordinance § 33.06554(b).

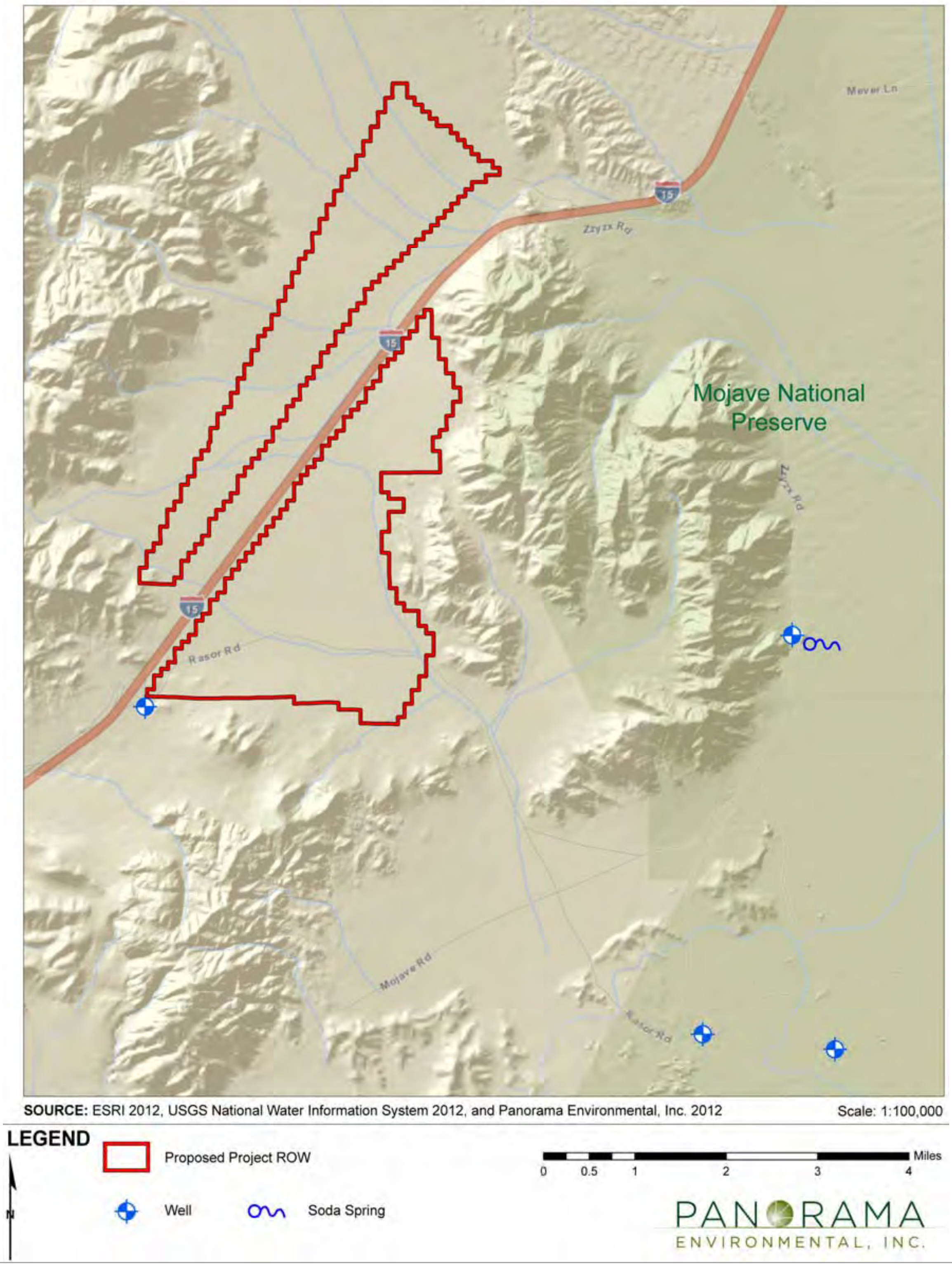
4.3 EXPECTED GROUNDWATER QUALITY

Limited water quality data are available for the Project area due to the absence of wells in the valley. The September 2010 geophysical survey collected subsurface resistivity data that can be used to estimate water quality. 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). 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), as discussed in the groundwater report. Groundwater at the northern data collection 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 slightly higher resistivity values (15 ohm-meters), indicating relatively high TDS concentrations but lower than at the northern location.

