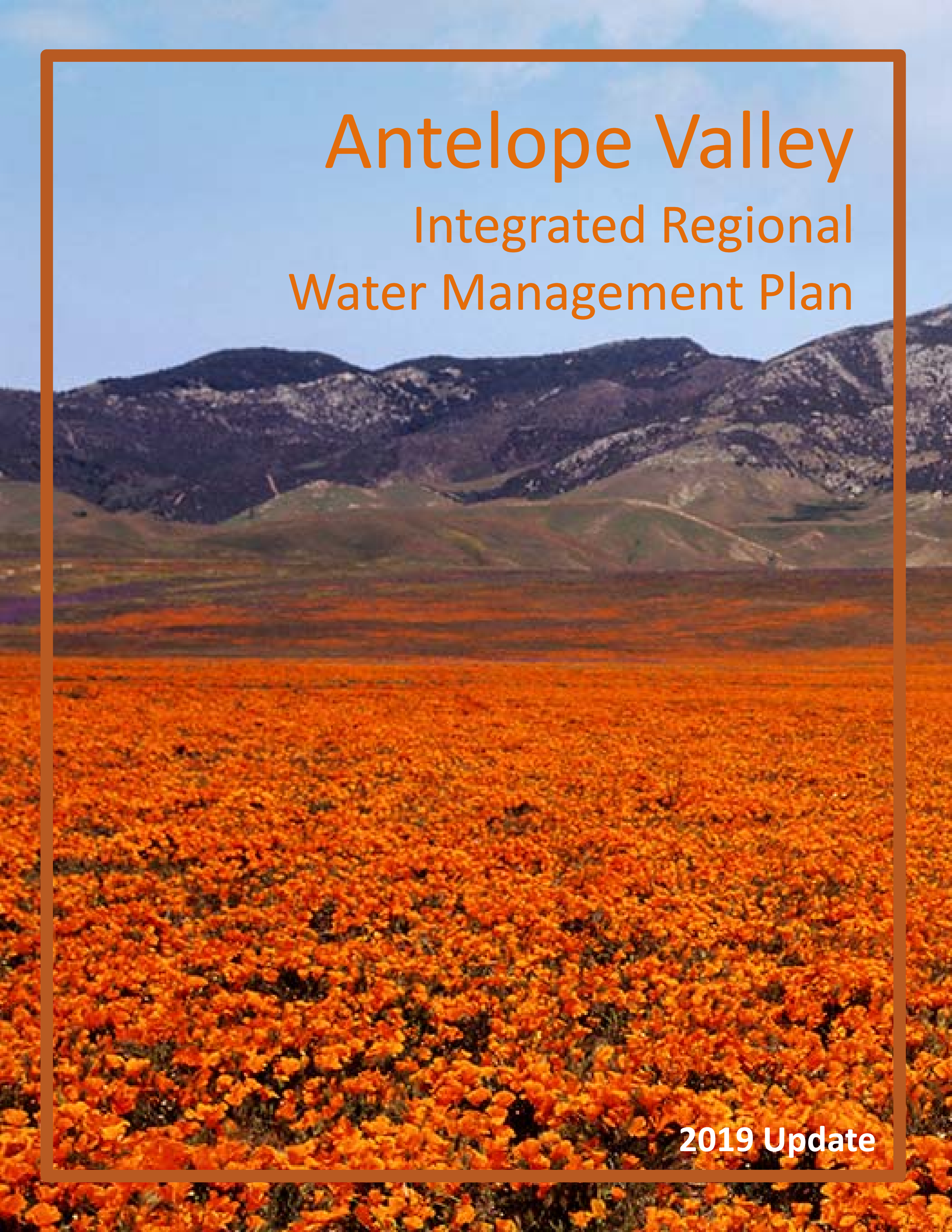
# Antelope Valley

## Integrated Regional Water Management Plan



**2019 Update**

2019 Update

# Antelope Valley Integrated Regional Water Management Plan

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# Executive Summary

## Antelope Valley Integrated Regional Water Management Plan Overview

This document is the 2019 Antelope Valley Integrated Regional Water Management (IRWM) Plan Update (2019 Plan Update). It includes new information as required by the California Department of Water Resources' (DWR) 2016 Integrated Regional Water Management Proposition 1 Guidelines as well as updates to previous information from the 2013 Antelope Valley IRWM Plan.

IRWM is a collaborative effort to manage all aspects of water resources in a region. The State recognizes that there is a need to consider a broader range of resource management issues, competing water demands, new approaches to ensuring water supply reliability, and new ways of financing. The State's IRWM program was developed beginning with Senate Bill 1672 which created the Integrated Regional Water Management Act to encourage local agencies to work cooperatively to manage local and imported water supplies to improve water quality, quantity and reliability.

Funding programs for IRWM planning were created when voters passed Proposition 50 in November 2002, Proposition 84 in November 2006, and Proposition 1 in 2014. These propositions set aside funds for IRWM planning and project implementation to be administered by the State. These grant programs state that IRWM Plans should include specific aspects, or "standards", as outlined in Table ES-1. This table also indicates where each standard may be located in the 2019 Plan Update.

