Proposed SoCalGas H2 System Water Supply Analysis

System 2 (Mojave)

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1 Introduction

This analysis of water supply feasibility has been completed for SPEC Services, Inc (SPEC) by D. Edwards, Inc. (DEI) with the assistance of Rincon Consultants, Inc. (Rincon), in support of the Proposed Southern California Gas Company (SoCalGas) Hydrogen (H2) System ("proposed project"). Five potential hydrogen production areas are being considered under the proposed project; however, the analysis provided herein is specific to the Mojave (System 2) production area only. Other potential production areas are assessed for water supply feasibility in respective reports, similar to the scope and content of this report.

1.1 Purpose

The purpose of this study is to identify and characterize existing water supply sources in the Mojave area, and assess the potential feasibility of existing sources to meet the water demands of the proposed project at the Mojave production site.

1.2 Approach

Section 2, *Water Supply Setting,* first characterizes the water supply setting currently applicable to the study area (defined below as the High Desert Region of the State Water Project [SWP] System) and Section 3, *Water Supply Analysis,* then considers the proposed project's potential water demand scenarios (defined below as Low, Medium, and High) against the water supply setting from Section 3. Specifically, the feasibility analysis provided in Section 3 addresses each of the following questions:

[redacted]

Reasonable assumptions have been developed where necessary to address a lack of data; the assumptions are identified in the analysis.

1.2.1 Study Area/Scope of Analysis

The geographic scope of this analysis is defined as the High Desert Region of the SWP System, which is shown in Figure 1. Mojave is located in the north-northwestern portion of the High Desert Region. This scope of analysis, also referred to as the "study area," is appropriate because it contains the naturally occurring and imported resources considered potentially feasible water supply sources for the proposed Mojave production site.

Figure 1 Desert Regions of the State Water Project System

Source: SWC 2021

1.2.2 Potential Demand Scenarios

In order to characterize the feasibility of water supply for the potential production area in the High Desert Region, the scale of the project's potential water demands must be considered. At this stage of analysis, water demands of the project are based upon general assumptions. The estimates below provide an overview of the scale of the project's water demands.

Water demand for the project is estimated as a factor of the total amount of hydrogen produced, and identified for three potential production scenarios (Low, Medium, High). The production of hydrogen would require a supply of process water and an assumed 20-percent margin for additional utilities; the potential scale of these demands is summarized in Table 1 below for the three potential production scenarios.

Table 1 Potential Water Demand Scenarios – Mojave Production Area

Production Scenario	Daily Demand (acre-feet/day)[1]	Daily Demand (million gallons/day [MGD])	Annual Demand (AFY)[2]
Low	[redacted]	[redacted]	[redacted]
Medium	[redacted]	[redacted]	[redacted]
High	[redacted]	[redacted]	[redacted]

[redacted]

[2] Annual demand assumes the daily demand is constant each day over 365 days of the year. For comparison to the proposed project demands shown here, total SWP water deliveries to the High Desert Region were recently 66,200 AFY (SWC 2021), although the actual demand quantity varies each year. In 2021, SWP deliveries will be reduced to five percent of allocations (DWR 2021a).

The overview of scale provided above does not account for cooling water requirements, water quality treatment requirements, or system flow rates which will be quantified as project design details progress. It is possible that the water quality treatment system (most likely a combined reverse osmosis [RO] and deionization [DI] system) could require between [redacted] the permeate (DM) water flow rate.

2 Water Supply Background

This section provides an overview of the water supply projects, systems, and managing agencies that produce and convey water supply throughout Southern California, including the Mojave area. The purpose of this section is to provide sufficient information to characterize the water supply scenario that defines water supply availability and reliability in the Mojave area. Specifically, this section provides an overview of the major water supply projects and systems summarized in Table 2 below. The following sections expand upon the projects identified below, including discussion of water rights entitlements or allocations, where relevant to the discussion of water supply availability. However, the information and discussion provided below does not constitute analysis of water rights availability, or support procurement of water rights for the proposed project.

Section 3, *Water Supply Setting*, includes analysis of the project's water demands in comparison to anticipated water supply availability.

Table 2 Overview of Water Supply Projects in the Mojave Area

Water Supply Project	Infrastructure Nearest to Mojave	Management	Source Water	Key Summary Data
State Water Project	California Aquduct	State – DWR	Sacramento-San Joaquin Delta (surface runoff)	**131,678 AFY** = 2021 SWP allocations (5% Table A amounts) to be conveyed in the California Aqueduct to Southern California SWP contractors
Central Valley Project	San Luis Unit (San Luis Dam, Reservoir, and Canal)	Federal – USBR	Sacramento-San Joaquin Delta (surface runoff)	**75,972 AFY** = 2021 CVP allocations for Municipal & Industrial in Southern California
Owens Basin and Mono Lake Projects	Los Angeles Aqueduct	Local – LADWP	Eastern Sierra Nevada Mtns. (snowpack / surface runoff)	**190,400 AFY** = total 2025 diversions to LADWP via Los Angeles Aqueducts for municipal demands
Colorado River Project	Colorado River Aqueduct	Federal – USBR; State – Multiple; Local – Metropolitan	Colorado River Lower Basin (surface runoff & conjunctive use management)	**550,000 AFY** = total authorized diversions from Colorado River Lower Basin to Metropolitan via Colorado Aqueduct for municipal demands

Notes:
AFY = acre-feet per year; CVP = Central Valley Project; DWR = Department of Water Resources; LADWP = Los Angeles Department of Water Resources; Metropolitan = Metropolitan Water District of Southern California; SWP = State Water Project; USBR = U.S. Bureau of Reclamation

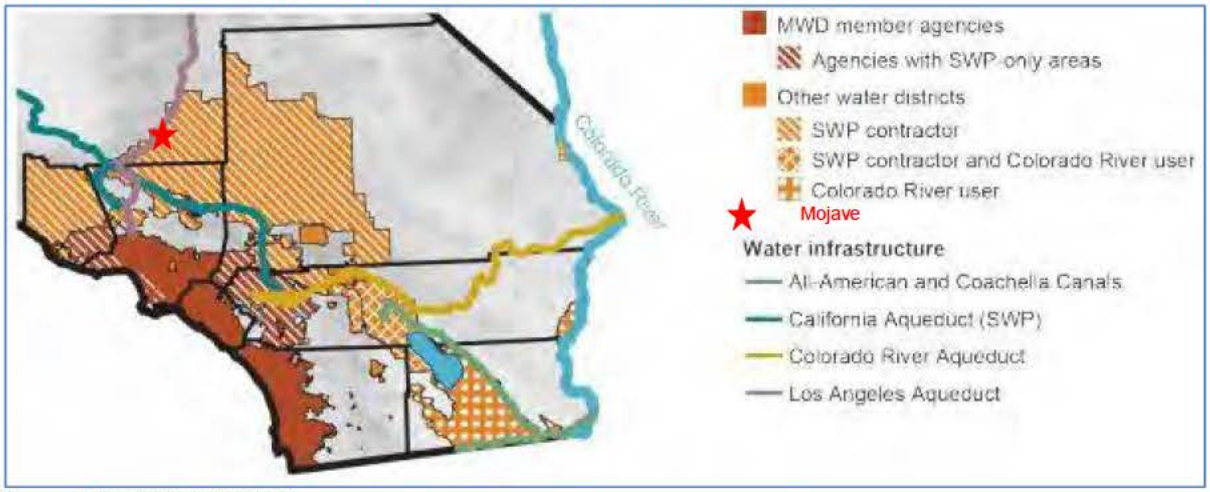
A variety of agencies are involved in water suppy management, including water rights allocations and water supply entitlements. Table 3 provides an overview of the key agencies and their primary responsibilities as related to water supply in the Mojave area and Southern California at large.

Table 3 Agencies Involved in California Water Suppy Management

Federal	Responsibility
U.S. Department of the Interior (DOI)	Watermaster for the Colorado River
U.S. Bureau of Reclamation (U.S. DOI)	Administers the Central Valley Project and Colorado River Project (among others)
U.S. Fish and Wildlife Service (USFWS)	Administers the federal Endangered Species Act (ESA) for inland fish species
National Marine Fisheries Service (NMFS)	Administers federal ESA for salmon, steelhead trout, and other species that spend at least part of their lives in the ocean
U.S. Environmental Protection Agency (USEPA)	Regulates water quality through the Clean Water Act, Safe Drinking Water Act, Resuorce Conservation and Recovery Act, and other federal laws
U.S. Army Corps of Engineers (USACE)	Builds and oversees flood control systems and flood operations of most reservoirs
Federal Emergency Management Agency (FEMA)	Operates the National Flood Insurance Program
Federal Energy Regulatory Commission (FERC)	Licenses and regulates dams that produce hydropower
State	**Responsibility**
State Water Resources Control Board (SWRCB)	Permits and administers state surface water rigts and regulates water quality
California Department of Water Resources (DWR)	Administers the State Water Project and oversees state water planning and state flood control operations
Calfironia Department of Fish and Wildlife (CDFW)	Implements California fish protection laws and the state Endangered Species Act
California Department of Public Health	Regulates drinking water quality (utilities, devices)
Central Valley Flood Protection Board	Permits construction and modification of levees within the Central Valley
California Public Utilities Commission	Regulates water rate structures for private water utilities (20 percent of urban customers)

In addition to the federal and state agencies involved in California water supply management, as mentioned in Table 2 above, there are also major local and regional agencies involved in water supply management. Specifically, the Metropolitan Water District of Southern California (MWD or "Metropolitan") is a wholesale SWP contractor to the DWR, and in turn holds contracts for the long-term delivery of SWP water to its own member agencies. Metropolitan also owns and operates the Colorado River Aqueduct, which conveys Colorado River water from the Lower Basin (of the Colorado River watershed) for more than 200 miles to the west, to Metropolitan's service area. In addition, the Los Angeles Department of Water and Power (LADWP) also conveys water supply from the Owens Valley and Mono Lake to its service territory in the urban center of Los Angeles via the Los Angeles Aqueduct (Nos. 1 and 2). An overview of these projects and the associated agencies is provided in Figure 2, followed by further information on the projects from Table 2.

Figure 2 Local and Regional Water Agencies and Infrastructure



Source: PPIC 2021; PPIC 2020

2.1 California Aqueduct (State Water Project)

The California Aqueduct is a primary feature of the SWP, and conveys SWP water from the Sacramento-San Joaquin Bay-Delta ("Delta") in Northern California to SWP Water Supply Contractors ("SWP contractors") in Southern California. The SWP is a multi-purpose water storage and delivery system comprised of canals, pipelines, reservoirs, and power facilities throughout California. The SWP is managed and operated by the California DWR. The DWR holds SWP contracts with 29 SWP contractors for annual delivery of specific allocations of SWP water. Each SWP contractor has a set "Table A" allocation, which is an initial allocation of SWP water that is assigned to each SWP contractor, based upon storage and releases anticipated to be made in the SWP system throughout the year; the actual amount of SWP water available for delivery varies each year, depending on factors including drought conditions, and environmental demands on the Delta. This is discussed below in Section 2.1.1, *SWP Allocations*.

The SWP was designed to deliver up to 4.2 million acre-feet per year (MAFY) of water throught the system. Between 1988 and 2017, agricultural water use in the San Joaquin Valley exceeded sustainable supplies by nearly two MAFY. During this same period, Southern California SWP contractors received an average of approximately 1.3 MAFY of SWP water via the California Aqueduct (PPIC 2020). On average, Southern California deliveries of SWP water increased by roughly 400,000 AFY, primarily due to Southern California's increased ability to take and store water it had rights to under long-standing SWP contracts, thanks to investments in surface storage (e.g., construction of Diamond Valley Lake) and underground storage (PPIC 2020). In addition, SWP supplies have become an increasingly important portion of Southern California's water supply portfolio starting in the early 2000s, as the region was required to reduce its reliance on Colorado River flows (PPIC 2020); Colorado River supplies are discussed below, in Section 2.2, *Colorado River Aqueduct*.

2.1.1 SWP Allocations

Southern California is the largest urban user of Delta exports, where "Delta exports" refers to the total amount of water exported from the pumps at the south of the Sacramento–San Joaquin Delta to the Bay Area, the San Joaquin Valley, the Central Coast, and Southern California (PPIC 2020). Once this water reaches southern California, it is referred to as "Delta imports". All agencies that receive SWP water directly from the SWP system, i.e., diverting SWP water from the California Aqueduct, are SWP contractors that hold a SWP contract with the DWR for the delivery of a specific amount of SWP water each year ("Table A"). There are 29 SWP contractors throughout the state; these are wholesale water agencies that in turn, hold contracts with their own member agencies for delivery of a portion of the wholesale agency's (SWP contractor) allocation of SWP water. However, the actual amount of each SWP contractor's allocation of SWP water that is delivered each year varies, largely depending on environmental conditions.

The California DWR operates and manages the overall SWP system. Since 1996, the DWR has issued a Notice to Contractors (NTC) to all SWP contractors at least once per year, and more frequently depending upon real-time water availability issues, to notify all SWP contractors of their approved allocation of SWP water as of the date of the NTC, where the approved allocation represents a percentage of the original Table A allocation. Records of historic SWP allocations approved as a percentage of original Table A allocations for water years 1996 through 2020 indicate that SWP deliveries have ranged from zero to 100 percent of each SWP contractor's Table A amounts, depending on the year (DWR 2021a). The March 2021 NTC notified SWP contractors that only five percent of the original Table A allocations are available, as shown in Table 4 below (DWR 2021b).

Table 4, below, indicates that with the exception of Butte County, all SWP contractors will receive a maximum of five percent of their Table A allocation in 2021. The difference between the original Table A allocations and the approved allocation amounts demonstrates the issue of "paper water", which is an amount of water that a party is legally entitled to use (i.e., the original Table A allocation for each SWP contractor as defined in the respective SWP Water Supply Contracts), which is not the same as the amount of water that is physically available for use during any given year. The DWR addresses the difference between paper water and physical water by issuing NTCs which specify the total amount of water that is physically available to SWP contractors based on current SWP conditions. As shown below, for 2021, the DWR has determined that only five percent of the "paper water" Table A allocations is physically available for delivery to SWP contractors. This cutback to five percent is a further restriction on the 2020 SWP cutbacks, under which SWP contractors received up to 15 percent of their Table A allocations (DWR 2021b).

Table 4 also indicates that in 2021, the cumulative total amount of SWP water delivered to Southern California SWP contractors is 131,678 acre-feet. This total will be distributed amongst the 13 Southern California SWP contractors throughout the year, and conveyed to each of the contractors via the California Aqueduct. Figure 1 identifies those SWP contractors located in the SWP High Desert Region and Low Desert Region, respectively. The Mojave area is located within the service area of the Antelope Valley-East Kern Water Agency (AVEK), for which DWR approved a 2021 SWP delivery amount of 7,242 acre-feet, equivalent to five percent of AVEK's contracted Table A allocation.