Other groundwater wells in the vicinity of the Project were analyzed to determine measured water quality in the area. Four wells are located within 5 miles of the Project area. These wells are shown on Figure 5.

Water quality at the Rasor Road service station well has TDS concentrations of approximately 3,000 mg/L and requires use of a reverse osmosis system to produce potable water (Young 2012). The Desert Studies Center is located along Zzyzx Road on the east side of the Soda Mountains, on the west margin of Soda Dry Lake and southeast of the Project ROW. A well located at the Center was sampled in May 2000. The Center is located on the other side of the Soda Mountains from the Project ROW, outside of the subbasin. TDS in the well is 1,890 mg/L. 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. Several wells are present in the region surrounding the Project ROW although none are located within the subbasin.

Figure 5: Groundwater Wells



5 PROJECT DEMAND ANALYSIS

5.1 EXISTING USES

The well at the Rasor Road service station is located in the Soda Mountain subbasin. This well is located in bedrock and is not in the alluvial aquifer. No wells are known to exist that are screened in the alluvial aquifer. The amount of water that is estimated to be used at the Rasor Road service station is approximately 16 to 19 AFY. There are no other uses of groundwater within the subbasin and no existing uses within the aquifer.

5.2 PLANNED FUTURE USES

There are no planned future uses of groundwater within the subbasin. Groundwater withdrawal at the Rasor Road service station would be expected to remain constant due to the limited well productivity. The solar panels of the Project would cover about 21% of the alluvium within the valley.