**Table ES-1: IRWM Plan Standards and Locations in AV IRWM Plan**

| IRWM Plan Standard | Location in Antelope Valley IRWM Plan |
|---|---|
| Governance | Section 1, Section 8 |
| Region Description | Section 2 |
| Objectives | Section 4 |
| Resource Management Strategies | Section 5 |
| Integration | Section 6 |
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| Technical Analysis | Section 3, Section 8 |
| Relation to Local Water Planning | Section 8 |
| Relation to Local Land Use Planning | Section 8 |
| Stakeholder Involvement | Section 1, Section 8 |
| Coordination | Section 1, Section 8 |
| Climate Change | Sections 2, 3, 4, 5, 6, 7, 8 |

## Introduction (Section 1)

Several years ago, leaders and agencies in the Antelope Valley Region recognized the need for regional cooperation and planning. In an effort to represent the broad interests within the Antelope Valley Region, a number of organizations joined to form a Regional Water Management Group (RWMG) to work together and create this IRWM Plan. Members of the RWMG include the Antelope Valley-East Kern Water Agency (AVEK), Antelope Valley State Water Contractors Association (AVSWCA), City of Lancaster, City of Palmdale, Littlerock Creek Irrigation District, Los Angeles County Sanitation District (LACSD) Nos. 14 and 20, Los Angeles County Waterworks District No. 40 (LACWD 40), Palmdale Water District (PWD), Quartz Hill Water District (QHWD), and Rosamond Community Services District (RCSD). These 11 public agencies signed a Memorandum of Understanding (MOU) to define what their roles and responsibilities are in developing and moving forward with implementation of the AV IRWM Plan. The decision-making structure of the MOU provides the RWMG with the responsibility to make formal decisions regarding the scope and content of the AV IRWM Plan. These agencies agreed to contribute funds to help develop the AV IRWM Plan, provide and share information, review and comment on drafts, adopt the final AV IRWM Plan, and assist in future grant applications for the priority projects identified in the Plan.

In January 2007, the RWMG and other community participants (the Stakeholders) set about developing a broadly supported water resource management plan that defines a meaningful course of action to meet the expected demands for water within the entire Antelope Valley Region through

2035. They chose to create the AV IRWM Plan consistent with the State sponsored Integrated Regional Water Management Program that makes grant funds available to support sound regional water management. In 2012, the RWMG began development of an IRWM Plan Update to incorporate changes to the Region's water resources that occurred since 2007. The IRWM Plan was revisited in 2017 and updated once again in two phases. The first phase revised the Plan to comply with the 2016 IRWM Grant Program Guidelines. The second phase (referred herein as the "2019 IRWM Plan Update") conducted an extensive update of the IRWM Plan so that the Plan is reflective of the current conditions of the Region. The 2019 IRWM Plan Update extended the planning horizon through 2040. This IRWM Plan contains information to help take action to meet shared objectives for long-term water management for the entire Region.

## Region Description (Section 2)

The Antelope Valley Region of California is home to approximately 461,000 people living in many different communities. Residents within this Region have experienced tremendous changes over the past generation due to rapid population growth in nearby large cities. Current forecasts of population growth suggest even larger changes will occur before 2040. Water plays a central role in the health and wellbeing of all residents within the Antelope Valley Region. People use water for drinking, bathing, household and outdoor activities, agriculture, business endeavors, recreation, and to sustain and enhance natural habitats. This common need for water links communities together in many ways. When anyone uses water, the ability of other people to use water within the Antelope Valley Region may be impacted.

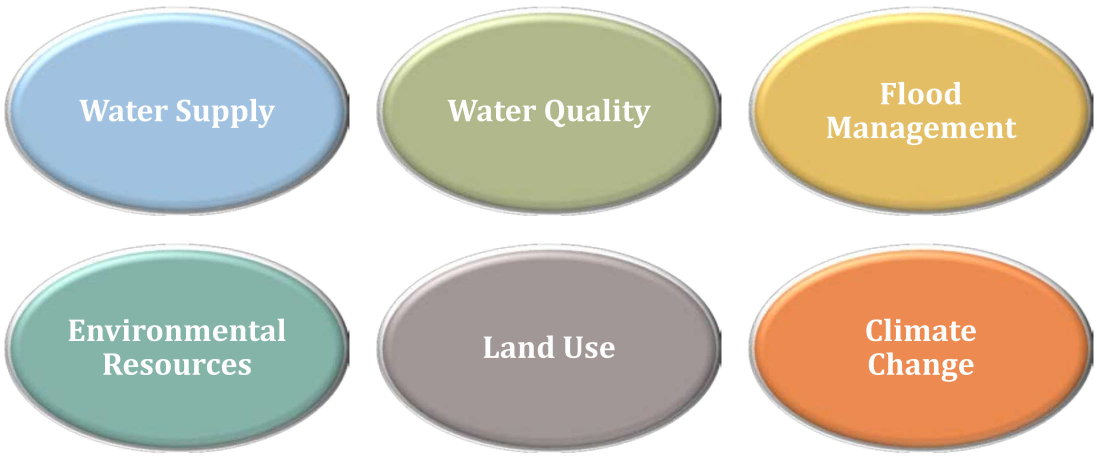
The Antelope Valley Region encompasses approximately 2,400 square miles in northern Los Angeles County, southern Kern County, and western San Bernardino County. Major communities within the Antelope Valley Region include Boron, California City, Edwards Air Force Base, North Edwards, Lancaster, Mojave, Palmdale and Rosamond. All of the water currently used in the Antelope Valley Region comes from two sources: (1) naturally occurring water within the Antelope Valley Region (surface water and groundwater accumulated from rain and snow that falls in the Antelope Valley and surrounding mountains, and recycled water), and (2) State Water Project water (surface water that is collected in northern California and imported into the Antelope Valley and other areas around the state).