Table 4 State Water Project 2021 Allocations Approved for Delivery (acre-feet)

SWP CONTRACTORS	TABLE A (1)	INITIAL REQUEST (2)	APPROVED ALLOCATION (3)	PERCENT INITIAL REQUEST APPROVED (3)/(2) (4)
FEATHER RIVER				
County of Butte	27,500	27,500	3,000	11%
Plumas County FC&WCD	2,700	2,700	135	5%
City of Yuba City	9,600	9,600	480	5%
Subtotal	**39,800**	**39,800**	**3,615**	
NORTH BAY				
Napa County FC&WCD	29,025	29,025	1,451	5%
Solano County WA	47,756	47,756	2,388	5%
Subtotal	**76,781**	**76,781**	**3,839**	
SOUTH BAY				
Alameda County FC&WCD, Zone 7	80,619	80,619	4,031	5%
Alameda County WD	42,000	42,000	2,100	5%
Santa Clara Valley WD	100,000	100,000	5,000	5%
Subtotal	**222,619**	**222,619**	**11,131**	
SAN JOAQUIN VALLEY				
Oak Flat WD	5,700	5,700	285	5%
County of Kings	9,305	9,305	465	5%
Dudley Ridge WD	41,350	41,350	2,068	5%
Empire West Side ID	3,000	3,000	150	5%
Kern County WA	982,730	982,730	49,137	5%
Tulare Lake Basin WSD	87,471	87,471	4,374	5%
Subtotal	**1,129,556**	**1,129,556**	**56,479**	
CENTRAL COASTAL				
San Luis Obispo County FC&WCD	25,000	25,000	1,250	5%
Santa Barbara County FC&WCD	45,486	45,486	2,274	5%
Subtotal	**70,486**	**70,486**	**3,524**	
SOUTHERN CALIFORNIA				
Antelope Valley-East Kern WA	144,844	144,844	7,242	5%
Santa Clarita Valley WA	95,200	95,200	4,760	5%
Coachella Valley WD	138,350	138,350	6,918	5%
Crestline-Lake Arrowhead WA	5,800	5,800	290	5%
Desert WA	55,750	55,750	2,788	5%
Littlerock Creek ID	2,300	2,300	115	5%
Metropolitan WDSC	1,911,500	1,911,500	95,575	5%
Mojave WA	89,800	89,800	4,490	5%
Palmdale WD	21,300	21,300	1,065	5%
San Bernardino Valley MWD	102,600	102,600	5,130	5%
San Gabriel Valley MWD	28,800	28,800	1,440	5%
San Gorgonio Pass WA	17,300	17,300	865	5%
Ventura County WPD	20,000	20,000	1,000	5%
Subtotal	**2,633,544**	**2,633,544**	**131,678**	
TOTAL	**4,172,786**	**4,172,786**	**210,266**	

Source: DWR 2021b

Notes:

(1) "Table A" refers to a fixed amount of SWP water that is allocated to each SWP contractor in its original Water Supply Contract with the DWR. Each of the 29 SWP contractors have a separate Table A allocation that remains constant each year. However, the amount of water that is physically available in the SWP system changes every year, depending on factors including environmnental (drought) condctions, and other uses of water in the SWP system. This Table A column identifies the original, annual allocation of SWP water for each SWP contractor.

(2) "Initial Request" refers to an annual request submitted by SWP contractors to the DWR, which requests all or a portion of each respective contractor's allocation of SWP water (Table A allocation). As mentioned above, Table A allocation amounts are fixed, but the actual amount of water that is physically available for delivery varies every year. SWP contractors who have signed the *Monterey Amendment* [to SWP Water Supply Contracts] may sell water from their annual Table A allocation to other SWP contractors, in accordance with the *Turn-Back Water Pool Program,* which is an annual program offered by the DWR in compliance with Article 56 of the SWP Water Supply Contracts. The *Monterey Amendment* of 1994 allows for excess flows (of SWP water allocated to SWP contractors) during wet years to be stored in groundwater banks and surface storage reservoirs, for use at a later time, or for environmental benefit on the Delta (WEF 2021a). A SWP contractor may choose to sell portions of its Table A allocation that it will not use, provided that the SWP contractor meets the following criteria: (a) the contractor has not elected to store project water outside of its service area in 2021, and (b) the contractor has not elected to carry over Table A water from 2020 pursuant to Article 12(e) or Article 56 of its Water Supply Contract. This Initial Request column is the amount of each SWP contractor's Table A allocation the contractor is requesting the DWR to provide. If a SWP contractor were to participate in the *Turn-Back Water Pool Program*, the Initial Request column would indicate an amount lower than the Table A column, i.e., the contractor would be requesting less water than it is allocated because it intends to sell the portion of its allocation that it doesn't need to other SWP contractor(s) for their beneficial use. As shown above, in 2021, all SWP contractors requested their full Table A allocation from the DWR.

(3) "Approved Allocation" refers to the actual physical amount of water that the DWR will deliver to each SWP contractor for the respective year. Sales and purchases of SWP water that may occur under the *Turn-Back Water Pool Program* do not affect the 2021 allocation of Table A water to any SWP contractors. As shown above, in 2021 the cumulative total amount of SWP water that DWR will provide to all 29 SWP contrators is 210,266 acre-feet, of which 131,678 acre-feet will be provided to Southern California SWP contractors.

(4) "Percent Initial Request Approved" refers to the percentage of each SWP contractor's original Table A allocation that is physically available for delivery to the respective contractors for the current year. The table above shows that for 2021, with the exception of Butte County, which will receive 11 percent of its original Table A allocation, the remaining 28 SWP contractors will each receive 5 percent of their Table A allocation.

As mentioned above and shown in Table 4, the Mojave area is located within the service area of the Antelope Valley-East Kern Water Agency (AVEK), for which DWR approved a 2021 SWP delivery amount of **7,242 acre-feet**, equivalent to five percent of AVEK's contracted Table A allocation.

Table 5, below, provides an overview of 2021 SWP allocations for all SWP contractors in the SWP System High Desert Region, which comprises the study area for the purposes of this review, as defined in Section 1.2.1.

Table 5 2021 SWP Allocations for High Desert Region SWP Contractors

SWP Contractor	Service Area Size	2021 SWP Allocation
AVEK Water Agency	2,400 square miles	7,242 AFY
Littlerock Creek Irrigation District	16 square miles	115 AFY
Mojave Water Agency	5,000 square miles	4,490 AFY
Palmdale Water Agency	187 square miles	1,065 AFY
Total for High Desert Region	**7,603 square miles**	**12,912 AFY**

As shown above, based on the March 2021 NTC from DWR, the cumulative total of approved SWP allocations to contractors in the High Desert Region of the SWP System as **12,912 AFY as of March 2021**, which represents five percent of the contracted Table A allocations. This reduction is in contract with the projections including in AVEK's current (2020) Urban Water Management Plan (UWMP), which evaluates SWP supply availability under future conditions by assuming a straight-line reduction in long-term average allocation from 58 percent (of Table A allocations) in 2020 to 52 percent in 2040, after which time it is assumed that SWP deliveries will remain constant at 52 percent of the original Table A allocations (AVEK 2021).

To demonstrate the variability in the actual amount of Table A allocations that are delivered to SWP contractors each year, Table 6, below, provides an overview of the approved Table A allocation amounts over the past 20 years, where the "approved amount" is a percentage of the original Table

A allocations, and represents the amount of water that is physically available for delivery at the date the notice of allocation reduction was provided (showni in the middle column below). The last column in Table 7 uses shading to indicate the following:

- red = SWP allocations were 0-25% of original Table A allocations
- orange = SWP allcations were 26-50% of original Table A allocations
- yellow = SWP allocations were 51-75% of original Table A allocations
- green = SWP allocations were 76-100% of original Table A allocations

In the categories listed above and shown below, the SWP allocations representing a percentage of the total original Table A allocation (last column) is the amount of water that was physically available for delivery to SWP contractors at the date of the notice of the respective change in allocation amount (center column).

Table 6 State Water Project Historical Table A Allocations

Year	Date of NTC to SWP Contractors[1]	Percentage of Original Table A Allocation Approved for Delivery
2021	March 23	5
	December 1	10
2020	May 22	20
	January 24	15
2019	December 2	10
	June 19	75
	March 20	70
	February 20	35
	January 25	15
2018	November 30	10
	May 21	35
	April 24	30
	January 29	20
2017	November 29	15
	April 14	85
	January 18	60
2016	December 21	45
	November 28	20
	April 21	60
	March 17	45
	February 24	30
	January 26	15
2015	December 1	10
	March 2	20
	January 15	15

Year	Date of NTC to SWP Contractors[1]	Percentage of Original Table A Allocation Approved for Delivery
2014	December 1	10
	April 18	5
	January 31	0
2013	November 19	5
	March 22	35
2012	December 21	40
	November 29	30
	May 23	65
	April 16	60
	February 21	50
2011	November 18	60
	April 20	80
	March 15	70
	January 20	60
2010	December 20	60
	November 22	25
	June 22	50
	May 20	45
	May 3	40
	April 22	30
	March 30	20
	February 23	15
2009	November 30	5
	May 20	40
	April 15	30
	March 18	20
2008	October 29	15
	February 1	35
2007	November 21	25
2006	November 30	60
	April 18	100
	March 23	80
	January 17	70
2005	December 14	65
	November 22	55
	May 27	90
	April 21	80
	April 1	70
	January 14	60
2004	December 1	40

Year	Date of NTC to SWP Contractors[1]	Percentage of Original Table A Allocation Approved for Delivery
	March 1	65
	January 15	50
2003	December 1	35
	May 16	90
	April 24	70
	March 26	50
	January 16	45
2002	December 3	20
	August 23	70
	May 14	65
	March 28	60
	March 22	55
	January 11	45
2001	November 30	20
	August 16	39
	May 17	35
	May 4	33
	March 15	30
	March 6	25
	January 31	20

Source: DWR 2021a; DWR 2021b

Notes:

(1) NTC = Notice to Contractors; Since 1996, the DWR has provided NTCs to all SWP contractors to notify them of the physical amount of water available to the SWP system, which contractors may expect to receive in their respective systems. NTCs are provided at a minimum once per year, and are issued more frequently as determined necessary based upon known and projected water supply conditions. DWR may issue an NTC at any time, depending on conditions influencing water supply availability.

The following conclusions are derrived from the historical data in Table 6, reflecting changes in approved allocations (actual delivery amounts), as represented by a percentage of the original Table A allocations, over the last 20 years:

- **66% of all alocation changes** over the past 20 years result in delivery of **50% or less** of the original Table A allocations, including 33% of allocation changes resulting in SWP deliveries equivalent to 25% or less of original Table A allocations, and 33% of allocation changes resulting SWP deliveries equivalent to 26-50% of original Table A allocations
- **34% of all allocation changes** over the past 20 years result in delivery of **51% or more** of the original Table A allocations, including 21% of allocation changes resulting in SWP deliveries equivalent to 51-75% of original Table A allocations, and 9% of all allocation changes resulting in SWP deliveries equivalent to 76% or more of original Table A allocations

Over the past 20 years of SWP operations, there was only one recorded occurrence of SWP allocations consisting of the full (100%) amount of Table A allocations (April 2006), while there were

four occurrences of 5% allocations (including the current March 2021 rate), and there was one occurrence of 0% allocations (January 2014), under which no deliveries of SWP water occured.

As discussed above Table 6, AVEK's current (2020) UWMP assumes that SWP allocations (actual deliveries) will decrease in a straight-line progression from 58 percent (of Table A allocations) in 2020, to 52 percent in 2040, after which time the UWMP assumes SWP deliveries will remain constant at 52 percent of the original Table A allocations (AVEK 2021). However, Table 6 indicates that in 2020, SWP allocations were only 15-20% of the Table A allocations, or less than half the amount assumed for 2020 in AVEK's UWMP. Furthermore, the historical data presented and discussed above indicate that SWP allocations equating to 50% or more of the original Table A allocations only occur under about one-third (34%) of DWR's notified changes in SWP allocations. In addition, it is twice as likely that SWP allocations will be less than 50% the original Table A allocations than it is they will be greater than 50% of the original Table A allocations.

This comparison of AVEK's UWMP assumptions to recorded historical changes to SWP allocations (actual deliveries) is provided to demonstrate the following key points, as relevant to the feasibility of procuring a sufficient water supply for the proposed Mojave production site:

- The amount of imported surface water supplies provided to SWP contractors may be changed at any time by the DWR, as the operator and manager of the SWP system, depending on current and anticipated weather conditions, water in storage, and state-wide water demands, including environmental requirements
- SWP contractors very rarely receive 100% of the original Table A allocations, indicating that the original allocation is not a reliable metric to use in water supply availability planning
- SWP contractors most commonly (66% of the time) receive less than 50% of the original Table A allocations, and of those deliveries, approximately half (33% of the time) are deliveries equivalent to less than 25% of the original Table A allocations

The address the inconsistecies and lack of reliability in actual SWP water deliveries, it is assumed that AVEK, as well as all other SWP contractors that rely on SWP imports to meet water demands in their service areas, will rely on stored / banked groundwater and conservation efforts to support service area demands under DWR's restricted deliveries of SWP water supplies. As mentioned above, all SWP water received by SWP contractors in the High Desert Region is conveyed to the High Desert Region via the California Aqueduct; once SWP water is diverted from the California Aqueduct by SWP contractors, each respective SWP contractor then conveys SWP water to their own contract holders, including agricultural, municipal, and industrial users.

2.1.2 Water Transfers

A water transfer is a temporary or long-term change in the point o diversion, place of use, or purpose of use due to a transfer, sale, lease, or exchange of water or water rights. In comparison, a water exchange is water delivered by one water user to another, with the receiving water user providing water in return at a specified time or when conditions of the parties' agreement are met. AVEK has executed 13 exchange agreements and eight transfer agreements totaling *over 170,000 acre-feet in the past 10 years*. In 2020, AVEK transferred or exchanged 11,286 acre-feet of water to four agencies (AVEK 2021), as summaried in Table 7 below.