2,691 acres of panels ÷ 12,632 acres of alluvium = 21% of alluvial area

5.3 PROPOSED USE

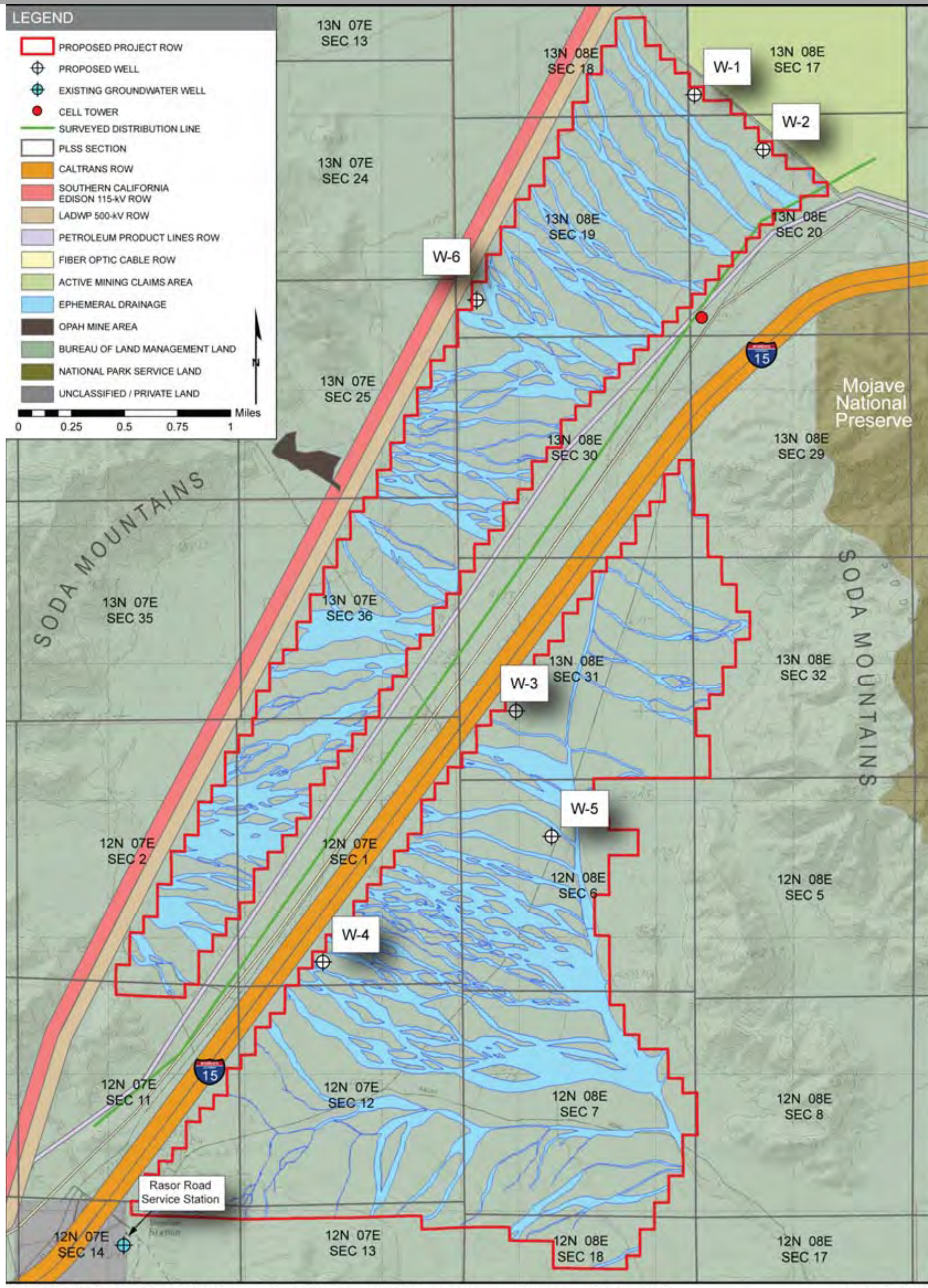
5.3.1 Location

It is anticipated that two to four wells will be constructed to provide the water supply for the proposed Project. Multiple wells will be required for the Project to provide spatial coverage over the 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 possible well locations have been identified to provide siting flexibility (Figure 6).

5.3.2 Quantity

During Project construction, extracted groundwater will be used primarily for dust control and soil compaction. Additional water will be extracted and stored for fire suppression. The quantity of water to be used is estimated to be approximately 192AFY, equivalent to a volume of 200,000 gpd when pumped 24 hours/day, 6 days/week. Pumping rates may periodically peak at 300,000 gpd but the amount of water pumped annually would equate to an average of 192AFY. Water will be applied directly to the ground surface by either a water truck or workers using hoses. Water used for dust control may be mixed with a dust suppressant prior to application (the dust suppressant would be determined by construction contractor). Dust control and soil compaction will be necessary throughout the entire 3-year construction period.

Figure 6: Potential 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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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. Approximately 7 AFY would be extracted from the site water supply wells during the operational phase. Approximately 5.4 AFY would be used for panel washing and 1.5 AFY would be used for potable water uses at the operations and maintenance buildings. Water will be applied directly to the panels through use of a panel cleaning system. Details of the cleaning system will be determined later in the Project development process. Panel cleaning will be necessary throughout the lifespan of the Project but will only occur once or twice each year during an estimated 21-day period. The total annual water demand for the Project is summarized in Table 2.

Table 2: Project Water Demand

Activity	Annual Water Demand (AFY)	Period of Performance	Total (AF)
Construction	192	3 Years	576
Operation	7	30 Years	210
Total Water Demand Over Life of Project			**786**

6 GROUNDWATER SUPPLY AVAILABILITY

This section assesses Project and non-Project water needs over a 20-year future projection to determine whether there are sufficient supplies to serve the Project over the next 20 years. The assessment considers average-year ("normal" year), single-dry year, and multiple-dry year (drought) conditions. A multiple-dry year scenario is assumed to be 3 years long for the purpose of this analysis.

