



2025 MOJAVE REGIONAL URBAN WATER MANAGEMENT PLAN



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This 2025 Regional Urban Water Management Plan (RUWMP) was prepared by Zanjero in conjunction with Mojave Water Agency.



This 2025 RUWMP was prepared under the direction of a California licensed civil engineer



The Victorville Water District Retail Chapter contained within this RUWMP was prepared by:

The Golden State Water Company - Barstow System Retail Chapter contained within this RUWMP was prepared by:



EXECUTIVE SUMMARY

LAYPERSON'S DESCRIPTION

After the devastating drought in the late 1970s, the California Legislature declared California's water supplies a limited resource, subject to ever-increasing demands, and that the long-term, reliable supply of water is essential to protect California's businesses, communities, agricultural production, and environmental interests. The Legislature also recognized a need to strengthen local and regional drought planning and increase statewide resilience to drought and climate change. Thus, in 1983, the California Legislature created the Urban Water Management Planning Act (UWMPA).¹ The UWMPA requires urban water suppliers serving over 3,000 customer connections or supplying at least 3,000 acre-feet of water annually to prepare and adopt an urban water management plan (UWMP) every five years,² and demonstrate water supply reliability in a normal year, single dry year, and droughts lasting at least five years over a twenty-year planning horizon.³ The UWMPA also requires each urban water supplier to prepare a drought risk assessment and water shortage contingency plan.⁴ In addition, each urban water supplier must prepare an annual water supply and demand assessment.⁵ The California Legislature emphasizes that aggregating these legal requirements at the urban water supplier management level will improve local, regional, and statewide water planning and water resilience.

At a practical level, the UWMP is the legal and technical water management foundation for urban water suppliers throughout California. A well-constructed UWMP provides elected officials, management, staff, customers, and the public with an understanding of past, current, and future water conditions. The UWMP integrates local and regional land use planning, water supply planning, infrastructure considerations, and demand management measures, while also addressing statewide challenges that may manifest through climate change, drought, and evolving regulations. Thoughtful urban water management planning provides an opportunity for water suppliers to integrate supplies and demands in a balanced and methodical planning platform that addresses short-term and long-term planning

¹ California Water Code Section 10610 *et seq.* (Chapter 1 added by Stats. 1983, Ch. 1009, Sec. 1) and its subsequent amendments

² California Water Code Section 10610 *et seq.*

³ California Water Code Section 10631-10635

⁴ California Water Code Section 10632

⁵ California Water Code Section 10632.1

conditions. In brief, the UWMP gathers, characterizes, and synthesizes water-related information from numerous sources into a plan with local, regional, and statewide practical utility.

ES-1 The Mojave Region

The 2025 Mojave Regional Urban Water Management Plan (2025 RUWMP or Plan) has been prepared by Mojave Water Agency (MWA) and the ten participating urban water suppliers within the Mojave Region. The Mojave Region is concurrent with MWA's service area and encompasses approximately 4,900 square miles of eastern San Bernardino County. The Region includes a diverse mix of incorporated cities, unincorporated communities, rural domestic users, small water systems, industrial and recreational uses, agricultural uses, and urban retail water suppliers that depend primarily on local groundwater supplies supported by imported water management.

The 2025 RUWMP represents the first regional urban water management plan prepared for the Mojave Region. The regional planning approach allows MWA and the participating urban water suppliers to prepare a coordinated water management plan that evaluates shared regional water supplies, regional water demands, and long-term water service reliability using consistent assumptions and methodologies. This approach also reduces duplicative analyses, improves regional coordination, and provides a common technical foundation for local and regional decision-making.

The participating urban water suppliers include MWA, as the Region's wholesale water supplier, and the urban water retail suppliers located within MWA's service area. For adoption purposes, each participating urban water retail supplier will adopt Regional Chapters 1 through 5, MWA's wholesale supplier chapter (Chapter 6), its own retail-specific chapter, its Water Shortage Contingency Plan (WSCP), and all applicable appendices. MWA will adopt the entirety of the 2025 RUWMP, including Regional Chapters 1 through 5, its wholesale supplier chapter, all participating retail supplier chapters, its WSCP, and all applicable appendices.

Chapters 1 through 5 provide the shared regional planning framework, including the regional description, regional water supply characterization, regional water use characterization, and regional water service reliability analysis. Chapter 6 describes MWA's wholesale water supply, imported water management, managed groundwater storage, and other regional water management responsibilities. The retailer-specific chapters provide the additional information necessary to satisfy the UWMPA requirements for each participating urban water retail supplier.

The Mojave Region's fundamental water management challenge is that urban, rural, industrial, agricultural, and other water demands have historically exceeded the natural replenishment capacity of local groundwater basins. Groundwater is the foundation of the Region's water supply portfolio; however, that groundwater supply is actively managed through adjudications, stipulated agreements, imported State Water Project supplies,

recharge operations, return flows, recycled water, transfers, exchanges, and ongoing coordination among MWA, retail water suppliers, watermasters, land use agencies, and other regional partners. Together, these management actions support regional groundwater sustainability and long-term water service reliability.

For purposes of regional supply and demand evaluation, the 2025 RUWMP organizes the Mojave Region into three planning subregions. This subregional framework allows the Plan to recognize hydrologic, infrastructure, and demand differences across the Region while still evaluating overall regional reliability. The subregional framework also supports comparison of regional supplies and demands in a manner that is useful for both MWA's wholesale planning responsibilities and the participating urban water suppliers' retail planning responsibilities.

ES-2 Mojave Region Water Service Reliability

The 2025 RUWMP aggregates regional water supplies and demands through MWA's role as the Region's wholesale water supplier, State Water Project contractor, Watermaster for the Mojave Basin Area Adjudication, and administrator for the Warren Valley Basin Judgment. Because the Mojave Region depends primarily on groundwater, regional reliability is not evaluated solely by comparing annual imported water deliveries to annual demands. Instead, reliability is evaluated based on the coordinated management of groundwater, imported water, return flows, recycled water, stored water assets, transfers, exchanges, and the legal and institutional frameworks that govern water use across the Region.

The 2025 RUWMP extends the regional planning horizon through 2050. This planning horizon allows MWA and the participating urban water suppliers to evaluate long-term population growth, land use changes, water demand trends, imported water reliability, groundwater management conditions, recycled water opportunities, and infrastructure needs. These considerations help improve regional coordination and provide a common planning framework for local and regional water management decisions.

As described in *Chapter 3 – Regional Water Supply Characterization*, the Mojave Region's water supply portfolio includes native groundwater, imported State Water Project supplies, return flows, recycled water, and other managed water supplies. These supplies are not all used in the same manner or at the same time. Native groundwater and return flows help support recurring local supply conditions; imported water is used by MWA to support recharge, replacement water obligations, and regional groundwater management; recycled water helps offset potable demands at the retail water supplier level where available; and stored water assets provide an important management tool for addressing hydrologic variability, imported water fluctuations, and dry-year conditions.

Chapter 4 – Water Use Characterization, characterizes current and projected regional water demands, including demands associated with participating urban water retail suppliers and other regional water users. These demands are organized by subregion to support regional

supply and demand comparisons while recognizing that water use, groundwater conditions, infrastructure, and management needs vary across the Mojave Region. The regional demand forecast provides a common planning basis for evaluating long-term reliability and for coordinating wholesale and retail water management actions.

Chapter 5 – Regional Water Service Reliability, evaluates regional water service reliability under normal year, single dry year, and five consecutive dry year conditions through 2050, as well as the five-year Drought Risk Assessment for 2026 through 2030. The analysis demonstrates that the Mojave Region has sufficient managed water supplies to meet projected regional demands under the planning scenarios evaluated in this RUWMP. The analysis also recognizes that reliability depends on continued regional management, including MWA's importation and recharge of supplemental water supplies, implementation of adjudication requirements, use of stored water assets when needed, local retail supplier management, recycled water development where feasible, and continued demand management.

The Region's water assets are based understood as a regional reliability and management tool rather than a recurring annual supply that should be added directly to all other annual supplies. MWA stores water in wet and normal years to help manage dry-year risks, imported water variability, and groundwater basin conditions. These stored supplies provide operational flexibility and support long-term resilience, but their use is guided by hydrologic conditions, infrastructure capacity, basin management objectives, adjudication requirements, and regional water management priorities.

Each participating urban water retail supplier also evaluates water service reliability within its own chapter. Those chapters address local supply portfolios, demands, infrastructure, conservation measures, and WSCPs. Together, the regional analysis and retailer-specific analyses demonstrate that the 2025 RUWMP provides a coordinated and locally implementable framework for maintaining reliable water service throughout the Mojave Region.

In summary, the Mojave Region's coordinated management of groundwater, imported water, return flows, recycled water, transfers, exchanges, and stored water assets provides a reliable water supply portfolio to meet current and projected regional demands through 2050. The 2025 RUWMP demonstrates that the Region has reliable water supplies under normal, single dry, and five consecutive dry year conditions, while also providing the foundation for annual water supply and demand assessments and implementation of retailer-specific WSCPs.

Chapter 1.0 INTRODUCTION

The 2025 Mojave Regional Urban Water Management Plan (2025 RUWMP, RUWMP, or Plan) establishes a long-term, coordinated framework for regional water resources planning and management through the year 2050 for the Mojave Region. The 2025 RUWMP applies to Mojave Water Agency (MWA or Agency) as the regional wholesale water supplier and to participating urban water suppliers within MWA’s service area. This Plan represents the first RUWMP prepared for the Mojave Region and reflects a shared commitment to integrated, collaborative, and forward-looking water management.

The RUWMP provides a consistent assessment of long-term water supply reliability, supports groundwater sustainability, and addresses regional vulnerability to drought, climate change, and population growth. The RUWMP is intended to inform elected officials, water supplier staff, water users, interested community parties, and the State of California regarding current conditions, projected demands, and strategies to ensure reliable and sustainable water supplies.

Participating urban water suppliers include:

- City of Adelanto
- County Service Area 64
- County Service Area 70J
- Hesperia Water District
- Hi-Desert Water District
- Golden State Water Company – Barstow System
- Joshua Basin Water District
- Liberty Utilities – Apple Valley Water Company
- Mojave Water Agency (Wholesale)
- Phelan Piñon Hills Community Services District
- Victorville Water District

While this RUWMP provides regionally consistent planning assumptions and analyses, each urban water supplier will separately prepare and adopt a Water Shortage Contingency Plan (WSCP) customized for its specific service area. The RUWMP and associated WSCPs will be adopted in accordance with statutory deadlines.

1.1.1 Background and Purpose

The California Urban Water Management Planning Act (UWMPA) requires urban water suppliers serving at least 3,000 connections or delivering more than 3,000 acre-feet of water

annually to prepare an Urban Water Management Plan (UWMP) every five years. The UWMPA authorizes multiple urban water suppliers that share common water supplies to prepare a RUWMP in lieu of individual plans.

Recognizing the benefits of regional coordination, MWA and its urban water retail suppliers jointly elected to prepare this RUWMP. Compared with developing separate agency-specific UWMPs, a regional approach promotes consistent technical assumptions, reduces duplicative effort, improves cost efficiency, enhances data accuracy, and strengthens the region's ability to pursue state and federal funding opportunities.

1.1.2 Basis for Plan Preparation

The purpose of the 2025 RUWMP is to provide a coordinated evaluation of regional water supplies, demands, and management strategies shared among participating agencies. By developing a single regional planning document, participating agencies leverage collective data resources, technical expertise, and institutional knowledge to support consistent planning and informed long-term decision-making.

This 2025 RUWMP fulfills the reporting requirements established by the California Department of Water Resources (DWR) to implement the UWMPA and aligns with statewide water management objectives. The Plan satisfies statutory requirements for MWA as a wholesale urban water supplier and for each participating retail urban water supplier.

1.1.3 Coordination and Outreach

Development of the 2025 RUWMP included coordination with local governments, neighboring water agencies, and relevant regulatory entities, as required by the UWMPA. Coordination efforts were undertaken to ensure consistency with applicable city and county General Plans, Water Master Plans, groundwater adjudications and stipulations, and other related planning documents.

In accordance with California Water Code Section (CWC) 10621(b), MWA and the participating urban water suppliers conducted joint public outreach and provided required public notices prior to adoption of the RUWMP by each individual urban water supplier. A summary of coordination and public outreach activities is provided in **Table 1-1**.

TABLE 1-1: PUBLIC AND PUBLIC AGENCY COORDINATION

Coordinating Agencies	Coordinate Regarding Demands	Sent Copy of Draft RUWMP	Sent 60-Day Notice	Notice of Public Hearing
Cities, Counties, Customers, and Relevant Parties				
Liberty Utilities (Apple Valley Water Company)	X	X	X	X
Bighorn-Desert View Water Agency		X	X	X
City of Adelanto	X	X	X	X
County Service Area 64	X	X	X	X
County Service Area 70J	X	X	X	X
Golden State Water Company - Barstow System	X	X	X	X
Helendale CSD		X	X	X
Hesperia Water District	X	X	X	X
Hi-Desert Water District	X	X	X	X
Joshua Basin Water District	X	X	X	X
Mojave Water Agency	X	X	X	X
Phelan Piñon Hills CSD	X	X	X	X
Victorville Water District	X	X	X	X
San Bernardino County Planning Department			X	X
California Department of Water Resources			X	X
Local Agency Formation Commission (LAFCO) for San Bernardino County			X	X
General Public				X

1.1.3.1 Water Supplier Information Exchange

CWC Section 10631 requires wholesale and urban water suppliers to provide each other with information regarding water supply and demand. Since both MWA, as a wholesale supplier that receives water from the California State Water Project (SWP) on behalf of the Mojave Region, and each of the urban water suppliers are already coordinating on this RUWMP, information exchange was happening throughout the RUWMP development, and any separate noticing was unnecessary.

1.1.4 Statutory Requirements for Notice

In accordance with the UWMPA, notification of the RUWMP update was provided to cities and counties within the RUWMP Planning Area at least 60 days prior to the public hearing of the RUWMP as required by CWC Section 10621(b). Electronic copies of the final RUWMP will be provided to the County of San Bernardino no later than 30 days after its submission to DWR.

1.1.5 RUWMP Adoption

Each participating agency has reviewed, approved, and will implement the portions of this RUWMP that are specific and applicable to their service area. While the RUWMP was developed collaboratively to ensure consistency and coordination across the Mojave Region, not all elements of the RUWMP apply equally to every agency. The RUWMP is therefore organized in a modular format, where Chapters 1 through 5 are universal, and Chapters 6 through 16 are unique to each participating agency. This approach allows each agency to adopt Chapters 1 through 5 collectively with their agency-specific chapter and relevant WSCP. As such, the specific timing of adoption for each supplier is referenced within their unique chapter of the RUWMP.

Any future amendments or updates made by individual agencies to their respective chapter will not alter or affect the adopted portions of the RUWMP for other participating agencies. This structure preserves local autonomy while maintaining the benefits of regional coordination, ensuring that all agencies continue to contribute to a unified framework for sustainable water management within the Mojave Region and the MWA service area.

1.1.6 Document Organization

This RUWMP is organized to reflect the collaborative efforts of all participating agencies, while still allowing each agency to meet its respective statutory reporting requirements. As such, the 2025 RUWMP is organized as follows:

- Chapter 1 – Introduction
- Chapter 2 – The Mojave Region
- Chapter 3 – Regional Water Supply Characterization
- Chapter 4 – Regional Water Use
- Chapter 5 – Regional Water Service Reliability
- Chapter 6 – Mojave Water Agency (*Wholesale Water Supplier*)
- Chapter 7 – City of Adelanto (*Urban Water Supplier*)
- Chapter 8 – County Service Area 64 (*Urban Water Supplier*)
- Chapter 9 – County Service Area 70J (*Urban Water Supplier*)

- Chapter 10 – Golden State Water Company – Barstow (*Urban Water Supplier*)
- Chapter 11 – Hesperia Water District (*Urban Water Supplier*)
- Chapter 12 – Hi-Desert Water District (*Urban Water Supplier*)
- Chapter 13 – Joshua Basin Water District (*Urban Water Supplier*)
- Chapter 14 – Liberty Utilities – Apple Valley Water Company (*Urban Water Supplier*)
- Chapter 15 – Phelan Piñon Hills Community Service District (*Urban Water Supplier*)
- Chapter 16 – Victorville Water District (*Urban Water Supplier*)

Note to DWR:

The MWA and the urban water suppliers within its service area have written this RUWMP primarily as a water resource planning tool to effectively manage water supply, reliability, and demand. This RUWMP also satisfies all the requirements of the UWMPA for MWA (as a wholesale urban water supplier) and for each participating urban water supplier.

The body of the document provides narratives, analysis, and data that DWR requests in its 2025 UWMP Guidebook, including any changes to the CWC since 2020. Efforts have also been made to include enhancements to this document wherever possible as recommended in the 2025 UWMP Guidebook.

To facilitate review by DWR for compliance with the UWMPA, data from the body of the document has been transferred into required DWR submittal tables consistent with the organization of the tables in Appendix E of the 2025 UWMP Guidebook. These tables are separately uploaded to DWR's web portal for each of the participating urban water suppliers, along with this RUWMP. This RUWMP has been reviewed for adequacy according to the UWMP Checklist as contained in Appendix F of the 2025 UWMP Guidebook.

Chapter 2.0 THE MOJAVE REGION

This chapter provides an overview of the Mojave Region (Region or RUWMP Planning Area) including its population characteristics, land use patterns, and climate conditions. It also introduces the various local entities and water purveyors that play key roles in managing and delivering water resources throughout the Region. As a foundational reason for preparation of this RUWMP, the Mojave Region is also concurrent with the MWA service boundary, which also fully encompasses all participating urban water suppliers that must also comply with the UWMPA. The Mojave Region, as a result, allows this RUWMP to capture the entirety of MWA's service area, as well as the service areas of each of the urban water suppliers that sit within MWA.

2.1.1 Regional Overview

The Mojave Region encompasses approximately 4,900 square miles of eastern San Bernardino County (**Figure 2-1**), corresponding to the MWA's service area. MWA serves as the Region's wholesale water supplier and as Watermaster for the Mojave Basin Area (MBA) adjudication. Located within the Mojave Desert of southeastern California, the Region includes several large, incorporated communities that collectively drive substantial and growing water demands despite extremely arid conditions.

The intermittent Mojave River is the Region's principal hydrologic feature. Its episodic flows provide the primary source of natural recharge to underlying groundwater basins and serve as a critical conveyance for imported SWP supplies used for managed groundwater recharge. Regional water management is shaped by a persistent structural water deficit, in which current primarily urban-driven demands exceed the natural replenishment capacity of local aquifers. Imported water is therefore essential to mitigating groundwater overdraft and supporting long-term regional sustainability.

Water management is organized across multiple geographic and administrative scales. At the regional level, MWA is responsible for managing and importing supplemental water supplies and coordinating their integration with local groundwater resources in cooperation with state, regional, and local partners. From a hydrogeographic perspective, the Region overlies all or portions of 36 groundwater basins and subbasins. For planning and management purposes, MWA groups these basins into eight subareas that cover the entire Region. Although the subareas are partially defined by faults and other geologic features, they generally remain hydrologically interconnected. Five subareas—Este, Oeste, Alto

(including the Alto Transition Zone), Centro, and Baja—are within the MBA adjudication and are named for their relative position along the Mojave River. The remaining three subareas lie outside the adjudicated basin and were part of MWA’s original service area or incorporated through subsequent adjudication actions. All eight subareas are managed in a coordinated manner by MWA, the MBA Watermaster and the Warren Valley Basin Watermaster, and the numerous urban water suppliers (**Figure 2-2**).

At the local level, urban water retail suppliers—particularly those serving the cities of Victorville, Hesperia, Adelanto, and Barstow along the Interstate 15 corridor—are the primary contributors to regional growth and future water demand. Expansion of these service areas directly influences regional demand conditions and the management strategies applied within individual subareas, with the most pronounced effects occurring in incorporated cities.

Groundwater provides the foundation of the Region’s water supply portfolio. Supplies consist of a managed combination of native groundwater and imported water, overseen by MWA on behalf of its constituent retail agencies, used to meet all demands within the Region. Recharge of native groundwater occurs through multiple mechanisms, including infiltration from the Mojave River and ephemeral streams, percolating rainwater, stormwater runoff, sublateral groundwater flow from surrounding mountains, treated wastewater and return flows, septic and irrigation seepage, and managed recharge of imported SWP supplies. As the SWP contractor for the Mojave Region, MWA manages the delivery and recharge of imported water using both the Mojave River and recharge sites located throughout its service area.

Effective water management in the Mojave Region relies on extensive coordination among MWA, retail water agencies, mutual water companies, adjudication watermasters, tribal entities, rural and self-supplied users, and land use and regulatory agencies. This collaboration supports coordinated infrastructure planning, groundwater monitoring, imported water operations, and drought response within a broader framework of regional and statewide water planning.

FIGURE 2-1: THE MOJAVE REGION

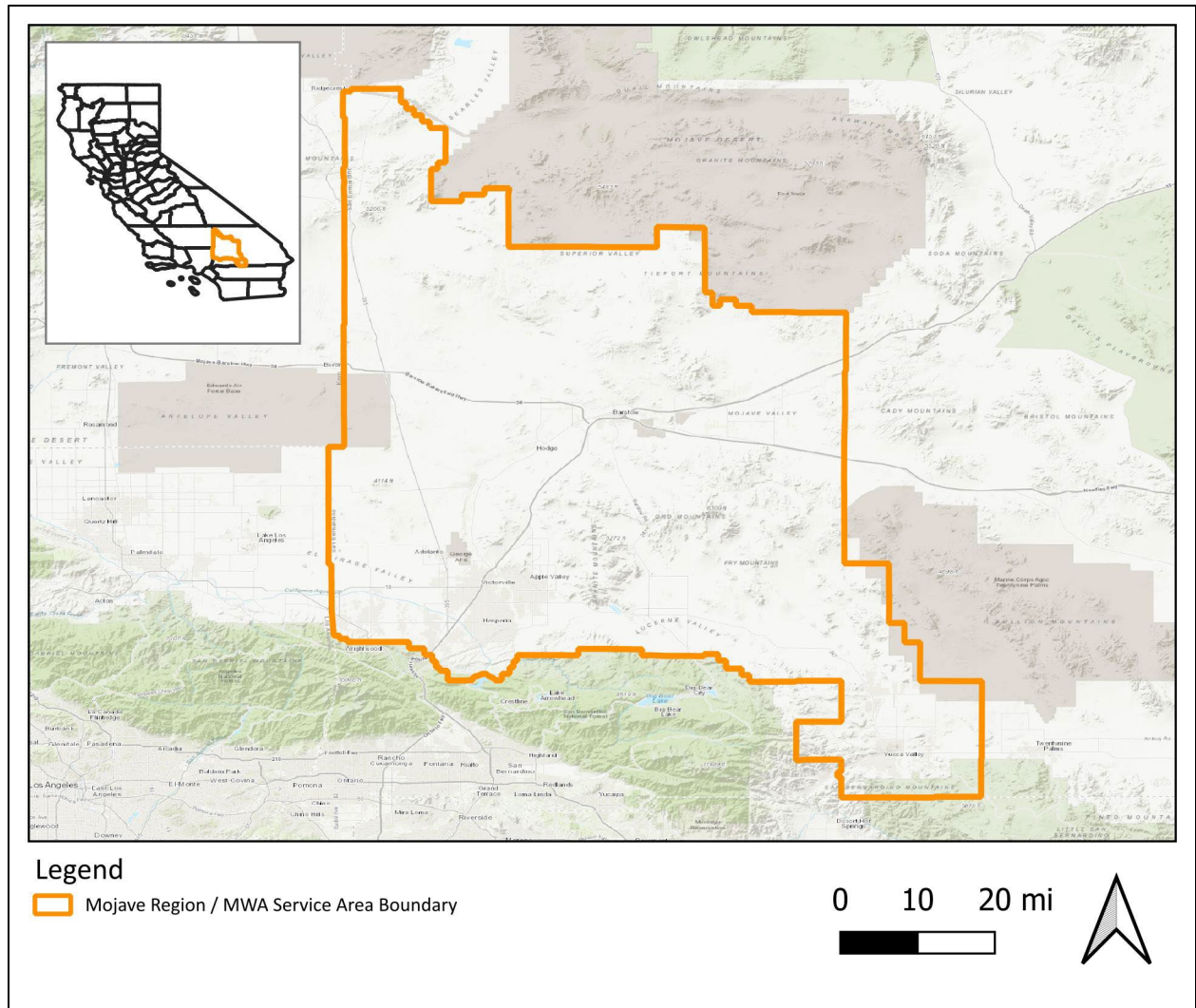
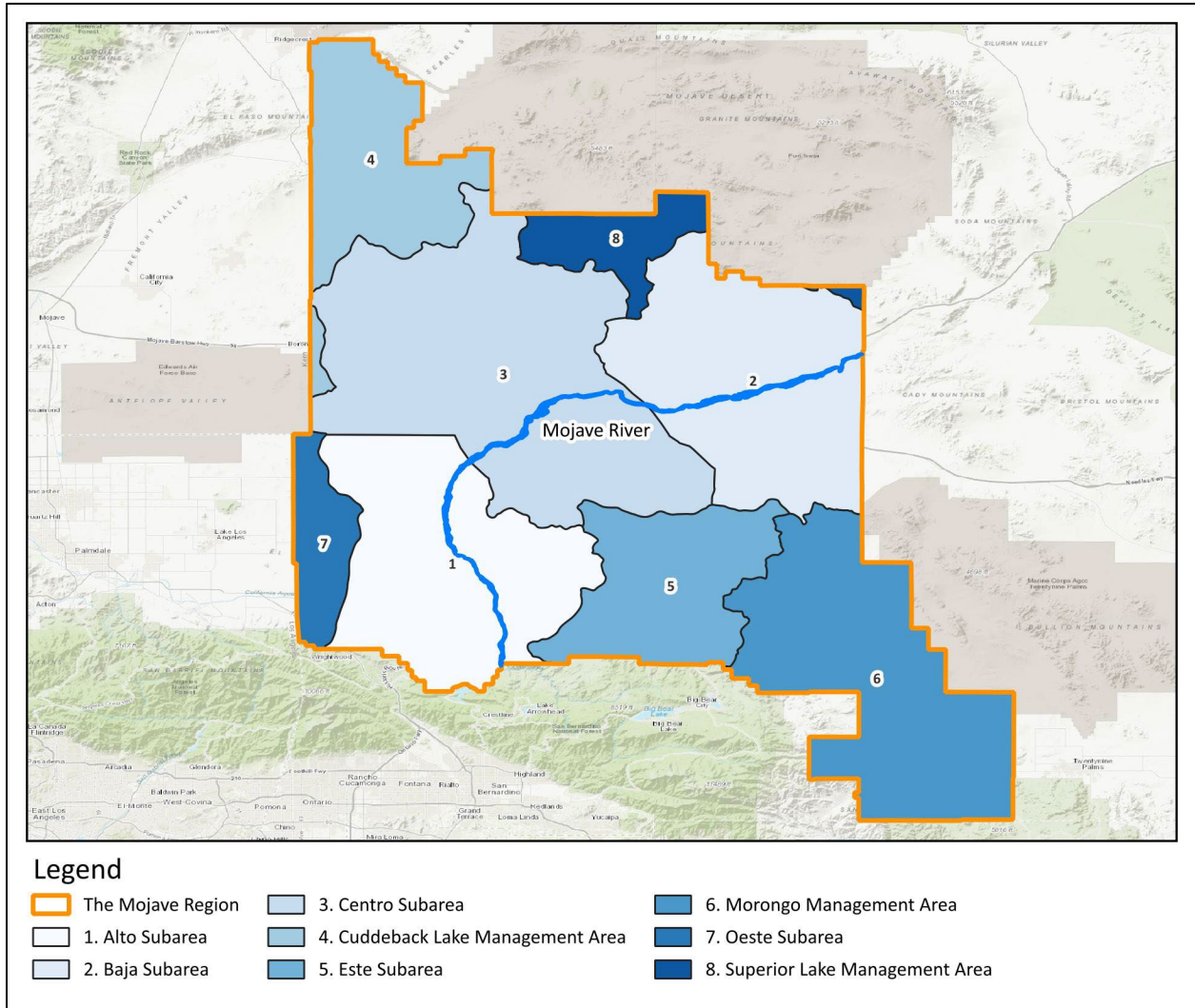


FIGURE 2-2: SUBAREAS AND MANAGEMENT AREAS WITHIN THE MOJAVE REGION



For the purposes of this RUWMP and evaluation of water supply reliability, the eight subareas are combined into the following three Subregions of the Mojave Region (**Figure 2-3**).

- Subregion 1 – Includes the subareas of Oeste, Alto (and Alto Transition), and Este: This subregion includes seven of the 10 participating RUWMP urban water suppliers (City of Adelanto, County Service Area 64, County Service Area 70J, Hesperia Water District, Liberty Utilities – Apple Valley, Phelan-Piñon Hills Community Service District, and Victorville Water District), as well as other demands reliant on MWA including other small urban water suppliers, Helendale Community Services District, rural pumpers, agriculture, and industry.
- Subregion 2 – Includes the subareas of Centro, Baja, Cuddeback Lake, and Superior Lake: This subregion includes one of the participating RUWMP urban water suppliers (Golden State Water Company-Barstow), as well as other demands reliant on MWA including other small urban water suppliers, rural pumpers, agriculture, and industry.
- Subregion 3 – Includes the subarea of Morongo: This subregion includes two of the 10 RUWMP urban water suppliers (Joshua Basin Water District and Hi-Desert Water District), as well as other demands reliant on MWA including other small urban water suppliers, Bighorn-Desert View Water Agency, rural pumpers, agriculture, and industry.

These Subregions are used to summarize demand and supply conditions in areas with generally similar groundwater conditions and MWA imported water opportunities.

2.1.2.1 Mojave Water Agency

MWA serves as the wholesale water supplier for the Mojave Region and manages water supply reliability across its approximately 4,900-square-mile service area. The Agency’s core responsibility is to address the Region’s structural water management challenges, including limited local runoff and chronic groundwater overdraft within underlying basins and subbasins.

To support long-term sustainability for its retail agency partners and other customers, MWA manages the importation of SWP supplies from the California Aqueduct. In addition, MWA serves as the court-appointed Watermaster for the MBA Adjudication Judgment (MBA Judgment) (see *Chapter 3 – Water Supply Characterization*), where it regulates groundwater production and coordinates water management activities across the adjudicated subareas.

Although MWA does not provide retail water service, it fulfills a central regional function by integrating imported supplies with local groundwater management to enhance supply reliability, facilitate groundwater recharge, and improve drought resilience. This role requires ongoing coordination with retail water purveyors, adjudication watermasters, and other regional stakeholders to align imported water operations with groundwater sustainability objectives and broader regional planning efforts.

2.1.2.2 Urban Water Retail Suppliers

There are a variety of small-to-large state-permitted Public Water Systems, also referred to as urban water suppliers, located in the Mojave Region. As noted above, MWA does not sell water directly to these retailers or to any consumers; rather, it supplies water to areas of the Region used to recharge local aquifers for specific retailers as needed to satisfy the MBA Judgment’s replenishment requirements, as stipulated by the MBA Watermaster, as requested to meet needs in other adjudicated areas, and as needed to maintain overall groundwater basin health or requested to address local circumstances or retail requests. Of the twelve (12) large urban water suppliers within the Region, ten (10) are required to complete an UWMP pursuant to the UWMPA detailed in CWC Section 10610 et al. The 12 large urban water suppliers are shown in **Figure 2-4**.