The number of residents within the Antelope Valley Region will expand by almost 350 percent between 1970 and 2020, growing from 103,000 people in 1970 to 461,000 people in 2020. Forecasters expect the population to continue to increase, potentially reaching 535,000 residents by the year 2040. As the number of people living and working in the Antelope Valley Region increases, the competition for water supply intensifies, and the challenge of maintaining good water quality and managing the interconnected water cycle becomes more challenging.

Creation of a proactive, "SMART[1]" approach for the fast-developing Antelope Valley Region makes this IRWM Plan essential to efficient and effective water management.

## Issues and Needs (Section 3)

Water managers and local planners face many daunting challenges related to supporting the wellbeing of the Antelope Valley Region. Past activities have created problems that need to be addressed and expected increases in population growth make resolving these problems even more difficult. In order to help address the broad challenges, the AV IRWM Plan was organized to address issues and needs in the following categories. Section 3 of the Plan describes these issues and needs in detail.




### *Supplies are Variable and Uncertain*

Determining the amount of water available for use at any given time (now or in the future) is challenging. All water supplies within the Antelope Valley Region come from two sources: (1) local rain and snowmelt that percolate into the groundwater aquifers or are captured in Littlerock Reservoir, or (2) imports of water from outside the Antelope Valley Region via the State Water Project. The amount of water supply available varies considerably due to changes in weather, rain and snow, and other conditions.

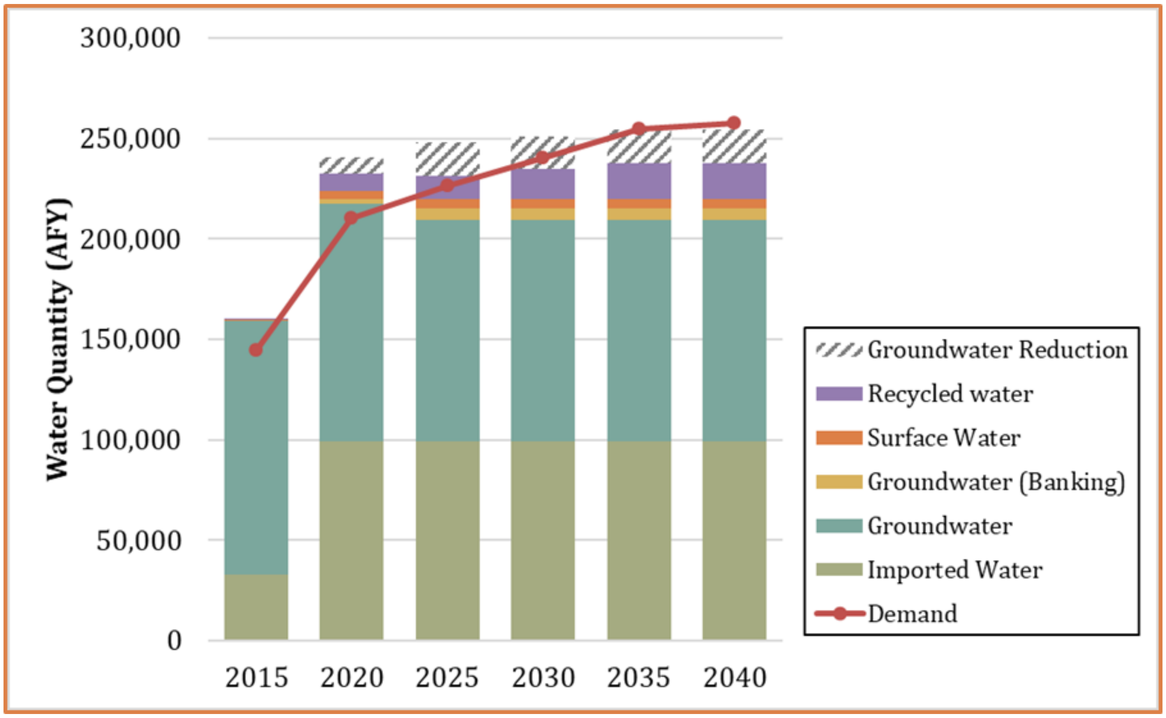
### *Demand is Greater than Supply in Average and Dry Years*

One fundamental challenge in the Antelope Valley Region is that demand for water exceeds available supplies in future average and dry years. In average years beyond 2025, the mismatch between water supply and demand is currently approximated at 19,500 AFY, as shown in the figure below. In future single dry years, the supply demand mismatch is estimated to be 77,200 AFY, while in future multi-dry year periods the mismatch is estimated at 198,800 AF over four years. If communities do not implement projects to account for these mismatches, such as conservation, recycled water, stormwater capture, and water banking projects, the Region will not be able to meet its demands during future average years and dry periods. The Region also recognizes the need for other actions to reduce the mismatch, such as reducing reliance on imported water and improving conveyance facilities.

[1] A SMART approach includes objectives that are Specific, Measurable, Attainable, Relevant, and Time-Based.

Historically, water supplies within the Antelope Valley Region have been used primarily for agriculture; however, due to population growth, water demands from residential and business uses have increased significantly and this trend is expected to continue. The expected continuation of rapid growth in the Antelope Valley Region will affect water demand and increase the threat of water contamination from additional urban runoff. More residents will also lead to higher demand for water-based recreation.