Project water demand for a projected 20-year period is summarized in Table 3. Project water demand would be greatest during the 3-year construction period. Total Project water use would be approximately 695 acre-feet for the 20-year period following the initiation of construction.

The subbasin is estimated to receive approximately 8,219 acre-feet of precipitation under normal-year conditions. The amount of mountain-front recharge within the subbasin is approximately 641 AFY, which is the precipitation recharge value used to represent normal-year conditions. Normal year conditions were estimated using PRISM (2012).

The precipitation monitoring station closest to the Project area is in Baker (#040436), about 6 miles to the northeast. Baker rainfall data for the years 1971 through 2012 were analyzed to determine single-dry year, and multiple-dry year precipitation based on measured (i.e., not modeled) data in the Project vicinity (Western Regional Climate Center [WRCC] 2012). Average annual precipitation in Baker between 1971 and 2012 is 4.009 inches. Precipitation in Baker is estimated to be approximately 0.846 inch less than that in the Soda Mountains subbasin (PRISM

Table 3: 20-year Project Water Use Projections (acre-feet)

Year	1	2	3	4	5	6	7	8	9	10
Water Use	192	192	192	7	7	7	7	7	7	7
5-year Average	--	--	--	--	118	--	--	--	--	7
Total	**192**	**384**	**576**	**583**	**590**	**597**	**604**	**611**	**618**	**625**
Year	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
Water Use	7	7	7	7	7	7	7	7	7	7
5-year Average	--	--	--	--	7	--	--	--	--	7
Total	**632**	**639**	**646**	**653**	**660**	**667**	**674**	**681**	**688**	**695**

2012). Baker is located 6 miles from the Project in an area with lower elevation than the Project site (elevations in Baker range from about 950 to 1,000 feet and in the project area the range is 1,250 to 1,550 feet). The difference in the estimated average rainfall between Baker and the Project site is attributed to the difference in elevation and topography between the two areas. The western Soda Mountains reach 3,600 feet.

6.1 SINGLE DRY-YEAR

A probability-based estimate is used to determine water availability during a single dry-year. Single dry-year rainfall is estimated as a year with a 10 percent probability of occurrence (DWR 2003). The predicted rainfall for a single dry-year is 1.726 inches or 43 percent of normal-year rainfall in Baker. Within the Soda Mountains subbasin, 43 percent of the normal-year rainfall of 4.855 inches is 2.088 inches. A single dry-year would not affect the safe yield of the basin. The aquifer would be expected to rebound following a single dry-year, when rainfall increases.

6.2 MULTIPLE DRY-YEAR

Multiple dry-years are estimated using historical precipitation analysis. Rainfall is estimated for the driest three-year period on record (DWR 2003). The 2005 to 2008 water years are the driest three-year period on record. Between 2005 and 2008 precipitation at the Baker monitoring station was measured as follows:

- Year 1: 1.34 inches (2005-2006 water year)
- Year 2: 3.83 inches (2006-2007 water year)
- Year 3: 1.83 inches (2007-2008 water year)

The Year 2 rainfall is less than 0.2 inch lower than the normal-year value; however, it occurs within the lowest 3-year period of precipitation during the recorded history. The Year 1, Year 2, and Year 3 precipitation values represent 33 percent, 96 percent, and 46 percent of average annual rainfall, respectively. Within the Soda Mountains subbasin this equates to precipitation values of 1.602 inches, 4.661 inches, and 2.233 inches, respectively.

6.3 DRY YEAR SUPPLY

Precipitation recharge in the subbasin during normal-, single dry-, and multiple dry-years is summarized in Table 4.

Under a single-dry year scenario the subbasin would be expected to have approximately 57 percent less recharge than during a normal water year. Under multiple-dry year conditions, the SM subbasin would have an average of 41 percent less recharge (over the 3 year period) than during normal water years.