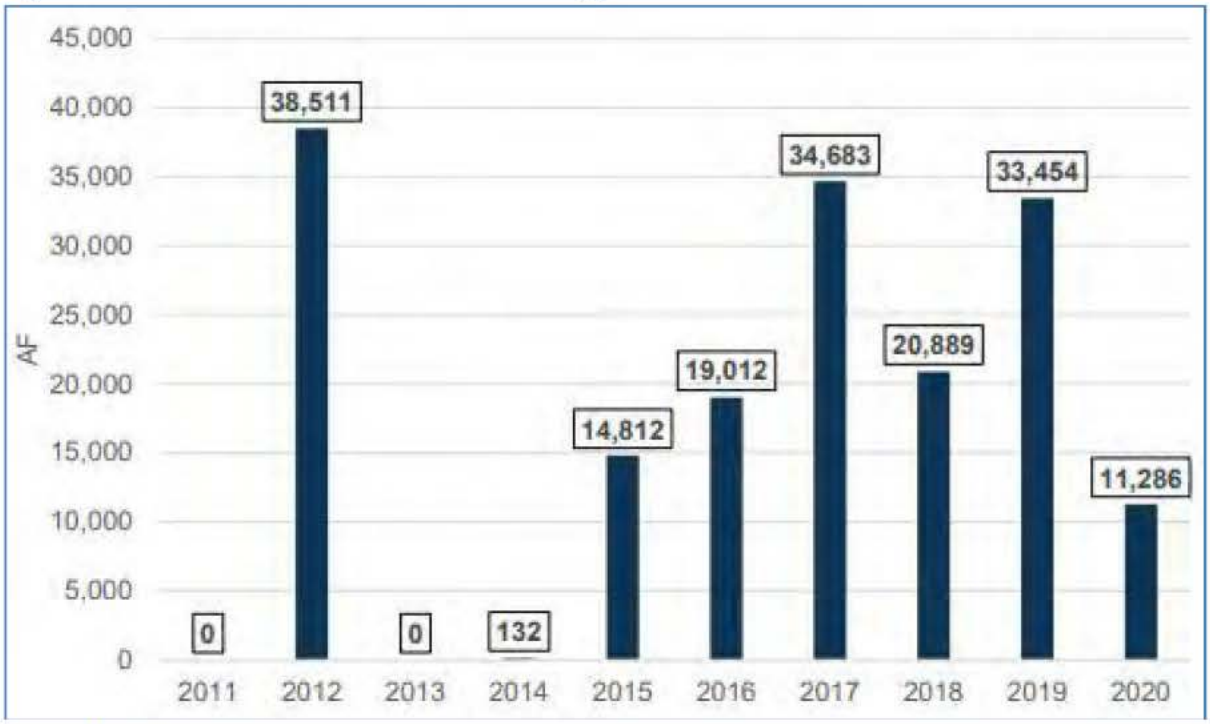
Table 7 Total AVEK Transfers and Exchanges in 2020

Entity Name	Description	DWR Agreement No.	Amount from AVEK to Other Agencies (AF)
Kern County WA/V Lions	Table A Transfer	10-026	7,000
Littlerock Creek ID	1:1 Table A Exchange	07-031	1,380
Palmdale WD	1:1 Table A Exchange	18-032	1,500
Santa Clarita Valley WA	2:1 Table A Exchange	19-032	1,406
		Total	**11,286**

Source: AVEK 2021

In addition, Figure 3 below shows an overview of AVEK's transfers and exchanges of water supplies between 2011 and 2020; a comparison between the data in Table 7 above and Figure 3 below reveals that 2020 transfers and exchanges were lower than the previous several years, and the highest amount of transfers and exchanges occurred in 2012, in the amount of 38,511 acre-feet.

Figure 3 Total AVEK Transfers and Exchanges between 2011 and 2020



Source: AVEK 2021

The discussion provided above is for background informational purposes only, and for comparison of scale between the amounts of water anticipated to be required for the project, and the amounts of water that are commonly traded and exchanged in the Mojave area. This discussion does not constitute securing water transfers or exchanges for the project. Water transfers that require the use of State, regional, or a local public agency's conveyance facilities require the owner of the conveyance facilities to determine that the transfers will not: harm any other legal user of water; unreasonably affect fish and wildlife; and unreasonably affect the overall economy of the county from which the water is transferred.

Water transfers that involve changes in point of diversion, place of use, or purpose of use to a post-1914 water right most often require the approval of the State Water Resources Control Board (SWRCB). Water transfers using SWP or CVP Delta export facilities can only occur if there is available conveyance capacity after meeting all operational and regulatory requirements. Transfer water can only be conveyed through the SWP and CVP export facilities during July through September consistent with the Biological Opinions for CVP and SWP operations issued by NOAA Fisheries and USFWS. Any buyer or seller wanting to move water outside the existing transfer window must first consult with NOAA Fisheries and USFWS.

2.2 San Luis Unit (Central Valley Project)

The Central Valley Project (CVP) is a federal power and water management project operated by the U.S. Bureau of Reclamation (USBR). The CVP is operated in a similar manner to the SWP, in that it moves water supply between northern and sothern California. The CVP and the SWP also share many common facilities, and transfer of water (between contracting agencies) that would use SWP and/or CVP facilities requires the approval of both managing agencies. The B.F. Sisk Dam forms the San Luis Reservoir and, in conjunction with the San Luis Canal, these facilities are jointly referred to as the "San Luis Unit", located in the western portion of the San Joaquin Valley. The San Luis Reservoir comprises the largest off-stream reservoir in the United States, and is a key facility for both the State SWP and the federal CVP. The San Luis Unit was constructed by the USBR, and is operated and maintained by the California DWR. The San Luis Canal is a 102-mile-long portion of the California Aqueduct that was federally built by the USBR as part of the San Luis Unit (USBR 2021a).

The San Luis Unit provides flexibility to both the SWP and the CVP by storing excess winter and spring flows diverted off the Delta until the water is needed later in the year by both SWP and CVP contractors. The CVP facilities are concentrated in the Central Valley Basin, which is comprised of the Sacramento River watershed in Northern California as well as the San Joaquin River watershed, which extends into Southern California. The southern-most extent of CVP facilities is near Bakersfield and the Tehachapi Mountains adjacent to the north of Mojave (USBR 2021a).

Because both the CVP and the SWP convey water from the Sacramento River and the Delta, facility operations are coordinated based on a Coordinated Operating Agreement, the Bay-Delta Plan Accord, and many other agreements (USBR 2021a). Irrigation and municipal water for both the SWP and the CVP is delivered from the main canals in accordance with long-term contracts negotiated with irrigation districts and other local organizations. Distribution of water from the main canals to the individual users is the responsibility of the local districts (USBR 2021a). Similar to the SWP, the actual quantity of water that is delivered to CVP contractors during any given year fluctuates, depending on the actual physical availability of water in any given year.

In 2020, the USBR submitted to Congress a final feasibility report to raise the B.F. Sisk Dam (which forms San Luis Reservoir) by 10 feet to create an additional 130,000 acre-feet of storage to meet existing contractual obligations; this additional storage would not serve any new demands (WEF 2021c). The USBR projects that in 2021, total CVP water deliveries for existing contractual obligations to support municipal and industrial (M&I) uses south of the Delta will be up to 75,972 acre-feet (USBR 2021b). As shown in Table 8, below, the M&I use category is highlighted because the proposed project would be considered an M&I use, and total CVP deliveries for M&I uses is therefore provided as a demonstration of the scale of existing M&I water demands supported by CVP water supplies. As mentioned above, any transfer or exchange of water from facilities shared by the State SWP and the federal CVP require approval of both the DWR and the USBR.

Table 8 CVP San Luis Unit – M&I Historical Use and 2021 Allocation

Service Area	Maximum per Contract or Agreement (acre-feet)	M&I Historical Use (1) (acre-feet)	Agricultural Use (2) (acre-feet)	2020 Allocation by %	2021 Allocation by acre-feet (9)
North of the Delta					
American River M&I	313,750	184,357		55%	101,397
Sacramento River					
Water Service	468,990				
Agriculture			441,784	5%	22,089
M&I		27,206		55%	14,963
Water Rights (3)	2,115,620			75%	1,586,715
Refuge - Level 2 (4)	151,250			75%	113,438
South of the Delta					
Water Service	2,112,898				
Agriculture			1,974,766	5%	98,738
M&I		138,132		55%	75,973
Water Rights	875,623			75%	656,717
Refuge - Level 2 (4)	271,001			75%	203,251
Contra Costa In Delta	195,000	170,000		55%	107,250
New Melones East Side (5)	155,000			100%	155,000
East-Side Water Rights (6)	600,000				600,000
Friant					
Class 1	800,000			20%	160,000
Class 2	1,401,475			0%	0
Buchanan Unit	24,000				24,000
Hidden Unit	24,000				24,000
Total Water (7) (8)	**9,508,607**				**3,943,531**

Source: USBR 2021b

Notes:

(1) Municipal and Industrial (M&I) historical use is computed when the M&I allocation is less than 100% and is based upon the average of actual deliveries made the last 3 years of unconstrained CVP delivery. The historical use for Contra Costa Water District is 170,000 acre-feet as agreed upon in contract renewal negotiations. Allocations are based on the percentage of M&I historical use. M&I allocations are the identified percent of historical use or public health and safety, whichever is greater.

(2) Agricultural use computed as maximum contract amount less M&I historical use, if any.

(3) Sacramento River Water Rights includes: base supply (1,775,509 acre-feet) plus Project supply (340,111 acre-feet)

(4) Project also acquires up to 133,264 acre-feet of incremental Level 4 from willing sellers subject to availability and funding.

(5) New Melones East Side allocation is computed as a quantity (versus a percent) because only one group receives this allocation.

(6) Oakdale I.D. and South San Joaquin I.D. receive up to 600,000 acre-feet of water annually based upon a 1988 Agreement and Stipulation in recognition of the Districts' Melones water rights. The Districts are not allocated water, but rather receive water based upon in-flows into New Melones and application of a formula in the 1988 Agreement.

(7) Water supplied to City of Sacramento under operations agreement not included: Amer. R. (245,000 acre-feet) and Sacramento R. (90,000 acre-feet)

(8) Total does not include 800,000 acre-feet of water dedicated to fish and wildlife annually under the CVP Improvement Act.

(9) This is the maximum amount that can be delivered. Actual deliveries may be lower.

2.3 Los Angeles Aqueducts (Owens River and Mono Lake Basin Projects)

The Los Angeles Department of Water and Power (LADWP) secured water rights on the Owens River in Inyo County, within the eastern Sierra Nevada Mountains, in the early 1900s by filing for water rights and by purchasing land (with accompanying water rights) throughout the Owens Valley (WEF 2021b). The first Los Angeles Aqueduct was completed in 1913, extending 233 miles from the Owens Valley to the Los Angeles Basin. The Mono Basin Project was developed in 1940 to increase water supply availability and reliability in the Los Angeles Aqueduct, which was extended 105 miles to convey water from Mono Lake to Los Angeles. In addition, the second Los Angeles Aqueduct was completed in 1970, extending 137 miles from Haiwee Reservoir just south of the Owens dry lake bed to the city of Los Angeles. The City currently relies on imported water supply from the combined first and second Los Angeles Aqueducts, which convey surface runoff from snowmelt in the Eastern Sierra Nevada Mountains, as well as SWP imports (discussed above), and Colorado River Aqueduct imports (discussed below). These imported sources are used in combination with local groundwater, stormwater, recycled water, and conservation efforts, which collectively comprise LADWP's water supply portfolio.

The LADWP has used computerized modeling to predict the amount of water that will be available for conveyance in the Los Angeles Aqueducts from Sierra Nevada snowmelt to the Los Angeles Basin during normal-year (non-drought) conditions, as well as a series of varying intensity drought conditions. Table 9 shows that under normal-year (non-drought) conditions, LADWP anticipates its available supply to meet the anticipated demand for all years, such that no excess supply is available beyond existing contractual obligations (LADWP 2021). LADWP's current (2020) UWMP also projects water supply availability and reliability under exended drought conditions; similar to the balance shown above, LADWP predicts that under all climatic (drought) scenario, sufficient supply would be available to meet all obligations and demands.

Table 9 LADWP Projected Water Supply for Average Year Conditions

Demand and Supply Projections (in acre-feet)	Average Year Fiscal Year Ending on June 30				
	2025	2030	2035	2040	2045
Total Water Demand[1]	**642,600**	**660,200**	**678,800**	**697,800**	**710,500**
Post-Conservation Demand	**509,500**	**526,700**	**536,100**	**554,500**	**565,800**
Existing / Planned Supplies					
Conservation (Additional Active[2] and Passive[3] after FYE 14)	133,100	133,500	142,700	143,300	144,700
Los Angeles Aqueduct[4]	190,400	188,900	187,300	185,800	184,200
Groundwater					
- Entitlements[5]	109,400	109,400	109,400	108,800	108,800
- Groundwater Replenishment	7,000	11,000	11,000	11,000	11,000
- Stormwater Recharge (Increased Pumping)	4,000	8,000	15,000	15,000	15,000
Recycled Water- Irrigation and Industrial Use	17,300	29,200	29,700	29,800	30,000
Subtotal	461,200	480,000	495,100	493,700	493,700
MWD Water Purchases With Existing/Planned Supplies	181,400	180,200	183,700	204,100	216,800
Total Supplies	**642,600**	**660,200**	**678,800**	**697,800**	**710,500**

Source: LADWP 2021

Notes:

(1) Total demand with existing passive conservation prior to fiscal year ending (FYE) 14.

(2) Cumulative hardware-based conservation savings since late-1980s reached 110,822 AFY by FYE 14.

(3) Additional non-hardware-based conservation inclusive of retained passive savings from the dry period ending in 2017.