**Figure ES-1: Water Supply Summary for an Average Water Year**




Note: "Groundwater Reduction" is the amount of groundwater production decreased as a result of the adjudication Judgment and therefore does not represent an additional supply source.

Much of the water used within the Antelope Valley Region is extracted from groundwater aquifers. The amount of water pumped within the Antelope Valley Region has varied tremendously since the early 1900's. The United States Geological Survey estimated that groundwater pumping in 1919 was about 29,000 AFY and reached as high as 400,000 AFY in the 1950's. For many of those years, the amount of water being pumped was greater than the amount of water being replenished, creating an imbalance within the groundwater aquifers. Because the amounts pumped were greater than the amounts being replenished, groundwater levels have declined significantly throughout the Antelope Valley Region. The long-term depletion of aquifers cannot be continued indefinitely without serious consequences. The historical declines in groundwater levels within the Antelope Valley Region have caused permanent damage to aquifers in some areas through land subsidence.

In order to prevent further damage from declining groundwater levels, many water providers and managers within the Antelope Valley Region recognize the need to balance the water being pumped from the aquifers with the water being put back. In response to this need, a legal process called adjudication was finalized in 2015. The adjudication process defined the Basin boundaries, quantified a safe yield, and established Production Rights in order to stabilize groundwater levels and prevent further damage that can result from declining groundwater levels. The Total Safe Yield of the Antelope Valley Groundwater Basin must be met by 2023 as defined in the adjudication Judgment.

## Water Quality and Flood Management

The groundwater basin within the Antelope Valley Region is an un-drained, closed basin, meaning there is no outlet for water to flow to the ocean. When water enters a closed basin, any minerals or chemicals in the water typically accumulate in the basin. Currently, groundwater quality is excellent within the principal aquifer but is not as good toward the northern portion of the dry lake areas. Some portions of the basin contain groundwater with high fluoride, boron, total dissolved solids, and nitrate concentrations. Arsenic is another emerging contaminant of concern in the Antelope Valley Region and has been observed in the northern and eastern areas of the Region. Research conducted by the LACWD 40 and the United States Geological Survey has shown the problem to reside primarily in the deep aquifer, therefore it is not anticipated that the existing arsenic concentrations will lead to future loss of groundwater as a water supply resource for the Antelope Valley. In addition, a Salt and Nutrient Management Plan was developed in 2014 to monitor and maintain water quality conditions in the Antelope Valley groundwater basin.

Much of the Antelope Valley Region is subject to flooding from natural runoff through alluvial fans in the nearby foothills. Some of these flood waters eventually move into developed areas, many of which lack sufficient drainage capacity, causing impacts to infrastructure and other improvements. Runoff flowing across impervious surfaces can also become contaminated with constituents such as petroleum products. At the same time, the Region recognizes the downstream benefits of flood waters, including habitat preservation, dust control, and other uses. The need for regional coordination of flood control efforts with natural habitat protection and water supply is critical as urban development and the accompanying paved surfaces increase throughout the Region.

## Environmental Resources

The Antelope Valley Region has many unique environmental features that are dependent on natural surface flows, such as the dry lakebeds (Rosamond, Buckhorn, Rogers), Piute Ponds, mesquite bosques, alkali mariposa lily, Joshua tree woodlands, desert tortoise, Le Contes thrasher, tricolored blackbirds, and others. Part of the Antelope Valley wash areas are incorporated into a Significant Ecological Area designated by Los Angeles County intended to provide added protection to sensitive natural resources. As the pressure for growth expands into undeveloped or agricultural lands, the need to balance industry and growth against the protection of endangered species and sensitive ecosystems requires a careful consideration of trade-offs, many involving water resources in the Region. The actions identified in the AV IRWM Plan can help to preserve open space and natural habitats in the Antelope Valley Region while maximizing the effective use of water resources.

## Water Management and Land Use

What people do on the land of the Antelope Valley and how they do it directly impacts many aspects of life, including the water cycle, within the Antelope Valley Region. Historically throughout California, land use planning and water use planning have been done almost independently of one another. The challenges identified within the Plan clearly show a need for much closer collaboration between land use planning efforts and water management planning efforts.

Continued development within the Antelope Valley Region depends heavily on meeting the objectives presented in the Plan to balance the growing demand for development while preserving recreational opportunities and avoiding major impacts to natural resources, agriculture, and the loss of local culture and values.

## *Climate Change*

The Antelope Valley Region's Stakeholders identified and prioritized a number of climate change vulnerability issues facing the Region's water resources based on the expected effects of climate change, including water demand, water supply, flooding, ecosystem and habitat, and water quality. The identified and prioritized vulnerabilities are discussed in Section 3.

## Objectives (Section 4)

The Stakeholders worked together to identify clear objectives and planning targets they wish to accomplish by implementing the AV IRWM Plan (see Table ES-2). Although the AV IRWM Plan is intended to address the Antelope Valley Region's water resource management needs, this document also identifies several open space, recreation, and habitat targets as well. Refer to Section 4 of the AV IRWM Plan for details on how the objectives and targets were developed.