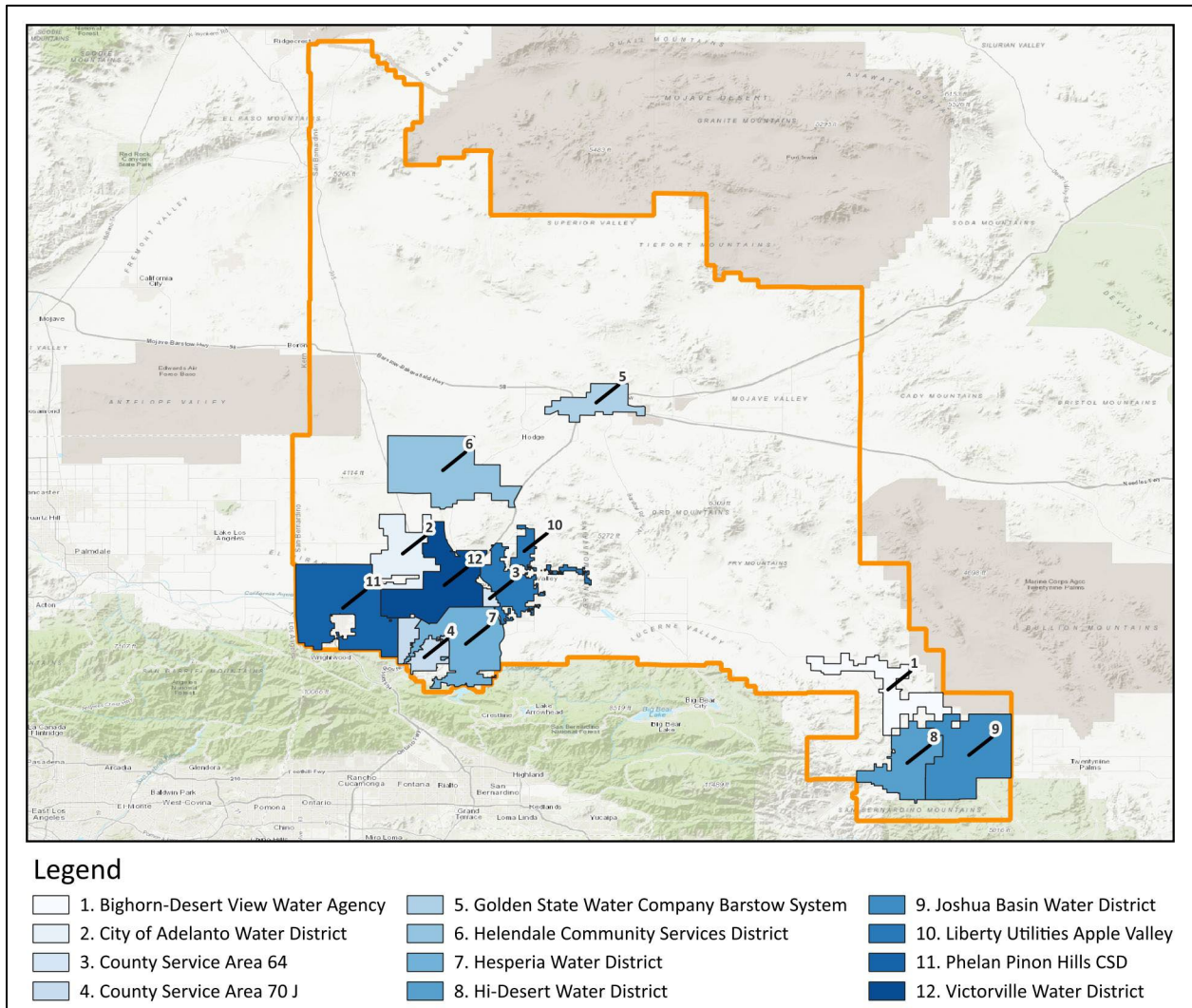
For the ten large suppliers required to prepare a UWMP, they collectively opted to pursue a coordinated RUWMP with MWA in lieu of ten individual UWMPs, hence this 2025 Regional UWMP document. **Table 2-1** lists the 10 suppliers that participated in this RUWMP, approximate service areas, and estimated total number of connections. Both Bighorn–Desert View Water Agency and Helendale Community Services District are incorporated into MWA’s wholesale demand forecast presented in *Chapter 6 – Mojave Water Agency*, as they both have not reached the UWMPA compliance threshold of 3,000+ service connections and/or do not supply more than 3,000 acre-feet of water per year, but have significant demands and are active coordinators within the Region.

TABLE 2-1: URBAN WATER RETAIL SUPPLIERS WITHIN THE MOJAVE REGION

Urban Water Retail Supplier	Service Area (sq. miles)	Approximate Connections
City of Adelanto	53	8,300
Liberty Utilities - Apple Valley Water Company	51	21,000
County Service Area 64	4	4,000
County Service Area 70J	28	3,400
Golden State Water Company - Barstow System	33	9,000
Hesperia Water District	78	27,600
Hi-Desert Water District	57	11,000
Joshua Basin Water District	97	4,900
Phelan Piñon Hills Community Service District	118	7,200
Victorville Water District	85	38,000
Bighorn-Desert View Water Agency	52	< 2,000
Helendale Community Services District	116	< 3,000

Several additional urban water suppliers dependent on MWA's supplies and management are not specifically discussed within unique chapters of this RUWMP as their size does not yet require completion of a UWMP. However, these smaller suppliers, as well as numerous other water users dependent on groundwater throughout the Region such as agriculture, industry, and rural domestic pumpers, are reflected in MWA's Wholesale chapter (*Chapter 6 - Mojave Water Agency*) and are incorporated into the Region's overall water demand characterization.

FIGURE 2-4: URBAN WATER RETAIL SUPPLIERS WITHIN THE MOJAVE REGION



2.1.3 Mojave Region Groundwater Basins

The Mojave Region overlies all or a portion of 36 groundwater basins and subbasins as defined by DWR Bulletin 118. Collectively, these basins and subbasins are broadly grouped into two larger hydrogeologically distinct areas – the South Lahontan Hydrologic Region and the Colorado River Hydrologic Region. Groundwater basins along the Mojave River and adjacent areas are referred to as the Mojave River Groundwater Basin. Remaining basins and subbasins in the southeastern Mojave Region are generally referred to as the Morongo Basin/Johnson Valley Area or “Morongo Area,” with the exception of the Lucerne Valley. The Lucerne Valley Subbasin is divided along the Helendale Fault with the southwest portion in the Mojave River Groundwater Basin and the northeast portion in the Morongo Area. Surface

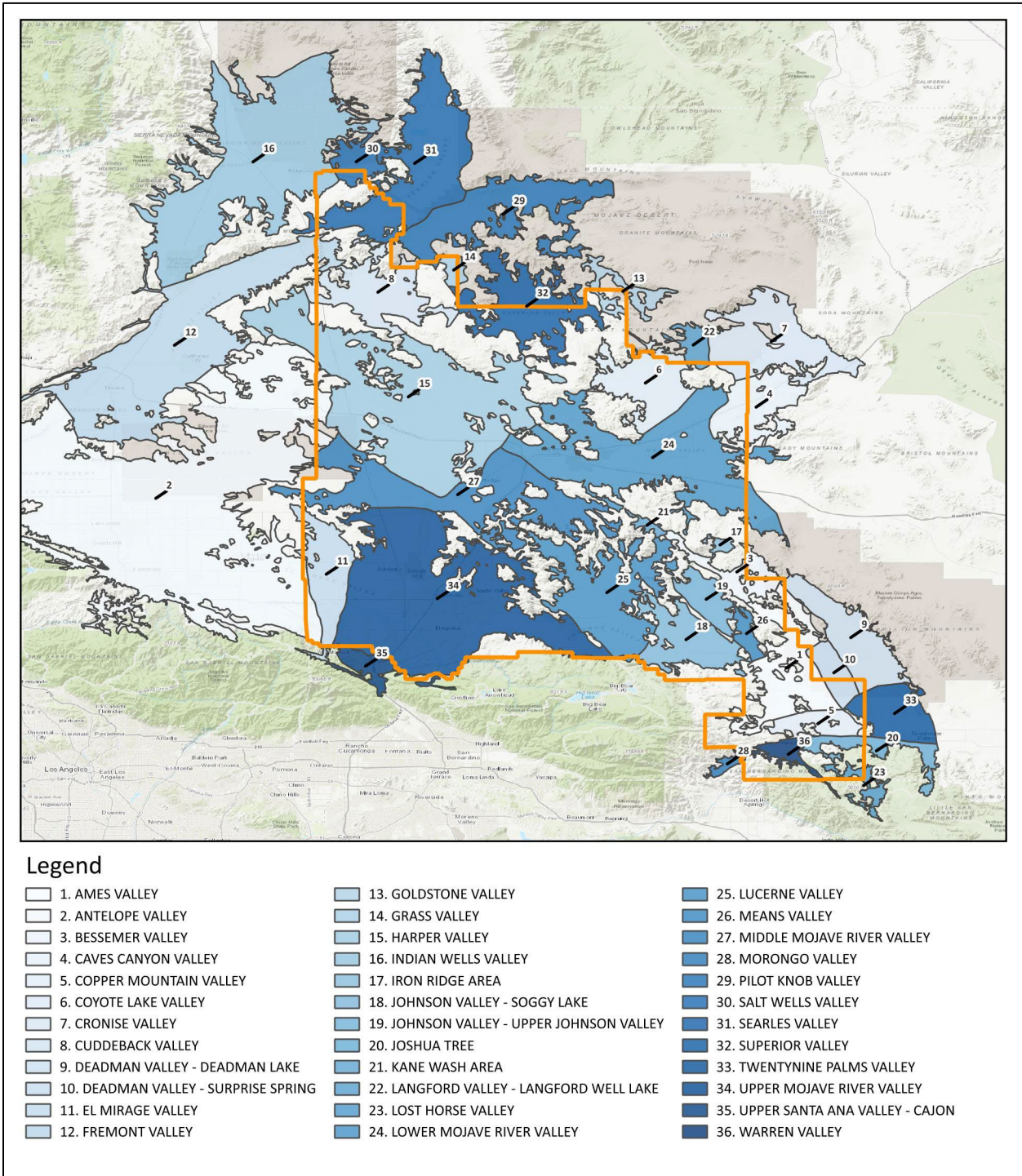
water drainage of Lucerne Valley is in the Colorado River Hydrologic Region but is not included in the Morongo Basin Area, isolating this area due to the hydrogeologic conditions.

Of the two main areas, the Mojave River Groundwater Basin is the largest. The 36 groundwater basins and subbasins are listed in **Table 2-2** and grouped by the South Lahontan (Region 6) and Colorado River (Region 7) Hydrologic Regions. The Mojave Region also overlaps a small portion of a DWR basin in the South Coast Hydrologic Region (Region 8) as shown by the last subbasin listed in **Table 2-2** – the Upper Santa Ana Valley. These basins are also shown in **Figure 2-5**.

TABLE 2-2: GROUNDWATER BASINS WITHIN THE MOJAVE REGION

DWR Basin	Groundwater Basin Name	DWR Basin	Groundwater Basin Name
South Lahontan Hydrologic Region		Colorado River Hydrologic Region	
6-35	Cronise Valley	7-10	Twentynine Palms Valley
6-36	Langford Valley	7-11	Copper Mountain Valley
6-37	Coyote Lake Valley	7-12	Warren Valley
6-38	Caves Canyon Valley	7-13	Deadman Valley
6-40	Lower Mojave River Valley	7-13	Deadman Valley
6-41	Middle Mojave River Valley	7-15	Bessemer Valley
6-42	Upper Mojave River Valley	7-16	Ames Valley
6-43	El Mirage Valley	7-17	Means Valley
6-44	Antelope Valley	7-18	Johnson Valley
6-46	Fremont Valley	7-18	Johnson Valley
6-47	Harper Valley	7-19	Lucerne Valley
6-48	Goldstone Valley	7-20	Morongo Valley
6-49	Superior Valley	7-50	Iron Ridge Area
6-50	Cuddeback Valley	7-51	Lost Horse Valley
6-51	Pilot Knob Valley	7-62	Joshua Tree
6-52	Searles Valley	8-2	Upper Santa Ana Valley
6-53	Salt Wells Valley		
6-54	Indian Wells Valley		
6-77	Grass Valley		
6-89	Kane Wash Area		

FIGURE 2-5: GROUNDWATER BASINS WITHIN THE MOJAVE REGION



Challenges in managing overdrafted groundwater resources along with the high cost of importing water drove the first adjudication efforts in the Region in the 1960s. In 1965, Morongo Basin was annexed into MWA's service area adding 35.5 square miles to MWA's boundary. The Morongo Basin was a sixth but separate area that added management and delivery obligations beyond the five other distinct hydrological subareas within the Mojave Basin Area: Este (East Basin), Oeste (West Basin), Alto (Upper Basin), Centro (Middle Basin) and Baja (Lower Basin).

2.1.3.1 Mojave River Basin

The Mojave River Basin (Mojave Basin Area or MBA) is the principal water management area of the Region. For management purposes, the MBA is separated into five distinct hydrologic divisions defined in previous studies (DWR, 1967), evolving over time based on a combination of hydrologic, geologic, engineering, and political considerations (**Figure 2-6**).

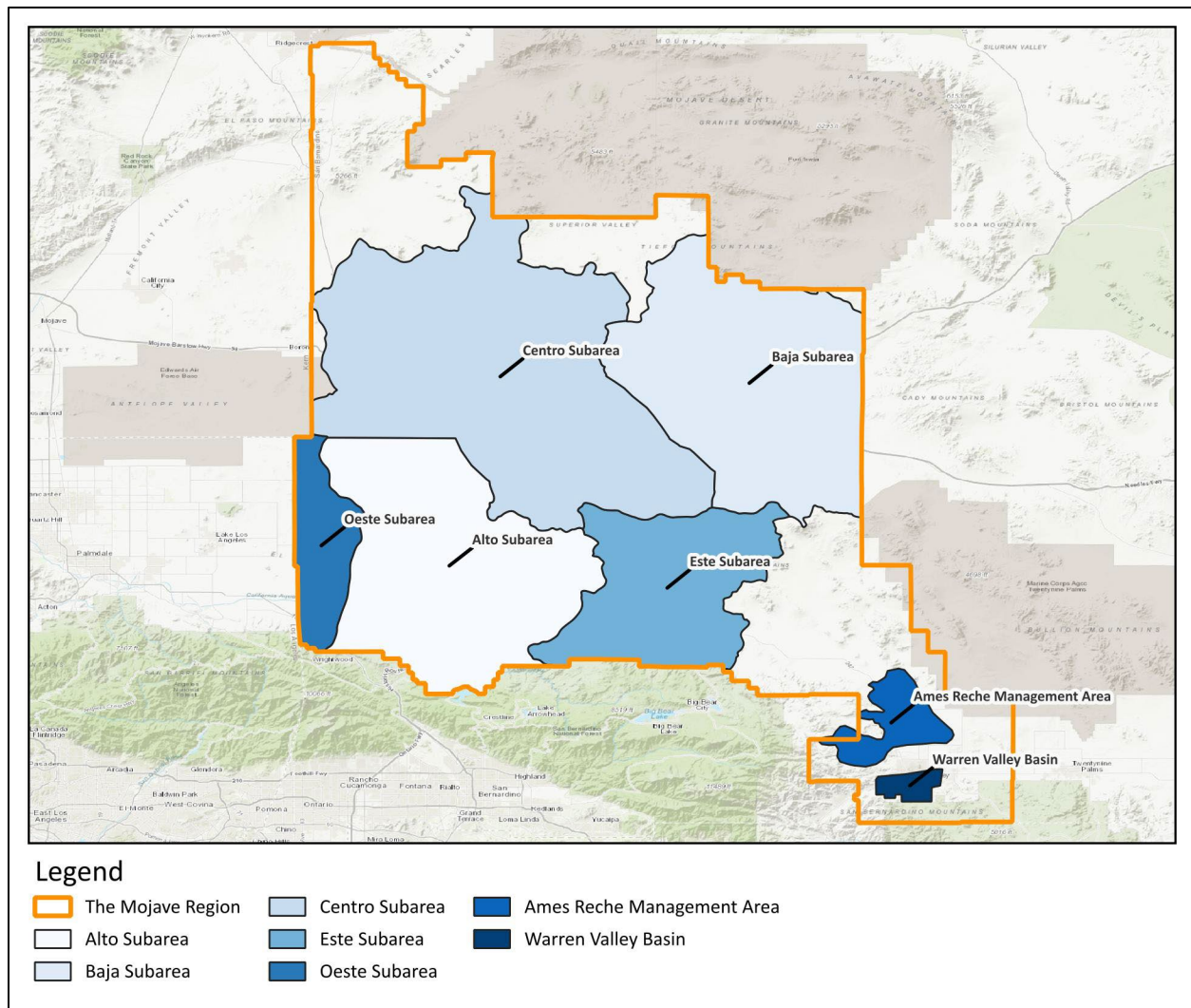
A second effort at adjudication within the MBA starting in 1990 proved more successful than attempts in the 1960s. The effort resulted in full adjudication of the MBA in 2002.⁶ It began when the City of Barstow and the Southern California Water Company filed a complaint against upstream (and up-basin) water users claiming that lowering groundwater levels and water availability due to withdrawals reduced the amount of water available to downstream users. A year later, MWA filed a cross-complaint declaring that native waterflow of the Mojave River and basin area groundwater was not sufficient to meet current and future demands. The cross-complaint asked the court to determine surface and groundwater rights for the Mojave Basin Area. Negotiations over the next two years produced a Stipulated Judgment in January 1996 that formed a class of producers which used 10 acre-feet or less per year that were dismissed from litigation and offered an equitable solution for the remaining water producers that use over 10 acre-feet per year (aka Minimal Producers). The Riverside Superior Court appointed MWA as Watermaster for the area as part of the MBA Judgment. Appeals by non-stipulated parties continued over the next several years with the California Supreme Court finally ruling on the case in August 2000. Most of the appealing parties have stipulated to the MBA Judgment since the 1996 ruling.

The MBA Judgment helps maintain proper water balances between the Mojave Basin Area's five distinct, but interrelated, subareas (Este, Oeste, Alto, Centro, Baja). The Alto Transition Zone was also defined as a sub-management unit to better understand the water flow from Alto to Centro. Some subareas were also recognized to historically receive natural water flow from upstream subareas; to maintain that relationship, annual obligations are set according to average annual natural flow baselines defined in the MBA Judgment as Base Annual Production (BAP). The MBA Judgment established a Free Production Allowance (FPA) allocation to Producers based on each Producer's percentage share of the BAP which is set

⁶ The MBA Judgment can be accessed at Mojave Water Agency's website: <https://www.mojavewater.org/basin-management/watermaster/reports/>

each year by the MBA Watermaster. FPA is reduced over time until it comes within 5% of the Production Safe Yield (PSY) defined by the MBA Judgment. All water produced in excess of any Producer’s share of the FPA must be replaced by the Producer, either by payment to the Watermaster of funds sufficient to purchase Replacement Water, or by transfer of unused FPA from another Producer. The court can review and adjust the FPA for each Subarea on an annual basis as appropriate. The dynamics of the FPA and resulting forecasts of available native groundwater for the general subareas are discussed in more detail in *Chapter 3 – Water Supply Characterization*.

FIGURE 2-6: ADJUDICATED SUBAREAS AND DEFINED MANAGEMENT AREAS WITHIN THE MOJAVE REGION



2.1.3.2 Morongo Area

The Morongo Area includes 15 groundwater basins and subbasins that cover portions of the Morongo Area as defined in this RUWMP and shown in **Figure 2-5**. Several of these basins lie mostly outside of the Mojave Region, have low populations, and are essentially undeveloped

with respect to groundwater. The remaining basins have been grouped into six within the Morongo Area, with two of primary importance: the Warren Valley Basin and Ames Valley Basin.

2.1.3.3 Warren Valley Basin

The Warren Valley Basin covers an area of approximately 17,200 acres and consists of water-bearing sediments beneath the Town of Yucca Valley and surrounding area. The Warren Valley Basin (**Figure 2-6**) is geologically defined by the Pinto Mountain Fault to the north; a bedrock outcrop of the Little San Bernardino Mountains to the south; a bedrock constriction called the ‘Yucca Barrier’ to the east; and by a bedrock constriction and topographic divide to the west. Natural recharge to the Warren Valley Basin includes direct percolation of precipitation and percolation of ephemeral streamflow from Water Canyon and Covington Canyon.

After extractions began exceeding supplies in the 1950s, the area was adjudicated in 1977 in a decision known as the Warren Valley Judgment. Hi-Desert Water District (HDWD) was appointed Watermaster in the Judgment (the “Warren Valley Watermaster”) and was ordered to help develop solutions to halting overdraft. A comprehensive approach was developed by the Warren Valley Watermaster Board which included adopting a Basin Management Plan that called for SWP water delivery from MWA through the Morongo Basin Pipeline (MBP) to address demand and replenish overdraft. Native groundwater supplies associated with the Warren Valley Judgment are described in more detail in *Chapter 3 – Water Supply Characterization*.

2.1.3.4 Ames Valley Basin

In 2014 the Ames/Reche Groundwater Storage and Recovery Program and Management Agreement replaced and superseded the original adjudication called Ames Valley Basin Water Agreement between HDWD and Bighorn-Desert View Water Agency (BDVWA) established in 1991. It was created for the construction and operation of the HDWD Mainstream Well located in the Ames Valley Basin (**Figure 2-6**). The 2014 Agreement was established by BDVWA, HDWD, and County of San Bernardino, with administrative support provided by MWA, and the Stipulation and Amended and Restated Judgment (Ames/Reche Judgment) was finalized by the Superior Court of California, County of Riverside in September 2014. The Ames/Reche Management Area includes 95 square miles encompassing the communities of Flamingo Heights, Landers, Pioneertown, and Yucca Mesa. Native groundwater supplies associated with the Ames/Reche Judgment are described in more detail in *Chapter 3 – Water Supply Characterization*.

2.1.4 Major Regional Infrastructure

This sub-chapter focuses specifically on MWA’s water delivery infrastructure. Individual infrastructure assets, such as distribution pipelines, well locations or other attributes, associated with each urban water supplier are discussed in their corresponding chapter.

2.1.4.1 State Water Project

The SWP or California Aqueduct is the largest state-built, multi-purpose water project in the country. It was authorized by the California State Legislature in 1959, with the construction of most facilities completed by 1973. Today, the SWP includes 28 dams and reservoirs, 26 pumping and generating plants, and approximately 660 miles of aqueducts.

The primary water source for the SWP is the Feather River, a tributary of the Sacramento River. The water flowing into the Feather River is captured by the SWP in Oroville Dam and Reservoir. Storage released from Oroville Dam flows down natural river channels to the Sacramento-San Joaquin River Delta (Delta). While some SWP supplies are pumped from the northern Delta into the North Bay Aqueduct or diverted by SWP contractors upstream, the vast majority of SWP supplies are pumped from the southern Delta into the 444-mile-long California Aqueduct. The California Aqueduct conveys water along the west side of the San Joaquin Valley to the Edmonston Pumping Plant, where water is pumped over the Tehachapi Mountains. From there the California Aqueduct divides into the East and West Branches. MWA takes its SWP deliveries from the East Branch, which was completed in 2003. MWA delivers its SWP supplies to recharge local groundwater basins through transmission pipelines, recharge facilities, and direct releases from Silverwood Lake – a SWP regulating reservoir. **Figure 2-7** depicts the SWP facilities that deliver water to MWA and details the sections of the Mojave Division Reaches of the California Aqueduct.

The initial SWP storage and conveyance facilities were designed to meet contractors’ water demands with the construction of additional storage facilities planned as demand increased. However, few additional SWP storage facilities have been constructed since the early 1970’s and a portion of the original conveyance design was never completed. SWP conveyance facilities were generally designed and have been constructed to deliver Table A amounts to all contractors. The maximum Table A Annual Amount of all SWP Contractors totals approximately 4.133 million acre-feet but full Table A Annual Amount deliveries rarely occur. Details regarding MWA’s characterization of SWP reliability is discussed in MWA’s wholesale *Chapter 6 – Mojave Water Agency*.

MWA diverts its SWP water from the East Branch of the California Aqueduct, which includes six turnout locations utilized by MWA (identified west to east): Sheep Creek Turnout, White Road Turnout, Highway 395 Turnout, Antelope Siphon Turnout, Unnamed Wash, and Cedar Springs Dam (Silverwood Lake). These turnouts are used to deliver water to recharge facilities located

throughout the MWA service area. **Figure 2-8** below depicts the MWA water turnout and delivery facilities.

FIGURE 2-7: SWP MOJAVE DIVISION AQUEDUCT REACH SECTIONS

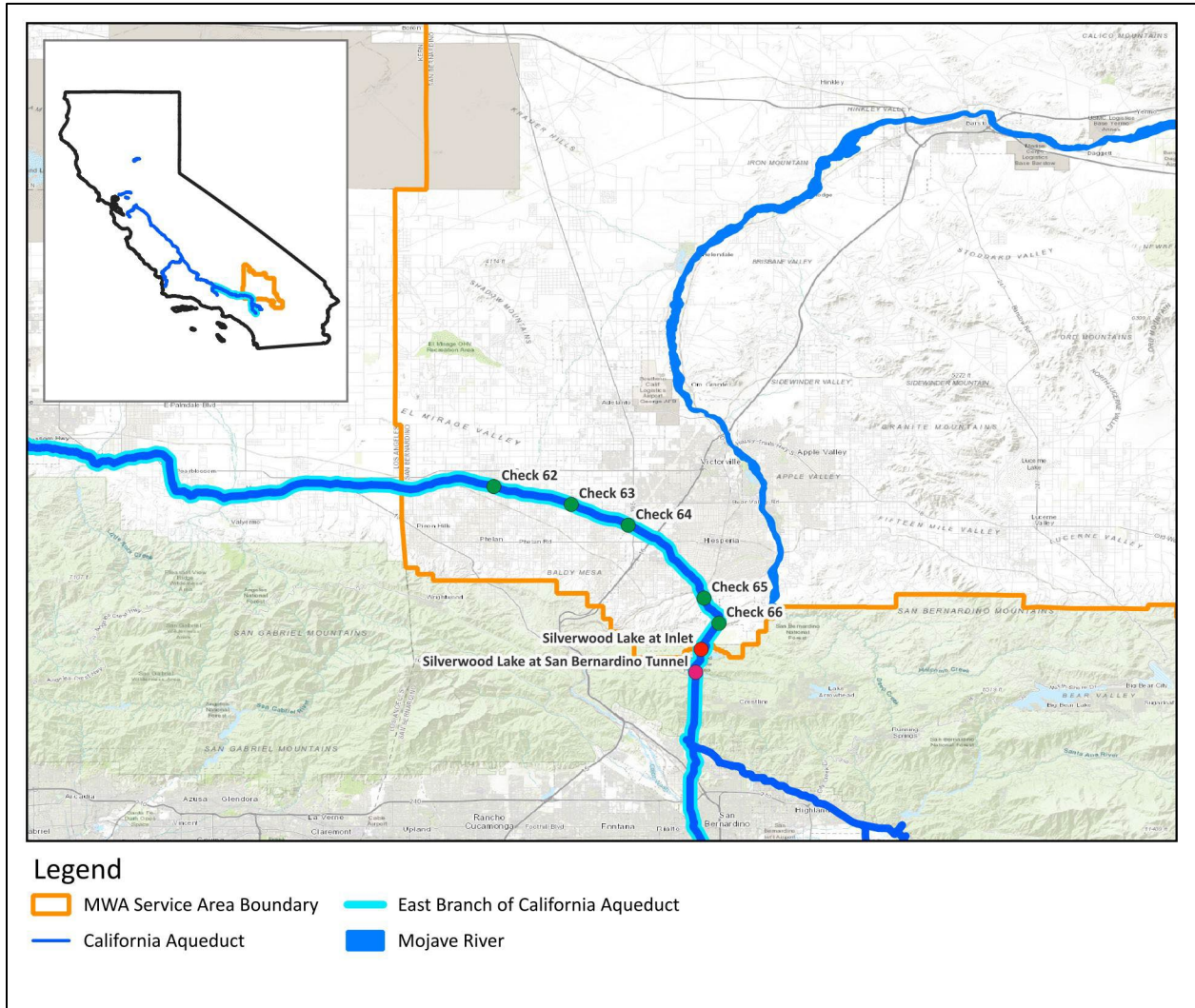
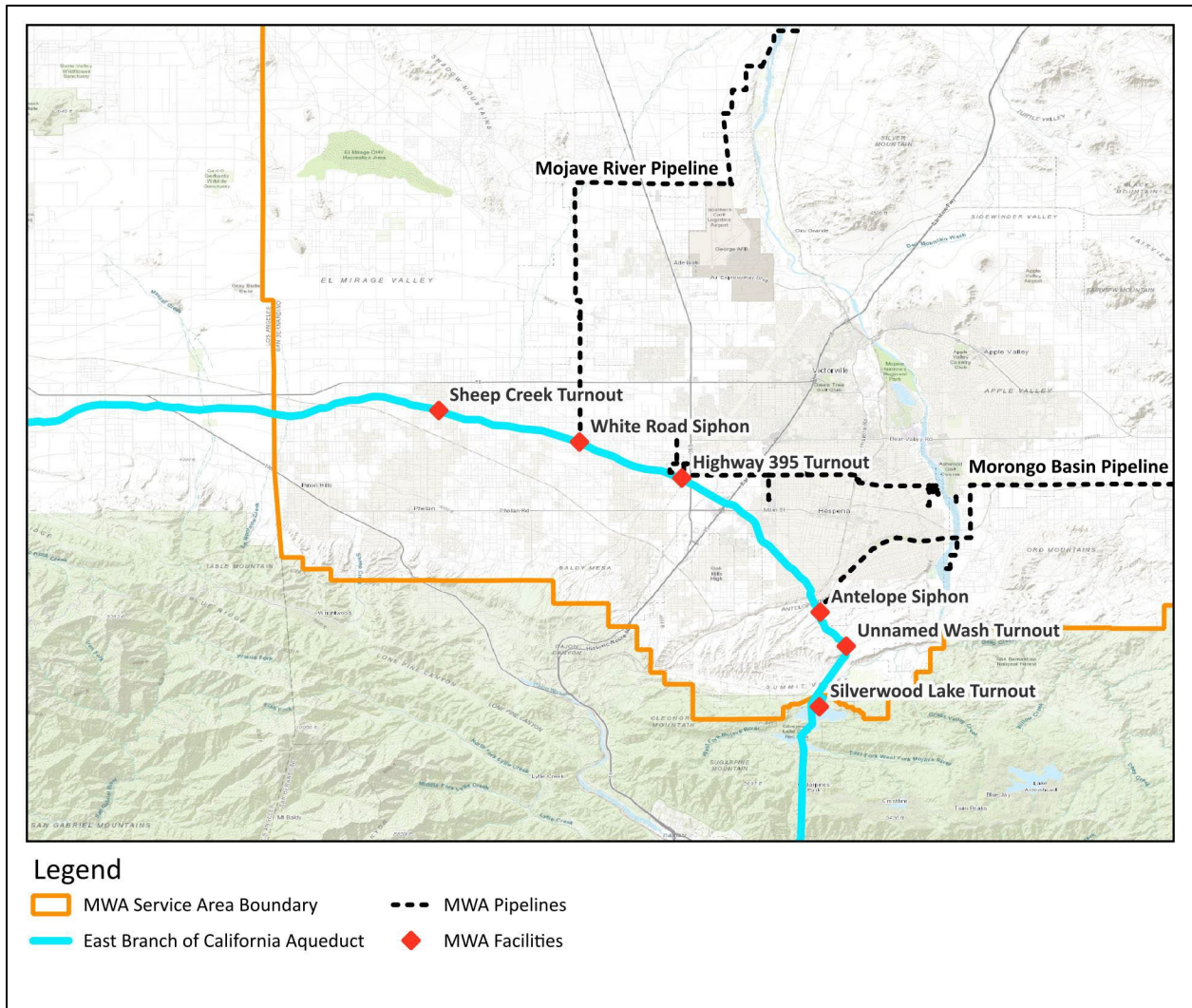


FIGURE 2-8: MWA TURNOUTS ALONG THE EAST BRANCH



2.1.4.2 Delivery System

MWA relies on the SWP contracted supplies to supplement local groundwater supplies throughout the Region using the Mojave River and two primary pipelines. The Mojave River Pipeline (MRP) is approximately 76 miles long, extending from the California Aqueduct in the Phelan area to four groundwater recharge basins along the Mojave River. These recharge basins are located in Hodge, Lenwood, Daggett/Yermo, and Newberry Springs. The MRP delivers up to 45,000 acre-feet of water per year to the Region. An additional pilot recharge basin is also currently under construction: the West Victorville Recharge Basin, located at the turnout of the MRP and adjacent to the California Aqueduct.