(4) Los Angeles Aqueduct supply is estimated to decrease 0.1652 percent due to climate impacts

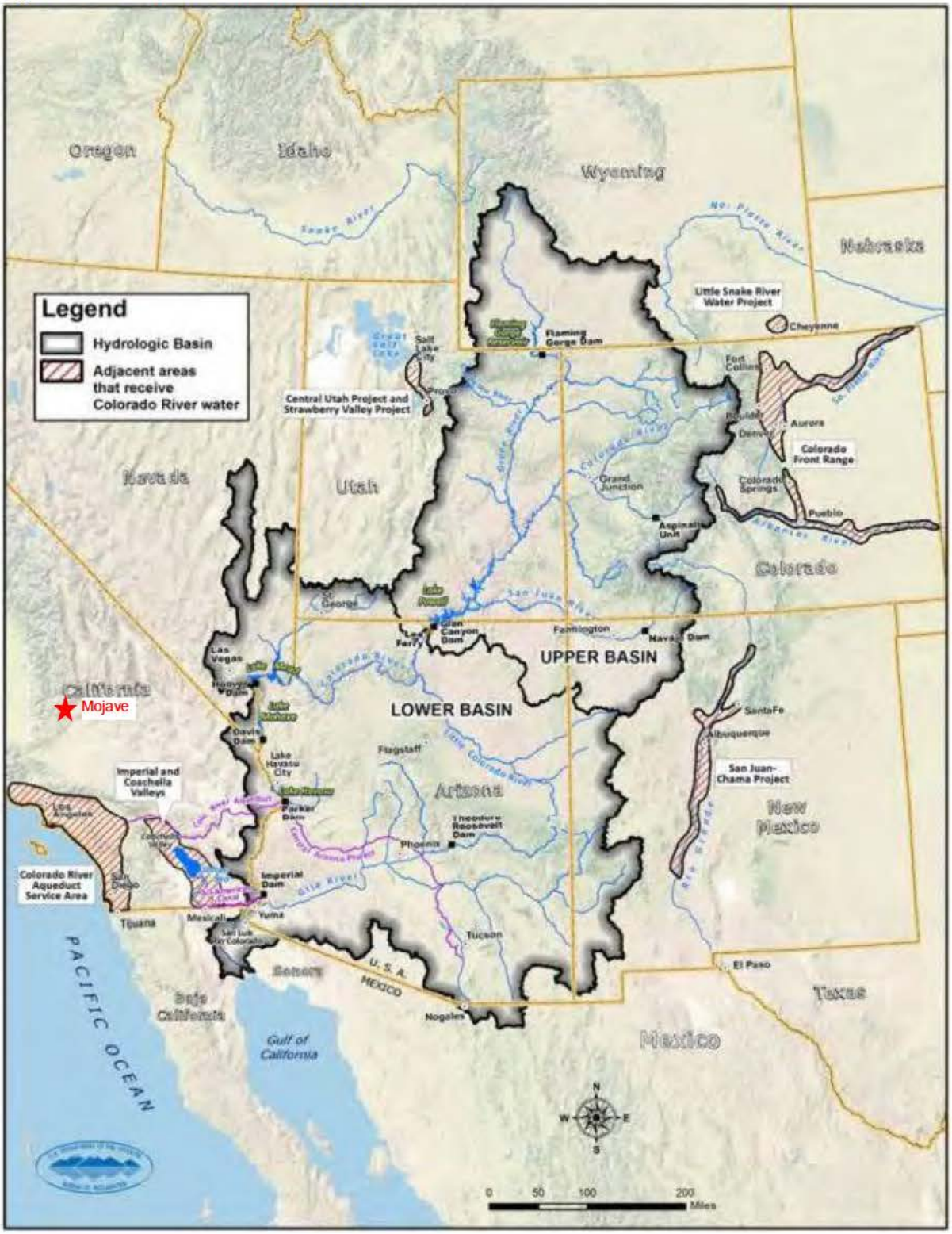
(5) LADWP Groundwater Remediation projects in the San Fernando Basin are expected to be in operation by FYE 2023. Sylmar Basin production will increase to 4,170 AFY from FYE 2021 to 2036 to avoid the expiration of stored water credits, then revert to entitlement amounts of 3,570 AFY in 2037.

2.4 Colorado River Aqueduct (Colorado River Project)

The Colorado River initiates in Wyoming and Colorado, and traverse through seven U.S. states including: Wyoming, Colorado, and Utah in the Upper Basin, and New Mexico, Arizona, Nevada, and California in the Lower Basin. The USBR manages Colorado River water supplies in accordance with the federal Colorado River Compact, as well as the "*Law of the River*", which includes a variety of laws, regulations, and court decisions which contribute to how water supply from the Colorado River is allocated and prioritized (CRS 2021).

The Colorado River watershed is divided into an Upper Basin and a Lower Basin, as shown on Figure 4. The Lower Basin has a base (guaranteed) allocation of 7.5 MAFY of Colorado River water. Of this 7.5-MAFY base allocation, 4.4 MAFY (nearly 59 percent) is allocated to California (CRS 2021). Colorado River water in conveyed into California via the Colorado River Aqueduct, which is owned and operated by Metropolitan, and diverts Colorado River water for 242 miles to Metropolitan's service area in Southern California.

Figure 4 Colorado River Watershed

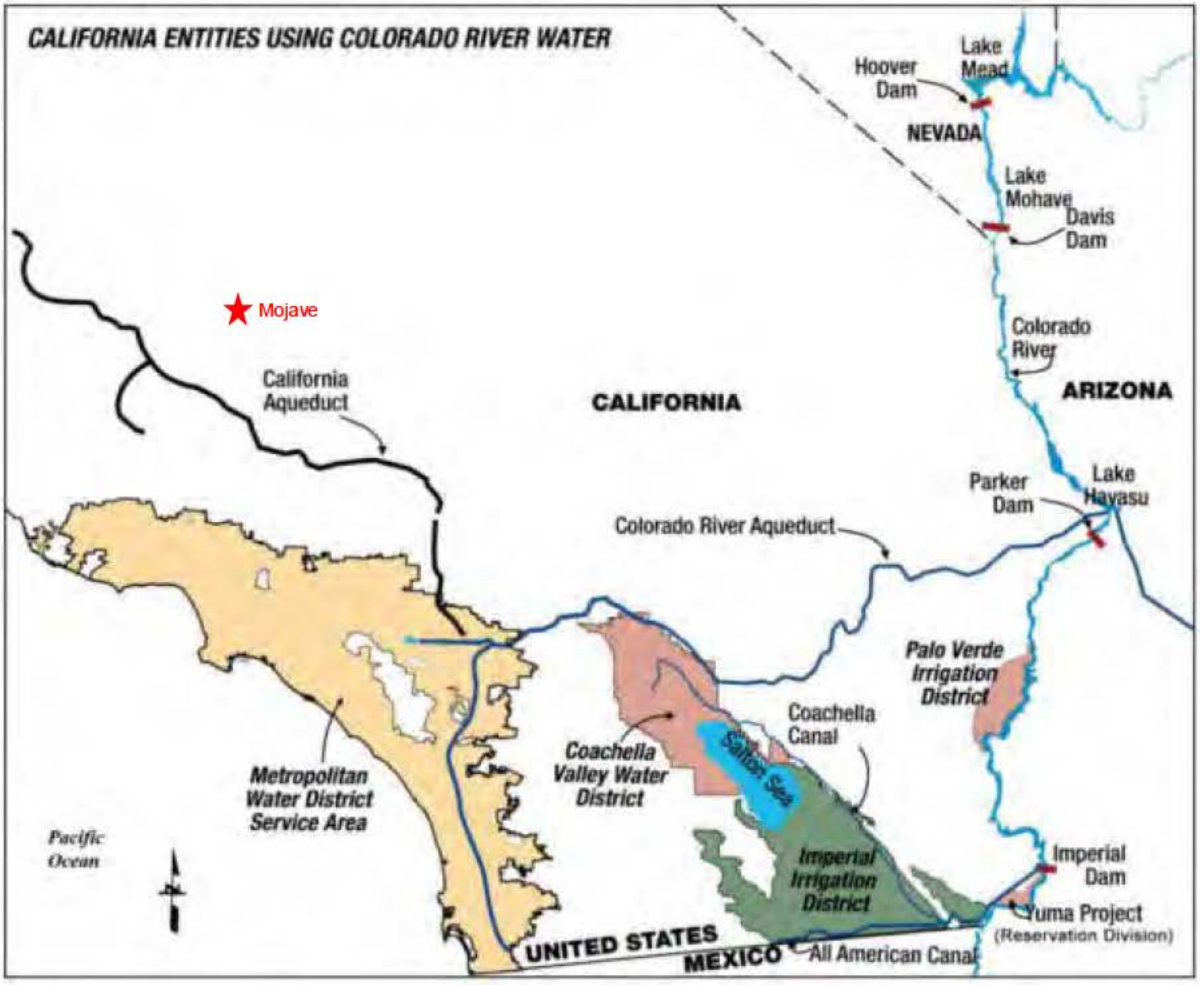


Source: CRS 2021

In addition to the Colorado River Aqueduct, two other aqueducts that convey Colorado River water into Southern California include the Coachella Canal, which diverts water from the Lower Basin to

the Coachella Valley Water District (CVWD) service area, and the All-American Canal, which diverts water to the Imperial Irrigation District (IID) service area. All these of these canals are shown below, on Figure 5.

Figure 5 California Entities Using Colorado River Water



Source: Metropolitan 2021

As mentioned above, California has a 4.4-MAFY allocation of Colorado River water. California has historically also diverted surplus flows in addition to its 4.4-MAFY allocation, where "surplus flows" refer to any flows of Colorado River water into the Lower Basin that are in excess of the Lower Basin's base allocation of 7.5 MAFY. This diversion of surplus flows has resulted in an inequitable distribution of Colorado River water supplies, as California was the only one of the four Lower Basin states diverting surplus supplies. Due to rapid population growth in Arizona and Nevada through the 1990s, as well as worsening drought conditions associated with climate change, the surplus water that had historically been diverted by California was needed by other states, requiring California to reduce its reliance on Colorado River water. In order to accomplish this, in October of 2003, the *Federal Quantification Settlement Agreement* (QSA) between USBR and the State of California, was jointly entered into by Metropolitan, San Diego County Water Authority (SDCWA), CVWD, and IID (USBR 2021c).

The 2003 QSA, also referred to as California's "Water Use Plan" [for the Colorado River], or the "4.4 Plan", is designed to save up to 800,000 AFY of water through conservation and water transfers from agricultural to urban usas, as well as through canal seepage recovery, groundwater banking, conjunctive use, reoperation of Lake Mead (surplus determinations), and possibly desalination of drainage water. The Water Use Plan quantifies each California party's share of Colorado River water, making possible water transfers among them, including a 35-year transfer (with potential extensions to 75 years) of water from the IID to the SDCWA. The ultimate goal of the Water Use Plan is to reduce California's demand on the Colorado River to its 4.4-MAFY entitlement, while also providing a restoration path forward for the environmentally sensitive Salton Sea (SDCWA 2020). Imperial County and others challenged the legality of the QSA in court but a Superior Court judge upheld the agreement in 2013. Below is an overview of some of the key requirements established by the 2003 QSA for the Water Use Plan, including major transfers of water from agricultural to urban uses:

- IID is entitled to 3.1 MAFY of Colorado River water
  - IID will transfer up to 200,000 AFY to SDCWA
  - IID will transer 105,000 AFY to Metropolitan
  - IID will transfer 103,000 AFY to CVWD
- CVWD is entitled to 330,000 AFY of Colorado River water
- Palo Verde Irrigation District will transfer 33,000 to 133,000 AFY to Metropolitan

An accounting of all current Southern California entitlements to Colorado River water is provided below, in Table 10. The parties identified below are presented in order of priority ranking, where the federal Indian Reservations have top priority, followed by the Present Perfected Rates (PPRs), and parties to the Seven-Party Agreement, which helped settle long-standing disputes between municipal and agricultural water uses, and finally surplus water contracts. The diversion amounts allowed in the Water Use Plan as defined by the 2003 QSA are conservation measures, intended to reduce California's consumption of Colorado River water to within its entitlement of 4.4 MAFY.

Table 10 Listing of Colorado River Water Entitlements in the State of California

Contractor or Decree Name	Diversion (AFY)
Federal[1]	
Chemehuevi Indian Reservation	11,340
Fort Yuma Indian Reservation	71,616
Colorado River Indian Reservation (Nov 22, 1873)	10,745
Colorado River Indian Reservation (Nov 16, 1874)	40,241
Colorado River Indian Reservation (May 15, 1876)	5,860
Fort Mojave Indian Reservation	16,720
Present Perfected Rates (PPRs)[2]	
Yuma Associates Ltd. And Winterhaven Water District	262.8
Wavers	517.2
Stephenson (PPR No. 30)	240
Campbell, Terry E. and Carol J.	0.71
Maureen E. and Robery M. Buncati	2.11
Bruncati Family Trust 12/19/02	1.90

Contractor or Decree Name	Diversion (AFY)
Sunrise Management LLC	2.81
Gary J. George	1.40
Robert L. & Christine M.	0.91
Lake enterprises of California, LLC	120
Gowan, Sonny (*Grannis)*	180
Morgan	150
Milpitas (PPR No. 34)	180
Simons	60
Colorado River Sportsmen's League	96
Milpitas (PPR No. 37)	69
Andrade (PPR No. 38)	66
Reynolds	36
Cooper	60
Chagnon	120
Lawrence	120
Needles, City of (PPR No. 43)	1,500
Needles, City of (PPR No. 44)	1.260
Conger	1
G. Draper	1
McDonough	1
Faubion	1
Dudley	1
Douglas	1
Beauchamp	1
Clark	1
Lawrence	1
J. Graham	1
Geiger	1
Schneider	1
Martinez	1
Earle	1
Diehl	1
Reid	1
Graham	1
Cate	1
McGee	1
Stallard (PCR No. 64)	1
Randolph	1
Stallard (PCR No. 66)	1

Contractor or Decree Name	Diversion (AFY)
Keefe	1
C. Ferguson	1
W.Ferguson	1
Vaulin	1
Salisbury	1
Hadlock	1
Streeter	1
J. Draper	1
Fitz	1
Williams	1
Estrada	1
Whittle	1
Corrington	1
Tolliver	1
Seven-Party Agreement[3]	
1. Palo Verde Irrigation District (104,500 acres)	3,850,000
2. Yuma Project (25,000 acres)	
3(a). IID and lands in Imperial and Coachella Valleys to be served by the AAC[4]	
3(b). Palo Verde Irrigaion District (16,000 acres of mesa lands)	
4. Metropolitan and/or City of Los Angeles and/or others on coastal plain	550,000
5. City and/or County of San Diego	112,000
6(a). IID and lands in Imperial and Coachella Valleys to be served by the AAC5	300,000
6(b). Palo Verde Irrigation District (16,000 acres of mesa lands)	
7. All remaining water available for use in California for agricultural uses	-
Surplus Water Contracts[6]	
Bureau of Land Management (BLM)	1,000
BLM (in lieu of water pumped from Lower Colorado Water Supply Project [LCWSP] facilities or in the event the LCWSP is non-functional)	1,150
Coachella Valley Water District	100,000
Department of the Navy	25
Needles, City of	10,000
Metropolitan Water District of Southern California	180,000

Source: USBR 2021c; USDOI 2003

Notes:

1. The Secretary agrees to deliver Colorado River water in the manner set forth in the 2003 QSA during the term of this Agreement (through 2037). The Secretary shall cease delivering water at the end of the term of the Agreement; provided, however, that the Secretary's delivery commitment to the San Luis Rey Indian Water Rights Settlement Parties (SLR) shall not terminate at the end of the term but shall instead continue, pursuant to Section 106 of Public Law 100-675, 102 Stat. 4000 et seq., as amended, subject to the terms and conditions of any applicable agreement to which the Secretary is a party concerning the allocation of water to be conserved from the lining of the All-American and Coachella Canals.
2. PPRs are the second most senior rights on the Colorado River, after federal and SLR enitlements. Article II(B)(3) of the 1964 Supreme Court Decree states that in any year where there is less than 7.5 million acre-feet available for use in California, Nevada, and Arizona, the Secretary of the Interior must first supply water to PPRs, in order of priority, regardless of state lines.