Table 4: Precipitation Recharge to Soda Mountains Subbasin		
Climate Scenario	**Precipitation Recharge (AFY)**	**Percent of Normal Year**
Normal Water Year[1]	641	100%
Single Dry-water Year[2]	276	43%
Multiple Dry-water Years[3]		
Year 1	212	33%
Year 2	615	96%
Year 3	295	46%

1 Normal water year precipitation recharge is based on the 40-year average rainfall between 1971 and 2000 for the mountainous areas of the subbasin (PRISM Climate Group 2012).

2 Single dry-year precipitation recharge is scaled from the 2001-2002 water year for the Baker gauging station (WRCC 2012).

3 Multiple-dry water year precipitation recharge is scaled from the 3-year period between 2005 and 2008 for the Baker gauging station (WRCC 2012). Although Year 2 precipitation is only slightly less than that for the normal water year, the 3-year period had the lowest precipitation overall on record for the data collection period.

6.4 DRY YEAR DEMAND

Water supply availability projections for a 20-year period are presented in Tables 5 and 6. Table 5 presents projections for the 3-year construction period with the highest Project related water use (192 AFY). Table 6 presents projections for the subsequent 17-year operational period. The existing pumping data refers to the estimated pumping rate for the Rasor Road service station well. It was assumed for the purpose of the analysis that the pumping rate at this well would remain constant because it is a low-producing well and the maximum pumping rate could not increase.

Table 5: Groundwater Availability Projections for Years 1 through 3 (Construction)					
Climate Scenario	**Precipitation Recharge (AFY)**	**Existing Pumping (AFY)[1]**	**Project Pumping (AFY)**	**Total Demand (AFY)**	**Balance (AFY)**
Normal Year	641	19	192	211	430
Single-dry Year	276	19	192	211	65
Multiple-dry Years					
Year 1	212	19	192	211	1
Year 2	615	19	192	211	404
Year 3	295	19	192	211	84
Multiple Dry-Year Balance					**489**

1 Existing pumping is from the Rasor Road service station well, the only well known to exist in the subbasin.

Table 6: Groundwater Availability Projections for Years 4 through 20 (Operation)

Climate Scenario	Precipitation Recharge (AFY)	Existing Pumping (AFY)[1]	Project Pumping (AFY)	Total Demand (AFY)	Balance (AFY)
Normal Year	641	19	7	26	615
Single-dry Year	276	19	7	26	250
Multiple-dry Years					
Year 1	212	19	7	26	186
Year 2	615	19	7	26	589
Year 3	295	19	7	26	269

1 Existing pumping is from the Rasor Road service station well, the only well known to exist in the subbasin.

The groundwater balance for construction and operation is positive under all water year conditions.

7 COMPARISON OF PROJECTED WATER SUPPLY AND DEMAND

The Project would use approximately 786 acre feet of water during construction and the estimated life of the project (33-year period). This volume of water is less than 1 percent of the estimated storage (125,000 AF) of the Soda Mountain subbasin.

The Soda Mountains subbasin is not currently in overdraft. Project construction needs (192 AFY) represent 30 percent of the estimated amount of subbasin recharge during a normal water year (641 AFY) and will be short-term (approximately 3 years) in duration. The subbasin would not result in overdraft during either a single dry-year or multiple dry-year scenario. Water use would significantly decrease during Project operation. Project operation needs of 7 AFY represent about 1 percent of the normal-year subbasin recharge and will be long-term in duration (up to 30 years or more). Overdraft conditions, if they were to occur, would be temporary, and the aquifer would recover from the potential negative water balance year(s) after construction is completed.

Water supply needs for both construction and operation can be met with the groundwater resources of the Soda Mountains subbasin. There is sufficient water available for the proposed Project under normal-year, single dry-year, and multiple dry-year conditions. The Project would not result in adverse impacts associated with groundwater supply or water supply reliability. Any potential negative water balance would be limited to extreme drought conditions with less than 10 percent chance of occurrence. The aquifer would subsequently rebound during normal water years and throughout operation of the project.

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