The second major pipeline linking the SWP to the subareas in the Region is the Morongo Basin Pipeline, which currently delivers water to groundwater recharge sites in Landers, Yucca Valley, and Joshua Tree to help address supplemental water needs for the Ames/Reche Judgment and the Warren Valley Judgment. The pipeline also allows MWA to deliver imported water into the Mojave River at the Deep Creek and Rock Springs discharge locations that serve the needs of the MBA Judgment. These two facilities are in areas of the River with high percolation rates, allowing water to recharge the aquifer directly upstream of the area with the highest groundwater pumping demand in MWA's service area (the Alto subarea). The facility includes a pipeline which extends south along the river from the MBP, a flow control facility and outlet. It can recharge a maximum of approximately 40,000 acre-feet per year.

The Amethyst Basin Facility, completed in 2019, delivers SWP water to recharge the Oro Grande Wash in Victorville just east of Sycamore Street and Amethyst Road in Victorville. It provides flood control and allows recharge through a series of dikes and recharge ponds. Water from the SWP is delivered to the recharge ponds through a pipeline that connects to the California Aqueduct at the Highway 395 turnout. Recharge capacity is about 8,000 acre-feet per year.

The Ames/Reche Recharge Facility delivers water from the SWP directly to the Pipes Wash in Landers, located north of Yucca Valley. The Ames/Reche facility consists of a pipeline extending west from the MBP at Winters Road to an outlet in Pipes Wash. Construction of the pipeline, flow control facility, and outlet was completed in 2014. The turnout is planned to flow up to a maximum capacity of five cubic feet per second, recharging a maximum of approximately 1,500 acre-feet per year.

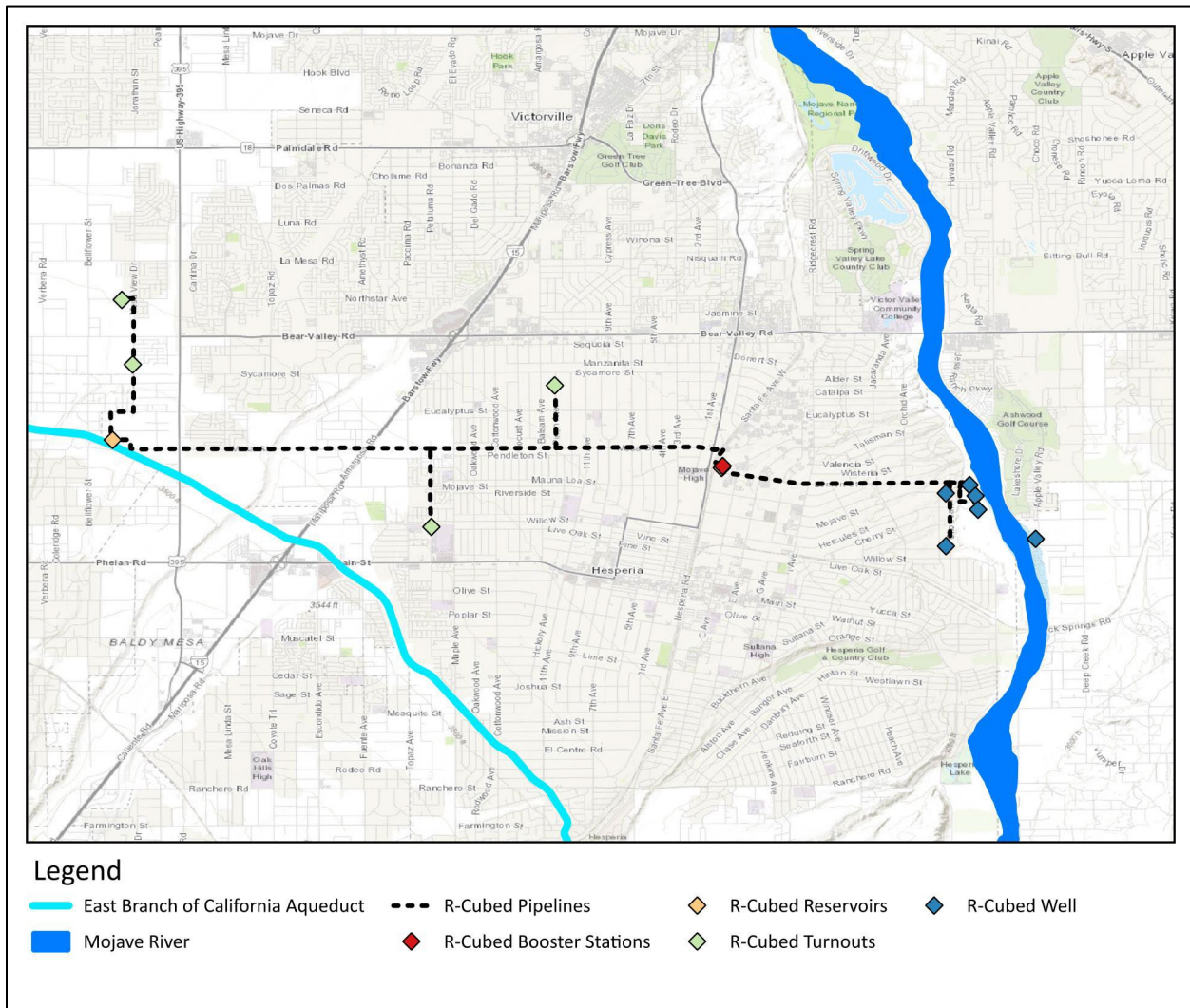
Silverwood Lake is a reservoir owned and operated by the State of California and DWR. At the California Aqueduct terminus in Hesperia, water is siphoned into the lake where it is stored for use in San Bernardino and Inland Empire areas. MWA takes deliveries of SWP from the lake via the Cedar Springs Dam which releases into the Mojave River.

Reflecting a more recent addition to the Region's infrastructure, MWA constructed and operates the Regional Recharge and Recover Project (R-Cubed). This conjunctive use project

stores SWP deliveries in recharge sites in the Floodplain Aquifer along the Mojave River near Hesperia and southern Apple Valley (Figure 2-9). When needed, MWA-owned production wells on both sides of the Mojave River, immediately downstream of the recharge area, can recover and deliver the stored water through pipelines directly to local urban water retail suppliers. Current beneficiaries of R-Cubed include Liberty Utilities (Apple Valley), City of Adelanto, City of Hesperia, and Victorville Water District.

Phase 1 of the R-Cubed Project was partially completed in 2013. It currently produces approximately 15,000 acre-feet per year, with expansion plans under consideration.

FIGURE 2-9: R-CUBED FACILITIES



2.1.5 Regional Climate

Located in the High Desert region of San Bernardino County, the climate in the Mojave Region is more extreme than the lowland areas of Southern California. As is typical of the Mojave Desert, the region is very arid because of the rain shadow effect of the surrounding mountains. The summers are extremely hot and dry with occasional monsoonal thunderstorms that can bring flash flooding and hail. Most of the precipitation happens in the winter, with snowfall possible, although much lighter than what occurs in the surrounding mountains and melting quickly.

The major settlements in the Region are along the Highway 15 corridor which generally parallels the Mojave River, primarily within the southern end of the Region including cities and communities of Hesperia, Victorville, Adelanto, and Apple Valley. Thirty-two miles to the north, also along the Highway 15 corridor, is the City of Barstow. The elevation variance across the Region leads to slight differences in reported climate data for various areas, but not significantly different for purposes of this discussion. Therefore, the following figures report data representing the southern area of the Region (using Victorville), with some discussion of the minor climate differences via reference to conditions in Barstow.

Historical averages show January as the coolest and wettest month, and July as the hottest and driest. The wet season is from December to March with a 30-year annual average rainfall of 5.8 inches for Victorville and 5 inches for Barstow. The annual mean temperature is about 62 degrees, but the High Desert climate leads to extreme temperature ranges with highs during the summer months regularly hitting the upper 90s and lows in winter dropping to averages in the lower 30s.

Other climate characteristics of the Region include monsoonal moisture in the later summer, which can cause thunderstorms. These thunderstorms do not deliver nearly as much rainfall as desert regions further east and the region receives only a small fraction of the annual precipitation compared to the eastern areas. Snowfall in Victorville during the winter, if it occurs, is light and tends to melt before accumulating. Snow in Barstow is much rarer and occurs infrequently. Autumn averages very warm and dry conditions still and becomes cooler by November with rainfall beginning as California's traditional rainy season begins. Winter conditions usually appear by late November. Spring is usually warm during the days although low temperatures are still quite cool. Rainfall usually tapers off by May.

Figure 2-10 shows the average monthly temperature, rainfall, and evapotranspiration (ET_o) for the service area. This figure reports data from Victorville. Actual annual rainfall totals deviate quite significantly from the 30-year average as illustrated in **Figure 2-11**. In most years, precipitation totals fall below the mean.

FIGURE 2-10: AVERAGE CLIMATE CONDITIONS

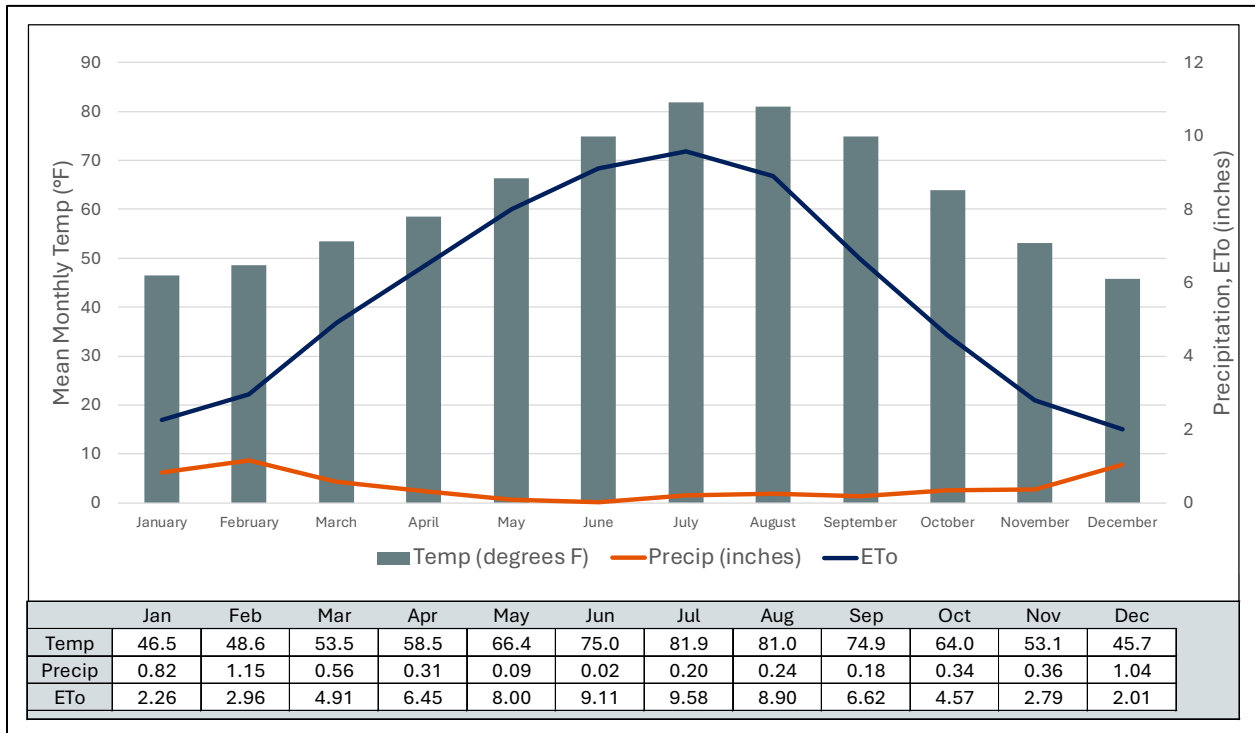
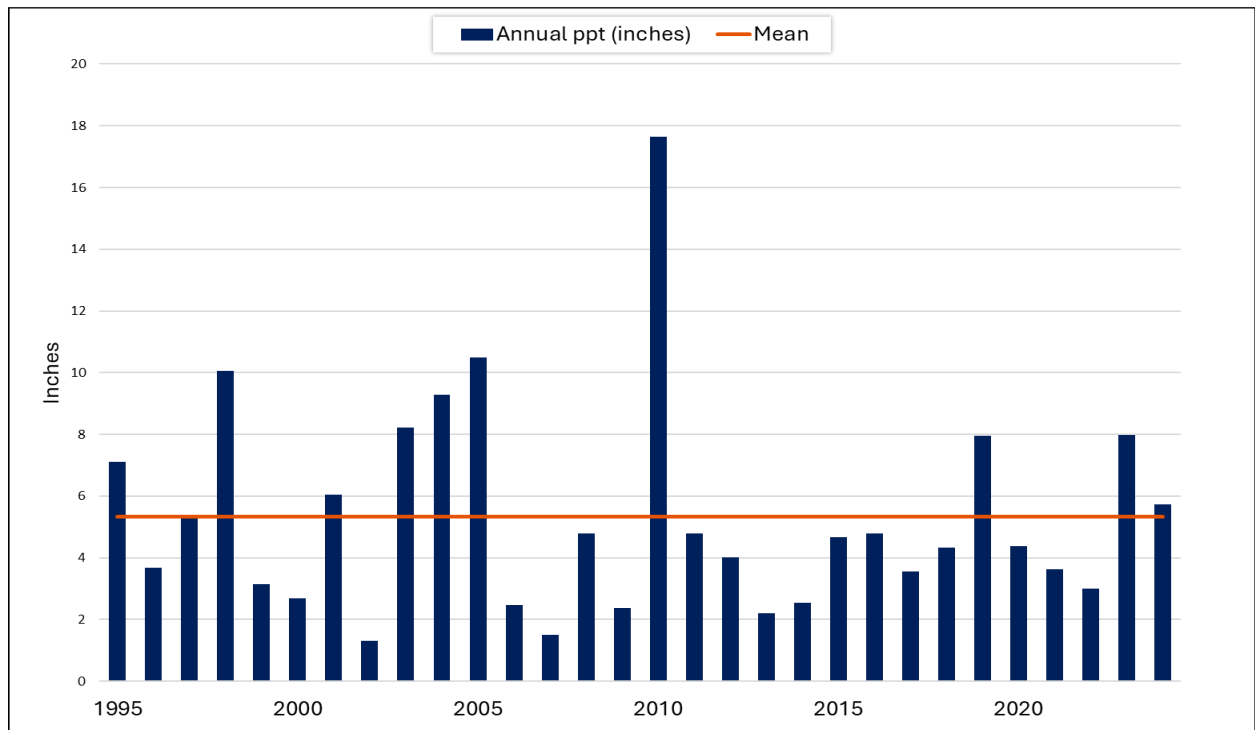


FIGURE 2-11: ANNUAL PRECIPITATION VARIABILITY (1996-2024)

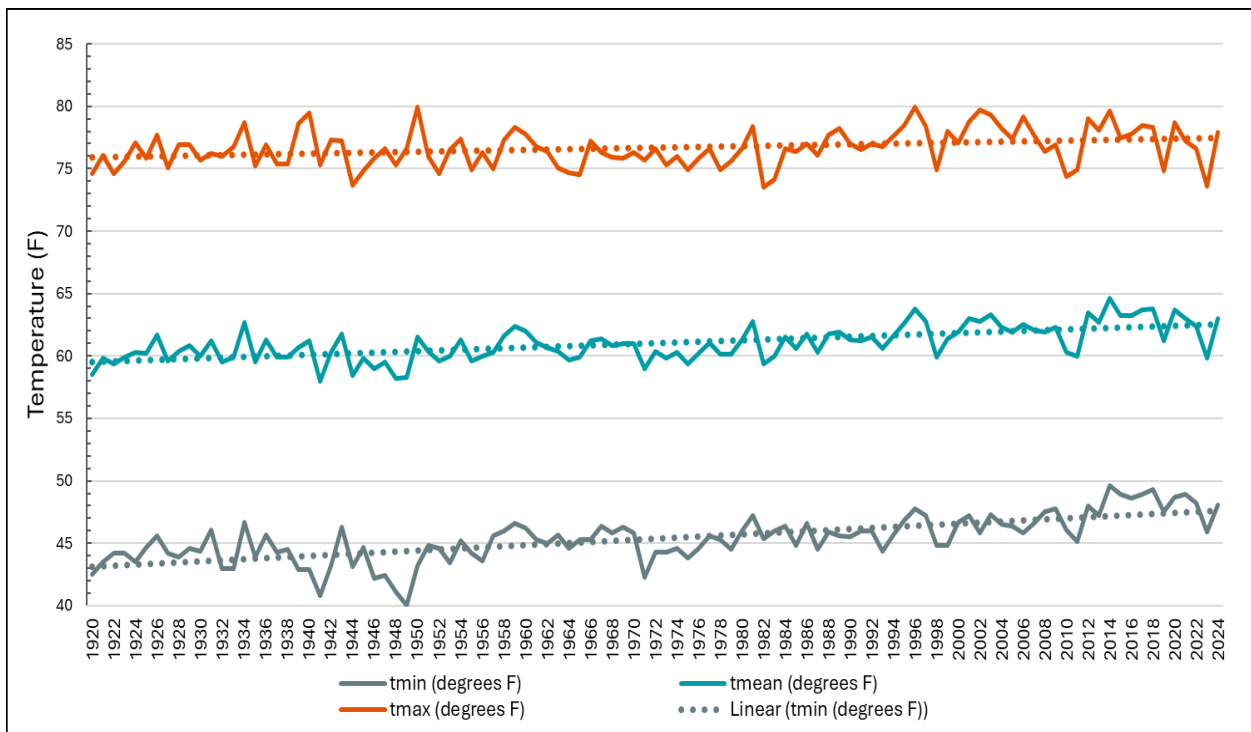


2.1.5.1 Climate Change

The CWC does not prescribe specific climate change planning and management measures for water suppliers; however, urban water suppliers should consider climate change when evaluating water supply availability and customer water use trends. For example, drier conditions or drought can lead to more residential irrigation and increased water use compared to wetter years.

Climate change will likely alter precipitation patterns, resulting in consequential externalities like reductions in Sierra Nevada snowpack. Given the region's reliance on imported water, particularly from the State Water Project, which relies on melting snowpack, any effect from climate change on Sierra Nevada snowpack levels and inflows to Northern California reservoirs and the Delta will have a serious impact on water availability. As shown by the trendlines in **Figure 2-12**, the region has experienced gradual warming in average temperatures over the last 100 years. Increasing temperatures locally within the Region can result in higher evapotranspiration, leading to additional water demand. Although annual median precipitation levels remain relatively consistent, projected changes in the frequency, magnitude, and volume of precipitation show large variability, which has implications for uncertainties in stormwater runoff and peak flow rates.

FIGURE 2-12: HISTORICAL ANNUAL TEMPERATURE AND TRENDS (YEARS)



2.1.6 Current and Projected Population

Service area population and land use projections are critical to developing a useful planning framework as population dynamics and growth are a primary influence on water use within the Mojave Region. These projections directly influence planning measures for system supply, delivery, infrastructure, and demand management. The projections also provide the Region with the necessary data-driven means for assessing whether MWA is accomplishing its purpose of providing sufficient water to meet the Region's current and future needs.

Similarly, the Region's economic, social, and demographic trends provide valuable insight to water management and planning. This sub-chapter of the RUWMP addresses these factors to provide a supportable basis for forecasting future water use.

2.1.6.1 Current Population and Historical Trends

The Mojave Region has undergone a dramatic demographic transformation over the past century. In the early 20th century, the Region was sparsely populated, with an economy anchored by agriculture and the railroads, supporting only modest communities in Barstow and the Victor Valley. Following World War II, the Region began developing as Southern California's suburban boom began pushing development eastward from Los Angeles into the Inland Empire. However, it was the housing affordability crisis in coastal California during the 1980s and 1990s that truly ignited the region's expansion, as middle-class families sought more affordable housing opportunities. Relatively affordable housing continued to drive growth through the early 2000s, as the City of Victorville and neighboring communities in the Victor Valley entered a period of explosive residential growth, with tens of thousands of new residential homes constructed across former scrubland. This rapid expansion, however, came with significant challenges, including long commutes to employment centers, infrastructure strain, and acute vulnerability during the 2008 Housing Crisis.

The Region slowly recovered following the 2008 housing crisis, fueled by a booming logistics and warehouse industry and a rebounding real estate market. Much of this growth has been concentrated along the Interstate 15 corridor as fulfillment centers and warehouse operations locate themselves near highways and the railroads. Another notable incident was the COVID-19 pandemic that brought an unexpected tailwind to the Planning Area as remote work flexibility and record low interest rates allowed more households to acquire affordable housing in the High Desert. Taken together, the Planning Area's growth has stabilized in recent years, with population and sprawl tempered by water conservation and growth limitations.

In terms of population, the estimated population of the Region in 2025 was 586,000. This accounts for 26% of the total population San Bernardino County and a 19.6% increase from MWA's 2020 UWMP population for the Region of just over 490,000.

This is a significant increase from the turn of the 21st Century when the Region only accounted for 16% of the County's entire population. There was a sizable migration into the

Region’s incorporated cities between 2000 and 2010; their annual average growth rate outpacing the overall County rate of 1.9%. Between 2011 and 2019, that growth rate slowed to 1.1% for Adelanto and 1.0% for Victorville, still outpacing the 0.8% rate for the County. **Table 2-3** provides a representation of the Region’s population over the past several decades.

TABLE 2-3: HISTORICAL POPULATION⁷

1990	2000	2010	2020	2025
266,232	321,264	453,649	507,000	586,000

2.1.6.2 Projected Population

As part of its 2020 Urban Water Management Plan (UWMP) development, MWA commissioned a population forecast by the Center for Economic Forecasting and Development at the University of California, Riverside, which was completed in 2020 (UCR Study or Beacon Economics Study). The population forecast provided population estimates for the entire Mojave Region, organized in multiple ways, as estimates for the large urban water retail suppliers, incorporated cities, and adjudicated subareas within the MWA service area. The following sections detail the population projections built from the UCR Study and subsequently used to estimate water use within the expansive Mojave Region.

Methodology

The UCR Study estimated that the Region’s population would increase by 39% over the next 35 years, surpassing San Bernardino County’s projected 21% increase as well as the State’s 13% increase for the same period – resulting in a population increase of about 200,000 people by 2065.⁸ Absent an updated UCR Study but given the release of 2020 Census data subsequent to the UCR Study’s completion, a review and update to the UCR Study was warranted to allow updated forecasts for this RUWMP. An update to the UCR Study and comparison with Southern California Association of Governments (SCAG) data was undertaken as follows:

- **2020 Census Data Update** – The UCR Study’s 2020 incorporated city population totals were compared to the subsequently available 2020 Census values, organized for the same incorporated city areas. This comparison allowed for differences between the two datasets to be captured and ultimately resulted in the derivation of refined population projections for the large urban water retail suppliers and the remaining

⁷ The 2020 and 2025 population values for the Mojave Region reflects the refined UCR Study projections described in the later portions of this chapter.

⁸ The UCR Study projected the Region’s population to increase by approximately 205,284 people by 2065. Note: this estimation was derived prior to the release of 2020 Census population data.

portion of the Region to reflect actual 2020 populations. This update is referred to as the *Adjusted UCR Study*.

- **Alternative Data Comparison** – The original UCR Study values as well as Adjusted UCR Study values were compared with projections from the SCAG. This comparison focused on assessing whether the magnitude of projected population growth within the Region by the Adjusted UCR Study was adequately characterized.

2020 Census Data Comparison

As depicted in **Table 2-4**, the 2020 Census population totals for five of the six incorporated cities within the Mojave Region were greater than their respective UCR Study population totals, with differences ranging from 2% to 6%. These differences were used to adjust the UCR Study population projections of the six large urban water suppliers associated with these particular incorporated cities (**Table 2-5**). The remaining six large urban water suppliers that do not serve an incorporated city were not adjusted as part of this validation since Census data is not available at the water retailer service area boundary level. Furthermore, the six large urban water retail suppliers associated with this adjustment collectively represent 96% of the total projected growth between 2020 – 2065.⁹

Lastly, the refined population projections presented in Table 2-5 were used to adjust the UCR Study population projection of the entire Region, as depicted in **Table 2-6**.

TABLE 2-4: COMPARISON OF INCORPORATED CITY POPULATION DATA

Incorporated City	2020 UCR	2020 Census	Percent Difference
Adelanto	35,800	38,000	6%
Apple Valley	74,200	75,800	2%
Barstow	24,200	25,400	5%
Hesperia	97,800	99,800	2%
Victorville	127,700	134,800	6%
Yucca Valley	22,200	21,700	-2%

⁹ The projected growth rate referenced is from the un-adjusted UCR Study population projections.

TABLE 2-5: URBAN WATER SUPPLIER POPULATION PROJECTIONS – UCR STUDY AND ADJUSTED UCR STUDY¹⁰

Large Urban Water Retail Supplier	UCR Study		Adjusted UCR Study	
	2020	2065	2020	2065
City of Adelanto	35,800	52,100	38,000	55,200
Liberty Utilities – Apple Valley Water Company	62,100	80,900	63,300	82,500
Golden State Water Company – Barstow System	32,200	35,100	33,800	36,900
Hesperia Water District	97,400	151,400	99,300	154,500
Victorville Water District	134,300	228,100	142,300	241,700
Hi-Desert Water District	25,700	31,000	25,100	30,300
Bighorn-Desert View Water Agency	4,100	4,600	N/A	N/A
County Service Area 64	11,200	13,700	N/A	N/A
County Service Area 70 J	10,200	11,500	N/A	N/A
Helendale CSD	6,600	7,300	N/A	N/A
Joshua Basin Water District	10,200	11,300	N/A	N/A
Phelan Piñon Hills CSD	20,800	23,000	N/A	N/A

TABLE 2-6: MOJAVE REGION POPULATION PROJECTIONS – UCR STUDY AND ADJUSTED UCR STUDY

UCR Study		Adjusted UCR Study	
2020	2065	2020	2065
492,000	698,000	507,000	722,000

¹⁰ The following six water districts which do not supply an incorporated city did not have their population projections adjusted as part of the population validation: Bighorn-Desert View Water Agency, County Service Area 64, County Service Area 70 J, Helendale CSD, Joshua Basin Water District, and Phelan Piñon Hills CSD.

Comparison to SCAG

The Adjusted UCR Study population projections were compared to population projections found in the 2024 SCAG SoCal Connect Report.¹¹ The purpose of this comparison was to ensure that the magnitude of the Adjusted UCR Study projected population growth as used for this RWUMP was within a reasonable range of SCAG’s projections, which used a different analysis and forecast method than the UCR Study. As depicted in **Table 2-7**, the SCAG provided a population projection specific to the Region through 2050.

TABLE 2-7: ADJUSTED UCR STUDY AND SCAG POPULATION PROJECTIONS

Mojave Region	2020	2050	2065
Adjusted UCR Study	507,000	673,000	722,000
SCAG	498,000	638,000	N/A

Results

The intent of the update and comparison was to provide confidence for a population projection critical to the water demand forecast method further described in *Chapter 4 – Water Use Characterization*. Population data is a key indicator used to understand per-capita demand and thus becomes the source for demand forecasts when more specific housing developments are less clear. For purposes of the RUWMP, the Adjusted UCR Study projections are used for each participating retail urban water supplier and for MWA, with the latter reflecting all the remaining small water suppliers and rural domestic users that are reliant on the water resources available to the Region. **Table 2-8** summarizes the population estimates for each participant.

¹¹ Link to the 2024 SoCal Connect Report: <https://scag.ca.gov/connect-socal-2024-read-draft-plan>. The SCAG SoCal Connect Report is updated every four years and utilizes 2020 Census data as an input for establishing its population projections.

TABLE 2-8: 2025 RUWMP POPULATION PROJECTIONS

Agency	2025	2030	2035	2040	2045	2050	2055	2060
City of Adelanto	44,588	45,913	47,239	48,565	49,890	51,216	52,542	53,867
County Service Area 64	11,691	12,099	12,390	12,646	12,884	13,103	13,304	13,490
County Service Area 70J	10,356	10,554	10,721	10,876	11,021	11,153	11,275	11,387
GSWC Barstow	35,947	37,744	39,542	43,137	46,731	54,209	57,861	61,513
Hesperia Water District	120,530	124,771	129,012	133,252	137,493	141,733	145,974	150,214
Hi-Desert Water Agency	27,139	27,538	27,938	28,338	28,737	29,137	29,537	29,937
Joshua Basin Water District	10,375	10,536	10,673	10,800	10,919	11,029	11,131	11,225
Liberty Utilities Apple Valley ¹²	70,707	72,184	73,661	75,138	76,615	78,092	79,569	81,045
Phelon-Piñon Hills CSD	21,136	21,465	21,744	22,003	22,245	22,469	22,676	22,869
Victorville Water District	148,323	157,229	166,135	175,042	183,948	192,855	201,542	210,689
Mojave Water Agency ¹³	85,602	84,485	83,152	79,907	76,230	68,100	64,002	59,422
Total Region	586,395	604,519	622,207	639,704	656,713	673,095	689,412	705,659

2.1.7 Land Use, Economy, and Demographics

Land use in the Mojave Region is undergoing a fundamental shift from its historical agricultural roots toward rapid urbanization and industrial expansion. The region's once thriving agricultural sector has declined as developmental pressures and geographic

¹² Projected population estimates for the City of Victorville presented in this table were further refined by the City using the methodology described in its retail-chapter.

¹³ The Mojave Water Agency population shown in this table represents the portion of the Mojave Region located outside the service areas of the participating urban water retail suppliers. The projected decline reflects the assumption that future population growth will be increasingly served within the urban water retail supplier service area, rather than by areas represented under MWA's wholesale population category.

proximity to Southern California have transformed the High Desert into a major commuter community and logistics hub. Broad land use trends reflect a mix of continued suburban growth, logistics and industrial expansion, and large-scale renewable energy development.

Incorporated communities such as Hesperia, Victorville, Apple Valley, and Adelanto have seen ongoing residential development, particularly single-family residential housing, driven by relatively affordable housing. At the same time, the Interstate 15 corridor has attracted significant warehouse, distribution, and manufacturing projects due to regional freight movement between Southern California and the Inland Empire, reinforcing the High Desert's role as a logistics hub. In outlying areas, land use has increasingly shifted toward utility-scale solar energy and related infrastructure, supported by state renewable energy policies and the availability of large tracts of land. However, growth is occurring alongside planning efforts tied to groundwater sustainability in the Mojave River Basin, which are influencing development patterns, water supply planning, and the pace of new projects, particularly in communities that rely heavily on groundwater in overstressed portions of the Region's many groundwater subbasins.