These objectives and planning targets represent the most important needs and issues the Stakeholders hope to address over the next several years. Everything done within the context of this IRWM Plan should contribute in some way to achieving these objectives. Also, because the planning targets are measurable, residents within the Antelope Valley Region can monitor how successfully the Plan is being implemented.

**Table ES-2: Antelope Valley Region Objectives and Planning Targets**

| Objectives | Planning Targets |
|---|---|
| ***Water Supply Management*** | |
| Provide reliable water supply to meet the Antelope Valley Region's expected demand between now and 2040; and adapt to climate change. | Maintain adequate supply and demand in average years. |
| | Provide adequate reserves (77,200 AFY) to supplement average condition supply to meet demands during single-dry year conditions, starting 2009. |
| | Provide adequate reserves (198,800 AF/ 4-year period) to supplement average condition supply to meet demands during multi-dry year conditions, starting 2009. |
| | Adapt to additional 7-10% reduction in imported deliveries by 2050, and additional 21-25% reduction in imported water deliveries by 2100. |
| Establish a contingency plan to meet water supply needs of the Antelope Valley Region during a plausible disruption of SWP deliveries. | Demonstrate ability to meet regional water demands over an average year without receiving SWP water for 6 months over the summer by 2025 |
| Stabilize groundwater levels. | Manage groundwater levels throughout the basin such that Production Rights defined in the adjudication Judgment are met by 2023. |
| ***Water Quality Management*** | |
| Provide drinking water that meets regulatory requirements and customer expectations. | Continue to meet Federal and State water quality standards as well as customer standards for taste and aesthetics throughout the planning period. |

| Objectives | Planning Targets |
|---|---|
| Protect and maintain aquifers. | Prevent unacceptable degradation of aquifer according to the Basin Plan throughout the planning period. |
| | Map contaminated sites and monitor contaminant movement, by 2017. |
| | Identify contaminated portions of aquifer and prevent migration of contaminants, by 2017. |
| Protect natural streams and recharge areas from contamination. | Prevent unacceptable degradation of natural streams and recharge areas according to the Basin Plan throughout the planning period. |
| Maximize beneficial use of recycled water. | Increase infrastructure and establish policies to use 33% of recycled water to help meet expected demand by 2015, 66% by 2025, and 100% by 2035. |
| ***Flood Management*** | |
| Reduce negative impacts of stormwater, urban runoff, and nuisance water, and adapt to climate change impacts in the future. | Coordinate a regional Stormwater Resources Plan and policy mechanism by the year 2025 and incorporate adaptive management strategies for climate change. |
| Optimize the balance between protecting existing beneficial uses of stormwater and capturing stormwater for new uses. | |
| ***Environmental Resource Management*** | |
| Preserve open space and natural habitats that protect and enhance water resources and species in the Antelope Valley Region. | Contribute to the preservation of an additional 2,000 acres of open space and natural habitat, to integrate and maximize surface water and groundwater management by 2025. |
| ***Land Use Planning/Management*** | |
| Maintain agricultural land use within the Antelope Valley Region. | Preserve 100,000 acres of farmland in rotation[2] through 2040. |
| Meet growing demand for recreational space. | Contribute to local and regional General Planning documents to provide 5,000 acres of recreational space by 2040. |
| Improve integrated land use planning to support water management. | Coordinate a regional land use management plan by the year 2025 and incorporate adaptive management strategies for climate change. |
| ***Climate Change Mitigation*** | |
| Mitigate against climate change | Implement "no regret" mitigation strategies,[3] when possible, that decrease greenhouse gases (GHGs) or are GHG neutral |

## Resource Management Strategies (Section 5)

The State of California, through the 2009 California Water Plan, has identified 37 different Resource Management Strategies (RMS) to improve regional water resource management. In order to determine what regional water management strategies should be included in the IRWM Plan, the Stakeholders considered the RMS listed and defined in Section 5 of the IRWM Plan. The relationship

[2] The phrase "in-rotation" means that not all 100,000 acres will be in agricultural production at one time rather the land will be rotated in cycles to make most efficient use of the land.
[3] No regret projects are projects that would still be considered beneficial even if climate change weren't happening.

of these strategies (Table ES-3) to the Region's objectives (Table ES-2) was discussed for those strategies included in the IRWM Plan.

**Table ES-3: RMS included in the IRWM Plan**

| Reduce Water Demand | Improve Operational Efficiency and Transfers |
|---|---|
| • Agricultural Water Use Efficiency<br>• Urban Water Use Efficiency | • Conveyance – Regional/Local<br>• System Reoperation<br>• Water Transfers |
| **Increase Water Supply** | **Flood Management** |
| • Conjunctive Management and Groundwater<br>• Recycled Municipal Water<br>• Surface Storage – Regional/Local | • Flood Risk Management |
| **Water Quality Management** | **Practice Resources Stewardship** |
| • Drinking Water Treatment and Distribution<br>• Groundwater and Aquifer Remediation<br>• Matching Water Quality to Use<br>• Pollution Prevention<br>• Salt and Salinity Management<br>• Urban Runoff Management | • Agricultural Lands Stewardship<br>• Ecosystem Restoration<br>• Forest Management<br>• Land Use Planning and Management<br>• Recharge Areas Protection<br>• Sediment Management<br>• Watershed Management |
| **People and Water** | **Other Strategies** |
| • Economic Incentives<br>• Outreach and Engagement<br>• Water and Culture<br>• Water-dependent Recreation | • Crop Idling for Water Transfers<br>• Irrigated Land Retirement |

## IRWM Project Integration, Evaluation and Prioritization (Sections 6 and 7)

Many local agencies and other community participants have worked well together to create a Plan that identifies challenging issues and needs being faced by all Antelope Valley residents. Fortunately, this IRWM Plan also identifies actions that can help meet the objectives for the Antelope Valley Region and identifies methods for cooperative implementation of those actions.