3. The Seven-Party Agreement (1931) helped settle the long-standing conflict between California agricultural and municipal interests over Colorado River water priorities. The seven principal claimants - Palo Verde Irrigation District, Yuma Project, Imperial Irrigation District, Coachella Valley Irrigation District, Metropolitan Water District, and the City and County of San Diego - reached consensus in the amounts of water to be allocated on an annual basis to each entity. During the term that the Colorado River Water Delivery Agreement (Federal QSA), dated October 10, 2003, remains in effect, the delivery of Colorado River water will be in accordance with the terms as set forth in that agreement and detailed in Exhibit B of the 2003 QSA (USDOI 2003).
4. IID = Imperial Irrigaion District; AAC = All-American Canal; PPR No. 27 = 2,600,000 AF.

   Except as otherwise determined under the *Inadvertent Overrun and Payback Policy* identified in 2003 QSA, the Secretary shall deliver Priority 3(a) Colorado River water to IID in an amount up to but not more than a consumptive use amount of 3.1 million AFY less the amount of water equal to that to be delivered by the Secretary for the benefit of CVWD, MWD, SDCWA, SLR (see note 1 above, SLR = *San Luis Rey Indian Water Rights Settlement Parties*), and Native American and miscellaneous PPRs as set forth in Exhibits A and B of the 2003 QSA. Colorado River water acquired by IID after the date of the QSA, and where necessary approved by the Secretary, shall not count against this cap.

   Except as otherwise determined under the Inadvertent Overrun and Payback Policy, the Secretary shall deliver Priority 3(a) Colorado River water to CVWD in an amount up to but not more than a consumptive use amount of 330,000 AFY less the amount of water equal to that to be delivered by the Secretary for the benefit of IID, MWD, SDCWA, SLR, and Indian and miscellaneous PPRs as set forth in Exhibits A and B of the 2003 QSA. Colorado River water acquired by CVWD in any transaction to the extent agreed upon prior to or concurrent with the execution of this Agreement by IID and MWD and, where necessary approved by the Secretary, shall not count against this cap.
5. Subject to any rights that PVID may have, and except as otherwise provided under the Interim Surplus Guidelines, or under the agreements contemplated by those guidelines, the Secretary shall deliver Priority 6(a) water to MWD, IID and CVWD in the following order and consumptive use volumes: (i) 38,000 AFY to MWD; (ii) 63,000 AFY to IID and (iii) 119,000 AFY to CVWD, or as those parties may agree to occasionally forbear. Any water not used by MWD, IID, or CVWD as set forth above will be available to satisfy the next listed amount in Section 3(a) above. Any additional water available for Priority 6(a) shall be delivered by the Secretary in accordance with IID and CVWD's entitlements under their respective Section 5 Contracts in effect as of the date of the 2003 QSA.
6. Surplus water contract will only be fulfilled if there is Colorado River water in excess of the 7.5-MAFY entitlement to the Lower Basin at large.

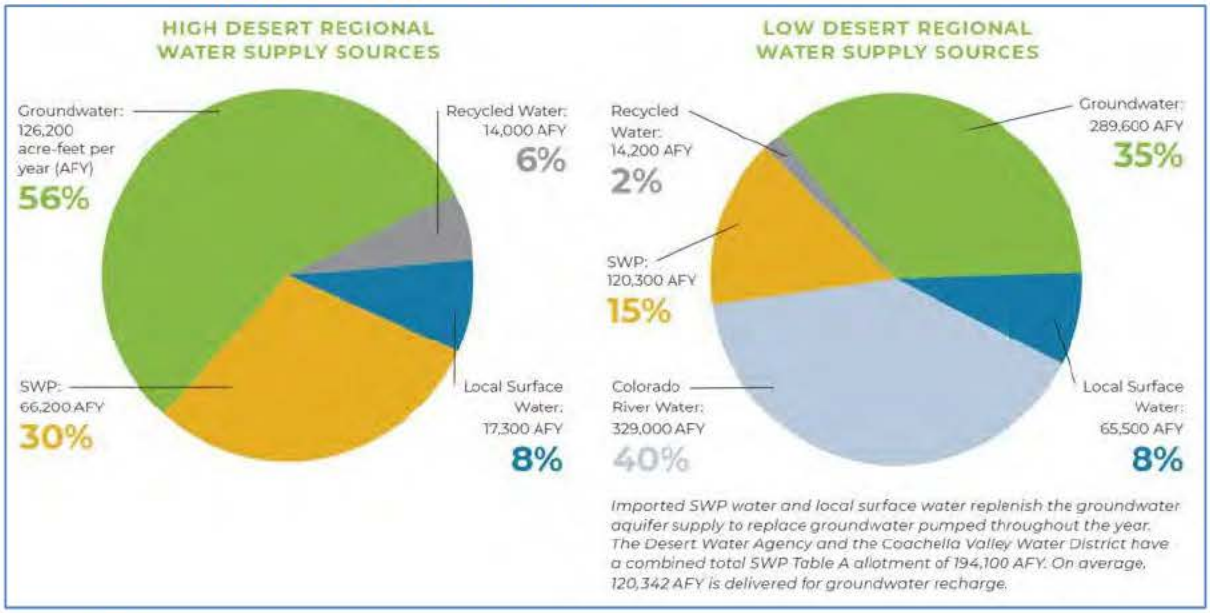
3 Water Supply Setting

[redacted]

3.1 [redacted] Supply Sources

Figure 6 provides an overview of the water supply sources used to meet existing demands in the High Desert Region and the Low Desert Region, respectively. Please note, the study area for water supply availability to the Mojave area is limited to the High Desert Region; however, the Low Desert Region is discussed where activities and/or water supplies therein have potential to affect water supplies available to the High Desert Region.

Figure 6 Existing Water Supply Sources and Scale



Source: SWC 2021

As shown above, in addition to SWP water and groundwater, High Desert Region sources also include recycled water, which currently comprises 14,000 AFY (six percent) of total supply, and local surface water, which currently comprises 17,300 AFY (eight percent) of total supply. [redacted]

[redacted]

As defined in Section 1.2.1, *Study Area/Scope of Analysis,* the scope of this analysis is defined as those water resources that occur within the High Desert Region of the SWP system, including: imported SWP water (see Section 3.2); local groundwater resources (see Section 3.3); and opportunities for recycled water development (see Section 3.4). The study area does not include the Low Desert Region (of the SWP system), [redacted]

Low Desert Region water supplies are substantially (40%) comprised of imported Colorado River water, which is managed under the direction of the United States Bureau of Reclamation (USBR) in accordance with the *Law of the River*, which refers to the federal Colorado River Compact and the suite of following laws and regulations which address distribution of Colorado River water allocations. Similar to SWP water, Colorado River water is fully allocated to existing contract-holders, and apportioned Colorado River water is widely acknowledged to be in excess of the river's natural flows (CRS 2021). In addition, Low Desert Region water supplies are also substantially (35%) from groundwater resources, which are largely adjudicated (see Figure 7). Non-adjudicated groundwater resources in the Low Desert Region are minimal [redacted]

3.2 Imported SWP Water

The availability of imported SWP water is determined by supplies and demands in the overall SWP system, which is managed by the DWR and relies on northern California precipitation and Sierra Nevada snowpack. The DWR administers long-term water supply contracts to 29 local water agencies for wholesale allocations of SWP water. The Antelope Valley East Kern (AVEK) water agency is the local SWP wholesaler in the Mojave area, and holds long-term delivery contracts with 20 municipalities within its service area, as well as U.S. Borax, a large mining operation, and Edwards Air Force Base (EAFB).

The Integrated Regional Water Management Plan (IRWMP) for the Antelope Valley Region, which is developed and implemented by the Antelope Valley Regional Water Management Group (RWMG), used estimates of future availability of SWP water deliveries based upon the DWR's (2017) *Delivery Capability Report* to estimate future deliveries of SWP water (Antelope Valley RWMG 2019). The *Delivery Capability Report* estimated that for an average water year, delivery of Table A water to wholesale SWP contractors would be 62 percent of the allocation amounts (DWR 2018). Figure 11 is from the Antelope Valley IRWMP, and provides average-year water budget projections assuming actual SWP deliveries will be 62 percent of the allocated amount (Antelope Valley RWMG 2019).

As shown in Table 11, under normal water-year (non-drought) conditions, and assuming delivery of 62 percent of SWP allocations, the Antelope Valley Region would experience a water supply deficit starting in 2030. However, actual SWP water deliveries have been substantially less than 62 percent; in 2015 the actual amount of SWP water received by AVEK was 29,937 acre-feet, or just under 21 percent of the contracted amount (AVEK 2016). AVEK's updated 2020 UWMP describes that Los Angeles County Waterworks Districts (LACWD), which represent roughly 70% of AVEK retailer sales, are required to acquire new supplemental water supplies for any new growth and, in accordance with a memorandum of understanding agreement between LACWD and AVEK, AVEK will deliver additional water to LACWD along with AVEK's existing supplies (AVEK 2021). The supplies may be

comprised of: (a) water supply originating outside the Basin and imported into the Basin by AVEK in addition to AVEK's SWP Table A annual allocation; (b) water supply generated by AVEK groundwater production rights; and (c) any other water supply generated through AVEK's acquisition of any other water right (AVEK 2021). The new supplemental water supplies provided by AVEK to the LACWDs are assumed to have greater reliability than SWP Table A supplies based on the mix of supply sources (AVEK 2021).

As further evidence of the reliability of SWP water deliveries, on March 23, 2021, the DWR issued a memorandum to notify all SWP contractors that deliveries of Table A allotments would be five percent of the contracted amounts, which is reduced from the 15 percent deliveries that were adjusted in October 2020 (DWR 2021c).

Table 11 Antelope Valley IRWMP – Water Budget Projections for an Average Year

	2015	2020	2025	2030	2035	2040
Groundwater						
Recharge + Return Flows (TSY)	126,300	118,100	110,000	110,000	110,000	110,000
Westside Water Bank [a]	0	0	0	0	0	0
Eastside Water Bank [b]	0	2,000	5,700	5,700	5,700	5,700
Direct Deliveries	33,000	99,500	99,500	99,500	99,500	99,500
Recycle/Reuse	350	8,700	11,900	15,100	18,300	18,300
Surface Water	500	4,000	4,500	4,500	4,500	4,500
Total Supply	**160,100**	**232,300**	**231,600**	**234,800**	**238,000**	**238,000**
Demands						
Urban Demand	71,700	137,500	153,600	167,600	181,700	184,500
Ag Demand	73,000	73,000	73,000	73,000	73,000	73,000
Total Demand	**144,700**	**210,500**	**226,600**	**240,600**	**254,700**	**257,500**
Supply and Demand Mismatch	**0**	**0**	**0**	**-5,800**	**-16,700**	**-19,500**

Notes: Values are rounded to the nearest 100.
(a) Assumes banked groundwater will not be used in an average year.
(b) Assumes banked groundwater supplies will be replenished and extracted the same year.
(c) 2015 deliveries represent actual deliveries in the Region; future projections assume the maximum Table A Amount available to the IRWM Region (160,452 AFY) multiplied by the SWP reliability of 62% for an average year.

Source: Antelope Valley RWMG 2019

Based on the March 2021 adjustments, AVEK's delivery of SWP water in 2021 is expected to be 7,242 acre-feet, or approximately five percent of its contracted SWP allocation of 144,844 AFY (DWR 2021); this amount will be split amongst all of AVEK's long-term SWP delivery contractors, and will exacerbate the supply deficits projected in the table above, likely resulting in deficit conditions developing sooner than projected. The Antelope Valley RWMG also projects water supply available for single-dry and multiple-dry water year (drought) conditions; however, those projections indicate more severe supply deficit conditions than projected above, [redacted]

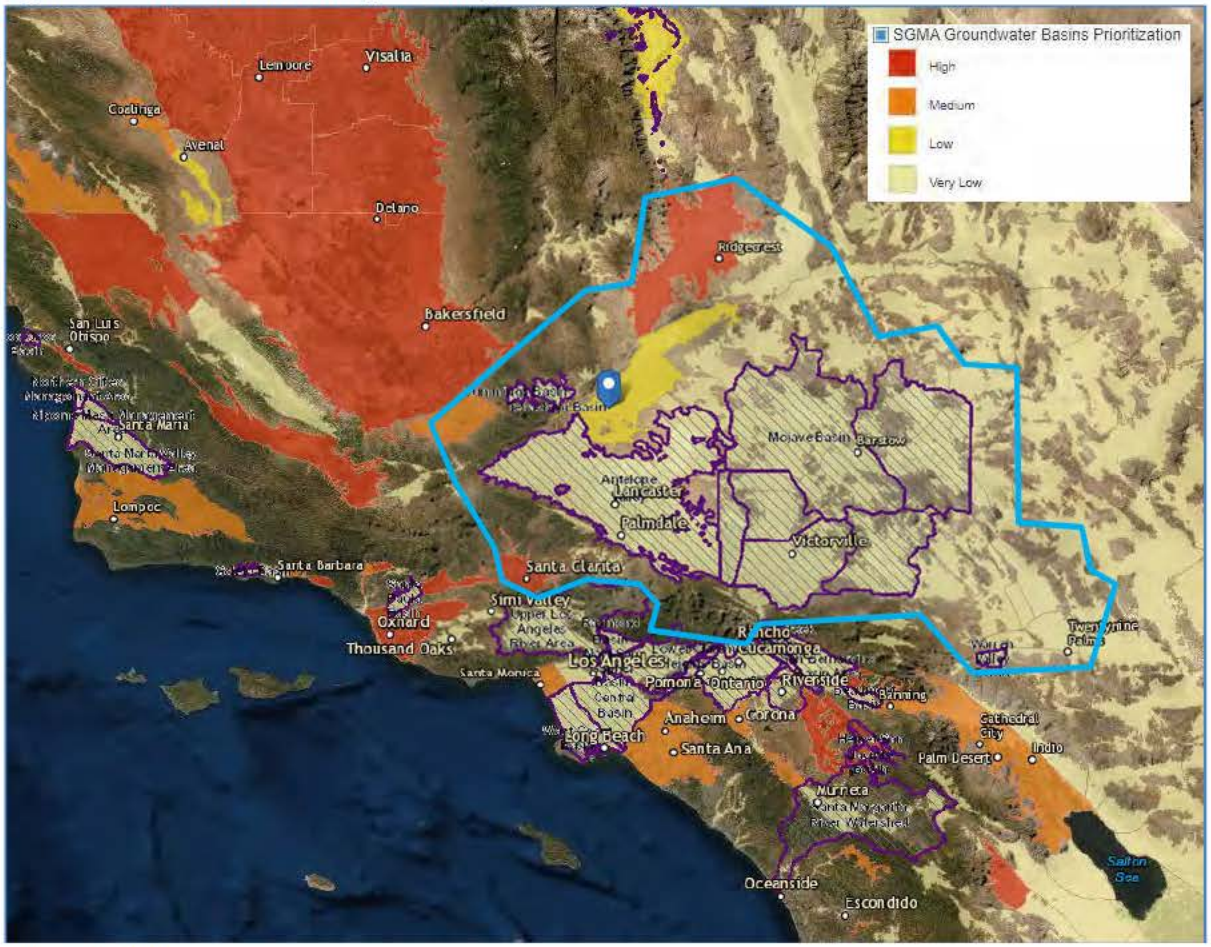
3.3 Local Groundwater

The availability of local groundwater is determined by overall basin condition [redacted] management [redacted] and existing uses [redacted] please see further discussion following Figure 7, which shows data from the SGMA Data Viewer (DWR 2021c) on the current status of groundwater basins throughout the High Desert Region and the surrounding region. Please note:

- The blue pin in the center of the image indicates the location of Mojave
- The groundwater basin underlying Mojave is the Fremont Valley Groundwater Basin, which is ranked by the DWR as Low Priority and therefore not currently subject to SGMA
- Hatched areas outlined in purple indicate adjudicated areas, where groundwater pumped from within the adjudication area may not be used outside the adjudication area; the Antelope Valley adjudicated basin to the south of the project site does not directly underlie the project site, [redacted]
- The blue line generally outlines the High Desert Region shown in Figure 1 as the study area for this analysis; as shown, the High Desert Region surrounds the Fremont Valley Groundwater Basin underlying Mojave and the adjudicated areas to the south and southeast

Figure 7 shows resources located beyond the primary study area; [redacted]

Figure 7 DWR Basin Priority Rankings and Adjudicated Basins



Source: DWR 2021c

[redacted]

1) [redacted] ***High Priority Basins.*** Groundwater basins identified by the DWR California Statewide Groundwater Elevation Monitoring (CASGEM) program (DWR 2021c) as High Priority [redacted] these basins are required by the Sustainable Groundwater Management Act (SGMA) to be managed under a Groundwater Sustainability Plan (GSP) administered by a Groundwater Sustainability Agency (GSA) to bring the basin into sustainable (i.e., non-overdraft) conditions [redacted]

2) [redacted] ***Adjudicated[1] Areas.*** Groundwater basins that are managed in accordance with an Adjudication Judgement and do not underlie the Mojave production site[redacted] Due to the nature of an Adjudication Judgement being to settle water rights disputes while providing sustainable management of the basin, groundwater may not be pumped from an adjudicated area and used outside of that adjudicated area.

[redacted]

1) [redacted]: **Fremont Valley Groundwater Basin.** The potential production location in Mojave is underlain by the Fremont Valley Groundwater Basin (Fremont Basin), which is identified by DWR as a Low-Priority basin under SGMA:
   a. Low-Priority basins are not currently subject to the requirements of SGMA to develop a GSP.
   b. The Fremont Basin is already extensively managed by a network of stakeholders which have formed the Fremont Valley Regional Water Management Group (Fremont Basin RWMG) and developed the 2018 Fremont Basin IRWMP; although not formally subject to SGMA at this time due to being ranked as Low Priority (versus High Priority or Overdrafted), the Fremont Basin RWMG serves the same purpose as a GSA, and the IRWMP likewise serves the same purpose as a GSP.
   c. The Fremont Basin [redacted] is addressed in Section 3.3.1, *Fremont Valley Groundwater Basin.*

[1] Adjudication occurs when a groundwater basin is not used sustainably and there is a dispute among water rights holders in the basin (tied to overlying landowner rights), which results in the issuance of a court ruling called an Adjudication Judgement. The Adjudication Judgement identifies each party to the subject area (i.e., each party with overlying water rights to the subject groundwater basin), and specifies how much water each party is allowed to produce from the basin each year. A court appointed Watermaster is responsible for administering the Adjudication Judgement.

2) [redacted]: **Antelope Valley Groundwater Basin.** Groundwater resources in the Mojave area are extremely constrained [redacted]

a. High Priority Basins. Aside from the groundwater basin underlying the Mojave area, which is identified as Low Priority (see Section 3.3.1, *Fremont Valley Groundwater Basin*), and the bordering adjudicated areas (discussed below), some of the nearest groundwater basins to the Mojave area are identified as High Priority [redacted]

   i. Indian Wells Valley Groundwater Basin (DWR No. 6-054), adjacent to the north of the Fremont Basin, is High Priority

   ii. San Joaquin Valley Groundwater Basin (DWR No. 5-022), to the north and north-northwest of the Fremont Basin, is High Priority

   iii. Cuyama Valley Groundwater Basin (DWR No. 3-013), west of Mojave and south of the San Joaquin Valley Groundwater Basin, is High Priority

   iv. Santa Clara River Valley Groundwater Basin (DWR No. 4-004.07), south of Mojave and the Antelope Basin, and south of the Los Padres National Forest and Angeles National Forest, is High Priority

b. Adjudicated Areas. There are 27 adjudicated groundwater basins throughout the state, of which five surround the Mojave area to the west and south, including:

   i. Tehachapi Basin (ID A18), small basin west of Mojave

   ii. Brite Basin (ID A20), small basin west of Tehachapi Basin

   iii. Cummings Basin (ID A19), small basin west of Brite Basin

   iv. Antelope Valley Groundwater Basin (ID A26), extensive basin south of Mojave; the Adjudication Judgement for the Antelope Basin covers 1,390 square miles of the total 1,580-square-mile basin area. AVEK holds overlying rights to 3,550 AFY of the basin; [redacted] this basin is addressed below in Section 3.3.2, *Antelope Valley Groundwater Basin*, [redacted]

   v. Mojave Basin Area (ID A08), extensive basin west of Antelope Basin, including subbasins identified as: Alto Transition Zone Subarea; Oeste Subarea; Centro Subarea; Este Subarea

3) [redacted]: White Wolf Subbasin and Carrizo Plain Groundwater Basin. There are two groundwater basins that do not underlie the proposed Mojave production area, but which also are neither High Priority nor adjudicated, [redacted] These basins include:
   a. White Wolf Subbasin (DWR No. 5-022.18) of the San Joaquin Valley Groundwater Basin is identified as Medium Priority, and located west of the Mojave area; this basin is addressed [redacted] in Section 3.3.3, *White Wolf Subbasin.*
   b. Carrizo Plain Groundwater Basin (DWR No. 3-019) is identified as Very Low Priority, located west of the White Wolf Subbasin, along the western boundary of the San Joaquin Valley Groundwater Basin; this basin is addressed [redacted] n Section 3.3.4, *Carrizo Plain Groundwater Basin.*

[redacted]

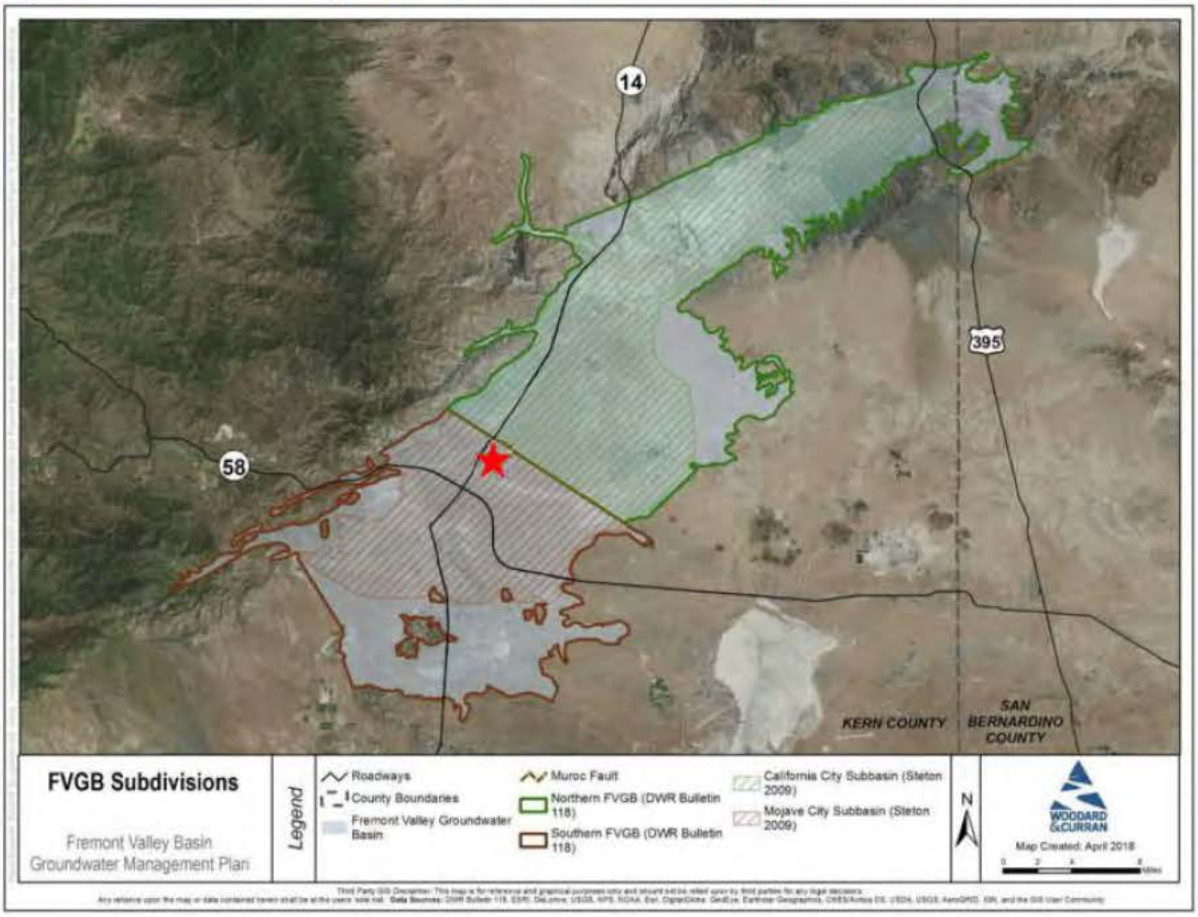
3.3.1 Fremont Valley Groundwater Basin

The Fremont Basin underlies the proposed production area in Mojave. This basin is not adjudicated, and has been identified by the DWR as Low Priority as defined by the CASGEM program (DWR 2021e). SGMA does not currently address Low-Priority basins; therefore, neither a GSP nor a GSA is required for the basin. However, stakeholders within the Fremont Basin have formed the Regional Water Management Group of the Fremont Basin Integrated Regional Water Management Region ("Fremont Basin RWMG"), which developed and implements a Groundwater Management Plan (GWMP) for the Fremont Basin. Figure 8 shows that the southern portion of the Fremont Basin, where the Mojave area is located, is identified as the Mojave City Subbasin, referred to herein as the "Southern Fremont Basin" (Fremont Basin RWMG 2018).

The Northern and Southern Fremont Basins are divided by the Murdoc Fault, which results in the Fremont Basin having two separate water budgets – one for each subunit. Groundwater pumping in the Fremont Basin is generally not metered, so the budget was compiled by the Fremont Basin RWMG member agencies based upon historical information, known land uses, population projections, and General Plan land use designations.

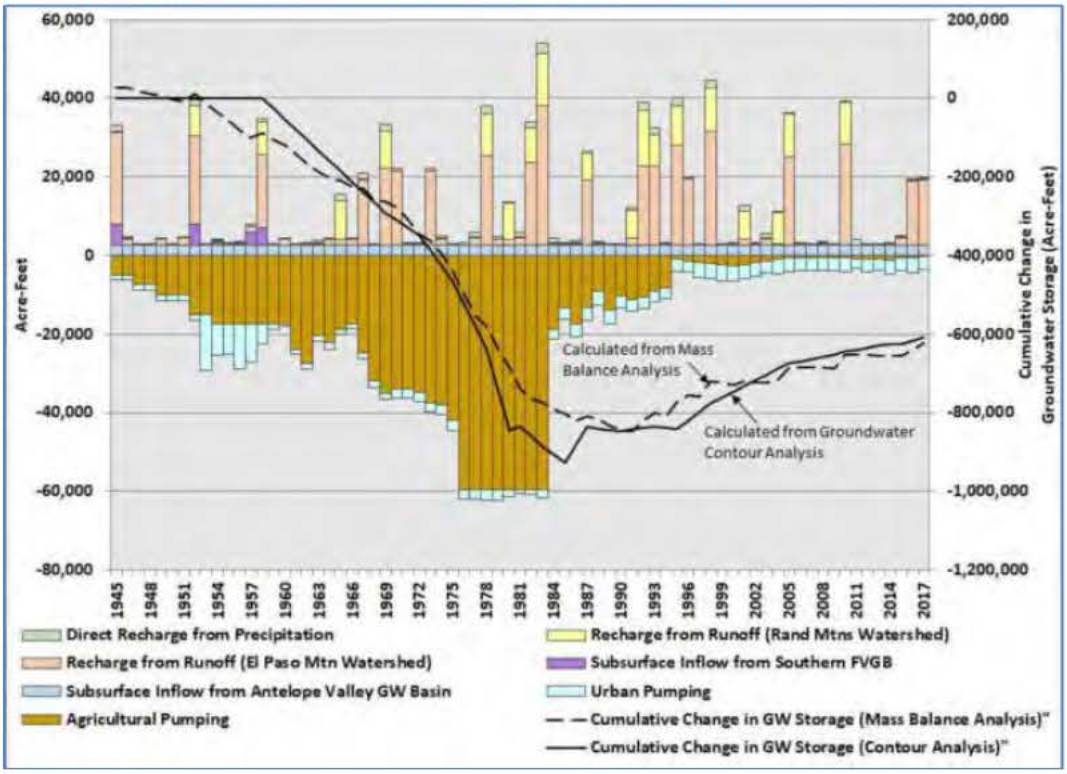
Although the Mojave area is located in the Southern Fremont Basin, because the subunits of the Fremont Basin are not adjudicated, groundwater pumped in the northern subunit may be used in the southern subunit; [redacted] Figure 9 and Figure 10, below, provide an overview of the balance of the Northern Fremont Basin and Southern Fremont Basin, respectively.