This transition is fueled by the Region's relatively affordable housing and its strategic location along major interstate and rail corridors, leading to a projected 40% population increase over the next four decades that continues to transform the High Desert from rural to urban. Specific land use and demographic trends are discussed in each individual retailer's chapter. This sub-chapter provides a region-wide outlook on its land use and demographic trends over the last several decades to present-day.

2.1.7.1 Current and Projected Land Use

Anchored by the rapidly growing incorporated communities of Victorville, Hesperia, and Apple Valley, the region continues to attract large master-planned residential developments and millions of square feet in new industrial and logistics facilities, fueled by affordable land and strategic infrastructure access. Utility-scale solar energy projects are simultaneously converting vast stretches of desert land to solar farms. The planned high-speed Brightline West rail station in Apple Valley is expected to further accelerate transit-oriented growth in the region. Underlying all these planned growth trends is a critical constraint: the basin's groundwater supply.

Trends in future land use will be largely influenced by urbanization as more of the High Desert landscape is transformed into residential developments. Most residential development will be concentrated in the communities in the surrounding Victor Valley at the southern end of the Region, and in and around the City of Barstow. These two growth areas are also the region's largest economic engines, where the region's burgeoning logistics and transportation industries are expanding. In addition to these broader trends, several large-scale development projects have been identified that are expected to further accelerate growth within the Region. As shown in **Table 2-9**, these projects are anticipated to significantly

influence population growth, job creation, and land use patterns, and have been incorporated into the population and water demand projections that underpin this RUWMP.

TABLE 2-9: KNOWN LAND USE PLANS IN THE MOJAVE REGION

Existing or Planned Project	Project Area (acres)	Residential Housing Units
BNSF Barstow International Gateway	4,500	N/A
Brightline West Station	300	N/A
Rancho Lucerne Planned Development	1,376	4,257
Silverwood Specific Plan	9,336	15,663

2.1.7.2 Economic Trends and Other Social and Demographic Factors

California’s High Desert region, anchored by the Cities of Victorville and Barstow, is one of the state’s most consequential emerging growth corridors. Since the end of the Great Recession, it has seen some of the strongest employment growth in California, with the third largest workforce of the state’s metropolitan areas. Straddling the convergence of Interstate 15 and Interstate 40, the region sits at a geographic crossroads between Greater Los Angeles, the Las Vegas metro, and the broader American Southwest. What was once characterized primarily as a pass-through zone, famous for Route 66, is now experiencing a structural economic transformation driven by a booming demand for logistics and warehouses, affordable housing, and multiple landmark infrastructure projects that stand to reshape the Region’s role in the national supply chain and passenger mobility network.

The most consequential economic development in the region is the emergence of large-scale logistics and warehousing infrastructure, driven by the exhaustion of industrial land in the traditional Inland Empire to the south and the availability of vast, inexpensive parcels in the High Desert. Over the last four years, approximately 4.5 million square feet of new industrial construction has been completed in the High Desert. Major investors include Prologis, Clarion, and LINK, with significant leasing activity from Amazon and Home Depot. The City of Victorville recently welcomed a 1.3-million square foot Goodyear Tire distribution center and an Amazon Fulfillment Center at the Southern California Logistics Airport (SCLA), with additional industrial projects totaling over 1.35 million square feet planned along Mojave Drive. The SCLA is already home to Boeing and General Atomics, giving it a dual identity as both an aerospace hub and an e-commerce distribution node.

Railroads have long played a foundational role in the economic development of the High Desert. The Cities of Barstow and San Bernardino first emerged as railroad hubs for local farmers to ship agricultural goods to market and as stopovers for trains heading into the Los

Angeles Basin. Recently, railroads have re-emerged as a transformative force in the region's economy with the advent of the BNSF Barstow International Gateway (BIG) and the Brightline West high-speed rail line. BNSF Railway has announced plans to invest more than \$1.5 billion in a master-planned rail facility designed to revolutionize cargo movement from Southern California ports. BIG will integrate a rail yard, intermodal facility, and warehouses to transfer containers directly from ships to rail for inland transit. It will directly connect the Ports of Los Angeles and Long Beach to Barstow via rail, allowing for faster transit of goods to the rest of the US. By moving containers by rail rather than trucks, BIG aims to reduce freeway traffic and cut emissions while creating 20,000+ jobs. Upon completion, BIG will be the largest intermodal transportation hub in North America – twice as large as any existing facility.

Passenger rail in the High Desert region anticipates a major tailwind from Brightline West. The privately financed 218-mile high-speed passenger rail line will connect Las Vegas to Rancho Cucamonga, with two planned railway station stops in Apple Valley and Hesperia. The project broke ground in 2024 and is projected to begin passenger service by 2028, with construction expected to generate more than 10,000 jobs and 1,000 permanent jobs. The Victor Valley station in Apple Valley is designed to accommodate commuter rail use, allowing High Desert residents to access employment in the Inland Empire and Los Angeles Basin at lower housing costs – a pattern that could accelerate population growth and transit-oriented development around the station.

Affordable housing is a critical driver of economic growth in the High Desert. As housing costs in coastal Southern California markets continue to rise, the High Desert has emerged as a population residential alternative for moderate household incomes. This popularity and proximity have spawned a large commuter population that works in nearby Los Angeles and Orange Counties. The number of residents commuting to jobs in neighboring counties is expected to increase in the near-term as housing prices continue to rise and supply remains constrained. Despite benefiting from population growth linked to affordable housing and commuters, the High Desert faces several structural economic and fiscal risks. With such a large proportion of the population commuting to coastal job centers in Los Angeles and Orange County, downturns in those economies can quickly ripple inland, reducing household income and housing stability. Moreover, dependence on commuters can distort land use and housing patterns. Effectively a “bedroom community,” where housing growth outpaces job creation, this imbalance can make it harder to attract employers seeking proximity to locally available workforce. However, the rise in remote workers and multiple major infrastructure developments have the potential to disrupt the High Desert's legacy status as a bedroom community into a burgeoning employment hub.

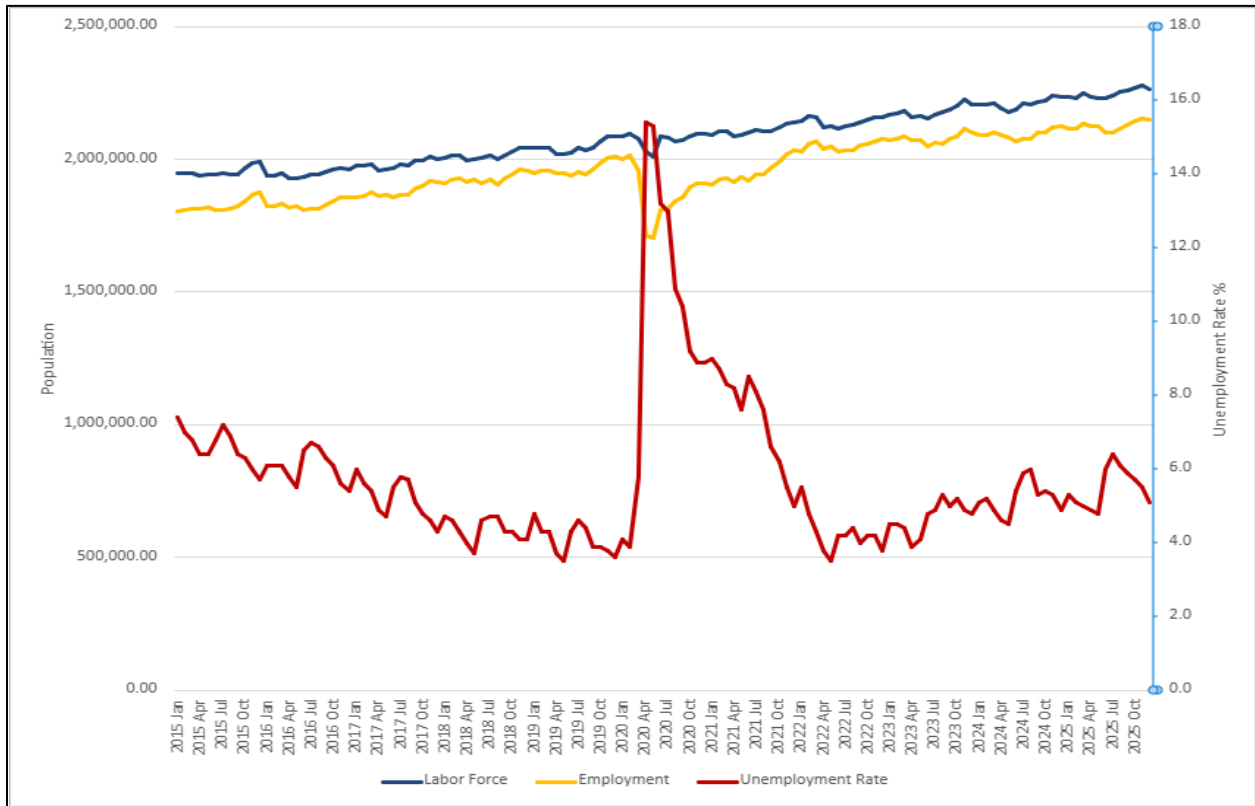
The High Desert is at an inflection point. Victorville has already become a significant logistics and population center, the fastest-growing large city in inland Southern California, though its economic gains are concentrated in lower-wage warehouse and distribution work rather than higher-value sectors that would diversify and deepen its tax base. Generally, the Region has experienced strong job growth and sectoral restructuring around the logistics industry, shaped by both regional dynamics in the High Desert and broader economic shocks such as

the COVID-19 pandemic. Over the past decade, the employment growth rate for non-farm labor in the San Bernardino County outpaced all other regions in Southern California and sustained less economic impact from the Covid-19 recession than Los Angeles, Orange, or San Diego Counties (**Figure 2-13**). Logistics, driven by the rise of e-commerce and the region's transportation infrastructure, has been the dominant sector, growing by approximately 80% over the decade, while healthcare and education have grown by roughly 30-40%, reflecting population growth and increasing service demand. These trends highlight a broader structural shift toward a service and distribution-oriented economy, with logistics serving as the region's primary economic engine.

At the same time, the labor market has shown improving stability compared to earlier decades. Unemployment rates, which were historically elevated in the Inland Empire, declined significantly following the post-Great Recession recovery and remained relatively moderate in the late 2010s. Although unemployment spiked sharply during the pandemic, reaching nearly 10% in 2020, the county experienced a strong recovery, with rates falling back to around 5% by 2024–2025, near statewide averages. This indicates a resilient labor market capable of rebounding from economic disruptions. However, more recent data suggest emerging signs of slowing growth and sectoral unevenness. Between 2022 and 2023, some key sectors, including logistics, manufacturing, and professional services, experienced modest employment declines, while healthcare and education continued to expand. This divergence reflects both post-pandemic normalization, particularly in goods movement, and broader economic headwinds affecting higher-wage industries.

Another defining feature of the past decade is the region's continued reliance on lower-wage and goods-moving sectors, even as wages have begun to rise across industries. While salary growth has been notable, especially in professional and healthcare fields, job concentration in logistics and warehousing has reinforced concerns about job quality and economic diversification. Overall, the High Desert has grown significantly and become more diversified over the past decade. Between the region's two largest cities, Victorville and Barstow, the High Desert is poised to leverage its emerging logistics industry and affordable housing stock to become a prosperous regional economy with its own identity.

FIGURE 2-13: SAN BERNARDINO COUNTY EMPLOYMENT DATA 2015-2025



2.1.8 Summary

The Mojave Region is one of the fastest growing regions in California. As discussed, relatively affordable housing and strategic infrastructure corridor access continue to accelerate population and economic growth. However, limited water supplies, further exacerbated by mounting hydrological and regulatory limitations, continue to adversely constrain the Region. Adequate water supplies and long-term resource management are paramount to the region’s outlook. This 2025 RUWMP helps MWA and the large urban water retail suppliers coordinate and collectively plan to meet an optimistic future condition.

Chapter 3.0 REGIONAL WATER SUPPLY CHARACTERIZATION

This chapter describes the Mojave Region’s water supply sources, which include imported surface water supplies managed by the Mojave Water Agency, and local surface and native groundwater supplies managed collectively by MWA, retail water suppliers, and designated watermasters in the adjudicated areas of the Region.

The more specific characterization of water available for import is presented in *Chapter 6 – Mojave Water Agency*, while the detailed characterization of retailer-specific groundwater is discussed within each urban water retail specific chapter (*Chapters 7 through 16*).

The available regional supplies discussed in this chapter reflect a summary of the more specific MWA and retailer supply conditions and are organized into the three Subregions described in *Chapter 2 – The Mojave Region*. Organizing supplies for each specific subregion facilitates the integration with subregional demands (*Chapter 4 – Water Use Characterization*), providing for supply reliability analysis to be presented by subregion (*Chapter 5 – Regional Water Service Reliability*). This subregional approach allows the entire Mojave Region to be viewed in a more aggregated form, while still reflecting important geographic, hydrologic and management circumstances that are lost if the analysis were completed for just the entire Mojave Region. Each of the retailer-specific chapters (*Chapters 7 through 16*) reflect each retailer’s reliance on the managed groundwater that results from two primary categories: (1) annually available sources including State Water Project (SWP) imports delivered through six turnouts on the East Branch of the California Aqueduct and subsequently recharged throughout the region, and (2) groundwater supplies comprised of natural recharge from the Mojave River and San Bernardino Mountains, return flows from water use, and imported wastewater from mountain communities. Recycled water is an important third component that is being deployed within the Mojave Region at the urban water retail supplier level and will continue to expand as an important supply source into the future.

3.1.1 Mojave Region Water Supply Sources

As described in *Chapter 2 – The Mojave Region*, the Mojave Region is situated in the High Desert of eastern San Bernardino County in a mostly closed topographic basin where water

supply is derived almost entirely from pumped groundwater from the various basins, subbasins and aquifers within its service area. Beyond the minimal precipitation in the Region, natural recharge of the aquifers occurs primarily from flows originating in the San Bernardino Mountains to the south that infiltrate into the basin-fill sediments along the mountain front. The Mojave River also contributes to groundwater recharge through streambed infiltration during wet periods and after significant mountain snowmelt that flows to the Mojave River and its tributaries. Augmentation of the native groundwater is dependent on State Water Project imports and transfers and exchanges conveyed to the Region. Additional local groundwater recharge occurs from irrigation return flows, wastewater imports, and recycled water.

The system is essentially a large underground reservoir where water moves slowly through interconnected aquifers creating the vital water supply for the region. For purposes of this RUWMP, water supplies available to the Region fall into the following major categories, each of which is described in detail throughout this chapter:

- Groundwater
- Imported Water
- Return Flows
- Treated Wastewater and Recycled Water
- Water Transfers and Exchanges
- Planned Water Suppliers

3.1.1.1 Groundwater

Groundwater is the principal source of municipal water supply in the Mojave Region. All retail water suppliers operating within the Region rely on managed groundwater – a blend of natural inflows and recharged imported water – to meet current and projected demand. As noted above, the MWA supports groundwater management in the Region by importing water supplies that are used to replenish groundwater extractions and help manage groundwater basin health.

Natural inflows into the groundwater aquifers are fed through direct percolated precipitation across the basin area and infiltration and storm runoff into stream systems during wet weather. The primary source of natural inflow is infiltration of stormflow runoff water from the San Bernardino Mountains into the Mojave River. The Mojave River is formed by the confluence of the West Fork Mojave River and Deep Creek, both originating in the northwestern San Bernardino Mountains. This mountain-front recharge provides the majority of natural groundwater replenishment to the basin and enters the system in the Alto subarea.

During Water Year 2024, natural water supplies exceeded historical averages, with total flow at the Mojave River Forks reaching 102,389 acre-feet. After accounting for 14,825 acre-feet of

SWP water that MWA imported to the West Fork Mojave River system, natural inflow was measured at 87,564 acre-feet compared to a Base Period average of 65,540 acre-feet. Despite this above-average year, the Region continues to experience long-term drought impacts, with native water supply conditions over the past 13 years averaging only 69.4% of the historical baseline (1931-1990).

As mentioned in *Chapter 2*, the Mojave Region overlies all or a portion of 36 groundwater basins and subbasins, as presented in **Figure 2-5**. Those situated along the Mojave River and adjacent areas are collectively referred to as the Mojave River Groundwater Basin, otherwise known as the Mojave Basin Area. The remaining basins in the southeastern portion of the Region are generally designated as the Morongo Basin/Johnson Valley Area (Morongo Area), with the exception of the Lucerne Valley, which is treated as a distinct management unit. MWA characterizes a long-term average of the natural supplies for the region, including both the Mojave Basin area and the Morongo Basin Area, as 57,349 acre-feet per year. This value is derived from previous assessments of natural supply available and groundwater basin conditions.

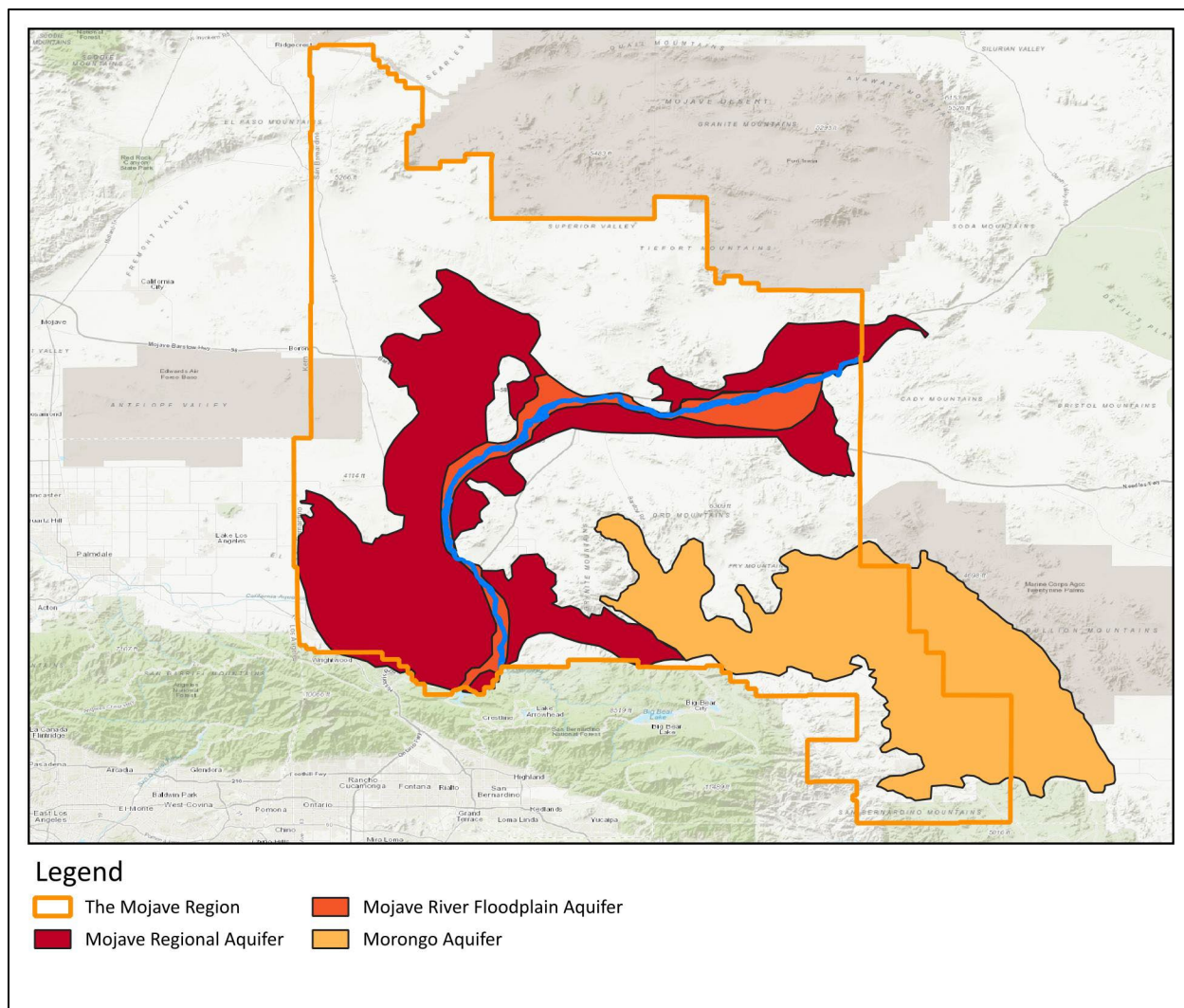
Most groundwater production in the Region relies on three primary aquifers: the Floodplain Aquifer, Regional Aquifer, and Morongo Aquifer (**Figure 3-1**). Each aquifer system has distinct hydrogeologic characteristics and recharge mechanisms. The Floodplain Aquifer is composed of sand and gravel weathered from metamorphic and granitic rocks of the San Gabriel and the San Bernardino Mountains, respectively, and deposited in a fluvial environment. Recharge occurs primarily through direct infiltration of Mojave River surface flows during the wet season, with the greatest recharge rates occurring near the mountain front where surface flows are most frequent and vigorous.

The Regional Aquifer underlies and surrounds the Floodplain Aquifer, comprising interconnected alluvial fan and basin fill deposits. Its primary recharge source is groundwater migrating laterally from the Floodplain Aquifer. Additional recharge is contributed by runoff from the higher elevations of the San Gabriel and San Bernardino Mountains, supplemented by smaller runoff volumes from local ephemeral streams and desert washes.

The Morongo Basin Area encompasses several interconnected basins in southern San Bernardino County. It is a vital water source, managed by the MWA and the local retail water suppliers, for the benefit of communities in the eastern portion of the Region. Groundwater supplies in the Morongo Area are supplemented by imported water conveyed through the 71-mile Morongo Basin Pipeline (MBP) that delivers water from the SWP's California Aqueduct to recharge basins in the Morongo Basin Area. The MBP serves a dual purpose: reducing overdraft in the Warren Valley Basin and Ames Valley Basin, and supporting groundwater

levels in the Joshua Tree Basin (see Chapter 2 – The Mojave Region).¹⁴ Groundwater flow in the Morongo Area is complex but is generally from south to north in Johnson Valley and from west to east-northeast elsewhere in the area. Natural recharge originates primarily from the mountains on the southern and western boundaries of the Morongo Area, resulting in groundwater flow gradients to the north, east, and south adjacent to the boundaries, before turning to the east-northeast. Groundwater flow is complicated locally by pumping, faulting, shallow bedrock, and enhanced recharge basins. For example, in the vicinity of the developed area of Yucca Valley, groundwater flow is controlled to some extent by local recharge basins.

FIGURE 3-1: FLOODPLAIN AND OTHER REGIONAL AQUIFERS



¹⁴ The following agencies jointly financed the MBP and currently rely on it for portions of their water supply: Hi-Desert Water District, Joshua Basin Water District, Bighorn-Desert View Water Agency, and CSA 70 W-4 Pioneer Town

3.1.1.2 Groundwater in the MBA Judgment Area

The MBA Judgment (see *Chapter 2 – The Mojave Region*) established a Production Safe Yield (PSY) system that defines sustainable groundwater pumping levels for each Subarea subject to the Judgment. Specifically, PSY is defined as the maximum production level that can be maintained over a sequence of years representative of long-term average natural water supply conditions, accounting for natural outflow, and under established patterns of water production, applied water, return flows, and consumptive use, while ensuring no long-term net reduction in groundwater storage. The MBA Judgment also assigned Base Annual Production (BAP) rights to each producer using 10 acre-feet or more, based on historical production during the period 1986-1990. Parties to the MBA Judgment are assigned a variable Free Production Allowance (FPA), which is a percentage of the BAP set annually by the Court for each Subarea based on the recommendation of the Watermaster. The BAP is reduced or “ramped-down” over time until FPA comes within 5% of the Judgment-defined PSY. The FPA changes over time as the MBA Watermaster assesses supply availability for all adjudicated purveyors against the long-term health and PSY.

The FPA is set as follows for each Subarea for water year 2025-2026:¹⁵

- Alto Subarea – 50.4% of BAP
- Oeste Subarea – 45% of BAP
- Este Subarea – 45% of BAP
- Centro Subarea – 56% of BAP
- Baja Subarea – 19.5% of BAP

Any Producer that pumps more than their FPA must purchase Replacement Water from the Watermaster equal to the amount of production in excess of their total available FPA or transfer unused FPA from another party within their Subarea. Funds collected for Replacement Water are then used by MWA for purchase of SWP supplies and recharged into the Subarea they were produced from. In addition to purchasing water to offset the Replacement Water Obligations under the Judgment, MWA purchases and stores water in the Mojave Basin Area for future obligations (see *Chapter 6 – Mojave Water Agency*).

In *Chapters 7 through 16*, the projected FPA for each urban water retail supplier participating in the 2025 RUWMP, consistent with the UWMPA requirements, is provided.¹⁶ Using the Subregions described in *Chapter 2 – The Mojave Region*, the summary of available native groundwater is presented in **Table 3-1**. These totals represent the native groundwater (i.e. FPA) in Subregions 1 and 2 and are inclusive of FPA available to the urban water retail

¹⁵ Water Year 2024-2025 Mojave Basin Area Watermaster Annual Report, June 2026

¹⁶ For instance, see values for Hesperia Water District in Table 11-8 and Table 11-9 in *Chapter 11 – Hesperia Water District*.

suppliers participating in the 2025 RUWMP as well as all other groundwater users within each subregion outside of a participating retailer’s service area.

TABLE 3-1: PROJECTED NATIVE GROUNDWATER FOR EACH SUBREGION THROUGH 2050 (AFY)

Projected Native Groundwater For All Year Types	2030	2035	2040	2045	2050
Subregion 1	70,389	70,389	70,389	70,389	70,389
Subregion 2	39,602	39,602	39,602	39,602	39,602

3.1.1.3 Groundwater in the Morongo Subarea

As described in *Chapter 2 – The Mojave Region*, the Morongo Subarea encompasses both the Ames Valley Judgment and the Warren Valley Judgment. While these Judgments function differently than the MBA Judgment, they reflect conditions where native groundwater use exceeded natural recharge. Unlike the MBA Judgment Area, the Morongo Subarea does not have a single regional framework that establishes a quantified native groundwater production allowance applicable across all basins and users. The Morongo Subarea is composed of multiple groundwater basins with varying levels of development, monitoring, adjudication, and management. As a result, the amount of native groundwater reasonably available across the entire Morongo Subarea is not conclusively quantified for purposes of this RUWMP.

3.1.1.4 Imported Water

MWA relies on a diverse portfolio of imported surface water supplies. Imported water is delivered to the Mojave Region via the SWP California Aqueduct. As one of 29 SWP Contractors, MWA’s primary imported supply source is its Annual Table A Allocation, followed by supplementary supplies obtained by various contractual agreements, transfers, and exchanges. Upon delivery of imported water, by the East Branch of the California Aqueduct, to the Agency’s service area, MWA delivers this blend of imported water to various recharge sites throughout its service area. Fundamentally, MWA’s mission is to provide the region with imported water to supplement local groundwater supplies and recharge local groundwater basins. A summary of the MWA’s imported water supplies is provided in **Table 3-2**. Additional details on the SWP supplies and forecast reliability are detailed in *Chapter 6 – Mojave Water Agency*.

TABLE 3-2: MWA’S PROJECTED IMPORTED WATER SUPPLIES (AFY)

Total Supply		Percent Allocation	2030	2035	2040	2045	2050
Normal		54%	48,492	48,492	48,492	48,492	48,492
Single Dry Year		5%	4,490	4,490	4,490	4,490	4,490
Multi-Year Drought	Year 1	35%	31,430	31,430	31,430	31,430	31,430
	Year 2	5%	4,490	4,490	4,490	4,490	4,490
	Year 3	5%	4,490	4,490	4,490	4,490	4,490
	Year 4	20%	17,960	17,960	17,960	17,960	17,960
	Year 5	35%	31,430	31,430	31,430	31,430	31,430

3.1.1.5 Return Flows

When water supplies are extracted from the groundwater basins, a portion of the water pumped is consumed and another portion of the extracted water is returned to the groundwater aquifer and becomes part of the available water supply. This “return flow” is an important component of the Region’s managed groundwater supply. For example, nearly all indoor water use is assumed to be returned to the basin either by percolation from septic tanks or treated wastewater effluent produced by municipal wastewater facilities. The MBA Watermaster Report calculates consumptive use for each producer in each Subarea of the MBA Judgment. The calculation is based on production amount, type of use, and an evaluation of processes that consume water.

Return flows shown in **Table 3-3** are calculated as a percentage of the previous years’ water production for each water use category, as defined by the MBA Watermaster. Return flow factors, on a regional basis, average approximately 40% of the groundwater production, although this amount can vary significantly by Subarea and on an annual basis. Importantly, as water extractions increase in the Region, the return flows will also increase over time. However, as system efficiencies improve, return flows may begin to slowly decline. Nevertheless, for purposes of this 2025 RUWMP, return flows are assumed to be a percentage of the total Water Year Verified Production for each Subarea for the most recent reported Water Year.¹⁷ This value is then held constant in all future year types and all years through 2050. A return flow is not calculated for the Morongo Subarea (Subregion 3).

¹⁷ Water Year 2024-2025 Watermaster Report, June 2026, Verified Projection by Subarea, Appendix B, p.15 of 16. This methodology is consistent with the investigation of consumptive use by the MBA Watermaster.

While this is a recognized source of water affecting determinations of available FPA within the MBA Judgment Subareas, for purposes of this RUWMP, this supply source is ignored. This is a conservative assumption that allows this value to be refined while the interaction among FPA, Return Flows, and Managed Stored Groundwater continues to be evaluated to avoid inadvertently double-counting supplies in the Region’s overall water reliability assessment.

TABLE 3-3: SUMMARY OF RETURN FLOW FOR SUBREGION 1 AND SUBREGION 2 THROUGH 2050 (AFY)

Subregion ¹⁸	Verified Production	Estimated Return Flow
Subregion 1	78,278	31,300
Subregion 2	23,605	9,500

3.1.1.6 Treated Wastewater and Recycled Water

The Region’s self-sufficiency includes development of recycled and reusable water supplies combined with a region-wide emphasis on water use efficiency. Additionally, the Region also accepts treated wastewater imported into certain subareas.

Treated wastewater effluent is imported from three wastewater entities outside the Region. Specifically, treated wastewater from the Lake Arrowhead Community Services District is imported into the Alto Subarea, while effluent from Big Bear Area Regional Wastewater Agency is imported to the Este Subarea. Wastewater from Crestline Sanitation District is also imported but already accounted for in the natural groundwater recharge. This water is considered indirect potable reuse. The MBA Watermaster recognizes these imports in its annual reporting, recognizing almost 3,400 acre-feet in the Water Year 2024-2025 Report. However, over half of this came from the Big Bear facility, which is currently implementing a local recycled water program that will result in this source rarely being available to the Region. For the purposes of this 2025 RUWMP, the recycled water is only assumed available to Region 1 and will be limited to approximately 1,200 acre-feet annually (continuing from Lake Arrowhead CSD and Crestline CSD).

The Region also relies upon and anticipates increasing the local recycled water portfolio to provide both direct use, direct recharge, and indirect aquifer replenishment within the Region, particularly in Subregion 1, where the Region’s largest population base drives wastewater generation and, in turn, recycled water supply availability.

The primary recycled water source is the Victor Valley Wastewater Reclamation Authority (VWVRA) with recycled water production from its Regional Water Reclamation Plant (Regional

¹⁸ As discussed in Chapter 2 – The Mojave Region, Subregion 1 includes the Alto, Este, and Oeste Subareas while Subregion 2 includes the Centro and Baja Subareas.