Table ES-4 lists the projects and actions that the Stakeholders believe will help meet the Regional objectives. In total, over 80 projects were submitted for inclusion in the IRWM Plan, and include implementation projects, plans and studies, and conceptual projects. All projects included in the IRWM Plan will help the Region to meet its goals and objectives. Implementation projects are programs or construction projects that have had some planning completed, such as facilities planning or cost analyses, and could potentially be implemented in the near future. Plans and studies may also be considered "implementation projects" because they are eligible under certain grant funding opportunities. Finally, conceptual projects are those projects identified by stakeholders that *could* contribute to meeting the Region's IRWM objectives but may not yet be developed enough to include in the IRWM Plan as an implementation project.

Implementing the IRWM projects will require focused effort, broad community support, political resolve, and funding. The Stakeholders are actively pursuing financial assistance through several grant programs designed to help leverage local investments. The RWMG is also working to establish a secure and long-lasting approach to coordinate resources to meet the growing needs of the entire Antelope Valley Region.

The projects proposed by Stakeholders are primarily expected to help the Region meet the water supply management objectives, some of the water quality management objectives, and the climate change objective described in Section 4. For the flood management, environmental resource management, land use planning/management, and climate change objectives, additional projects need to be developed and proposed to ensure progress in those management areas.

**Table ES-4: Stakeholder Implementation Projects**

| Sponsor | Project Name | Project Type |
|---|---|---|
| Antelope Valley Resource Conservation District | Antelope Valley Regional Conservation Project | Implementation |
| AVEK | AVEK Strategic Plan | Study/Report |
| AVEK | South North Intertie Pipeline (SNIP) Phase II Project | Implementation |
| AVEK | South Antelope Valley Intertie Project | Implementation |
| AVEK | Water Supply Stabilization Project (WSSP) – Westside Expansion | Implementation |
| City of Lancaster | Antelope Valley Recycled Water Master Plan | Study/Report |
| City of Lancaster | Division Street and Avenue H-8 Recycled Water Tank | Implementation |
| City of Lancaster | Lancaster National Soccer Center Recycled Water Conversion | Implementation |
| City of Lancaster | Pierre Bain Park Recycled Water Conversion | Implementation |
| City of Lancaster | Whit Carter Park Recycled Water Conversion | Implementation |
| City of Palmdale | Palmdale Power Plant Project | Implementation |
| City of Palmdale | Upper Amargosa Creek Recharge and Channelization Project | Implementation |
| Palmdale Recycled Water Authority | Phase 2 Distribution System | Implementation |
| Palmdale Water District | Littlerock Dam Sediment Removal | Implementation |
| Palmdale Water District | Palmdale Regional Groundwater Recharge Project | Implementation |
| Rosamond CSD | Wastewater Treatment Plant Rehabilitation and Groundwater Project | Implementation |
| Willow Springs Water Bank | Willow Springs Water Bank | Implementation |

In terms of supply, the implementation and conceptual projects proposed will allow the Region to maintain adequate supply and demand in average years. The IRWM projects identify approximately 24,400 AFY of new supply, while also identifying up to approximately 1,000,000 AFY of water bank storage capacity. These projects, if implemented, would help the Region to meet demands during single-dry years and multi-dry year periods, as well as during a plausible six month disruption of State Water Project deliveries.

A number of projects were proposed that would help the Region to meet its water quality targets, including improving drinking water quality, protecting and maintaining aquifers, protecting natural streams and recharge areas from contamination, and maximizing beneficial use of recycled water. As water quality issues are further studied and plans such as the Salt and Nutrient Management Plan are implemented, it is expected that additional projects will be identified to target specific water quality issues.

Additional projects may be necessary to help address the Region's flood management issues, particularly since a majority of the projects proposed to help improve flooding are conceptual and require further development. Section 6 lists a number of suggestions for improving flood management in the Region, including beneficial use identification, existing flood hazard mapping, development of policy actions, and flood mitigation.

The environmental resource management objective will also require more projects. Proposed projects that would help the Region to meet its environmental resource management targets are mainly multi-benefit projects that would provide water supply, water quality and/or flood improvements in additional to providing open space and habitat. Section 6 suggests development of a habitat conservation plan for the Region, and promotion of land conservation projects that enhance flood control, aquifer recharge and watershed and open space preservation to further identify projects to meet this objective.

Similarly, additional projects may be necessary to meet the Region's targets that include preserving farmland, increasing recreational space and coordinating a regional land use plan. Many of the projects identified would indirectly support these targets by providing water to irrigate farm and recreational lands, but few projects would directly support these targets.

A majority of the projects proposed would support the Region's climate change objective. For example, projects that increase local supply production are expected to reduce the embedded energy required to supply imported water. Projects that would increase habitat would allow for the sequestration of carbon through the increase in vegetation. Further planning and study would be necessary to numerically assess GHG reductions in the Region.