Figure 8 Fremont Valley Groundwater Basin Subdivisions



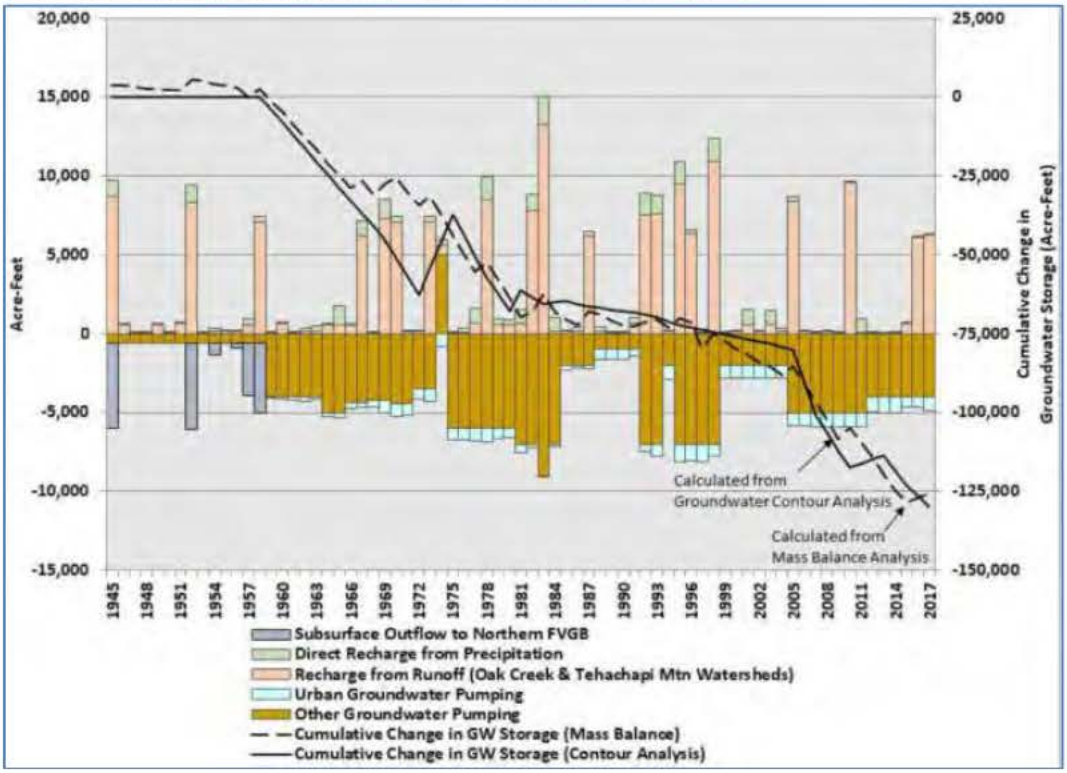
Source: Fremont Valley RWMG 2018

Figure 9 Northern Fremont Basin - Mass Balance Overview



Source: Fremont Basin RWMG 2018

Figure 10 Southern Fremont Basin – Mass Balance Overview



Source: Fremont Basin RWMG 2018

[redacted]

Overall, the cumulative change in storage in the Fremont Basin was estimated to be negative 738,000 acre-feet, of which the Northern Fremont Basin deficit is approximately 608,000 acre-feet and the Southern Fremont Basin deficit is approximately 130,000 acre-feet (Fremont Basin RWMG 2018) [redacted] As stated in the Fremont Basin GWMP (Fremont Basin RWMG 2018), and consistent with United States Geological Survey modeling conducted in 1977, recharge to the Northern Fremont Basin is approximately 11,300 AFY, while recharge to the Southern Fremont Basin is approximately 2,500 AFY (Fremont Basin RWMG 2018).

3.3.2 Antelope Valley Groundwater Basin

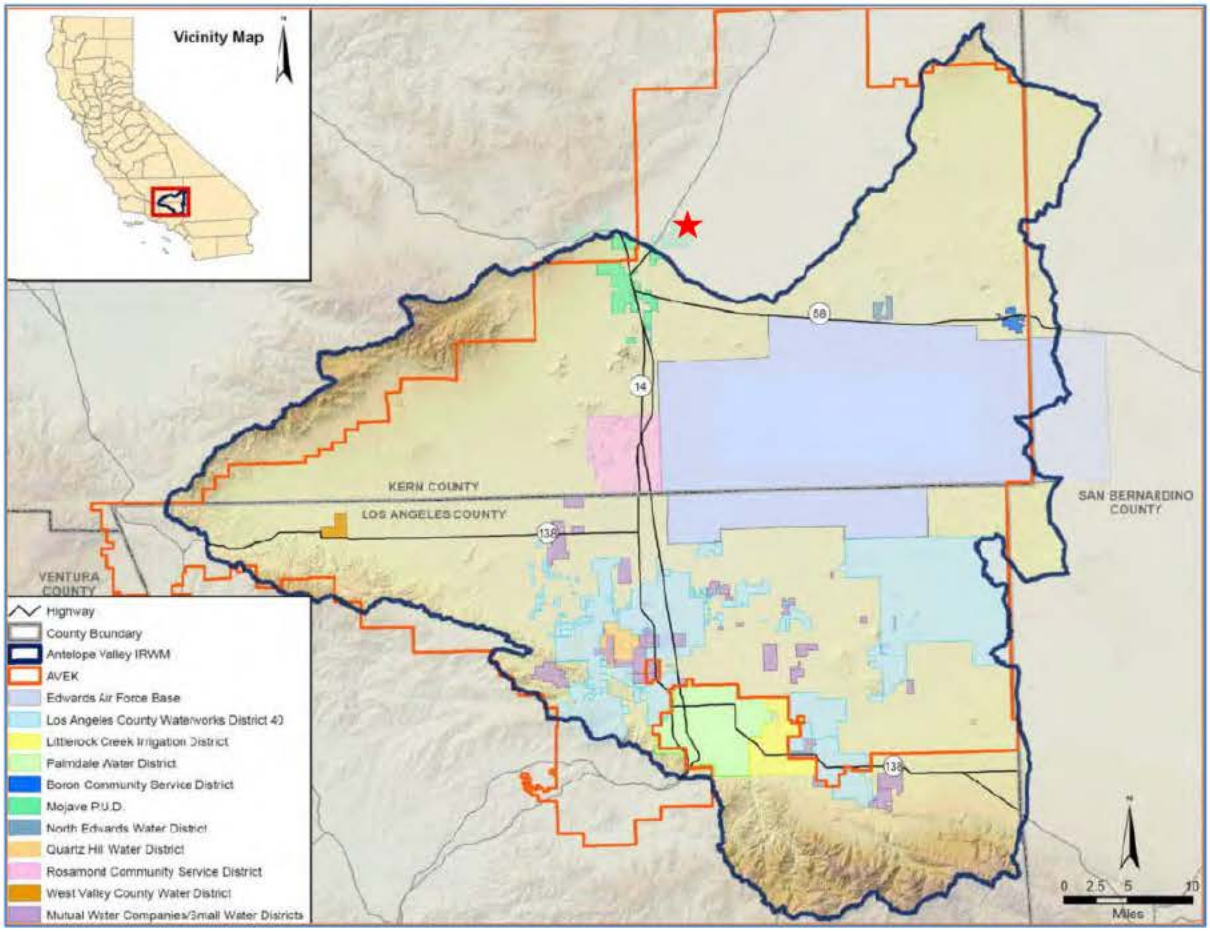
The Antelope Valley Groundwater Basin (Antelope Basin) is adjudicated, with specific rights of each party to the basin (i.e., landowner with water rights in the adjudicated area), and a court approved Watermaster is identified to administer the Adjudication Judgment. The Adjudication Judgment for the Antelope Basin, which is included as Appendix F to AVEK's current UWMP (AVEK 2021), specifically prohibits water produced in the adjudicated area from being used outside that area. The Antelope Basin covers 1,580 square miles, but the Adjudication Area only covers approximately 1,390 square miles; the Adjudication Area does not include the adjacent alluvial portions of the groundwater basin to the northeast and south because subsurface flows between these adjacent alluvial areas and the Adjudication Area are generally considered nominal (Antelope Valley RWMG 2019).

Figure 11 shows that AVEK's service area extends beyond the Antelope Basin boundaries to the north of Mojave; this area includes the alluvial fan area that is not addressed in the adjudication.

[redacted] The water supply availability projections AVEK makes in its UWMP assumes that groundwater supply received from

the Antelope Basin will remain constant at 3,550 AFY, due to the adjudicated status of the basin having a positive effect on reliability (AVEK 2021). Further, it is assumed that during dry water-year (drought) conditions, AVEK's supply of Antelope Basin groundwater will increase to 39,550 AFY, accounting for the baseline 3,550 AFY plus returns on banked groundwater supplies of 36,000 AFY (AVEK 2021). However, according to AVEK's current (2020) UWMP, AVEK's supply from the Antelope Basin, including the supply sourced from overlying pumper rights and banked groundwater, is already planned for other uses within AVEK's service area (AVEK 2021). [redacted]

Figure 11 Antelope Valley Service Districts



Source: AVEK 2016

3.3.3 White Wolf Subbasin

The White Wolf Subbasin was originally part of the Kern County Subbasin (of the San Joaquin Valley Groundwater Basin), which is identified by the DWR as Critically Overdrafted or High Priority. The White Wolf Subbasin was re-defined by DWR as separate from the Kern County Subbasin, due to hydrologic differences between the two areas, including persistent overdraft conditions in the Kern County Subbasin that do not affect the White Wolf Subbasin (DWR 2021d).

The White Wolf Subbasin is identified by the DWR as a Medium Priority basin, and therefore will require a GSP and GSA for SGMA compliance. Stakeholder agencies with common interest in the

White Wolf Subbasin, including the Arvin-Edison Water Storage District (AEWSD), Tejon-Castac Water District (TCWD), Wheeler Ridge-Maricopa Water Storage District (Wheeler Ridge-Maricopa WSD), and Kern County, currently operate in coordination through a mutually agreed upon Memorandum of Understanding (MOU) to fulfill the role of a GSA (White Wolf GSA 2016). In support of the DWR basin boundary modifications, these agencies developed the *White Wolf Subbasin Technical Study* (White Wolf GSA 2016). The technical study included the water balance table presented in Table 12.

Table 12 White Wolf Subbasin Water Balance Overview

Water Balance Component	Amount, Rounded (AFY)	Method of Estimation	Notes and Assumptions
Inflows			
Percolation of a Portion of Applied Irrigation Water	17,000	Equals difference between total applied water (including leaching and irrigation efficiency demands) and crop water demand	• Unit crop water demand factors from WRMWSD (2015) • Crop areas from KCDAMS 2010 to 2015 data, with double cropping • Irrigation efficiency and leaching demand = 20% of crop water demand (WRMWSD, 2007 and 2015; AEWSD, 2008)
Percolation from Surface Water Streams	14,000	Equals difference between precipitation and evapotranspiration in contributing watersheds	• Precipitation from gridded NWS normals for watershed; • Reference ET from CIMIS Zone 14; • Crop coefficient = 1.15
Percolation of Precipitation on Non-Agricultural Lands	1,000	Equals difference between precipitation and evapotranspiration for non-agricultural lands	• Precipitation from gridded NWS normals for subbasin; • Reference ET from CIMIS Arvin-Edison station; • Crop coefficient = 0.9
Percolation of Wastewater Discharges	Negligible	Small fraction of small wastewater discharge	• Most wastewater generated is recycled, lost to landscape evapotranspiration
Groundwater Inflow From Adjacent Basins	Negligible		• No upgradient basins directly connected to subbasin
Total Inflows	32,000	Sum of inflow components	
Outflows			
Groundwater Pumping for Agricultural Use	27,000	Equals product of total applied water and groundwater fraction	• Groundwater fraction = 26% of total applied water, based on WRMWSD (2007) value for WRMWSD lands during the 1971-2001 period
Groundwater Flow Across the White Wolf Fault	1,000	Closure term in water balance	
Discharges to Springs	500	Equals product of spring-fed vegetation area, reference ET, and crop coefficient	• Area = 100 acres • Reference ET from CIMIS Arvin-Edison station • Crop coefficient = 1.0
Pumping for Municipal and Industrial Use	Negligible		• Most M&I water supplied by imported surface water
Total Outflows	28,500	Sum of outflow components	
Change in Storage	3,500	Equals product of groundwater level change, representative area, and specific yield	• Groundwater level change = 1 ft/yr; • Area = 35,516 acres (approx. irrigated agricultural area) • Specific yield = 0.10

Source: White Wolf GSA 2016

As shown above, the majority of inflow to the White Wolf Subbasin is comprised of return agricultural flow (17,000 AFY) and return from surface streamflow (14,000 AFY), while the primary outflow from the subbasin occurs from agricultural pumping (27,000 AFY); overall, White Wolf Subbasin is understood to be characterized by a positive water balance of approximately 3,500 AFY, based upon estimates for groundwater level change and specific yield (White Wolf GSA 2016).

3.3.4 Carrizo Plain Groundwater Basin

The Carrizo Plain Groundwater Basin is located in San Luis Obispo County, and within the county's Water Planning Area (WPA) 10, for management purposes; the Carrizo Plain basin is the only defined groundwater basin in WPA 10. The Carrizo Plain basin includes agricultural and rural users, and potentially future solar farms; there are no large population centers with urban demands in this WPA (Carrizo Plain GSA 2012). Groundwater in the basin is found in alluvium, the Paso Robles Formation, and the Morales Formation (DWR 2004). Recharge to the basin is predominantly from percolation of stream flow and infiltration of precipitation (DWR 2004). There is one small public water system serving the local school (part of the Atascadero Unified School District), and other pumping in the basin is for agricultural and residential purposes by overlying users. Table 13 provides an overview of water supply and demand in the Carrizo Plan WPA 10.

Table 13 Carrizo Plain WPA 10 Demand and Supply

	Urban	Solar Power[1]	Agriculture	Rural	Environmental[5]
Demand					
Existing Demand (AFY)	0	0	800	210	
Forecast Demand (AFY)	0	13.8	680-890	9,610-12,740[2]	
Supply					
Carrizo Plain Basin (AFY)[3]	0	0	800	210	
Other Groundwater Supply Sources (AFY)	0	0	Uncertain	Uncertain	
SWRCB Water Diversions (AFY)	0	0	[4]	[4]	
Total Supply (AFY)	**0**	**Uncertain[1]**	**800**	**210**	
Environmental Water Demand					
Environmental Water Demand (AFY)					Uncertain
Unimpaired Mean Annual Discharge(AFY)					Uncertain

Notes:
1. Potential demands from two identified future solar power projects (Topaz Solar Farm and Sun Power-California Valley Solar Ranch), which have yet to be approved.
2. Carrizo Plain rural demand projections are based on existing zoning, which includes the potential for extensive California Valley development. The actual development may be much lower than the range shown due to water quality and other considerations.
3. The safe seasonal yield was estimated at 8,000 - 11,000 AFY.
4. Diversions do not distinguish type of use. Potentially 81 AFY could be diverted for use to either agriculture or rural residential.
5. The eastern portion of the County (i.e., WPAs 9, 10, 11, 14, and 15) was ultimately excluded from the environmental water demand analysis due to the lack of data and regional physiographic differences.