WRP) and two additional Subregional WRPs, one in Hesperia, and one in Apple Valley. There are currently five permitted recycled water users in the service area: American Organics, the City of Victorville, High Desert Power Plant, the City of Hesperia, and the Town of Apple Valley.¹⁹

The VVWRA also contributes recycled water through wastewater effluent discharges to the Mojave River to replenish the downstream aquifer and to support the riparian corridor that lies within the Alto Transition zone. In the Water Year 2024–2025 Watermaster Report, Victorville and VVWRA contributed approximately 14,000 acre–feet of recharge to the Mojave River. While only permitted to discharge 14 million gallons per day (MGD)²⁰, the main Victorville facility is designed to produce up to 22 MGD of water and is capable of discharging up to 18 MGD. The Apple Valley²¹ and Hesperia²² facilities are designed to be operational in phases, with Phase I having a capacity of 1 MGD, Phase II having a capacity of 2 MGD, and Phase III having a capacity of 4 MGD. Water from the main VVWRA facility is used to both provide flows in the Mojave River and recharge the aquifer as well as cooling in a nearby power plant. The Hesperia Subregional facility is used for irrigation at the Hesperia Golf Course and local area parks (see *Chapter 11 – Hesperia Water District*). The Apple Valley Subregional Facility at Brewster Park is expected to produce irrigation water for Brewster Park, the Civic Center and Apple Valley Golf Course among other locations.

Recycled water is subject to certain restrictions within the law, and localized use requires specific infrastructure investments. The recycled water facilities are governed by National Pollutant Discharge Elimination System (NPDES) permit restrictions. Additionally, the facilities are permitted only for the following beneficial uses: Municipal and Domestic Supply, Agricultural Supply, Industrial Service Supply, Freshwater Replenishment, and Aquaculture. Future recycled water projects will play a central role in enabling the Region to continue demonstrating reduced reliance on Delta imports.

For the purposes of this 2025 RUWMP, Subregion 1 will conservatively only represent the estimated recycled water volume that is available to Hesperia Water District and the City of Victorville, as further detailed in their individual retail chapters. **Table 3-4** presents projected recycled water supplies for Subregion 1 through 2050.

TABLE 3-4: RECYCLED WATER SUPPLIES FOR SUBREGION 1 THROUGH 2050 (AFY)

Subregion	2030	2035	2040	2045	2050
Subregion 1	2,004	3,238	3,834	4,408	4,908

¹⁹ VVWRA 2024 Annual Recycled Water Report, Table 2.

²⁰ <https://www.vvraca.gov/home/showpublisheddocument/194/637694937439730000>

²¹ <https://www.vvraca.gov/home/showpublisheddocument/200/637694940317370000>

²² <https://www.vvraca.gov/home/showpublisheddocument/204/637694942003170000>

3.1.1.7 Water Transfers and Exchanges

As discussed in *Chapter 6 – Mojave Water Agency*, MWA engages in water transfers and exchanges involving its SWP assets and other SWP Contractors' SWP assets. Historically, MWA has both received and delivered water through these transfers and exchanges with various agencies throughout California. These transfers are essentially spot market transfers where short-term opportunities are identified and then actions taken for purchase and acquisition. These transfers help support management of MWA's and its retail agencies' water supply portfolios. Future MWA transfers and exchanges depend upon allocations available to MWA and other water purveyors and are not considered an available supply for purposes of this RUWMP.

3.1.1.8 Planned Water Supplies

Potential future water supply projects, supplementary to existing supplies, consist of the MWA's participation in Sites Reservoir, Delta Conveyance Project, and potential recharge projects. All of these focus on helping MWA improve the reliability and management of SWP supplies and are discussed in more detail in *Chapter 6 – Mojave Water Agency*.

3.1.2 Water Quality

Water quality is a critical consideration in the Mojave Region. Because local potable supplies are derived from blended groundwater sources, well locations, recharge activities associated with imported water, and other key system components are actively coordinated and managed among participating retailers and MWA.

3.1.2.1 Imported Water Quality

Generally, the imported surface water conveyed through the California Aqueduct and recharged throughout the Region is considered to be good quality. Many retailers rely on the imported supplies to help manage the quality of water delivered to customers, using the benefits of the imported water as a blending supply to the native groundwater. Water quality delivered to the Region is monitored by the DWR Division of Operations and Maintenance within the California Aqueduct. More details regarding the specific quality information are included in *Chapter 6 – Mojave Water Agency*.

3.1.2.2 Groundwater Quality

MWA has implemented a comprehensive groundwater monitoring program to improve understanding of both water quantity and quality across the Mojave Region’s groundwater basins. In coordination with the United States Geological Survey (USGS), this program includes an 850-well monitoring network. Water levels from these wells are recorded on a regular basis and several of the wells are tested for water quality on a rotating sampling schedule.

Numerous studies dating back to the early 1900’s have been conducted by various agencies to characterize groundwater quality in the Region and further the understanding of the Mojave River and Morongo Groundwater Basins. The most recent study was the Mojave Salt and Nutrient Management Plan completed in 2015.²³ Despite local groundwater quality degradation, these studies generally confirmed the suitability of groundwater for beneficial uses in the Region. Groundwater quality data, including intrinsic tracers, have been used to confirm sources of groundwater recharge and travel times along interpreted flow paths in the Floodplain and Regional aquifers. Investigations have also been conducted to identify the source and occurrence of key naturally occurring groundwater contaminants, including hexavalent chromium (Cr-VI) and arsenic, in the Mojave Desert region.

The impairment of groundwater from the perspective of its beneficial use as drinking water is determined by comparing concentrations of constituents of concern in the groundwater against drinking water maximum contaminant levels (MCLs) and agricultural water quality parameters needed for specific crops. Key groundwater constituents of concern in the Region include arsenic, nitrates, iron, manganese, Cr-VI, fluoride, and total dissolved solids (TDS). Some of these constituents are naturally occurring in desert environments while others are associated with human (anthropogenic) activities. Measurements exceeding drinking water standards have been found for some of these constituents within the Mojave River Basin and the Morongo Basin. If necessary, groundwater in these areas may require treatment prior to consumption.

MWA’s Salt and Nutrient Management Plan (SNMP) provides an evaluation of potential groundwater quality issues that may result from sources of salts and nutrients. The SNMP addresses whether these constituents would unreasonably degrade groundwater quality and potentially decrease the beneficial uses of groundwater within the basin. For the MWA SNMP, TDS and nitrate were analyzed as appropriate indicator constituents of salts and nutrients.

Total salinity is commonly expressed in terms of TDS as milligrams per liter (mg/L). TDS concentrations in the groundwater are influenced by the chemistry of the aquifer and quality of water recharging the aquifer. TDS is not a health hazard at typical groundwater

²³ Relevant water quality studies are available at <http://www.mojavewater.org/regional-studies.html>. Hereafter “2015 Salt and Nutrient Plan”).

concentrations but can be an aesthetic issue and can shorten the useful life of pipes and water-based appliances in homes and businesses. TDS monitoring data are widely available for source waters (both inflows and outflows) in the Region, and because TDS is a general indicator of total salinity, TDS is an appropriate indicator of salt loading. TDS concentrations generally increase in downgradient portions of the Mojave River Basin and along groundwater flow paths away from the primary recharge source in the basin, the Mojave River. Elevated TDS concentrations (greater than 1,000 mg/L) are generally associated with natural processes including mineralization and evaporation beneath dry lake beds. In the Morongo Basin, groundwater TDS concentrations generally increase along groundwater flow paths away from the southwestern margins of the basin where mountain-front recharge occurs.

Nitrate is a widespread contaminant in California groundwater. High levels of nitrate in groundwater are associated with agricultural activities, septic systems, confined animal facilities, landscape fertilization, and wastewater treatment facilities. Nitrate does occur naturally in groundwater – however, natural nitrate levels in groundwater are generally very low (typically less than about 10 mg/L as nitrate-NO₃).

The volume-weighted average of existing TDS and nitrate-NO₃ concentrations were calculated for each of the 22 analysis subregions. Results are summarized in **Table 3-5**. Average subregional TDS concentrations vary considerably, ranging from 153 mg/L to 1,716 mg/L across the Region. Average TDS concentrations are very low in the upgradient portions of the Mojave River Basin (less than 300 mg/L) and increase along the pathways along and away from the Mojave River due to natural processes (e.g., mineralization) and impacts from anthropogenic loading. Eight of the nine downgradient analysis subregions composing the Alto Transition Zone, Centro, and Baja Subareas have average TDS concentrations at or above 500 mg/L (Baja – Floodplain is the lone exception). In the Morongo Basin, average TDS concentrations are generally below the recommended secondary MCL for TDS of 500 mg/L. Exceptions include Lucerne Valley (north) (1,716 mg/L) and Johnson Valley (678 mg/L), where elevated TDS concentrations primarily reflect a high degree of mineralization and dry lakebed evaporation. Elevated TDS concentrations are naturally characteristic of dry lakes in arid desert environments.

Nitrate-NO₃ concentrations are generally low across the Region. Average SNMP subregional concentrations are approximately 6.0 mg/L. Average nitrate-NO₃ concentrations exceed 15 mg/L in Centro – Floodplain and Warren Valley. Additionally, nitrate-NO₃ concentrations are slightly elevated (between 7.5 and 10 mg/L) in Centro – Regional (west), Alto Transition Zone – Floodplain (Helendale), and Alto – Right Regional. In the Centro Subarea, elevated nitrate concentrations are associated with historical and existing agricultural operations (crop field and dairies) and other naturally occurring processes. In the Alto subarea, septic tank return flows are likely the most significant contributing factor to slightly elevated groundwater nitrate concentrations. In the Warren Valley Basin, elevated nitrate concentrations are associated with historical entrainment of septage following managed aquifer recharge operations and a high density of septic tanks in the subarea.

Chapter 3 – Regional Water Supply Characterization

The emerging water quality constituents of concern are per- and polyfluoroalkyl substances (PFAS) and perfluorooctanoic acid (PFOA). These chemical constituents are generally produced through chemical manufacturing of items like Teflon pans, stain resistant carpet, and fast-food packaging. Acceptable levels for PFAS and PFOA compounds are regulated by the State of California and have recently been lowered. As such, the regulatory actions may have some impact on the regional availability of groundwater supplies. MWA and the regional purveyors are addressing this emerging issue in the region-wide management of groundwater resources and imported supplies that augment the local sources.

TABLE 3-5: AVERAGE EXISTING TDS AND NITRATE CONCENTRATIONS BY SNMP SUBREGION

SNMP Analysis Subregion	Average Existing TDS Concentration (mg/L)	Average Existing Nitrate-NO ₃ Concentration (mg/L)
Mojave River Basin		
Baja - Floodplain	401	3.9
Baja - Regional	617	1.4
Centro - Floodplain	711	20.7
Centro - Regional (east)	618	3.2
Centro - Regional (west)	711	7.7
Centro - Regional (Harper Dry Lake)	1,028	4.0
Alto Transition Zone - Floodplain (Helendale)	915	10.0
Alto Transition Zone - Floodplain	500	3.4
Alto Transition Zone - Regional	529	3.9
Alto - Floodplain (Narrows)	205	4.3
Alto - Floodplain	177	3.3
Alto - Left Regional	310	0.9
Alto - Mid Regional	153	3.5
Alto - Right Regional	579	7.5
Oeste - Regional	781	2.5
Este - Regional	299	4.3
Morongo Basin		
Lucerne Valley (north)	1,716	5.6
Lucerne Valley (south)	472	5.7
Johnson Valley	678	6.2
Ames-Means Valley	330	5.7
Warren Valley	243	15.4
Copper Mountain-Giant Rock	247	7.5
Joshua Tree	202	14.7

3.1.2.3 Groundwater Monitoring and Protection

The general goal of groundwater protection activities is to maintain the groundwater and the aquifer to ensure a reliable high quality water supply. Activities to meet this goal include continued and increased monitoring, data sharing, education and coordination with other agencies that have local or regional authority or programs. The current MWA groundwater monitoring program includes groundwater quality data collected by MWA and the USGS through their cooperative water resources program and through the Drinking Water Program directed by the State Water Resources Control Board Department of Drinking Water (SWRCB DDW).

The SWRCB DDW enforces the monitoring requirements established in Title 22 of the CCRs for drinking water wells and all the data collected must be reported to the DDW (note: each participating retailer's specific Consumer Confidence Report is included within its respective Chapter). Title 22 also designates regulatory limits (e.g., MCLs) for various water contaminants, including volatile organic compounds, non-volatile synthetic organic compounds, inorganic chemicals, radionuclides, disinfection byproducts, general physical constituents, and other parameters. Title 22 testing applies to potable public drinking water systems. MWA performs Title 22 testing only on water produced for the R-Cubed distribution system which supplies wholesale potable water to a few retail water suppliers in the Alto Subarea.²⁴ All retail water purveyors are subject to drinking water standards set by the Federal Environmental Protection Agency (EPA) and the SWRCB DDW.

MWA has developed and actively maintains a Key Well program to support ongoing groundwater management activities, including monitoring of groundwater levels and water quality throughout the Region. Wells in the Key Well program include a combination of dedicated monitoring wells, scientific investigation wells, domestic water supply wells, and agricultural irrigation wells. Retailer's public water supply wells are not included in the Key Well program but data from these wells are tracked and included in the MWA database. Important wells identified or installed during scientific studies are continually added to the Key Well program.

There are a range of groundwater contamination sites across the region. These sites are regulated by the Lahontan and Colorado River Basin Regional Water Quality Control Boards. The potential detriments to water supply from these sites are being monitored by MWA and potentially effected retailers on a regional basis.

²⁴ Groundwater quality data are submitted electronically and are available for download online at the SWRCB water quality analyses data and download page:
http://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/EDTlibrary.shtml

3.1.3 Desalination Opportunities

The California UWMP Act requires a discussion of potential opportunities for use of desalinated water (Water Code Section 10631(i)). In the past, MWA has evaluated potential options for developing desalination projects. However, none of the opportunities are currently practical or economically feasible for MWA or the Mojave Region, and MWA has no current plans to pursue them. Therefore, desalinated supplies are not included in the supply summaries in this RUWMP.

As discussed elsewhere in this document, the groundwater supplies in the Region are not considered brackish in nature, and desalination is not required. There are brackish supplies near the dry lakes, but it is not practical to pump, treat and potentially induce migration of better-quality water to the dry lake areas. However, MWA and the retail water purveyors could partner with other SWP contractors and provide financial assistance in construction of other regional groundwater desalination facilities in exchange for SWP supplies. The desalinated water would be supplied to users in communities near the desalination plant, and a similar amount of SWP supplies would be exchanged and allocated to MWA from the SWP contractor for use in the Mojave Region. In addition, should an opportunity emerge with a local agency other than an SWP contractor, an exchange of SWP deliveries would most likely involve a third party, such as Metropolitan Water District. Most local groundwater desalination facilities would be projects implemented by retailers of SWP contractors and, if an exchange program were implemented, would involve coordination and wheeling of water through the contractor's facilities to MWA.

Because the MWA service area is not in a coastal area, it is neither practical nor economically feasible for MWA to implement a seawater desalination program.

3.1.4 Delta Reliance

The Mojave Region continues to demonstrate reduced reliance on water supplies derived from the Delta and regional self-sufficiency through the actions of the retail agencies and MWA. The reduced reliance and regional self-sufficiency are attributable to significant advances in developing recycled and reusable water supplies combined with a region-wide emphasis on water use efficiency among MWA and the retail agencies. **Table 3-6** presents the reduced reliance analysis for the Mojave Region. The Reduced Delta Reliance and improved regional self-sufficiency are detailed in **Appendix 2**.

TABLE 3-6: REDUCED DELTA RELIANCE

Year	2010	2015	2020	2025	2030	2035	2040	2045	2050
Total Water Supplies from the Delta Watershed	34.2%	34.2%	31.0%	26.1%	24.6%	23.5%	22.9%	22.3%	21.7%
Change in Water Supplies from the Delta Watershed		-0.1%	-3.3%	-8.2%	-9.6%	-10.7%	-11.4%	-12.0%	-12.5%

3.1.5 Climate Change

While the CWC does not prescribe specific climate change planning and management measures for water suppliers, it does emphasize that climate change is appropriate to consider when assessing drought risk assessment, water conservation and use efficiency, and demand management and supply – both in an historical and future – projection context. The Region’s primary climate change concern involves MWA’s capability of providing imported SWP water for groundwater recharge and changes to the pattern and intensity of rainfall within the Region and snowfall in the mountains that feed the Mojave River and various local ephemeral streams.

As discussed in *Chapter 6 – Mojave Water Agency*, MWA uses DWR’s 2025 Delivery Capability Report (DCR) to assess current and future reliability of SWP Contract Table A supplies. MWA’s representation of supply availability during single dry and multiple dry years reflects its consideration of climate change impacts on its Table A water supplies.

3.1.6 Summary of Existing and Planned Water Supplies

Available wholesale water supplies in the RUWMP Planning Area consist of supplies managed exclusively by MWA and other supplies managed by constituent retail water agencies. MWA coordinates with its retailers to meet regional demands. Each retail water agency in the RUWMP Planning Area uses a unique mix of supplies and not all supply comes from MWA.

The projected total water supplies required to meet the demands of all of MWA’s retail agencies and other water uses within the Mojave Region are summarized below in **Table 3-7** and **Table 3-8**. While MWA does not anticipate meeting all regional demands solely through collective water assets it directly manages, the Agency will work collaboratively with retail agencies and other stakeholders to manage available water supplies and ensure that projected regional demands can be met. The Region’s overall water asset portfolio consists of same-year SWP Table A allocations, Article 56 Carryover (and Article 21 Interruptible Water), Stored SWP supplies as managed by MWA, Water Transfers and Exchanges, local native groundwater, local surface water, return flows, and recycled supplies.

TABLE 3-7: PROJECTED TOTAL WATER SUPPLY FOR THE MOJAVE REGION FOR THE NEXT 5-YEARS (AFY)

Year Type		All Sources (Native Groundwater, Recycled Water, SWP Table A)
Normal		162,812
Single Dry Year		118,810
Multi-Year Drought	2026 (1 st Year)	145,759
	2027 (2 nd Year)	118,810
	2028 (3 rd Year)	118,810
	2029 (4 th Year)	132,280
	2030 (5 th Year)	145,759

TABLE 3-8: PROJECTED TOTAL WATER SUPPLY FOR THE MOJAVE REGION THROUGH 2050 (AFY)

Year Type All Sources		2030	2035	2040	2045	2050
Normal		162,812	164,046	164,642	165,216	165,716
Single Dry Year		118,810	120,044	120,640	121,214	121,714
Multi-Year Drought	Year 1	145,759	146,993	147,589	148,163	148,663
	Year 2	118,810	120,044	120,640	121,214	121,714
	Year 3	118,810	120,044	120,640	121,214	121,714
	Year 4	132,280	133,514	134,110	134,684	135,184
	Year 5	145,759	146,993	147,589	148,163	148,663

Chapter 4.0 WATER USE CHARACTERIZATION

Understanding water use characteristics across the Mojave Region is fundamental to evaluating long-term water supply reliability and informing regional water management strategies. As described in Chapter 2, the Region encompasses a diverse range of communities with varying population densities, land use patterns, and economic drivers, all of which influence water use behavior and demand. This chapter characterizes current water use across the region and develops projections of future water demand over the planning horizon.

Consistent with the coordinated regional approach established for the 2025 RUWMP, population, land use, and economic assumptions described in Chapter 2 form the basis for demand projections presented herein. Retailer-specific demand characteristics, including customer class distributions and system water use profiles, are developed within their respective retailer chapters and incorporated into the regional demand projections presented in this chapter. Demands occurring outside the service area boundaries of participating urban water retail suppliers – including agricultural, industrial, and recreational uses, as well as demands from small water systems and rural domestic pumpers – are characterized within the Mojave Water Agency’s wholesale planning framework as described in *Chapter 6 – Mojave Water Agency*.

Projected water demands developed in this chapter serve as the analytical framework for integrating regional water use with available supplies described in Chapter 3 – Water Supply Characterization. Together, these elements support the evaluation of system reliability under normal, single dry year, and multiple dry year conditions presented in Chapter 5 – Water System reliability and Drought Risk Assessment.

This chapter therefore provides a comprehensive and consistent framework for quantifying regional water use, supporting both near-term and long-term planning requirements and water resource management across the Mojave Region.

4.1.1 Current Regional Water Use

Water use within the Mojave Region reflects a diverse mix of urban, rural, industrial, recreational, and agricultural demands supported by a combination of managed

groundwater and supplemental supplies. Understanding how water is currently used across the Region provides critical context for evaluating demand trends, informing future projections, and assessing long-term water supply reliability.

Water use within the Mojave Basin Area is tracked and reported through Mojave Watermaster Verified Production reports, which document production across the five Subareas in accordance with the terms of the adjudication. In addition, urban water suppliers track and report their production to the State Water Resources Control Board (SWRCB) through monthly reporting requirements. For areas outside of the Mojave Basin Area, such as Subregion 3, water use data for Hi-Desert Water District and Joshua Basin Water District is derived from agency production records and State Water Resources Control Board reporting. Historic demand data for other uses within Subregion 3, including smaller systems and non-urban demands, are based on estimates developed as part of MWA's chapter, Chapter 6 – Mojave Water Agency.

Collectively, these data sources are synthesized to characterize recent and current water use across the Mojave Region. **Table 4-1** presents a summary of regional water use for the period 2021 through 2025 by major use categories, including (1) urban water retail suppliers, (2) small potable water systems and rural domestic users, (3) other uses such as industrial, commercial, and recreational demands, and (4) agricultural uses. To further illustrate spatial variability in water use **Table 4-2 through Table 4-4** provide a breakdown of these same categories by subregion.

This characterization of recent and current water use provides insight into regional demand patterns, the relative magnitude of different water use sectors, and the influence of long-term demand management measures and regulatory frameworks. These observed trends form the basis for developing and evaluating future water demand projections presented in the later portions of this chapter.

TABLE 4-1: REGIONAL WATER USE 2021-2025 (AFY)

Water Use Category		2021	2022	2023	2024	2025
Urban Water Retail Supplier	City of Adelanto	4,487	4,640	4,570	4,636	5,044
	County Service Area 64	2,793	2,677	2,561	2,597	2,666
	County Service Area 70 J	1,794	1,725	1,633	1,146	1,742
	Golden State Water Company - Barstow	6,004	5,604	5,421	5,591	5,437
	Hesperia Water District	14,253	13,645	12,604	13,724	13,852
	Hi-Desert Water Company	2,909	2,919	2,800	2,874	2,817
	Joshua Basin Water District	1,333	1,299	1,276	1,307	1,292
	Liberty Utilities - Apple Valley Water Company	10,014	9,538	9,399	9,698	9,642
	Phelan Piñon Hills CSD	3,094	2,863	2,555	2,674	2,717
	Victorville Water District	22,346	22,071	20,079	20,389	20,956
	Subtotal Urban Water Retailer	69,028	66,981	62,897	64,636	66,164
Other	Small Water Systems and Rural Domestic	17,836	15,869	15,215	16,699	17,050
	Industrial	10,435	10,135	9,035	9,235	7,335
	Golf Course	4,615	4,715	3,515	4,415	5,215
	Recreational	9,050	9,250	8,250	7,850	7,250
	Agricultural	21,700	16,200	15,300	15,100	14,500
	Subtotal Other	63,636	56,169	51,315	53,299	51,350
Total Water Use in Mojave Region		132,664	123,150	114,212	117,934	117,514

TABLE 4-2: SUBREGION 1 WATER USE 2021-2025 (AFY)

Water Use Category		2021	2022	2023	2024	2025
Urban Water Retail Supplier	City of Adelanto	4,487	4,640	4,570	4,636	5,044
	County Service Area 64	2,793	2,677	2,561	2,597	2,666
	County Service Area 70 J	1,794	1,725	1,633	1,146	1,742
	Hesperia Water District	14,253	13,645	12,604	13,724	13,852
	Liberty Utilities - Apple Valley Water Company	10,014	9,538	9,399	9,698	9,642
	Phelan Piñon Hills CSD	3,094	2,863	2,555	2,674	2,717
	Victorville Water District	22,346	22,071	20,079	20,389	20,956
	Subtotal Urban Water Retailer	58,781	57,159	53,400	54,864	56,619
Other	Small Water Systems and Rural Domestic	12,243	10,893	10,444	11,463	11,704
	Industrial	5,600	5,100	4,900	5,500	4,400
	Golf Course	4,400	4,500	3,300	4,200	5,000
	Recreational	7,000	7,400	6,400	6,000	5,400
	Agricultural	4,700	3,800	3,400	3,400	3,000
	Subtotal Other	33,943	31,693	28,444	30,563	29,504
Total Water Use in Subregion 1		92,724	88,852	81,844	85,427	86,122

TABLE 4-3: SUBREGION 2 WATER USE 2021-2025

Water Use Category		2021	2022	2023	2024	2025
Retailer	Golden State Water Company - Barstow	6,004	5,604	5,421	5,591	5,437
	Subtotal Urban Water Retailer	6,004	5,604	5,421	5,591	5,437
Other	Small Water Systems and Rural Domestic	2,971	2,644	2,535	2,782	2,840
	Industrial	4,500	4,700	3,800	3,400	2,600
	Golf Course	0	0	0	0	0
	Recreational	2,000	1,800	1,800	1,800	1,800
	Agricultural	17,000	12,400	11,900	11,700	11,500
	Subtotal Other	26,471	21,544	20,035	19,682	18,740
Total Water Use in Subregion 2		32,476	27,148	25,456	25,273	24,178

TABLE 4-4: SUBREGION 3 WATER USE 2021-2025²⁵

Water Use Category		2021	2022	2023	2024	2025
Retailer	Hi-Desert Water Company	2,909	2,919	2,800	2,874	2,817
	Joshua Basin Water District	1,333	1,299	1,276	1,307	1,292
	Subtotal Urban Water Retailer	4,243	4,218	4,076	4,180	4,109
Other	Small Water Systems and Rural Domestic	2,621	2,332	2,236	2,454	2,506
	Industrial	335	335	335	335	335
	Golf Course	215	215	215	215	215
	Recreational	50	50	50	50	50
	Agricultural	0	0	0	0	0
	Subtotal Other	3,221	2,932	2,836	3,054	3,106
Total Water Use Subregion 3		7,464	7,150	6,912	7,234	7,214

²⁵ Subregion 3 "Other" water use categories were estimated by Zanjero using available spatial and water-use indicators as no single Watermaster or centralized reporting source tracks all non-urban retail water use throughout Subregion 3.

4.1.2 Forecasting Regional Water Use

Forecasting water use leverages the current understanding of prevailing regional water needs and trends while considering factors directly influencing more recent urban water use efficiency regulatory pressures and regional population trends. The following discusses the assumptions used to forecast water use at both the regional and subregional levels.

4.1.2.1 Forecasting Urban Water Retail Supplier Use

There are several factors significantly impacting the projection of future water use for the urban water retail suppliers ultimately informing the majority of the water use within the Mojave Region. These factors include State and local landscape regulations, building code requirements, and residential water-use mandates, as well as changes in types of housing products offered. These factors are incorporated into determining appropriate per-customer connection water demand values for use in forecasting future water needs. Relevant factors include:

- California Model Water Efficient Landscape Ordinance²⁶
- Green Building Standards Code (hereafter the “CAL Green Code”)²⁷
- Per-capita Urban Water Conservation Objectives²⁸

A significant portion of the projected growth in water demand includes a range of residential and non-residential uses within the urban water retail supplier’s service areas, driven by the varied development proposals already approved (but not yet built) as well as future proposals, to meet regional population increases. Residential customers will include both single-family dwelling units, some with accessory dwelling units, built under a variety of densities, as well as multi-family residential dwelling units. Non-residential uses are expected to include a blend of commercial, institutional, industrial, and active landscapes such as parks, in ratios similar to current residential-to-non-residential connections. The forecasted future demands of the 10 RUWMP urban water retail suppliers will reflect the needs of existing customers and future new customers. The methodology repeats that used for the 2020 Mojave Water Agency UWMP, where existing customer use and forecasted new customer use are primarily based upon multiplying the population by a gallons-per-capita-per day water factor for residential and non-residential uses.

²⁶ Information regarding the California Model Water Efficient Landscape Ordinance (MWELO) can be accessed [here](#).

²⁷ Information regarding the Green Building Standards Code (CAL Green Code) can be accessed [here](#).

²⁸ Information regarding Per-capita Urban Water Conservation Objectives can be accessed [here](#).

Forecasting Existing Customer Future Use

For each urban water retail supplier, data submitted to the SWRCB to satisfy monthly reporting requirements was obtained to establish the current water use characteristics, as presented in **Table 4-1**. The current total annual production values were then divided by each retailer's current population to generate gallons-per-capita-per-day (gpcd) values which are representative of each retailer's total gpcd when considering all residential and non-residential uses. The "current" gpcd values for these populations were then used to generate representative gpcd values for new customers as discussed below.

For existing customers' future use, the gpcd was either (1) held constant or (2) reduced slightly to reflect expected conservation through replacement of fixtures and appliances, continued adoption of a conservation ethic, and modifications of irrigated landscapes, as well as a function of continued implementation of the retailer's ongoing conservation programs.

Forecasting New Customer Future Use

One element of the information reported to SWRCB is the percentage each retailer serves to residential customers, a key value for the SWRCB's determination of the "residential gallons-per-capita-per-day" water use – or "r-gpcd." Using the total r-gpcd value as well as the wintertime r-gpcd values, which are often lower than during summer months, an estimate of the (1) residential versus non-residential per-capita use and (2) the residential indoor versus outdoor per-capita water use factor was derived for each retail supplier. The estimated gpcd values were then used to establish an anticipated gpcd value for each new customer using the following criteria:

- As stipulated by the CWC, each new residential user should have an indoor factor of 47 gpcd, dropping to 42 gpcd in the future.²⁹ For purposes of this forecast, 47 gpcd is used for all new customers until 2030 and 42 gpcd is used for growth beyond 2030.
- Using the residential indoor versus outdoor gpcd estimate from the existing customer data, an outdoor gpcd value was determined (as the difference between total r-gpcd and the estimated indoor r-gpcd). This outdoor value was added to the indoor value of 47 gpcd or 42 gpcd to generate a total residential gpcd value for future customers.
- The difference between the residential gpcd and the total gpcd created a representative non-residential gpcd value unique to each retailer. This non-residential

²⁹ CWC Section 10609.4(a)(2) establishes the indoor residential water use 'standard' to be 47 gpcd beginning in 2025 through January 1, 2030 while CWC Section 10609.4(a)(3) establishes the indoor residential water use 'standard' to be 42 gpcd beginning in 2030. These values represent average values across the entire customer base served by any urban water supplier.

gpcd was added to the residential gpcd to create an expected total gpcd for each new customer.

- The new gpcd value was multiplied by the incremental additional population anticipated during each five-year increment through 2050.
- The existing customer future demand and the new future customer demand were combined to represent the total demand for each large water retail supplier.

Projected water use for each participating urban water retail supplier is presented in the Water Use Characterization sub-chapter of each respective retailer chapter (Chapters 7 – 16). Each sub-chapter describes the retail-specific assumptions, customer use trends, existing and new customer demand forecasts, distribution system losses, and other factors used to develop each retailer's projected water use. The regional demand summaries presented in this chapter rely on those retail-specific forecasts and aggregate them, where appropriate, to support the broader regional water use characterization and reliability analysis.

4.1.2.2 Forecasting Non-Urban Water Retail Supplier Uses

In addition to the demands associated with participating urban water retail suppliers, the Mojave Region includes other water uses such as agricultural, industrial, golf, recreational, small systems, rural domestic, and other non-retailer demands. Historical use associated with these categories is summarized in this chapter to provide a more complete accounting of regional water use.