## Framework for Implementation (Section 8)

The AV IRWM Plan is a dynamic document that identifies monitoring guidelines and sets forth procedures for measuring the success, benefits, and impacts of the Plan. The Region will continue with its current governance structure and continue its efforts to encourage stakeholder involvement in the IRWM program. An ongoing management process is proposed for evaluating, updating and maintaining the Plan, and a funding and financing plan has been established to implement the Plan. The stakeholders decided to continue using the current approach of facilitated broad agreement to implement and update the AV IRWM Plan.

Implementation of the priority projects in the IRWM Plan is currently the responsibility of individual lead agencies with the jurisdictional authority to approve projects. The Stakeholders and RWMG have chosen these projects because they directly address the objectives and planning targets for the most pressing issues and constitute the most well-developed projects to improve management of water resources within the Region. Furthermore, implementing the projects in an integrated fashion is understood to achieve greater benefits to the Region.

The collection, management, distribution and use of data collected as part of this IRWM Planning effort, and through implementation of the Plan, are essential to making this a sustainable effort that will benefit the Antelope Valley Region for years to come. Data regarding water quantity and quality are currently collected and distributed by a number of different agencies. The Stakeholders have identified strategies in this IRWM Plan to ensure quick identification of data gaps, avoiding duplicative (and costly) studies that result in the same information/findings, and successful integration with other important regional, statewide, and federal programs.

This IRWM Plan also identifies performance measures that will be used to evaluate performance, monitoring systems that will be used to gather actual performance data, and mechanisms to change these strategies if the data collected shows the Antelope Valley Region's IRWM objectives and planning targets are not being met. The Stakeholders also recognized that additional technical detail is needed for several of the IRWM Plan's performance measures to be properly implemented and measurable. The Stakeholder group has agreed to continue to refine these performance measures as the AV IRWM Plan is implemented.

Finally, the Region evaluated the funding and financing that would be necessary to implement this IRWM Plan. To meet the resource needs identified above, the Region will need to secure funding as both in-kind services and monetary resources. Given that local revenue sources will not be sufficient to fully fund all aspects of the IRWM Program's financing needs over the 20-year planning horizon, the Region intends to fund its activities using a combination of local, state and federal funds.

This IRWM Plan is a Stakeholder-driven planning process. The RWMG invites the public and interested Stakeholders to become active participants in the Region's ongoing efforts to:

- Identify, evaluate, prioritize, and implement solutions to the Region's complex water management issues, challenges, and conflicts; and
- Continue the development and evolution of this Plan.

*For additional information on this IRWM Plan and the Antelope Valley Region, please visit www.avwaterplan.org.*

# Section 1 | Introduction

***This Integrated Regional Water Management Plan (IRWM Plan)[1] defines a clear vision and direction for the sustainable management of water resources in the Antelope Valley Region (Region) through 2040. This version of the Plan includes 2019 updates to the 2013 version, and it complies with all requirements of the 2019 IRWM Grant Program Guidelines-IRWM Plan Standards.***

***Although the Antelope Valley IRWM Plan contains a viable action plan to provide a wide range of crucial water-related services necessary to support the well-being of people living in the Antelope Valley Region, this Plan is a planning and feasibility study only and no implementation or any project is being approved or required through its adoption. Implementation of this IRWM Plan will require further discretionary approvals either individually or jointly by the stakeholder group members. The IRWM Plan identifies existing key water-related challenges being faced by the residents of the Antelope Valley Region, along with projections of how these challenges will change by 2040. In response to current and expected challenges, this IRWM Plan provides a thorough inventory of possible actions to address the challenges, along with estimated costs and benefits of implementing each action. This IRWM Plan also documents an extensive collaborative process that led to the selection of a robust combination of actions that may be implemented cooperatively by the stakeholders in the Antelope Valley Region.***

[1] All references to "IRWM Plan" in this document indicate the 2019 updated version.

Before the original IRWM Plan was adopted in 2007, individual water purveyors and users had been actively studying the effects of accelerated development of the Antelope Valley Region and were attempting to identify appropriate actions to address the increased need for water services. At the time, the acceleration of industrial and residential activity had stimulated demand for both more water supply and higher quality water. Attempts by individual agencies to meet the growing challenges had been frequently criticized and the atmosphere was not conducive to collaborative partnerships. Water managers and stakeholders in the Antelope Valley Region began to recognize that some of the challenges being faced by residents could not be addressed using a single-agency or single-purpose perspective.

These entities agreed that water resource needs in the Antelope Valley Region are highly interconnected and require a broad and integrated perspective in order to provide efficient and effective services.

**The Stakeholders discuss funding opportunities from the California Department of Water Resources.**

Acknowledging the need for a more comprehensive view, proactive stakeholders in the Antelope Valley Region (including agencies with an interest in water and other resource management) began meeting in May 2006 to improve communication and explore opportunities to leverage their resources. As a result, eleven public agencies signed a memorandum of understanding (MOU) to form the Antelope Valley Regional Water Management Group (RWMG). The MOU was amended in 2009, and again in 2018, to establish the organization and responsibilities of the IRWM governance structure, including the RWMG, the Advisory Team, and the Stakeholder Group. Copies of these two documents are included in Appendix A and may be found on the www.avwaterplan.org website.

During the early (pre-2007) discussions, the stakeholders decided to develop a plan with a regional focus designed to identify a set of integrated solutions addressing goals for water supply, water quality, flood management, environmental resource management including habitat improvement, and increased recreational park space and open space. These topics were re-examined during the 2013 Plan Updates, and climate change impacts were added to the discussion. In 2019, these topics were reevaluated and updated once again to reflect the evolving conditions of the Region.