Source: San Luis Obispo County 2012

Footnote (3) to the demand and supply balance shown above indicates that seasonal safe yield of the basin may be up to 8,000 to 11,000 AFY; however, known supply from agricultural and rural return flows is only 1,210 AFY. As noted above this table, inflow to the Carrizo Basin is primarily

from percolation of stream flow and infiltration of precipitation; this dependence on natural inflow sources is likely the reason for seasonal variability in the basin's safe yield. Overall, safe yield and recharge conditions and constraints in the Carrizo Basin are not well defined, and published hydrogeologic information for this basin is compiled from older reports and may not be representative of current conditions (County of San Luis Obispo 2012).

3.4 Recycled Water

[redacted] recycled water development typically occurs in response to an identified demand; [redacted]

The IRWMP for the Antelope Valley region states that use of recycled water as a supply is primarily limited by the availability of infrastructure and demand (Antelope Valley RWMG 2019). The following facilities currently provide wastewater treatment for the major urbanized portions of the Antelope Valley:

- Lancaster Water Reclamation Plant (WRP), owned and operated by Los Angeles County Sanitation District (LACSD) No. 14
- Palmdale WRP, owned and operated by LACSD No. 20
- Rosamond Wastewater Treatment Plant (WWTP), owned and operated by the Rosamond Community Services District.

[redacted]. In 2008, the Los Angeles County Waterworks District No. 40, Antelope Valley (LACWWD40) published the Final Environmental Impact Report (FEIR) for the proposed North Los Angeles/Kern County Regional Recycled Water Project (also referred to as the "Antelope Valley Backbone System") to provide the primary backbone system for distribution of recycled water to end users in the Antelope Valley. The following agencies partnered with LACWWD40 as Responsible Agencies for CEQA purposes, demonstrating the regional collaboration for establishing recycled water infrastructure: City of Lancaster; City of Palmdale; Rosamond Community Services District; LACSD Nos. 14 and 20; Palmdale Water District (PWD); AVEK; and Quartz Hill Water District.

The Antelope Valley Backbone System would provide the primary backbone system for distribution of recycled water to end users in the Antelope Valley, with end users comprised of: Municipal and industrial (M&I) applications; Agricultural irrigation; Cooling water for power plants; and Groundwater recharge

At the time that CEQA analysis was conducted for the Antelope Valley Backbone System, the identified existing and future end users of recycled water in the Antelope Valley represented a recycled water demand of 21,210 AFY (LACWWD40 2008), which included the following:

- 17,491 AFY for M&I end uses in Los Angeles County
- 1,119 AFY for M&I end uses in the Rosamond Community Services District service area in Kern County
- 2,600 AFY for use as cooling water at the planned Palmdale Hybrid Power Plant (PHPP)

Notably, the capacity of the Antelope Valley Backbone System was designed to meet this projected demand. The planned PHPP was, at the time, the largest single potential end user of recycled water in the Antelope Valley, with an anticipated demand of up to 2,600 AFY.

As filed with the California Energy Commission (CEC), the PHPP is now referred to as the Palmdale Energy Project (PEP). The CEC issued a license to the City of Palmdale to construct and operate the PEP in August of 2011. On June 10, 2015, the CEC approved a transfer of ownership of the PEP from the City of Palmdale to Palmdale Energy, LLC (CEC 2021). On August 9, 2017, the CEC approved an amendment to increase the power generation capacity of the PEP from 570 megawatts (MW) to 654 MW (CEC 2021). The proposed PEP is not yet constructed, so the "largest single potential end user of recycled water in the Antelope Valley" has not yet been implemented.

[redacted]

Table 14 Opportunities for Recycled Water Development

Observation	Project Implications
Recycled water development in the study area is currently limited by end-user demand.	[redacted]
There is existing coordination and cooperation between stakeholder agencies for the increased development of regional recycled water supply.	
There is existing infrastructure for a regional recycled water system, and multiple proposals for improvements to the existing system have been developed but are limited by demand.	
Existing M&I peak day demand for recycled water is less than available supply of recycled water, indicating that recycled water storage may be necessary for some M&I uses.	
Existing water reclamation facilities are producing recycled water [redacted]	
Population in the service areas of the stakeholder agencies continues to increase, producing wastewater at a rate of approximately 85 percent of water consumed.	
The CEC required the proposed PEP (formerly PHPP) to have a redundant source of water, which was made available through the Antelope Valley Backbone System by the connection to multiple reclamation plants and multiple sources of recycled water.	

As noted above, the amount of wastewater produced by municipal water customers represents approximately 85 percent of the total amount of water consumed in the area (NAS 1996). Wastewater collection and treatment for the cities of Palmdale and Lancaster, which are within this study area for the Mojave production site, are provided by LACSD Districts Nos. 14 and 20 (PWD 2021). The two districts serve a combined wastewater service area of approximately 76 square miles and approximately 310,000 people, with collection provided through a network of 104 miles of

trunk sewers that provide wastewater conveyance through gravity flow (PWD 2021).

The 2008 EIR for the Antelope Valley Backbone System, introduced above, projected that eight percent of the regional water demands in 2030 would be met with recycled water, although substantially more would be available as additional end use demand develops (LACWWD40 2008). Currently, excess tertiary-treated effluent produced at the Lancaster WRP, Palmdale WRP, and Rosamond WWTP that is not delivered for beneficial use is disposed of via agricultural irrigation (PWD 2021). It is anticipated that the amount of recycled water provided for agriculture may reduce as other beneficial uses are developed; however, until these alternative uses become effective, the recycled water must still be disposed of via agricultural irrigation (PWD 2021).

The PWD's current (2020) UWMP identifies a per capita daily water demand of 55 gallons per day for indoor residential water uses (PWD 2021). Applying this per capita demand to the existing service area population of 310,000, this equates to daily water demand of 52.3 acre-feet, or an annual demand of 19,089.5 AFY; using the wastewater factor of 85 percent of water demand, this equates to 16,226 AFY of wastewater generation from municipal user within LACSD District Nos. 14 and 20, which could potentially be used to produce recycled water. This is approximately 34 percent higher than the current (2020) influent to Palmdale WRP of 12,140 AFY (PWD 2021), indicating there is potential to expand recycled water production in the area.

4 Water Supply Analysis

This water supply analysis addresses each of the questions identified in Section 1.2, *Approach*, and is based upon the water supply setting detailed above in Section 2, *Water Supply Setting*.

4.1

[redacted]

4.1.1

[redacted] For comparison, the existing Lancaster WRP and Palmdale WRP currently have a combined permitted treatment capacity of 33,500 AFY but in 2015, only 500 AFY of recycled water was provided to recycled water customers, while the bulk of recycled water produced was disposed of on agricultural fields, as irrigation water (Antelope Valley RWMG 2019). [redacted]

The amount of recycled water able to be produced is a direct function of the amount of wastewater entering the treatment system. Population throughout southern California continues to increase, [redacted] Furthermore, recycled water is assumed to be 100 percent reliable since it is based on a consistent water supply and is not expected to change for average, single-dry, or multi-dry year water conditions (Antelope Valley RWMG 2019). [redacted]

[redacted]

4.2 [redacted]

[redacted] the amount of SWP water that is actually delivered in the project area is highly variable and subject to fluctuations within the state-wide system; for example, in 2021, SWP contractors will only receive five percent of their allocated supply (DWR 2021c).

[redacted] For comparison, Table 15 provides an overview of existing water demands associated with agricultural uses throughout the Antelope Valley Region, which includes the proposed project area in Mojave.

Table 15 Annual Agricultural Water Use in Antelope Valley Region

		Average Water Year		Dry Water Years	
Crop	**Acreage[a]**	**Gross Crop Water Requirements (AF/acre)[b]**	**Gross Water Demand (AFY)[c]**	**Gross Crop Water Requirements (AF/acre)[b]**	**Gross Water Demand (AFY)[c]**
Field Crops					
Alfalfa Hay	5,319	7.10	37,800	7.88	41,900
Grain Hay	3,852	3.07	11,800	3.84	14,800
Sudan Hay	1,090	3.07	3,300	3.84	4,200
Irrigated Pasture	480	6.87	3,300	7.65	3,700
Other Crops					
Onions	1,199	4.61	5,500	5.39	6,500
Fruits/Nuts/Grapes	219	4.61	1,100	5.38	1,200
Root Crops	519	3.57	1,900	4.35	2,300
Misc. Nursery (mostly sod)	1,067	7.32	7,800	8.09	8,600
Pistachios	444	1.33	600	2.11	900
Idle	1,321	0.00	0	0.00	0
Total	**16,000**		**73,000**		**84,000**

Notes: Totals rounded to the nearest 1,000 AF.
(a) Data from the Los Angeles Department of Agricultural Commissioner / Weights And Measures and the Kern County Farm Bureau. Acreage does not include land cultivated for recycled water purposes.
(b) From Farm Advisor gross crop water requirements specific to Antelope Valley Region.
(c) Acreage multiplied by crop water requirements.

Source: Antelope Valley RWMG 2019

As shown above, gross water demand for agricultural uses in the Antelope Valley region in an average year is 73,000 AFY.

[redacted]

4.2.1 [redacted]

[redacted]

4.3 [redacted]

[redacted]

4.3.1 [redacted]

[redacted]

5 Cost Analysis

This section provides data and analysis to characterize the approximate scale of costs associated with purchasing recycled water in the quantities required to meet the demands of the proposed project at the Mojave production site. The actual price of water for the project will be determined by the water provider(s), and will be influenced by factors including but not limited to the cost of building or expanding facilities to accommodate the proposed project's water demands.

5.1 Recycled Water

5.1.1 Scope of Recycled Water Cost Analysis

The following parameters were used to frame the scope of this cost analysis:

- The study area includes all southern California wholesale water agencies producing and selling recycled water; this review focuses on wholesale recycled water rates and does not consider retail rates, because it is anticipated that the scale of the project's water demands require a wholesale water provider.
- This analysis is based upon review of publicly available data, information, and analysis on recycled water pricing and rates in southern California.
- This analysis considers the price of recycled water from sources capable of producing amounts of water comparable to the demands of at least the "Low" production scenario for the proposed project. Table 16 provides an overview of the anticipated annual water demands for each production scenario at the Mojave production site.

Table 16 Potential Water Demand Scenarios – Mojave Production Area

Production Scenario	Water Demands at the Proposed Project Mojave Production Site	Comparison of Scale
Low	[redacted]	
Medium		
High		

1. Source: Antelope Valey RWMG 2019
2. Source: MWA 2021

[redacted]

5.1.2 Existing Recycled Water Rates

Recycled water pricing in California is largely market-based, and there is no over-arching policy for pricing. Conservation efforts in California have encouraged a trend towards using tiered pricing for recycled water, where the price per acre-foot sold decreases as the amount of water purchased by the same user increases. Due to the scale of the proposed project water demands at the Mojave production site, a tiered pricing approach would likely be accessible. Table 17 provides an overview of known recycled water prices for various wholesale agencies in southern California.

Table 17 Recycled Water Pricing – Southern California Wholesale Agencies

Agency	Pricing Structure	Consumption Rate
Calleguas MWD	Base Rate	$750/AF
Irvine Ranch WD	10% less than potable	$449/AF
Central Basin MWD	Tiered rates	$275-497/AF
West Basin MWD	Tiered rates	$501-1,195/AF
Orange County WD	Base rate per AF	$326/AF
Upper San Gabriel WD	Various agreements	$315-360/AF
Eastern Municipal WD	Tiered rates	$181-288/AF
Inland Empire Utilities Agency	Base rate	$75/AF

Source: NBS 2016

As shown above, wholesale recycled water rates vary substantially, and are generally concentrated in the range of $300 to $500 per acre-foot.

5.1.3 Potential Recycled Water Cost Scenarios

Due to the scale of the project's water demands at the Mojave production site, it is anticipated that multiple agencies would be involved in implementing and operating a new recycled water facility to provide supply for the project. As such, a variety of different pricing structures and rates may influence the total supply acquired for the Mojave production site. Therefore, the table below characterizes three potential cost scenarios:

- [redacted]

The cost scenarios above are shown in Table 18 for each of the project's three potential production scenarios. The actual cost of water for the proposed project will be determined by the water provider(s), and may include a surcharge, discussed below Table 18.

Table 18 Potential Cost Scenarios for Recycled Water – Mojave Production Site

Production Scenario (water demand)	$100/AF	$500/AF	$1,000/AF
Low	[redacted]	[redacted]	[redacted]
Medium	[redacted]	[redacted]	[redacted]
High	[redacted]	[redacted]	[redacted]

As shown in Table 18, based upon the published rates shown in Table 17, the cost of recycled water to meet water demands at the Mojave production site could range from **nearly** [redacted] based upon the assumptions discussed above. Recycled water service to customers with larger demands are typically provided on a contractual basis whereby the agency and customer develop an agreement for factors including: the level of service; specified deliveries of recycled water; and payment of capital costs. This arrangement would likely include a surcharge for outside customers, which typically reflects the additional costs of serving customers farther from service centers, the lack of initial investment in capital facilities by outside customers, and the fact that outside customers do not carry the same liability and/or financial burden of debt service payments or other risks (NBS 2016). Surcharges may be determined on a case-by-case basis, depending upon the aforementioned variables associated with out-of-service-area customers, and can be as much as 50 percent of the total sale amount per year. With consideration to the ranges shown above, a surcharge on the project's water bill could range from [redacted] to [redacted] As such, the total water bill could range from [redacted] to [redacted] **per year**, based upon the assumptions discussed above.

[redacted]

5.2 Desalinated Water Potential

[redacted]

[redacted]. The proposed project medium production scenario requires approximately [redacted] gallons per day of treated water, or [redacted] of raw water. The Poseidon Carlsbad desalination plant and the proposed Huntington Beach desalination plant each are sized to produce 50 million gallons per day, [redacted] Based on news articles only, the Carlsbad plant apparently provides water at $2,250 per acre-foot, or $0.0069 per gallon of water. [redacted] Water from the California Aqueduct (see Section 2.1) passes south of Mojave, as well as water from the Colorado River (see Section 2.4) which is conveyed to the southern California coastal region, passing through potential green hydrogen production area.

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