Future demands for non-urban water retail supplier uses were developed separately from the participating retailer demand projections. The methodology and assumptions used to forecast these demands are described in *Chapter 6 – Mojave Water Agency*. The regional demand projections presented later in this chapter aggregate these retailer and non-retailer forecasts to provide a total regional demand forecast for use in *Chapter 5 – Regional Water Service Reliability*.

4.1.3 Summary of Future Regional Water Use

The preceding sections identify the forecast sources used to develop future water use projections for the Mojave Region, including participating urban retail water supplier demands and non-urban/non-retailer demands. For regional planning purposes, these forecasts are aggregated in this section to present total projected water use for the Mojave Region.

Table 4-5 through Table 4-7 summarize projected water use from 2030 through 2050 by subregion. **Table 4-8** summarizes projected regional water use from 2030 through 2050 and provides the long-term regional demand forecast used to evaluate supply and demand conditions in *Chapter 5 – Regional Water Service Reliability*.

The projections presented in **Table 4-5 through Table 4-8** reflect baseline planning demands, do not include an additional adjustment for climate change, and are rounded to the nearest five acre-feet.

TABLE 4-5: PROJECTED SUBREGION 1 WATER DEMAND 2030-2050 (AFY)

Subregion 1	2030	2035	2040	2045	2050
Year 1	89,700	91,070	92,150	93,155	93,530
Year 2	89,975	91,290	92,355	93,220	93,560
Year 3	90,250	91,500	92,545	93,305	93,585
Year 4	90,525	91,715	92,750	93,375	93,610
Year 5	90,795	91,930	92,950	93,450	93,635

TABLE 4-6: PROJECTED SUBREGION 2 WATER DEMAND 2030-2050 (AFY)

Subregion 2	2030	2035	2040	2045	2050
Year 1	24,270	24,480	24,875	25,510	26,120
Year 2	24,315	24,560	25,000	25,630	26,270
Year 3	24,355	24,635	25,130	25,755	26,415
Year 4	24,395	24,715	25,255	25,875	26,565
Year 5	24,435	24,795	25,380	25,995	26,715

TABLE 4-7: PROJECTED SUBREGION 3 WATER DEMAND 2030-2050 (AFY)

Subregion 3	2030	2035	2040	2045	2050
Year 1	7,280	7,290	7,245	7,175	6,985
Year 2	7,285	7,275	7,225	7,140	6,965
Year 3	7,280	7,270	7,210	7,100	6,955
Year 4	7,285	7,260	7,205	7,060	6,935
Year 5	7,285	7,250	7,190	7,025	6,920

TABLE 4-8: PROJECTED REGIONAL WATER DEMAND 2030-2050 (AFY)

Mojave Region	2030	2035	2040	2045	2050
Year 1	121,250	122,840	124,270	125,840	126,635
Year 2	121,575	123,125	124,580	125,990	126,795
Year 3	121,885	123,405	124,885	126,160	126,955
Year 4	122,205	123,690	125,210	126,310	127,110
Year 5	122,515	123,975	125,520	126,470	127,270

Chapter 5.0 REGIONAL WATER SERVICE RELIABILITY

This chapter outlines the Mojave Region’s general water system reliability findings as required under CWC §10635 and provides reliability information that the MWA and its constituent retail agencies may use in completing an annual supply and demand assessment under CWC §10632.1.

Assessing water service reliability is the fundamental purpose for MWA and the participating retail suppliers in preparing this 2025 RUWMP. Water service reliability reflects the Region’s ability to demonstrate that the regional water needs may be satisfied under projected hydrological and regulatory conditions. The Region’s 2025 RUWMP considers the reliability of meeting water demands by analyzing plausible hydrological variability, regulatory variability, climate conditions, and other factors that impact the regional water supplies. The reliability assessment looks beyond past experiences and considers what could be reasonably foreseen in the future in order to reflect potential water supply planning scenarios. This chapter synthesizes the details imbedded in Chapters 3 and 4, which each on their own reflect synthesis of Chapters 6 through 16, and provides a rational basis for future decision-making related to supply management, demand management, and project development. This chapter presents two regional water reliability findings:³⁰

- Five Year Drought Risk Assessment: the 2026 through 2030 Drought Risk Assessment (“DRA”) for the Mojave Region;
- Long-Term Service Reliability: the reliability findings for a Normal Year, Single Dry Year, and Five Consecutive Dry Years in five-year increments through 2050;

In summary, regional water supplies are sufficient to meet regional water demands during normal, single dry, and five consecutive dry years through 2050.

³⁰ These findings are also used by Mojave Water Agency to represent reliability for their “wholesale water supplier” responsibilities under the UWMPA.

5.1.1 Mojave Region Five-Year Drought Risk Assessment

The Region is characterized by a unique portfolio of water supplies and infrastructure components. As noted in *Chapter 3 – Regional Water Supply Characterization* and *Chapter 6 – Mojave Water Agency*, the regional supplies that are available include MWA’s SWP Table A Annual Amount, Native Groundwater, Imported Wastewater, Return Flows, Recycled Water and Stored and Carryover supplies (such as Article 56). These supplies are managed throughout each of the Subregions. For example, although MWA brings its annual SWP Table A allocation into its service area for delivery into the Subregions, it also may store some of its Table A allocation within the SWP system under the Carryover provisions in its SWP Contract or may store portions of the Table A allocation in regional groundwater basins for use in later years. As such, the annual management of the diverse water supply sources in the regional water supply portfolio forms the supply reliability assessment described in this Chapter.

The Region, as coordinated through MWA, the participating retailers and other users, manages its water supplies to address projected dry conditions. Specifically, MWA captures and stores surplus imported water in normal and wet years to use those water assets to meet regional demands in dry years. These strategic management actions stabilize annual fluctuations in supplies that may not meet regional demands under certain dry conditions. In other words, any surplus imported water supplies are captured and stored for future delivery to improve long-term supply reliability. As discussed in *Chapter 6 – Mojave Water Agency*, MWA has preemptively stored over 250,000 acre-feet of water to mitigate against dry conditions.

Table 5-1 below shows the Region’s Five-Year Drought Risk Assessment (DRA) which integrates all of the regional water supplies for 2026 through 2030 as described in *Chapter 3 – Regional Water Supply Characterization* and reflects the water uses described in *Chapter 4 – Water Use Characterization*. As presented in the table, the Region maintains surplus water assets in the first, fourth, and fifth years of a projected five-year dry period but also indicates how stored water supplies are required to meet demands in the second and third years of the projected dry year period.

TABLE 5-1: MWA FIVE YEAR DROUGHT RISK ASSESSMENT (AFY)

	2026	2027	2028	2029	2030
Supply	145,759	118,810	118,810	132,280	145,759
Demand	119,390	119,856	120,351	120,832	121,252
Difference	26,369	-1,046	-1,541	11,448	24,507
Use of Managed Groundwater Storage	0	1,046	1,541	0	0
Revised Difference	0	0	0	0	0

The key takeaway is that MWA uses a portion of its stored water assets in the middle of a multi-year drought period to address deficits in the otherwise predictable water supplies (e.g. native groundwater, recycled water, and current-year SWP Table A). In shoulder years, where imported supplies in combination with other supplies exceed the demands, MWA has the option for excess water to be stored for future use as either carryover supply in the SWP system (e.g., San Luis Reservoir) or banked underground in local groundwater basins.

5.1.2 MWA Long-Term Service Reliability

The UWMPA directs urban water purveyors to analyze water supply reliability in normal, single dry, and five consecutive dry years over a 20-year planning horizon. The 2025 UWMP Guidebook recommends extending that period to 25 years to provide a guiding document for future land use and water supply planning through the next UWMP Cycle. The following sub-chapters describe the long-term water service reliability for the Region through 2050.

5.1.2.1 Normal and Single Dry Conditions 2030–2050

The Region’s long term service reliability is characterized in normal, single dry, and five consecutive dry years through 2050. The future water supplies in normal and single dry conditions depicted in this section reflect the same hydrological, regulatory, and institutional criteria associated with each water asset as described in *Chapter 3 – Regional Water Supply Characterization*. In normal years, for example, SWP supplies are generally constrained only by the projected Table A allocations derived from DWR’s DCR. Under the normal conditions, the same-year SWP Table A allocation, combined with other supplies, is adequate to fully meet demand without using any of the locally pre-stored Managed Groundwater. In dry years, additional hydrological, regulatory, and institutional issues may constrain the availability of water that reduce SWP supply availability based on reduced allocation percentages as noted in Chapter 3. In these years, Managed Groundwater Storage is available to address any shortfall forecast absent the stored groundwater. Additionally, other future water supplies, like return flow, tend to grow in annualized volumes as annualized

demands grow in parallel. However, as described in Chapter 3, many of these other supplies are not reflected as an annually available predictable supply to allow this RUWMP to make a conservative estimate of reliability. This information is described in detail in Chapter 3 and is incorporated into the supply and demand tables presented below.

The Region’s future water demands in normal and single dry conditions through 2050 reflect the same considerations described in previous sections of this chapter. In both normal and dry conditions, demands tend to reflect anticipated uses based upon the climatological conditions in the Region. Future water demands are generally predicted to increase as land uses and populations grow within the Region. This information is detailed in *Chapter 4 – Water Use Characterization* and reflected in the values shown in the tables below. In normal years, the Region projects surplus water conditions, allowing MWA to recharge and store available supplies for future dry-year needs or coordinate with other SWP contractors to manage surplus supplies. The 2027 Master Plan, currently under development, is expected to reflect MWA’s continued efforts to establish an imported water policy that helps provide further clarity regarding decisions during such circumstances.

Table 5-2 shows the normal year and single dry-year supplies and demands from 2030 through 2050. The single-dry conditions reflect the use of Managed Groundwater Storage to meet forecast shortfalls (shown as a negative difference), where the volume of Managed Groundwater Storage is set to resolve any shortfall to zero.³¹

³¹ As described in Chapter 6, MWA currently has over 250,000 acre-feet of Managed Groundwater Storage throughout the three Subregions. This supply is also available to help retail suppliers meet demands during future periods where demands may exceed the supply shown in their retail chapters in interim years but fall within the total 2050 supply shown in this RUWMP.

TABLE 5-2: NORMAL AND SINGLE DRY YEAR WATER SUPPLY AND DEMAND THROUGH 2050 (AFY)

Normal Year	2030	2035	2040	2045	2050
Supply	162,812	164,046	164,642	165,216	165,716
Demand	121,250	122,840	124,270	125,840	126,635
Difference	41,562	41,206	40,372	39,376	39,081

Single Dry Year	2030	2035	2040	2045	2050
Supply	118,810	120,044	120,640	121,214	121,714
Demand	121,250	122,840	124,270	125,840	126,635
Difference	-2,440	-2,796	-3,630	-4,626	-4,921
Use of Managed Groundwater Storage	2,440	2,796	3,630	4,626	4,921
Revised Difference	0	0	0	0	0

5.1.2.2 MWA Five Consecutive Dry Years through 2050

The Region defines a drought condition lasting five consecutive years as one that constrains MWA from obtaining some of the water supplies within its water supply portfolio due to hydrological, regulatory, and institutional constraints. These conditions include more restrictive regulatory constraints that limit its Table A allocation but do not limit the availability of groundwater resources or wastewater imports. As more thoroughly described in *Chapter 6 – Mojave Water Agency*, the multiple dry years are assumed to use the following consecutive Table A allocations: 35%, 5%, 5%, 20%, 35%. These assumptions set forth the available same-year Table A supply that is added to the native groundwater and other local supplies, as summarized in *Chapter 3 – Regional Water Supply Characterization*.

The future dry year projections show the Region relying more on Managed Groundwater Storage as its population grows and water demands increase. Specifically, the Region continues to increase its use of MWA’s Managed Groundwater Storage supplies in years two and three of a five consecutive year drought through the entire planning horizon. This gradual decrease in supply availability and eventual reduction in Managed Groundwater Storage in years one, four, and five would also impact MWA’s ability to store surplus water in those years. Accordingly, although MWA will have adequate water supplies to meet the regional demands for five consecutive dry years in 2050, the Region will be using more of MWA’s Managed Groundwater Storage supplies to handle those conditions. These issues are described in significant detail in *Chapter 3 – Regional Water Supply Characterization* and reflected in the

monthly reliability table below. **Table 5-3** presents the water supply and demand conditions for MWA’s service area in five consecutive dry years from 2030 through 2050.

TABLE 5-3: FIVE CONSECUTIVE DRY YEARS WATER SUPPLY AND DEMAND THROUGH 2050 (AFY)

		2030	2035	2040	2045	2050
Year 1	Supply	145,759	146,993	147,589	148,163	148,663
	Demand	121,250	122,840	124,270	125,840	126,635
	Difference	24,509	24,153	23,319	22,323	22,028
Year 2	Supply	118,810	120,044	120,640	121,214	121,714
	Demand	121,575	123,125	124,580	125,990	126,795
	Difference	-2,765	-3,081	-3,940	-4,776	-5,081
	Use of Managed Groundwater Storage	2,765	3,081	3,940	4,776	5,081
	Revised Difference	0	0	0	0	0
Year 3	Supply	118,810	120,044	120,640	121,214	121,714
	Demand	121,885	123,405	124,885	126,160	126,955
	Difference	-3,075	-3,361	-4,245	-4,946	-5,241
	Use of Managed Groundwater Storage	3,075	3,361	4,245	4,946	5,241
	Revised Difference	0	0	0	0	0
Year 4	Supply	132,280	133,514	134,110	134,684	135,184
	Demand	122,205	123,690	125,210	126,310	127,110
	Difference	10,075	9,824	8,900	8,374	8,074
Year 5	Supply	145,759	146,993	147,589	148,163	148,663
	Demand	122,515	123,975	125,520	126,470	127,270
	Difference	23,244	23,018	22,069	21,693	21,393

5.1.3 Water Supply Reliability Summary

The Mojave Region’s water supply portfolio is capable of meeting the water uses in Region in normal, single dry, and five consecutive dry years from 2025 through 2050.

Chapter 6.0 MOJAVE WATER AGENCY



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Sub-Chapter 6.1 – Introduction

The Mojave Water Agency (MWA or Agency) was formed in 1960 as a special act district codified in Chapter 97 of the California Water Code (CWC) Appendix as the Mojave Water Agency Law (MWA Law).³² The MWA Law states that MWA was created, in part, “to do any and every act necessary to be done so that sufficient water may be available for any present or future beneficial use of the lands and inhabitants of the agency....”³³ That statutory charge has long been shaped by the region’s fundamental water management challenge: groundwater use in excess of natural replenishment. The aquifers in MWA’s service area have been in overdraft since the early 1950s, as residents and other water users have historically used more water than is naturally replaced by limited rainfall and surface flows from the Mojave River and its tributaries originating in the San Bernardino mountains to the south. The Mojave Basin Area (MBA) Adjudication further reaffirmed MWA’s role in managing local water supplies and tasked MWA with seeking and securing supplemental water supplies to help address groundwater overdraft and support the quality of life within its boundaries.

The MWA service area encompasses approximately 4,900 square miles of eastern San Bernardino County (County) and is concurrent with the Mojave Region (Region or RUWMP Planning Area) boundary as that is used for purposes of this 2025 RUWMP. Its service area is divided into eight Subareas, each one affiliated with a hydrological groundwater basin or boundary defined through adjudications or resulting from other practical basis (see **Figure 2-1**).

As discussed in *Chapter 3 – Regional Water Supply Characterization*, water supply for the Region is sourced almost entirely from pumped groundwater. As a State Water Project (SWP) contractor and MBA Watermaster, MWA acts as a wholesale supplier to large and small retail water agencies as well as many other individual users and uses throughout its service area by importing water supplies and placing them into the various groundwater basins to support on-going groundwater basin health needs – whether stipulated by judgments or based upon pre-emptive and anticipatory actions – to support the Region’s reliance on pumped groundwater.

³² California Water Code Appendix, Mojave Water Agency Law, Section 97-1 et seq., 1960.

³³ MWA Law Section 97-1.5, July 21, 1960

6.1.1 Background and Purpose

The Agency has ensured compliance with the Urban Water Management Plan Act (UWMPA) requirements for urban water suppliers through its participation in the 2025 RUWMP and preparation of this wholesale-specific chapter.³⁴ The UWMPA requires urban water suppliers to evaluate the adequacy of their water supplies to meet projected demands under average conditions, single dry years, and multiple dry year scenarios through a 20-year planning horizon. This chapter, in conjunction with critical Regional summary tables presented in Chapter 3, Chapter 4, and Chapter 5, presents MWA’s evaluation of these requirements and demonstrates its ability to meet anticipated water demands under near-term and long-term normal and drought conditions.

The 2025 RUWMP, together with this wholesale-specific chapter, updates MWA’s 2020 Wholesale Urban Water Management Plan (UWMP) and incorporates new data, analyses, and regulatory guidance issued since 2020 by the California Department of Water Resources (DWR) pursuant to the CWC. In addition to satisfying statutory requirements, the 2025 RUWMP serves as a comprehensive planning document describing existing and future water supplies, projected water demands, demand management progress, and actions necessary to maintain long-term supply reliability. The regional approach also documents cooperative efforts among participating agencies to efficiently manage shared resources and address future water needs across the RUWMP Planning Area.

6.1.2 Basis for Plan Preparation

With one exception, MWA does not operate as a Public Water System (PWS) as described in California Health and Safety Code Section 116275. Rather, it is solely classified as an Urban Water Supplier pursuant to CWC Section 10617, as it provides water for wholesale water supplies for municipal purposes to more than 3,000 service connections and supplies more than 3,000 acre-feet of water annually through the management of imported water supplies on behalf of the Region. These qualifications require the preparation and adoption of a UWMP every five years. Under CWC Section 10620 (d)(1), these requirements may be satisfied through participation in a RUWMP, which the MWA and the other Urban Water Suppliers within the RUWMP Planning Area have elected to prepare collaboratively.

The one exception of a PWS is MWA’s Regional Recharge and Recover Project (R-Cubed) which is a conjunctive use project that pumps a combination of participating retailers’ MBA Judgement FPA and MWA’s Managed Groundwater Storage within the Floodplain Aquifer along the Mojave River in Hesperia and southern Apple Valley (see **Figure 2-9** and **Figure 3-1**). When needed, MWA-owned production wells on both sides of the Mojave River, immediately

³⁴ California Water Code Sections 10610 through 10657

downstream of the recharge areas, can recover and deliver the FPA or stored water through pipelines directly to local retail suppliers. Details of the MWA’s PWS are provided in **Table 6-1**.

TABLE 6-1: PUBLIC WATER SYSTEM INFORMATION

Public Water System Number	Public Water System Name	Number of Municipal Connections
CA3610129	Mojave Water Agency (R-Cubed)	5

6.1.3 Coordination and Outreach

Preparation of the 2025 RUWMP involved coordination among the participating Urban Water Suppliers and MWA. This coordination ensured consistency in assumptions, methodologies and regional analyses. MWA actively participated in this collaborative process through technical meetings, data sharing, and review of draft materials addressing regional conditions as well as MWA- and retailer-specific operations,

As required by the UWMPA, MWA coordinated with nearby agencies during development of this chapter to ensure consistency with related land use and water resource planning efforts, including City General Plans, Water Master Plans, and Specific Plans associated with anticipated development.

Consistent with CWC Section 10641, MWA encouraged active participation from a broad cross-section of the community representing diverse social, cultural, and economic interests within its service area during preparation of this chapter. Public notice of the plan’s availability and the scheduled public hearing was provided, and a public hearing was conducted prior to adoption to solicit input from customers, stakeholders, and interested parties.

Comprehensive documentation of the regional planning process, including interagency coordination, formal notifications provided in accordance with CWC Section 10621(b), stakeholder engagement, and outreach activities conducted on behalf of all participating agencies is provided in *Sub-Chapter 1.1.3 Coordination and Outreach of Regional Chapter 1 – Introduction*.

6.1.3.1 Water Supplier Information Exchange

Compliance with CWC Section 10631 is described in *Sub-Chapter 1.1.3 Coordination and Outreach of Regional Chapter 1 – Introduction*.

6.1.4 RUWMP Adoption

The Agency held a public hearing regarding the 2025 RUWMP on June 11, 2026. Before the hearing, the Agency made a draft of the 2025 RUWMP available for public inspection at 13846 Conference Center Drive Apple Valley, CA 92307, and posted on MWA’s website. Pursuant to CWC Section 10642, general notice of the public hearing was provided through publication of the hearing date and time in the local press as required under the UWMPA.

The Agency’s elected body adopted this 2025 RUWMP on June 11, 2026. A copy of the 2025 RUWMP will be submitted to DWR, provided to the County and the California State Library, and posted onto MWA’s website.

MWA plans to submit all required documentation related to the UWMPA through the DWR submittal website soon after adoption, including the on-line submittal of information associated with the following DWR Excel workbooks:

“FINAL Submittal 2025 UWMP Tables – MWA – 06.01.2026.xls”

“Appendix F 2025 Checklist – MWA – 06.01.2026.xls”

6.1.5 Document Organization

This chapter is organized as follows:

- Sub-Chapter 6.2 Water Service and System Description
- Sub-Chapter 6.3 Population, Land Use, Economy, and Demographics
- Sub-Chapter 6.4 Imported Water Supply and Reliability Characterization
- Sub-Chapter 6.5 Managed Groundwater Storage
- Sub-Chapter 6.6 Water Use Characterization
- Sub-Chapter 6.7 Water Conservation and Shortage Response
- Sub-Chapter 6.8 Water System Reliability and Drought Risk Assessment
- Sub-Chapter 6.9 Energy Intensity Analysis

Sub-Chapter 6.2 – Water Service and System Description

The Agency manages water supplies from the urban, rural, industrial, recreational, and agricultural users throughout its expansive service area, depicted in **Figure 2-1**, which covers large portions of eastern San Bernardino County and the California side of the Mojave Desert.

The Mojave River is central to MWA history and settlement in the region. The river is more of an ephemeral stream which derives its flow from drainage of 217 square miles of the northern slope of the San Bernardino Mountains. Early farmers aggressively planted the Victor Valley with fruit trees and crops, which by the 1950s created serious water overdraft. This overdraft led to a halt in development in the area. Legislation for the SWP passed in 1959 to begin work on the California Aqueduct, along with the Davis-Grunsky Act, which afforded regions the opportunity to form local water agencies. Soon after, in 1960, the Mojave Water Agency was formed.

MWA's service area is divided into seven divisions, each one represented by a publicly elected board member who serves a four-year term. The MWA Board uses a committee format to inform decisions and receive recommendations for voting matters with each committee member serving a one-year term (or until a successor is appointed). These committees generally meet once a month and include: Legislative and Community Partners Committee; Planning, Resources, Engineering and Operations Committee; Personnel, Finance, Security and Technology Committee; Morongo Basin Pipeline Commission; Technical Advisory Committee; and Watermaster.

MWA's Sphere of Influence (SOI) is generally contiguous with its service area; however, there are two areas within the SOI that are currently not in its service area. Golden State Water Company serves the Wrightwood community's 2,700 customers on the southern boundary of the MWA SOI. The other area is near Grass Valley Creek, which is a tributary to the Mojave River. These two areas are at the base of the San Bernardino Mountains and are part of the headwaters that connect the drainage to the groundwater basins that are part of the MBA Adjudication. MWA, serving as the court appointed MBA Watermaster according to the MBA Judgment, coordinates with these entities within the SOI to ensure established water supplies into the subbasins are maintained. An overview of the MBA Judgment is described in *Chapter 3 – Regional Water Supply Characterization*.

As also described more thoroughly in Chapter 3, water supply for MWA's service area is sourced almost entirely from pumped groundwater from the various basins, subbasins, and aquifers in the area. MWA's role is to help manage the groundwater basins by importing and

managing delivery of imported supplies. To help with this, two primary water delivery projects were developed to deliver much-needed supply to additional locations in MWA's service area from the SWP. The Morongo Basin Pipeline (MBP), completed in 1995, provides imported water to the upper portions of Mojave River Basin and to the Morongo subarea. The Mojave River Pipeline, completed in 2006, provides critical recharge to lower portions of Mojave River Basin (e.g. Centro and Baja subareas) and, more recently, will provide supplies to the Regional Aquifer west of Victorville.

6.2.1 Service Area Climate

A thorough description of the Mojave Region's climate and considerations of climate change are included in *Chapter 2 – The Mojave Region*. Since MWA's service area is concurrent with the Region's boundary, details in Chapter 2 sufficiently address this UWMPA requirement and no additional details are provided in this sub-chapter.

Sub-Chapter 6.3 – Population, Land Use, Economy, and Demographics

Service area population and land use projections are critical to developing a useful planning framework as population dynamics and growth are a primary influence on water use in the Mojave Region. These projections directly influence planning measures for system supply, delivery, infrastructure, and demand management. Because MWA’s service area is concurrent with the Mojave Region as defined for this 2025 RUWMP, the regional population, land use, economic, and demographic conditions applicable to MWA are described in *Chapter 2 – The Mojave Region*.

Accordingly, this sub-chapter does not repeat the full regional population and land use discussion provided in Chapter 2. Instead, it identifies the subset of the regional population that is directly relevant to MWA’s wholesale demand forecast: the small water system and rural domestic user population located outside the service area boundaries of the participating urban water retail suppliers. This population is summarized at the regional level in **Table 2-8** and is further organized by RUWMP Subregion in **Table 6-2** to support the water demand forecast presented in *Sub-Chapter 6.6 – Water Use Characterization*.

6.3.1 Small Water System and Rural Domestic User Population

The MWA population presented in **Table 2-8** represents the portion of the Mojave Region associated with small water systems and rural domestic users outside the service area boundaries of the participating urban water retail suppliers. While **Table 2-8** summarizes this population at the regional level, the water demand forecast presented in *Sub-Chapter 6.6* requires this population to be organized by RUWMP Subregion.

To support this subregional breakout, residential lands outside the service area boundaries of the participating urban water retail suppliers were identified using the SCAG HELPR 2.0 land use shapefile.³⁵ Lands designated as Mixed Use Residential, Commercial and Mixed Use Residential, Mobile Home and Trailer Parks, Multi-Family Residential, Rural Residential, and Single-Family Residential were classified as residential for purposes of this analysis. These residential lands were then assigned to the appropriate RUWMP Subregion.

³⁵ SCAG HELPR 2.0 shapefile accessed at: <https://rdp.scag.ca.gov/helpr/?page=Main-Page>

The number of residential parcels within each Subregion was used to determine the proportional share of the total small water system and rural domestic user population presented in **Table 2-8**. This method allowed the regional population total to be distributed among Subregions in a manner that reflects the relative location of residential land uses outside the participating retailer service areas. The resulting population projections are presented in **Table 6-2** and provide basis for the small water system and rural domestic demand forecast presented in *Sub-Chapter 6.6*.

TABLE 6-2: PROJECTED SMALL WATER SYSTEM AND RURAL DOMESTIC USER POPULATION 2030-2050

Subregion	2030	2035	2040	2045	2050
Subregion 1	57,994	57,080	54,852	52,328	46,747
Subregion 2	14,075	13,853	13,313	12,700	11,345
Subregion 3	12,415	12,220	11,743	11,202	10,007

Sub-Chapter 6.4 – Imported Water Supply and Reliability Characterization

This sub-chapter describes MWA's water supply sources. The description includes the historical sources available to MWA as well as projected water supply sources through 2050.³⁶ MWA delivers imported surface water to recharge facilities and groundwater systems throughout its service area, where the water contributes to local aquifer replenishment and can subsequently be extracted by retail agencies and other water users.

MWA categorizes its supply sources in essentially two groupings. The first grouping includes supply sources that are generally available on an annual basis. These sources include MWA's SWP supplies that are made available each year. Other sources may occasionally fall into this category but are not incorporated into this RUWMP. The second set of supply sources are those that MWA could make available in any given year but are generally not renewable in MWA's supply portfolio once they are used. In other words, although they can be replaced, like a water savings account, they are not guaranteed to be replaced on an annual basis. MWA's long-term water supply management actions focus on optimal utilization of its annually available supply sources and protection of its pre-stored supply sources to guard against extended drought conditions and catastrophic outage impacting water users in the Region. This sub-chapter describes MWA's water supply portfolio and develops a supply matrix that integrates the supply sources to reflect MWA's operational objectives.

6.4.1 State Water Project

The SWP provides a primary water supply for MWA. The water supply is derived from a series of water rights and water contracts as well as pumping and conveyance structures that connect the SWP supplies to MWA's delivery system as described in *Chapter 2 – The Mojave Region*. MWA became a State Water Project contractor in June 1963, entering into a water service contract with the California Department of Water Resources (DWR).

³⁶ The UWMP Act mandates a 20-year planning horizon and the 2025 UWMP Guidebook recommends a 25 year planning horizon.

6.4.1.1 SWP Table A Contract Amount

MWA's SWP Contract amount (Table A) has gradually increased since the Agency started taking deliveries in 1972. Initially the maximum Table A amount was 8,400 acre-feet per year (AFY) escalating to 50,800 AFY by 1990. MWA participated in two notable Table A permanent transfers, one in 1997 with Kern County Water Agency that augmented MWA's Table A by 25,000 AFY, and one in 2009 with Dudley Ridge Water District for 14,000 AFY that stepped up the Table A amount in three increments (7,000 AF in 2010, 3,000 AF in 2015, and the final 4,000 AF in 2020). MWA's current maximum SWP Contract Table A is 89,800 AFY.

MWA's SWP Contract has numerous components that allow MWA to administer and control the annually available SWP water supplies. MWA's SWP Contract has six important provisions that characterize the available supplies and the water delivery activities. The key aspects are: (1) Annual Table A Amount, (2) Annual Table A Allocation, (3) Article 56 Carryover, (4) Article 21 Surplus Supplies, (5) Article 12(f) on SWP conveyance priorities, and (6) water transfer and exchanges supported by Amendment No. 17, the "Water Management Tools".

As mentioned previously, MWA's Annual Table A Amount is 89,800 AFY, representing the maximum Table A amount available to the Agency under its SWP Contract. Although MWA's SWP Contract provides for the Annual Table A Amount, that total volume of water supply is subject to reduction each year based on actual water supply availability in the SWP system as determined by DWR. The last 100% allocation year occurred in 2023. However, actual deliveries vary widely with significantly reduced percentages of maximum contract amount being available during drought years. The long-term average annual Table A Allocation provided by DWR's 2025 Delivery Capability Report (DCR) is 54%.³⁷ Since 2005 the DCR's estimated average of total annual Table A water deliveries has decreased from 2,828 thousand acre-feet (TAF) to 2,234 TAF. This is based on several factors of note, including hydrology,³⁸ infrastructure issues through the system, Delta regulations which constrained exports, and updates to the CalSim3 model. As such, the estimated long-term average annual Table A deliveries were adjusted down from 57% of maximum in 2021, to the Final DCR 2025 long-term average estimate of 54% under existing climate conditions.

³⁷ The DWR 2025 Delivery Capability Report uses a hydrological modeling simulation to determine estimated deliveries under existing conditions using a historical time period from 1922-2021. Future delivery capability conditions are also modeled using these simulations along with CalSim3 and multiple climate change scenarios and future SWP system performance "levels of concern". Projections of future delivery capability are not part of this analysis.

³⁸ The 2025 DCR adjusted its hydrological baseline that incorporates statistically significant changes in inflow from the rim watersheds into California's Central Valley in which standard deviations of precipitation and runoff during the early periods of the past 100 years are significantly different from the recent 30 years due to climate change.

As a point of reference, from 2010–2025, the average Table A Allocation for MWA was 39,218 AF (46% of max) in which allocations during that 15–year span ranged from 5% - 100%, as presented in **Table 6-3**. Average Table A Allocations over this period closely align with the 2025 DCR model projections for future conditions that incorporate climate change.³⁹ It is important to note that extreme hydrologic variability may become more commonplace in future climate scenarios, and MWA could experience drastic variations in Table A Allocation and deliveries in the future.

TABLE 6-3: MWA’S HISTORIC SWP TABLE A ALLOCATIONS AND DELIVERIES

Year	MWA Contract Amount (AF)	Table A Allocation	Annual Allocation Amount (AF)
2010	82,800	50%	41,400
2011	82,800	80%	66,240
2012	82,800	65%	53,820
2013	82,800	35%	28,980
2014	82,800	5%	4,140
2015	82,800	20%	16,560
2016	85,800	60%	51,480
2017	85,800	85%	72,930
2018	85,800	35%	30,030
2019	85,800	75%	64,350
2020	89,800	20%	17,960
2021	89,800	5%	4,490
2022	89,800	5%	4,490
2023	89,800	100%	89,800
2024	89,800	40%	35,920
2025	89,800	50%	44,900
Average Allocation and Deliveries:		46%	39,218

³⁹ Climate change effects modeled into the DCR delivery capability estimates include changes to monthly patterns of flows, more extreme hydrologic and drought events, and lower reservoir storage levels. Long-term average Table A delivery projections are estimated between 43–48% of maximum. (2025 DCR at Section 6, Table 6-2.)

MWA's annual Table A allocation has specific utility to provide replacement water for the adjudicated basins and support sustainable groundwater management. The Morongo Basin Pipeline and Mojave River Pipeline, along with the Mojave River itself, deliver this imported water directly to dedicated recharge facilities throughout the various adjudicated subareas. MWA utilizes SWP water primarily for groundwater recharge at these facilities, while maintaining over 250,000 acre-feet of stored water supplies both within local groundwater basins and as carryover storage in the SWP system to provide reliability during drought conditions and ensure long-term water security for the numerous retail water suppliers and end users within its service area.

6.4.1.2 Article 21

Article 21 of MWA's SWP contract outlines the rules for "interruptible water service." Interruptible water service means allocation of water that is essentially surplus in the SWP system and is in addition to the Table A Allocation in any given year. In other words, DWR may determine at a later date that there is additional water that could be delivered to requesting contractors that is in excess to that system-wide Table A Allocation. Article 21 was recently amended (Contract Amendment 17), and outlines the provisions for allocation, notice, and process for obtaining, rates, and transfers of Article 21 interruptible water. Notably, Amendment 17 allows for transfers of Article 21 water from certain SWP contractors to others if the contractor can demonstrate a special need for the transfer.

As a SWP Contractor, the Agency has access to Article 21 water when "excess" water is made available. Article 21 water is identified as non-Table A water that becomes available on an intermittent, interruptible basis. Allocations of Article 21 water are made based on the available supply in proportion to each contractor's annual entitlement as set forth in its Table A for that year.

When available, Article 21 water delivery is typically made in the wettest months of the year, December through May. As such, Article 21 water is sometimes called "wet weather water". It is offered to contractors when there is ample water in the system, and the State publishes a notice to contractors when it is made available. Article 21 water is not available for carryover storage in SWP facilities; however, a change in point of delivery is possible with a separate agreement with DWR in order to store Article 21 water outside of the service area. Notifications of Article 21 water availability come based on forecasting and existing hydrology, and the Article provides for the timely processing of requests by contractors for delivery. Demands are typically submitted for Article 21 water on a weekly basis.

The ability to take advantage of Article 21 water for MWA requires access to conveyance capacity in the aqueduct and available storage outside of San Luis Reservoir. Importantly, that priority for conveyance within the SWP goes to Table A water, and Article 21 water delivery may be interrupted if it is impacting a contractor's Table A water delivery through a shared reach of the aqueduct. The Agency's location on the East Branch of the aqueduct factors into the inherent conveyance priority limitations associated with Article 21 water.

The 2025 SWP Delivery Capability Report indicates that Article 21 availability will be more frequent, especially in very wet years. Between 2000–2020, Article 21 water was available in all but two years; however, during multi-dry year stretches such as 2008–2010 and 2014–2016 the amount of Article 21 water available was orders of magnitude smaller than in normal to wet years. In summary, Article 21 water requires opportunistic operational flexibility for storage and conveyance capacity in the aqueduct to maximize its intermittent availability. Because of this uncertainty, this RUWMP does not include Article 21 as a quantifiable part of MWA’s water supply. Rather, MWA will continue to be opportunistic and access this supply as may best serve longer-term imported water policy objectives and groundwater basin needs.

6.4.1.3 Article 56 Carryover

Article 56 of MWA’s SWP Contract outlines the rules for storing unused Table A Allocation in any year for use in a subsequent year. The Article 56 Carryover water is stored in San Luis Reservoir. There are limitations to the total carryover amounts, subject to a percentage of the Annual Table A Amount, dependent on the final allocation percentage for that year. For example, if the final Table A Allocation was 50% (44,900 AF), MWA could store (carryover) 25% of its Table A Amount (22,450 AF). If storage requests exceed capacity in San Luis Reservoir, the available capacity will be allocated among contractors in proportion to their Table A entitlement. Reallocation can also result in “displacement” of stored water, sometimes known as “spill” that results in stored amounts being released.

Storing water in San Luis Reservoir for multiple years is allowed but comes with risk because of the potential of losing the stored water due to capacity restraints. Nevertheless, storage of SWP water in San Luis Reservoir under Article 56 is a critical component of MWA’s water asset management portfolio because it is a south of Delta storage option that allows carryover in multiple years. As an example of how this supply is managed, MWA had about 20,400 acre-feet of Article 56 supply available coming into the 2025 delivery year.

Due to the circumstances and water management choices made by MWA in 2025, a small amount of the available Table A supply was added to the carryover, resulting in the end-of-year 2025 Article 56 total being slightly over 21,000 acre-feet. Due to hydrologic and operational conditions in early 2026, a portion of this carryover supply was at risk of spilling. MWA anticipates that carryover storage by the end of 2026 will be slightly more than 12,500 acre-feet. The difference is expected to be used as part of MWA’s broader imported water management strategy, including meeting regional needs in 2026, potentially increasing storage in local subareas, and supporting transfers to other SWP contractors.

Although MWA may use its carryover supplies under normal year conditions, it generally preserves these supplies to manage shortage conditions derived from extended drought or catastrophic water outages.

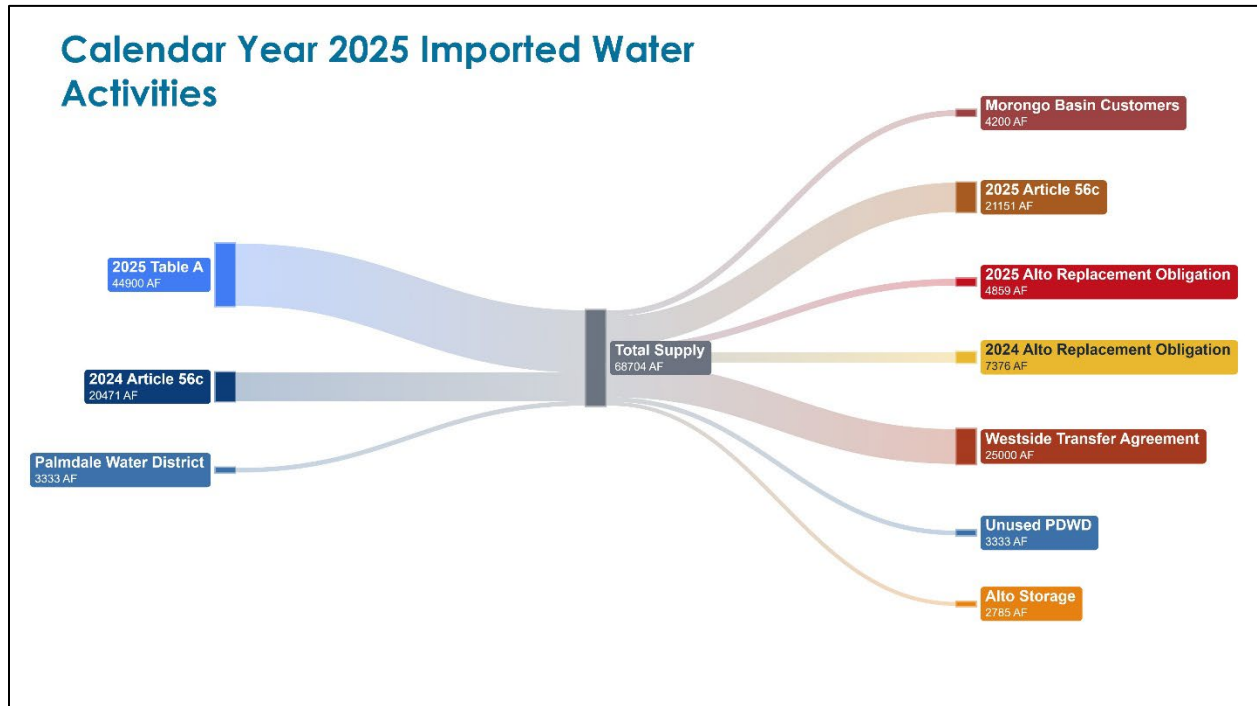
6.4.1.4 Summary of Historic SWP Deliveries

Collectively, MWA manages its SWP water supplies based on a variety of conditions, with each year reflecting a slight variance in both allocations, deliveries into the Region, and storage or sales to other parties. **Table 6-4** shows this variance between 2010 and 2025 while **Figure 6-1** provides a useful representation of how MWA evaluates and tracks its available SWP supplies year-over-year.

TABLE 6-4: SWP ALLOCATION COMPARED TO ACTUAL DELIVERIES INTO MWA SERVICE AREA

Year	Allocation	Table A Amount (AF)	Actual Deliveries (AF)
2010	50%	44,900	35,566
2011	80%	71,840	48,775
2012	65%	58,370	26,175
2013	35%	31,430	7,398
2014	5%	4,490	3,595
2015	20%	17,960	8,909
2016	60%	53,880	23,574
2017	85%	76,330	34,750
2018	35%	31,430	5,869
2019	75%	67,350	21,824
2020	20%	17,960	3,379
2021	5%	4,490	2,306
2022	5%	4,490	4,536
2023	100%	89,800	99,471*
2024	40%	35,920	2,618
2025	50%	44,900	19,220

FIGURE 6-1: EXAMPLE REPRESENTATION OF MWA’S ANNUAL MANAGEMENT OF SWP SUPPLIES



6.4.2 SWP Restrictions

Neither DWR nor the SWP guarantees delivery of 100% of water allocations every year. Under the historic lowest 5% of allocations, SWP deliveries to MWA were 4,490 AF for the year. This, in conjunction with the expected decrease in reliability of the SWP over time, places a significant constraint on the reliability of SWP supplies as a source of imported water for recharge of the Region’s managed groundwater supplies. In addition to SWP system conveyance capacity limitations, MWA’s SWP supplies are also subject to notable policy and regulatory constraints.

6.4.2.1 The Delta Reform Act

The Delta Reform Act (DRA) of 2009 established the Delta Plan and the Delta Stewardship Council.⁴⁰ Ultimately, the DRA requires water purveyors to reduce reliance on water supplies derived from the Sacramento–San Joaquin Delta and improve reliance on locally developed water sources (see this RUWMP’s representation of compliance in *Chapter 3 – Regional Water Supply Characterization*). The Delta Plan is the governing document that guides the Delta’s future and spawned the DRA regional self-reliance policies. The Delta Plan has two “co-equal goals:” (1) providing a more reliable water supply for California; and (2) protecting, restoring, and enhancing the Delta ecosystem.

⁴⁰ California Water Code Section 85225

Specifically, urban water purveyors should demonstrate consistency with Delta Plan Policy WR PI – Reduce Reliance on the Delta Through Improved Regional Water Self-Reliance (WR PI).⁴¹ WR PI subsection (a) states that:

Water shall not be exported from, transferred through, or used in the Delta if all of the following apply:

- 1) One or more water suppliers that would receive water as a result of the export, transfer, or use have failed to adequately contribute to reduced reliance on the Delta and improved regional self-reliance consistent with all of the requirements listed in paragraph (1) of subsection (c);
- 2) That failure has significantly caused the need for the export, transfer, or use; and
- 3) The export, transfer, or use would have a significant adverse environmental impact in the Delta.

The DRA is relevant to MWA’s water asset portfolio and the water asset portfolios of its retailers because the DRA’s rules require reduced reliance on water supplies derived from the Delta in favor of locally developed water supplies. The methodology needed to comply with DRA’s regulatory requirement as noted in the policy is a reduction in “the percentage of water used from the Delta watershed.”

6.4.2.2 Healthy Rivers and Landscapes

The Bay Delta Plan’s Healthy Rivers and Landscapes program, implemented through Voluntary Agreements (VAs), establishes specific “forgone export” requirements that would directly restrict SWP deliveries to south-of-delta contractors. Under these agreements, DWR and the Bureau of Reclamation must reduce exports from key Delta pumping facilities (Jones Pumping Plant and Clifton Court Forebay) based on water year types. The required export reductions range from zero in critical and wet years to 125,000 acre-feet in dry and below normal years, and up to 175,000 acre-feet in above normal years. These forgone exports are designed to ensure that additional upstream flows provided under the VAs actually reach the Delta as outflow rather than being captured by the export facilities.

The restriction mechanism works by establishing “reference conditions” representing pre-VA baseline operations, then requiring that SWP and Central Valley Project operations avoid exporting both these reference flows and the new additive VA flows. This creates a complex accounting system where south-of-delta water contractors would experience reduced deliveries not only from the direct export limitations, but also from the operational constraints needed to ensure VA tributary flows bypass the pumps and contribute to Delta outflow. The

⁴¹ Cal. Code Regs., tit. 23 Section 5003.

program includes detailed daily and monthly tracking requirements to verify that the projects are indeed forgoing exports rather than simply capturing the additional upstream flows, effectively prioritizing ecosystem benefits over south-of-delta water supply reliability.

6.4.3 Delta Conveyance Project

The Delta Conveyance Project (DCP) is a proposed project by DWR to mitigate lost supply to the SWP associated with transporting water through the Sacramento-San Joaquin Delta (Delta). SWP contractors situated south of the Delta are exposed to multiple risk scenarios for long-term SWP supplies, including previously discussed regulatory compliance statutes. Additional mitigation against other water supply risks driven by rising sea levels, earthquakes, progressive risk of levee failures, and extreme drought and flood are also identified as DCP benefits. Continuation of existing operation of the Delta is expected to increasingly expose water users that depend on water exported from the Delta to risks of interrupted water supply and decreasing water supply reliability over time. In short, the DCP is a significant risk mitigation component to help overcome uncertainties associated with conveying SWP water through the Delta.

MWA is an investor and participant in the DCP. The investment costs associated with MWA's role are to fund the work plan and reserve capacity space in the project. The DCP does not increase water rights associated with the SWP but rather would restore losses caused by current physical and regulatory issues and mitigate against future changed conditions affecting SWP exports by adding a new point of diversion in the northern Delta. The Final Environmental Impact Report for the DCP was certified by DWR in December 2023 and a Change in Point of Diversion Petition was filed with State Water Resources Control Board (SWRCB) February 22, 2024. MWA's participation in the DCP is safeguard for long-term supply reliability for the Region and its critical imported water supply.

6.4.4 Evaluating and Managing Supply Reliability Risks

MWA's water supply reliability is anchored by a diverse portfolio that includes SWP allocations, natural and managed groundwater, imported wastewater, return flows, and strategically stored water supplies totaling over 250,000 acre-feet. This diversity provides crucial flexibility in responding to varying hydrological and regulatory conditions, though it also introduces complex interdependencies that require sophisticated risk management approaches.

As both SWP contractor and MBA Watermaster, MWA must navigate the intersection of imported water reliability—in which average delivery projections have declined an estimated 22% over the last 20 years—with local groundwater management obligations under multiple court judgments. The Agency's stored SWP water assets serve as a critical buffer, enabling the system to maintain reliability even during extended drought periods when imported supplies may be curtailed.

Still, MWA's water supply portfolio faces a range of threats that require comprehensive risk assessment and mitigation planning, including SWP operational and regulatory constraints, local infrastructure vulnerabilities, climate change-driven hydrological variability, extended drought scenarios, seismic risk, and other emerging challenges that could impact the Agency's ability to reliably meet regional water demands through the planning horizon.

6.4.5 Evaluating Future Risk Scenarios

MWA's reliability risk management operates within an increasingly complex regulatory environment, requiring coordination with Groundwater Sustainability Plans under the Sustainable Groundwater Management Act (SGMA), compliance with updated Urban Water Management Planning Act requirements, integration with local hazard mitigation planning, and compliance with statutes and authorities protecting federally endangered and threatened species under the Endangered Species Act (ESA), D-1641 Bay Delta Water Quality Control Plan, and California Endangered Species Act (CESA), among others.

Climate change introduces additional layers of complexity to traditional reliability planning. Regional temperature data shows gradual warming trends over the past century, potentially increasing evapotranspiration rates and water demand pressures. While the high desert climate already experiences extreme conditions that limit the impact of incremental change, MWA recognizes the need to incorporate climate vulnerability assessment into long-term planning frameworks.

The significant risks to MWA's water supplies mainly relate to sustained reductions in SWP deliveries. The SWP's own climate adaptation planning, addressing more intense flood and drought cycles and rising sea levels in the Delta, directly impacts MWA's imported supply reliability. The DWR Delivery Capability Report, as discussed previously, indicates the expectation that the long-term average of the SWP deliveries will decrease. This trend of predicted long term average reductions has occurred in previous Delivery Capability Reports as well, and it is clear DWR plans to manage the SWP along these expectations. Even as projects like the Delta Conveyance Project are proposed to alleviate some of this supply reduction, it is only expected to mitigate reductions in supply rather than eliminate or even just stabilize the trend.

The most significant risk in the immediate future would be a sustained drought. If a multi-year severe drought were to impact SWP supplies and the MWA service area simultaneously, MWA would face a period with minimal capacity to recharge groundwater coupled with significant demand from within the service area that would strain basin health. Additionally, groundwater overdraft has led to ground subsidence along certain parts of SWP infrastructure, and while SMGA aims to mitigate subsidence and its impacts to the infrastructure, several groundwater basins across the State are still not in compliance and place the infrastructure at continued risk.

Seismic risks must also be considered in water supply reliability planning. Earthquakes put SWP infrastructure at risk, including dams, pumping plants, aqueducts, tunnels, and pipelines, many of which are located in seismically active parts of the state. Cascading risk such as fire from broken gas or electrical lines and flood risk from damaged dams or levees are also of concern. For instance, a major earthquake in the Bay Area that caused levee failure in the Delta could cause a catastrophic outage of water deliveries that could last for months or longer while repairs were made and salinity levels were restored. Seismic risks to critical infrastructure and potential supply disruptions require seismic monitoring and preparedness, infrastructure improvements, and comprehensive emergency response planning and system hardening strategies.

Water supply infrastructure within the MWA service area also poses potential risks to water deliveries. Significant portions of MWA's pipelines face corrosion challenges, and repairs or replacement could reduce service capacities and the ability to take SWP water deliveries for groundwater recharge. Capital improvement projects must also be aligned to prevent artificial constraints on MWA supplies. Additionally, certain assets face other technical or biological constraints, such as water imports that could impact the Arroyo Toad or debris in the California Aqueduct limiting the ability to take water. These are systemic issues that impact the reliability of MWA's water supplies but are manageable with foresight and prioritized action.

Sub-Chapter 6.5 – Managed Groundwater Storage

As previously indicated, managed groundwater storage represents a critical component of water supply reliability across the Mojave Region, encompassing both the five MBA Judgment subareas and the Morongo Basin. MWA directly stores imported water in the MBA subareas, accounted for as “Managed Groundwater Storage,” and in the Morongo Basin under two separate agreements in the Ames Valley Basin and Warren Valley Basin.

Based on the most recent reporting, MWA maintains approximately 256,000 acre-feet of stored groundwater within the Mojave Basin Adjudication subareas, with an additional 173 acre-feet stored in the Morongo Basin under separate agreements.⁴²

6.5.1 Alto Subarea

The Alto Subarea storage account balance is approximately 194,000 acre-feet. The Alto Subarea above the Lower Narrows continues to serve as the largest repository of MWA’s stored groundwater. Operating parameters have been established with a minimum operating level based on 2016 storage conditions and a maximum level representing eight years of average annual consumptive use (approximately 55,000 acre-feet). Since 1996, the subarea has experienced significant storage depletion, with a cumulative change of -510,826 acre-feet through 2024, though recent years showed recovery with a positive change of 35,963 acre-feet in Water Year 2023-2024. Water levels exhibit seasonal variation near the Mojave River, with declining trends in heavily pumped areas, particularly in the western portion of the Regional Aquifer.

6.5.2 Centro Subarea

The Centro Subarea storage account balance is approximately 35,000 acre-feet. The Centro Subarea operates under defined parameters established since 1997. The minimum operating range reflects the lowest storage since establishment of the Judgment when the basin was considered healthy, with maximum levels representing five years of average annual consumptive use (approximately 18,000 acre-feet). The subarea demonstrated positive storage recovery in Water Year 2023-2024 with a net gain of 29,794 acre-feet.

⁴² Planning, Resources, Engineering, and Operations Committee presentation, March 31, 2026.

6.5.3 Baja Subarea

The Baja Subarea storage account balance is approximately 25,000 acre-feet. The Baja Subarea faces ongoing challenges, having lost approximately over 500,000 acre-feet of groundwater storage since 1996. However, recent trends suggest potential stabilization, with indications that continued pumping at current or lower levels due to reduced agricultural operations may halt continuous depletion. Optimal operating parameters remain under development.

6.5.4 Este Subarea

The Este Subarea storage account balance is approximately 1,300 acre-feet. The Este Subarea appears to maintain natural balance, with water supply and use remaining balanced over the past 20 years based on water level data. The subarea achieved equilibrium in Water Year 2023-2024 with no net change in storage. While optimal operating parameters have not been formally established, the long-term stability suggests sustainable management under current conditions. MWA has developed demonstration groundwater recharge facilities in the subarea and is continuing geotechnical investigations to support future recharge basin development.

6.5.5 Oeste Subarea

The Oeste Subarea currently maintains no MWA stored water accounts but demonstrates natural balance between water production, supply, and outflow. Water level data indicates short-term stability, leading to a "no change in storage" designation for planning purposes. MWA has installed monitoring wells and approved design of a pilot recharge basin on a 10-acre Agency-owned parcel.⁴³ Geotechnical investigations are also ongoing to identify optimal locations for future off-Mojave River recharge facilities.

6.5.6 Morongo Basin

Beyond the MBA subareas, MWA maintains strategic storage in the Morongo Basin through two separate agreements. Storage includes 173 acre-feet in the Ames-Reche Management Area but zero acre-feet in Joshua Basin. The Ames-Reche Agreement covers 95 square miles and involves multiple agencies including Bighorn Desert View Water Agency and Hi-Desert Water District. Since 2012, water levels across the Ames-Reche Management Area have remained relatively stable, with annual pumping around 1,200 acre-feet compared to the established baseline of 1,646 acre-feet per year. The Warren Valley Basin within the Morongo area benefits from imported water deliveries through the Morongo Basin Pipeline, supporting

⁴³ MWA Watermaster 2023-2024 Supply Conditions Report at p. 16.

both the Warren Valley Basin Judgment requirements and enhanced storage management. Water levels have generally increased since implementation of recharge and management actions.

6.5.7 Summary of Managed Groundwater Storage by Subregion

When organized into the three Subregions discussed in *Chapter 2 – The Mojave Region*, the Managed (Stored) Groundwater Storage is:

Subregion 1: 194,000 AF (*Alto*) + 1,300 AF (*Este*) + 0 AF (*Oeste*) = 195,300 AF

Subregion 2: 35,000 AF (*Centro*) + 25,000 AF (*Baja*) = 60,000 AF

Subregion 3: 173 AF (*Ames*) = 173 AF

While no formal minimum storage target has been set by MWA, this supply is viewed as a vital contingency source for potential repeating instances of very low SWP Table A Allocations in consecutive years – or for other drivers impacting the current year’s SWP Table A availability. As such, this source is recognized as available to meet Subregional demands whenever native groundwater (e.g. FPA for parties subject to the MBA Judgment), local recycled supplies, and anticipated Table A supplies are insufficient.

This supply is also available to help retail suppliers meet demands during future periods where demand may exceed the supply shown in their retail chapters in interim years but fall within the total 2050 supply shown in this RUWMP. Overall, use of this supply is represented within this RUWMP by making these supplies available in forecast supply tables for multiple dry year supply reliability in any event where a shortfall in Table A, native groundwater, or recycled water is projected prior to the use of the managed storage (see *Chapter 5 – Regional Water Service Reliability*).

6.5.8 Water Quality

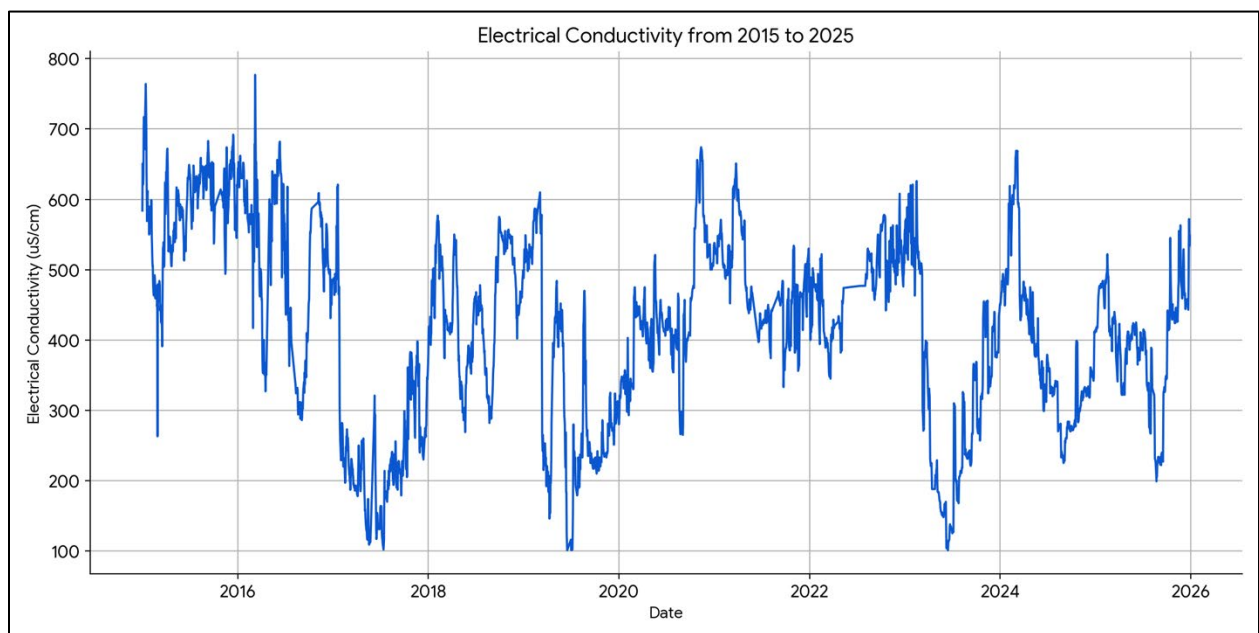
This subsection focuses on the quality of State Water Project supplies imported into the region and recharged into the various portions of the groundwater basins and adjudicated areas throughout the Mojave Region. A discussion of groundwater quality is included in *Chapter 3 – Regional Water Supply Characterization*.

The quality of imported surface water conveyed through the California Aqueduct is monitored by the DWR Division of Operations and Maintenance. DWR maintains 16 continuous water quality monitoring stations located throughout the SWP and data collected from these stations is regularly updated to the California Data Exchange Center (CDEC). The parameters for monitoring SWP water quality include electrical conductivity, water temperature, turbidity, pH, and fluorescence. SWP water quality changes as the water moves from precipitation and snowmelt runoff in Northern California to its termination points in Southern California. As such,

the water quality measurements at each station are important for purposes of tracking water quality constituents in the SWP system.

Of the 16 water quality monitoring stations, Check 66 is located closest to MWA’s turnouts and Check 41 is examined to align operational decisions and data monitoring. Check 66 is located at an elevation of 3,448 feet in San Bernardino County near the City of Hesperia in the South Lahontan Hydrologic Region (see **Figure 2-7**). **Figures 6-2** through **6-4** show the measured publicly available electrical conductivity, temperature, and turbidity at Check 66 since 2015 through 2025. **Figure 6-5** shows pH at the Check 41 Kern measurement location and **Figure 6-6** shows fluorescence at the Pacheco Pumping Plant.⁴⁴

FIGURE 6-2: CHECK 66 ELECTRICAL CONDUCTIVITY 2015-2025



⁴⁴ These varying water quality monitoring station locations were chosen because Check 66 does not collect these water quality parameters and the Kern location (Check 41) and Pacheco Pumping Plant monitoring stations were the nearest to Check 66.

FIGURE 6-3: CHECK 66 WATER TEMPERATURE 2015-2025

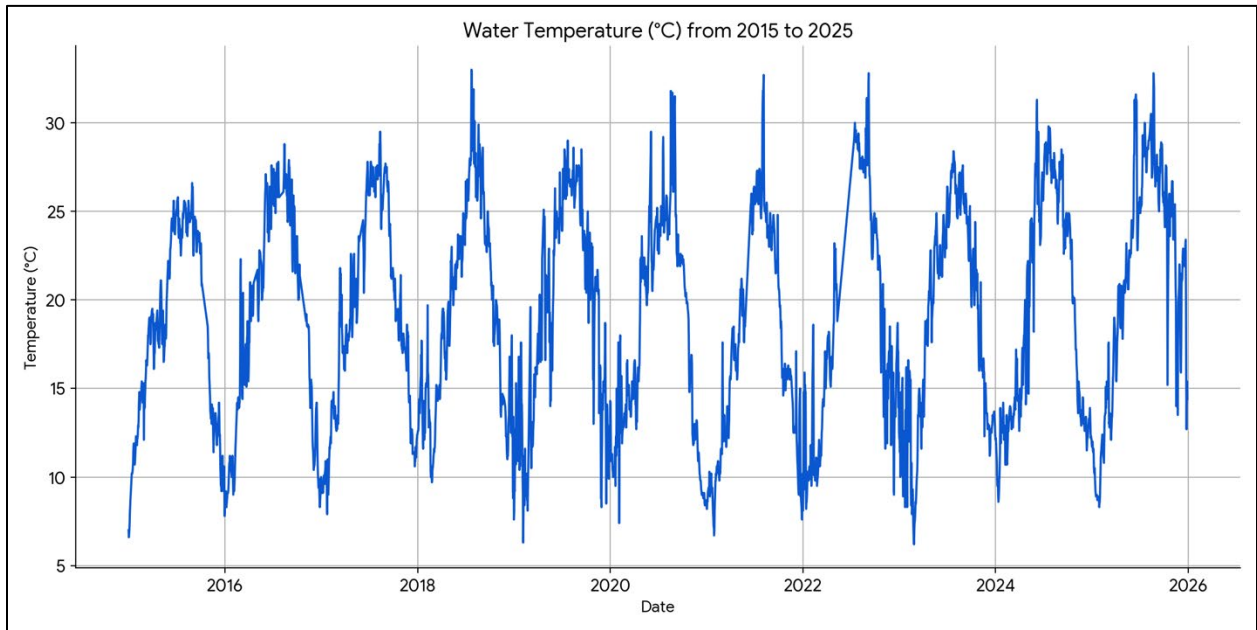


FIGURE 6-4: CHECK 66 WATER TURBIDITY 2015-2025

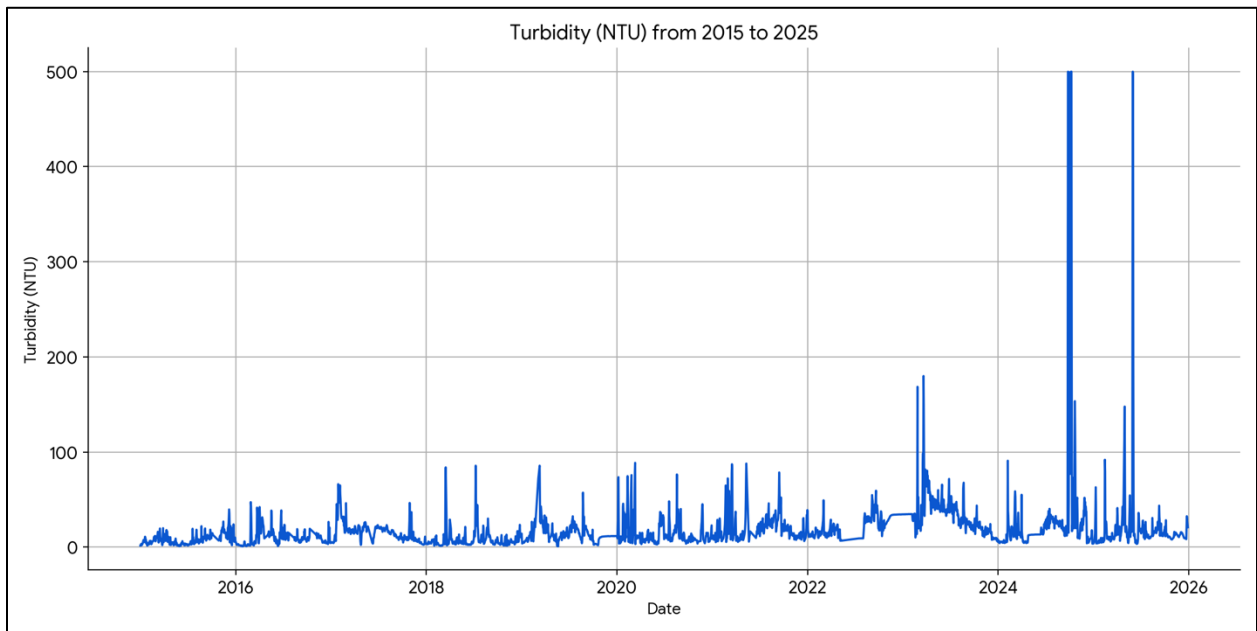


FIGURE 6-5: CHECK 41 (KERN) PH VALUE (2015-2025)

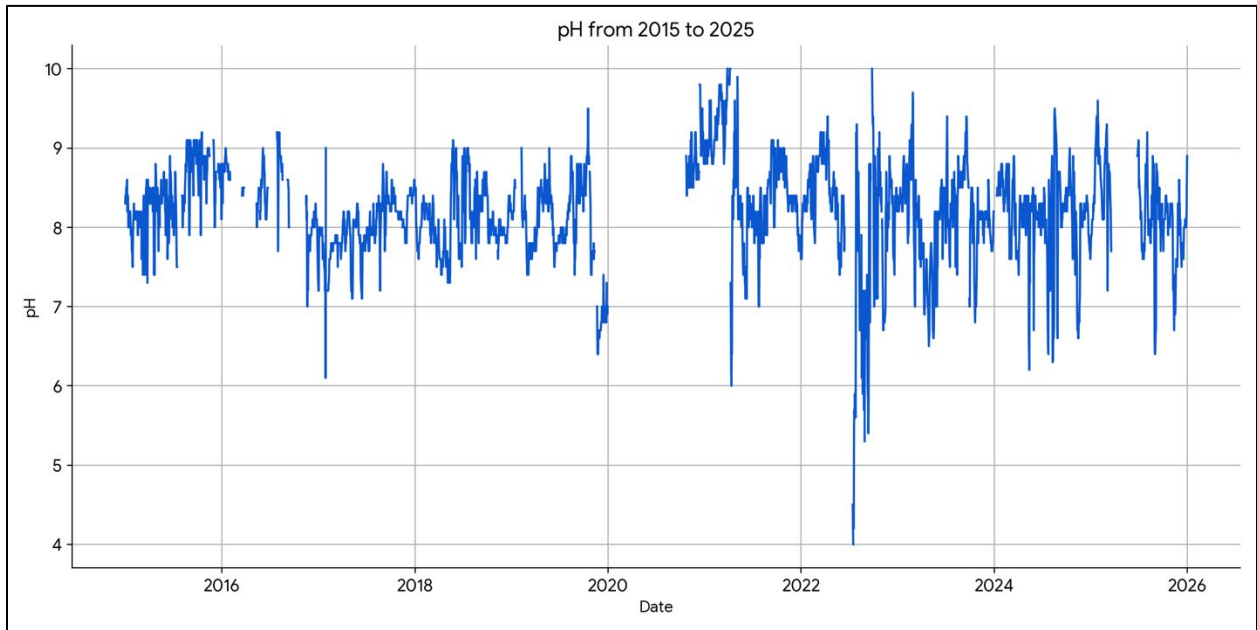
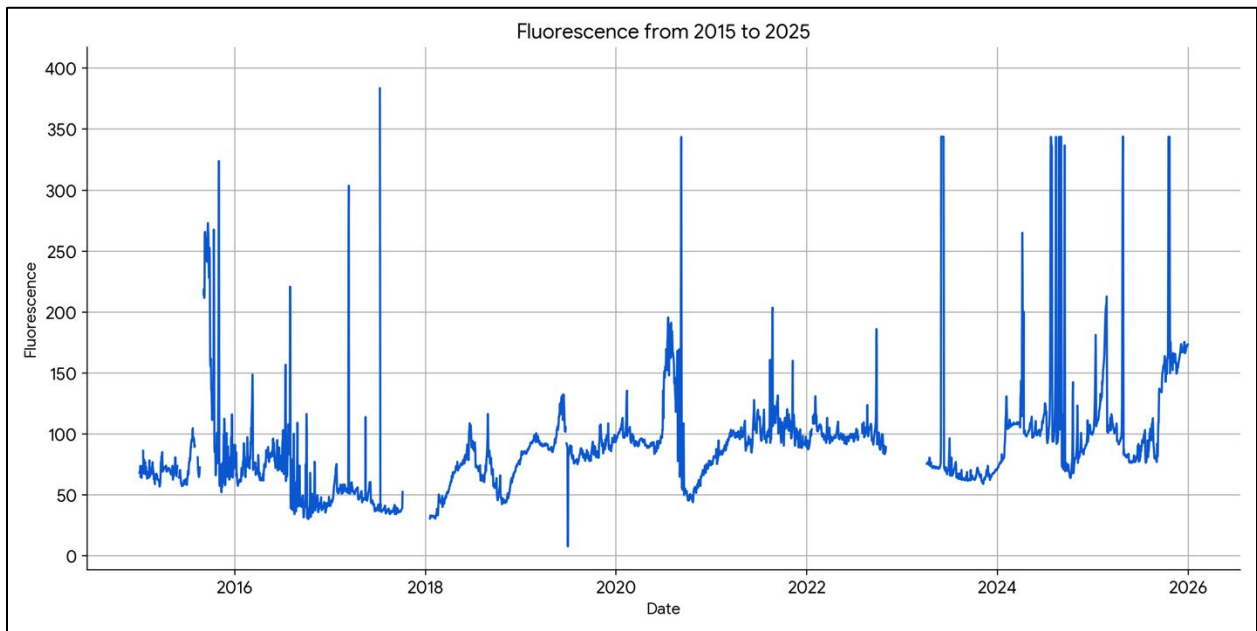


FIGURE 6-6: PACHECO PUMPING PLANT FLUORESCENCE 2015-2025



6.5.9 Recycled Water Supplies

MWA is not directly involved with the creation or distribution of recycled water supplies. This activity does occur within a few of the retailer's service areas, notably Hesperia Water District and the City of Victorville. MWA has zero recycled water supplies nor forecasts for such supplies.

6.5.10 Desalination Opportunities

The California UWMP Act requires a discussion of potential opportunities for use of desalinated water (Water Code Section 10631[i]). This discussion takes place in *Section 3.1.3 of Chapter 3 – Regional Water Supply Characterization*.

6.5.11 Water Transfers and Exchanges

MWA engages in water transfers and exchanges involving its SWP assets and other SWP Contractors' SWP assets. Historically, MWA has both received and delivered water through these transfers and exchanges with various agencies throughout California. These transfers are essentially spot market transfers where short-term opportunities are identified and then actions taken for purchase and acquisition. These transfers help support management of MWA's and its retail agencies' water supply portfolios. Future MWA transfers and exchanges depend upon allocations available to MWA and other water purveyors and are not considered an available supply for purposes of this RUWMP.

6.5.12 Supply Summary

Mojave Water Agency operates a diverse and strategically managed water supply portfolio that serves over 500,000 residents across a 4,900-square-mile service area. As both a SWP contractor and MBA Watermaster, MWA's water supply strategy centers on importing surface water for groundwater recharge to support sustainable management of local groundwater basins.

MWA's water supply portfolio consists of four primary components that work together to provide reliable water service through varying hydrological conditions. SWP imports form the foundation of MWA's supply strategy, with a maximum annual Table A contract amount of 89,800 acre-feet delivered through six turnout locations on the East Branch of the California Aqueduct. These imported supplies are primarily used for groundwater recharge rather than direct service delivery, supporting the adjudicated basin management framework that governs regional water use.

This integrated portfolio enables MWA to maintain water supply reliability across normal, single dry year, and multiple dry year conditions. The Agency's water supply diversification includes annual imported water deliveries combined with strategically managed locally

stored groundwater as well as SWP carryover supplies. A summary of MWA’s water supply portfolio is shown in **Table 6-5**.

TABLE 6-5: MWA WATER SUPPLY PORTFOLIO SUMMARY

Source	Annual Amount	Description
State Water Project – Table A	89,800	Maximum Table A contract amount; actual deliveries vary (46% average 2010–2025)
SWP – Article 21	Variable	Intermittent SWP surplus water when available
SWP – Article 56 Carryover	Variable	Stored SWP allocation in San Luis Reservoir
Managed Groundwater Storage	256,000 ⁴⁵	Storage across Mojave Basin subareas and Morongo Basin

For purposes of this RUWMP, the forecast of MWA’s SWP supplies are presented in **Table 6-6** and **Table 6-7**.

TABLE 6-6: MWA’S PROJECTED SWP SUPPLY FOR 2026 – 2030 (AFY)

Year		SWP Contract Table A	Percent Allocation	Allocation Amount
Normal		89,800	54%	48,492
Single Dry		89,800	5%	4,490
Multi-Year Drought	2026 (1st year)	89,800	35%	31,430
	2027 (2nd year)	89,800	5%	4,490
	2028 (3rd year)	89,800	5%	4,490
	2029 (4th year)	89,800	20%	17,960
	2030 (5th year)	89,800	35%	31,430

⁴⁵ March 2026 State Water Project Allocation and Imported Water Operations Plan Update, Presentation on March 31, 2026 to the Planning, Resources, Engineering, and Operations Committee.

TABLE 6-7: MWA’S PROJECTED SWP SUPPLY THROUGH 2050 (AFY)

Total Supply		Percent Allocation	2030	2035	2040	2045	2050
Normal		54%	48,492	48,492	48,492	48,492	48,492
Single Dry Year		5%	4,490	4,490	4,490	4,490	4,490
Multi-Year Drought	Year 1	35%	31,430	31,430	31,430	31,430	31,430
	Year 2	5%	4,490	4,490	4,490	4,490	4,490
	Year 3	5%	4,490	4,490	4,490	4,490	4,490
	Year 4	20%	17,960	17,960	17,960	17,960	17,960
	Year 5	35%	31,430	31,430	31,430	31,430	31,430

The characterizations of MWA’s SWP Table A Allocation long-term reliability reflect numerous hydrological and regulatory issues that inform the State’s DCR modeling, are reasonable assessments related to SWP system management, and reflect MWA’s local conditions. Long-term water management hydrological and regulatory issues include the Bay-Delta Water Quality Control Plan, the Coordinated Operations Agreement, the Delta Biological Opinion, the Delta Conveyance Project, modifications to San Luis Reservoir, SWP seismic considerations, DWR’s Emergency Planning, and assessments related to MWA’s local groundwater conditions and climate. MWA thoughtfully engages on all these issues and undertakes actions that help mitigate supply related impacts that may be caused by one or more listed items. These issues are all considered in MWA’s planning and incorporated into its supply characterizations in this RUWMP.

6.5.13 Groundwater within the Remaining Areas of the Mojave Region

Besides its primary role as an importer of SWP supplies, MWA provides the geographic representation for the use of groundwater throughout the rest of the Region that is outside the service areas of the participating RUWMP retailers. The demand for water mostly reflects the other small retail water suppliers, rural domestic users, agricultural users, and large and small industries that are subject to the MBA Judgment.

Like to the other retail agencies, these users pump groundwater from the adjudicated MBA, specifically in Subregion 1 and Subregion 2 (see **Figure 2-3**). As discussed elsewhere, the basins used to meet these demands are recharged through several means, including natural recharge from the Mojave River, lateral subsurface groundwater movement from the adjacent San Gabriel mountains, imported water from the State Water Project (managed by MWA), and other sources like irrigation runoff, return flows from septic systems and water

delivery systems, and treated wastewater effluent. A detailed description of the MBA, Subareas, aquifer characteristics, adjudication, management areas, and other adjudicated basins is presented in *Chapter 2 – The Mojave Region*.

6.5.13.1 Mojave Region’s Remaining Free Production Allowance

Under the MBA Judgment, each producer is assigned a Free Production Allowance (FPA), representing the annual quantity of groundwater that may be extracted without replacement obligations. The FPA for each participating retail water supplier is discussed and quantified for near- and long-term forecasts in each of their respective Chapters. For the remaining areas of the Mojave Region not part of the retail service areas, particularly in Subregion 1 and Subregion 2, there is a cumulative FPA that represents the near- and long-term FPA available to meet all these other users and uses. This groundwater is not controlled directly by MWA as a water supply but is managed through MWA’s role as the MBA Watermaster and represented in determinations of Base FPA.

For purposes of fully representing available FPA, this subchapter uses recent FPA quantities as they are presented by the MBA Watermaster in recent reports. Specifically, the forecast availability of native groundwater is determined by removing the retailer-specific FPA from the MBA Watermaster report for Base FPA.⁴⁶ This value, along with the representation of MWA’s imported supply, is reflected in the water supply summary tables presented in *Chapter 3 – Regional Water Supply Characterization*.

Subregion 1 – Total annual Base FPA is approximately 70,400 acre-feet. Total RUWMP Retailer FPA is approximately 38,000 acre-feet. Remaining Base FPA is approximately 32,300 acre-feet.

Subregion 2 – Total annual Base FPA is approximately 39,600 acre-feet. Total retailer FPA is approximately 8,050 acre-feet. Remaining Base FPA is approximately 31,500 acre-feet.

⁴⁶ Water Year 2024–2025 Watermaster Report, Appendix B–Summary, p. 15 of 16.

Sub-Chapter 6.6 – Water Use Characterization

This sub-chapter describes the methodology used to forecast water demands within MWA’s service area that occur outside the service area boundaries of the ten participating urban water retail suppliers addressed in Chapters 7 through 16. These demands include small water systems, rural domestic users, agricultural uses, industrial uses, and golf course and recreational uses that are not otherwise quantified in the individual retailer chapters. Because MWA’s service area is concurrent with the Mojave Region, these demands are part of the overall regional water use forecast and are necessary to evaluate MWA’s wholesale water supply planning responsibilities.

Current regional water use, including use by participating urban water retail suppliers and other water users within the Mojave Region, is summarized in *Section 4.4.1 – Current Regional Water Use of Chapter 4 – Water Use Characterization*. Section 4.4.1 presents recent water use by major category and subregion and provides the current-use accounting used for the regional demand analysis. To avoid duplicating these tables and descriptions, this sub-chapter focuses on the methodology used to project future demands for small water systems and rural domestic users, industrial uses, golf course, recreational uses, and agricultural uses outside the service areas of the participating RUWMP retailers.

The resulting forecasts are incorporated into the regional demand summaries presented in *Chapter 4 – Water Use Characterization* and carried forward into *Chapter 5 – Regional Water Service Reliability*. Accordingly, this sub-chapter does not repeat the regional demand totals presented in Chapter 4 or the retailer-specific forecasts presented in Chapters 7 through 16. Instead, it presents the other-use demand forecasts developed for MWA’s wholesale planning purposes and documents the assumptions, data sources, and methods used to develop those values. When combined with the applicable retailer forecasts, these other-use demands form the basis for the Subregion and Regional demand totals summarized in **Tables 4-5 through 4-8**.

6.6.1 Forecasting Water Demands Outside Participating Retailer Service Areas

Small retail water supplier and rural domestic uses, agricultural uses, industrial uses, recreational uses, and golf course uses were forecast separately from the demands developed for the participating urban water retail suppliers. For the adjudicated portions of

MWA’s service area, these categories are tracked and reported annually by the Mojave Watermaster by adjudicated subarea. The Watermaster-reported production data were used as the primary basis for characterizing historical use and developing future demand forecasts in Subregions 1 and 2.

The Morongo Subarea is not part of the MBA adjudication, and comparable Watermaster-reported production data are not available for water uses outside of Hi-Desert Water District and Joshua Basin Water District. Accordingly, small retail water supplier and rural domestic, agricultural, industrial, recreational, and golf course demands outside of those retailer service areas were estimated using best available planning-level information, including available supplier data, land use and spatial information, and demand assumptions developed as part of MWA’s broader demand analysis.

6.6.1.1 Small Water Systems and Rural Domestic Use

MWA’s service area includes small public water systems and rural domestic users located outside the service area boundaries of the participating urban water retail suppliers. *Chapter 2 – The Mojave Region* presents the overall population associated with MWA’s wholesale demand area; however, this sub-chapter focuses on the methodology used to translate that population into projected water demands. For the adjudicated portions of MWA’s service area, small water system and rural domestic use is tracked through Mojave Watermaster reporting. Water use for small public water systems is generally metered and reported, while use by small private pumpers, which primarily reflects rural residential domestic use, is estimated by the Mojave Watermaster. These data were used to characterize recent historical use and develop a representative per-capita demand factor.

Future demand for this user class within Subregions 1 and 2 was estimated by dividing the reported total water use by the associated small water system and rural domestic population. In 2025, this user class within Subregions 1 and 2 had an estimated population of approximately 72,023 and a total water use of 14,544 acre-feet, resulting in an estimated use factor of 178 gallons per capita per day, or approximately 0.20 acre-feet per person per year. This use factor is generally consistent with values calculated using 2021 through 2024 data and was therefore determined to be representative of recent and future demand conditions for this user class.

In 2025, the small water system and rural domestic population within Subregion 3 was estimated at approximately 12,580. However, because the Morongo Subarea is not part of the Mojave Basin Area adjudication, no comparable Watermaster reporting framework exists to track small water system and rural domestic production outside the service areas of Hi-Desert Water District and Joshua Basin Water District. Thus, future demands for this user class in Subregion 3 were estimated by applying the 0.20 acre-foot per person per year use factor developed from Subregions 1 and 2 to the Subregion 3 small water system and rural domestic population projections.

The resulting demand forecast was developed by applying the representative 0.20 acre-foot per person per year use factor to the small water system and rural domestic population projections presented in **Table 6-2**. Projected demands for this user class are summarized by Subregion in **Table 6-8** and rounded to the nearest 5 acre-feet.

TABLE 6-8: PROJECTED SMALL WATER SYSTEM AND RURAL DOMESTIC DEMAND 2030-2050 (AFY)

Subregion	2030	2035	2040	2045	2050
Subregion 1	11,550	11,370	10,925	10,420	9,310
Subregion 2	2,805	2,760	2,650	2,530	2,260
Subregion 3	2,475	2,435	2,340	2,230	1,995

Helendale Community Services District represents a notable component of the small water system and rural domestic demand forecast in Subregion 1. In 2025, Helendale CSD accounted for approximately 13% of Subregion 1’s small water system and rural domestic demand. Although Helendale CSA does not currently meet the UWMPA reporting threshold and is therefore not required to prepare an individual UWMP, it is one of the larger small retail water suppliers within the Mojave Region and is approaching the statutory threshold for UWMP preparation. Appropriately, Helendale CSD was included in MWA’s wholesale demand forecast and coordinated during development of the RUWMP, but its demands are addressed within this MWA wholesale chapter rather than in a separate retailer chapter.

6.6.1.2 Agricultural Use

Like the majority of groundwater users governed by the MBA Adjudication, agricultural users are assigned an FPA that is monitored by the Mojave Watermaster. Agricultural use has historically represented one of the larger water use categories in the Mojave Region; however, agricultural demands have declined substantially over the past several decades as production has adjusted to the adjudication framework and changing land use conditions. Watermaster Annual Production Reports prepared since the 2020 MWA Wholesale UWMP indicate that agricultural has continued to decline below levels previously projected, particularly in the Centro and Baja Subareas where some agricultural lands have converted to solar development.⁴⁷

For purposes of this 2025 RUWMP, the 2025 agricultural demand of approximately 14,500 acre-feet is considered representative of long-term planning conditions. Therefore, agricultural demands are held constant by Subregion through 2050. The resulting agricultural demand forecast, rounded to the nearest five acre-feet, is presented in **Table 6-9**.

⁴⁷ Regional Agricultural Water Use from 2021 through 2025 is presented in Table 4-1.

TABLE 6-9: PROJECTED AGRICULTURAL DEMAND 2030-2050 (AFY)

Subregion	2030	2035	2040	2045	2050
Subregion 1	3,000	3,000	3,000	3,000	3,000
Subregion 2	11,500	11,500	11,500	11,500	11,500
Subregion 3 ⁴⁸	0	0	0	0	0

6.6.1.3 Industrial, Golf Course, and Recreational Uses

Industrial, recreational, and golf course uses outside the service area boundaries of the participating urban water retail suppliers were forecast separately from the small water system, rural domestic and agricultural demands. For the adjudicated portions of MWA’s service area, these uses are tracked by the Mojave Watermaster and reported in the Watermaster Annual Production Reports. Based on recent reporting, these use categories have shown modest declines between 2021 and 2025, with no identified growth trend or known development activity indicating a near-term increase in demand.

For purposes of this 2025 RUWMP, 2025 water use was determined to be representative of long-term planning conditions for industrial, recreational, and golf course uses. Accordingly, the 2025 demand values are held constant by subregion through 2050. For Subregion 3, demands outside the service area boundaries of Hi-Desert Water District and Joshua Basin Water District were estimated using publicly available aerial imagery, remote sensing data, and land use information as the Morongo Subarea is not subject to a centralized Watermaster reporting framework. The resulting demand forecast, rounded to the nearest five acre-feet, is presented in **Table 6-10**.

⁴⁸ A spatial review using aerial imagery, remote sensing data, and land use information confirmed the no agricultural use in Subregion 3. This review was conducted because the Morongo Subarea is not subject to a centralized Watermaster reporting framework comparable to the MBA adjudicated subareas.

TABLE 6-10: PROJECTED INDUSTRIAL, RECREATIONAL, AND GOLF COURSE DEMAND 2030-2050 (AFY)

Subregion		2030	2035	2040	2045	2050
Industrial	Subregion 1	4,400	4,400	4,400	4,400	4,400
	Subregion 2	2,600	2,600	2,600	2,600	2,600
	Subregion 3	335	335	335	335	335
Recreational	Subregion 1	5,400	5,400	5,400	5,400	5,400
	Subregion 2	1,800	1,800	1,800	1,800	1,800
	Subregion 3	50	50	50	50	50
Golf Course	Subregion 1	5,000	5,000	5,000	5,000	5,000
	Subregion 2	0	0	0	0	0
	Subregion 3	215	215	215	215	215

The forecasts presented in **Tables 6-8** through **6-10** represent the water demand components within MWA’s service area that are outside the service area of the participating urban water retail suppliers. These forecasts are not intended to replace or duplicate the regional demand summaries presented in *Chapter 4 – Water Use Characterization*. Rather, they provide the supporting other-use demand values that are combined with the applicable retailer demand forecasts to develop the Subregion and regional demand totals presented in **Tables 4-5** through **4-8**. The integrated regional demand forecast is then carried forward into *Chapter 5 – Regional Water Service Reliability*.

Sub-Chapter 6.7 – Water Conservation and Shortage Response

Pursuant to CWC Sections 10631(e) and 10632, this sub-chapter summarizes the MWA’s demand management measures and water shortage response framework. As a wholesale urban water supplier, MWA’s conservation and shortage response responsibilities differ from those of the participating retail water suppliers. MWA does not generally provide direct retail water service; rather, it supports regional water reliability through imported water management, groundwater recharge, stored water management, regional conservation coordination, and administration of adjudicated groundwater management responsibilities.

MWA’s demand management efforts are focused on supporting efficient regional water use, coordinating conservation messaging and programs with participating agencies, and maintaining long-term reliability of the groundwater supplies that serve the Mojave Region. These efforts complement the retail-level demand management measures implemented by the participating urban water retail suppliers within their respective service areas.

MWA’s Water Shortage Contingency Plan (WSCP), adopted with the 2020 UWMP and readopted as part of this 2025 RUWMP, provides the Agency’s framework for evaluating water supply conditions and responding to potential shortages. The WSCP addresses water supply reliability, Annual Water Supply and Demand Assessment procedures, six standard shortage levels, shortage response actions, communication protocols, legal authorities, financial considerations, reevaluation procedures, and plan adoption and availability. Because MWA’s role is regional and wholesale in nature, implementation of the WSCP emphasizes coordination with retail water agencies, management of available imported and stored supplies, and actions to mitigate extended drought conditions or catastrophic interruptions to regional water supply availability.

No substantive changes have been made to MWA’s 2020 WSCP for purposes of this 2025 RUWMP. However, the water supply reliability analysis, demand forecasts, drought risk assessment, and related planning assumptions have been updated through the 2025 RUWMP. Accordingly, the WSCP remains applicable as MWA’s shortage response framework, while the updated reliability findings presented in this chapter and in *Chapter 5 – Regional Water Service Reliability* provide the current basis for evaluating supply conditions over the planning horizon.

A complete description of MWA’s WSCP, including detailed implementation procedures and supporting documentation, is provided in Appendix 4.

6.7.1 Demand Management Measures

MWA has implemented a broad set of demand management measures (DMMs) to promote efficient use of water resources and support long-term regional water supply reliability. Because MWA functions primarily as a wholesale water supplier, State Water Project contractor, and regional groundwater management agency, its DMMs differ from those implemented by retail water suppliers. MWA does not generally provide direct retail water service or regulate day-to-day customer water use within the service areas of participating urban water retail suppliers. Instead, MWA’s DMMs focus on regional conservation coordination, public education and outreach, technical support, water use efficiency programs, regional supply planning, and management of imported and stored water supplies.

MWA’s DMMs are implemented in coordination with participating retail agencies, small water systems, rural domestic users, and other regional water users. These efforts complement the retail-level DMMs described in the individual retailer chapters of this RUWMP and help provide a consistent regional framework for water conservation, efficient water use, and long-term reliability planning.

MWA will continue to implement and refine its DMMs to support efficient water use, regional water supply reliability, and compliance with applicable State requirements. Additional information regarding MWA’s foundational, recent, and planned DMM activities is provided in the following subsections.

6.7.2 Foundational Demand Management Measures

MWA’s foundational DMMs remain generally consistent with those described in the 2020 UWMP and continue to serve as the basis for regional conservation and water use efficiency efforts. These measures include metering of imported water deliveries, public education and outreach, conservation program coordination and staffing support, distribution system asset management for MWA-owned facilities, and wholesale supplier assistance.

Water Measurement and Accounting

MWA measures State Water Project deliveries received through its turnouts and tracks water delivered to recharge, recovery, and other Agency-managed facilities. These data support regional water accounting, operational planning, and long-term supply reliability analyses.

Public Education and Outreach

MWA implements public education and outreach programs to promote efficient water use throughout the Mojave Region. These efforts include conservation messaging, educational materials, public presentations, workshops, community events, and coordination with regional partners such as the Alliance for Water Awareness and Conservation.

Conservation Program Coordination and Staffing Support

MWA supports regional conservation through dedicated program coordination, staffing, and funding. These efforts include technical and administrative support for conservation programs, participation in regional events and conferences, and support for rebate, education, and outreach activities that encourage efficient water use across the Region.

MWA-Owned Facility Management

MWA operates and maintains facilities associated with imported water delivery, recharge, recovery, and regional water supply management. MWA monitors and maintains these facilities to support reliable operations, accurate flow measurement, water quality compliance where applicable, and efficient use of imported and stored water supplies.

Wholesale Supplier Assistance

MWA provides technical, financial, and programmatic assistance to retail suppliers and regional partners to support conservation and water-use efficiency. This assistance includes coordination through regional conservation programs, support for public information and education efforts, and implementation of programs that help retail suppliers and their customers reduce demand where appropriate.

6.7.2.1 Recent DMM Activities

Since the 2020 UWMP, MWA has continued to implement regional conservation, education, and coordination activities. These efforts have included continued public outreach, regional conservation messaging, coordination with participating retail agencies, support for conservation programs, and development of updated regional planning analyses through the 2025 RUWMP.

6.7.2.2 Planned DMM Activities

MWA will continue implementing DMMs that reflect its wholesale and regional water management role. Planned activities include continued coordination with participating retail agencies, ongoing public education and outreach, support for regional conservation programs, continued measurement and accounting of imported and stored supplies, and maintenance of MWA-owned facilities needed to support long-term regional water supply reliability.

6.7.3 Water Shortage Contingency Plan

MWA has adopted a WSCP in accordance with CWC Section 10632. The WSCP establishes a structured framework for evaluating regional water supply conditions, coordinating with retail water suppliers, and implementing appropriate response actions during drought, constrained imported water conditions, or other supply interruptions. Because MWA functions as a wholesale water supplier, SWP contractor, and regional groundwater management agency, the WSCP is focused on regional supply management and coordination rather than direct regulation of retail customer water use.

6.7.3.1 Summary of Water Shortage Levels and Response Actions

MWA's WSCP includes six standard shortage stages corresponding to progressively severe shortage conditions of up to 10%, 20%, 30%, 40%, 50% and greater than 50%. These stages provide a consistent framework for evaluating the relative severity of regional supply constraints. However, unlike retail shortage stages, MWA's stages are implemented primarily through wholesale and regional water management actions, including use of stored supplies, access to flexible or alternative supplies, coordination of voluntary demand reduction messaging, and operational adjustments to MWA facilities, including R-Cubed deliveries where appropriate.

Stage 1 – Up to 10% Shortage:

During Stage 1, MWA may access stored supplies, as needed, to address supply deficits. MWA may also coordinate voluntary conservation messaging with retail agencies, public agencies, and the broader community to encourage efficient water use and communicate the potential for future shortage conditions.

Stage 2 – Up to 20% Shortage:

During Stage 2, MWA may continue to access stored supplies while increasing coordination with retail agencies. MWA may also implement voluntary demand reduction messaging and reduce R-Cubed deliveries, as appropriate, to help align supply availability with projected demands.

Stage 3 – Up to 30% Shortage:

During Stage 3, MWA may intensify regional coordination, continue use of stored supplies, and further evaluate operational adjustments to MWA-managed facilities. R-Cubed deliveries may be reduced in coordination with affected retail agencies, while voluntary demand reduction messaging may be expanded to address increased severity of the shortage condition.