This planning process acknowledges that a separate adjudication process was completed in 2015. The members of the RWMG have agreed that since the IRWM Plan and the adjudication are focused on different (but related) aspects of water management, they can and should proceed in parallel. This IRWM Plan contains information to help take action to meet shared objectives for long-term water management for the entire Region. The adjudication process helps provide important clarity and certainty for groundwater users about how the groundwater resources are utilized and managed. The Members of the RWMG agreed that no information developed for the purposes of the IRWM Plan should be interpreted to interfere in any way with the implementation of the adjudication

**A variety of flora may be found in the Antelope Valley climate.**

outcomes. Nothing in the IRWM Plan supersedes the adjudication of the Antelope Valley Groundwater Basin (Basin).

This IRWM Plan creates opportunities for new partnerships and collaboration and documents a collective vision to meet water resource needs and improve the ecological health of the Antelope Valley Region. The quantitative planning targets provide interested stakeholders the means to measure progress and account for tangible community benefits. This updated IRWM Plan describes a specific and financially feasible set of actions necessary to manage the precious water resources within this Antelope Valley Region through 2040.

## 1.1 Background

The Antelope Valley Region is a triangular-shaped, topographically closed basin bordered on the southwest by the San Gabriel Mountains, on the northwest by the Tehachapi Mountains, and on the east by a series of hills and buttes that generally follow the Los Angeles/San Bernardino County line (Figure 1-1, Antelope Valley IRWM Plan Region). The Antelope Valley Region encompasses approximately 2,400 square miles in northern Los Angeles County, southern Kern County, and western San Bernardino County, and it covers the majority of the service area of the Antelope Valley-East Kern Water Agency (AVEK), the largest water wholesaler in the Antelope Valley Region. Major communities within the Antelope Valley Region include Boron, California City, Edwards Air Force Base (EAFB), Lancaster, Mojave, Palmdale, and Rosamond.

On November 23, 2009, the Antelope Valley Region successfully completed the Region Acceptance Process (RAP) with the Department of Water Resources (DWR). The RAP was the first step in becoming eligible for Proposition 84 grant funding and helps to define certain aspects of the Region. Specifically, the RAP provides documentation of contact information, governing structure, RWMG composition, stakeholder participation, disadvantaged communities (DAC) participation, outreach, stakeholder decision-making, geographical boundaries and other features, water management issues, water-related components, and relationships with adjacent Regions. The Region boundary shown in Figure 1-1 was determined during the RAP.

Water supply for the Antelope Valley Region comes from three primary sources: the State Water Project (SWP), surface water stored in the Littlerock Reservoir, and the Antelope Valley Groundwater Basin. The Antelope Valley Region's SWP contractual Table A Amount is 168,444[2] acre-feet per year (AFY). With proper treatment, SWP water is generally high quality water well-suited for municipal and industrial (M&I) uses; however, the reliability of the SWP water supply is variable and is widely regarded to have decreased in recent years. Surface water stored at the Littlerock Reservoir, which has a storage capacity of 3,500 acre-feet (AF), is used directly for agricultural uses and for M&I purposes following treatment.


The State Water Project delivers imported water to the Antelope Valley.

The Antelope Valley Groundwater Basin is comprised of a principal aquifer that yields most of the current groundwater supplies and several less-used deep aquifers. The Basin encompasses 1,580 square miles in Los Angeles, Kern and San Bernardino counties. Groundwater levels in some areas have declined significantly since the early 1900s due to over-extraction. Groundwater quality is excellent within

[2] Includes the total Table A allocation for AVEK. Approximately 5 percent AVEK's supplies are delivered to customers outside of the Antelope Valley IRWM Region. Please see Section 3.1.1.2 for more details.

most of the principal aquifer but degrades toward the northern portion of the dry lakes areas. High levels of arsenic, fluoride, boron, and nitrates are a problem in some areas of the Basin. The groundwater in the Basin is currently supplied to both agricultural and M&I uses.

The Basin was adjudicated in December 2015 after 15 years of complex proceedings among more than 4,000 parties, including public water suppliers, landowners, small pumpers and non-pumping property owners, and the federal and state governments. The Antelope Valley Area of Adjudication covers approximately 1,390 square miles, or 90 percent of the groundwater basin. The Antelope Valley Groundwater Basin Adjudication Judgment (Judgment) determined the Basin is in a state of overdraft, established respective water rights among groundwater producers based on the Basin's Native Safe Yield, and ordered a rampdown of production to meet the Native Safe Yield by 2023. Following the adjudication, the Antelope Valley Watermaster was formed to implement the Judgment. The Watermaster is charged with administering the adjudicated water rights and managing of the groundwater resources within the adjudicated portion of the Antelope Valley. The adjudication process is discussed in more detail in Section 2.4.2.1 of this IRWM Plan.

Recycled water and stormwater are secondary sources of water supply. A portion of the recycled water from the Antelope Valley Region's two large water reclamation plants, Los Angeles County Sanitation Districts' (LACSD) plants in Palmdale and Lancaster, are used for maintenance of Piute Ponds wetlands, agricultural irrigation, landscape irrigation, and a recreational lake at Apollo Park. The expansion of recycled water use continues in the Region.

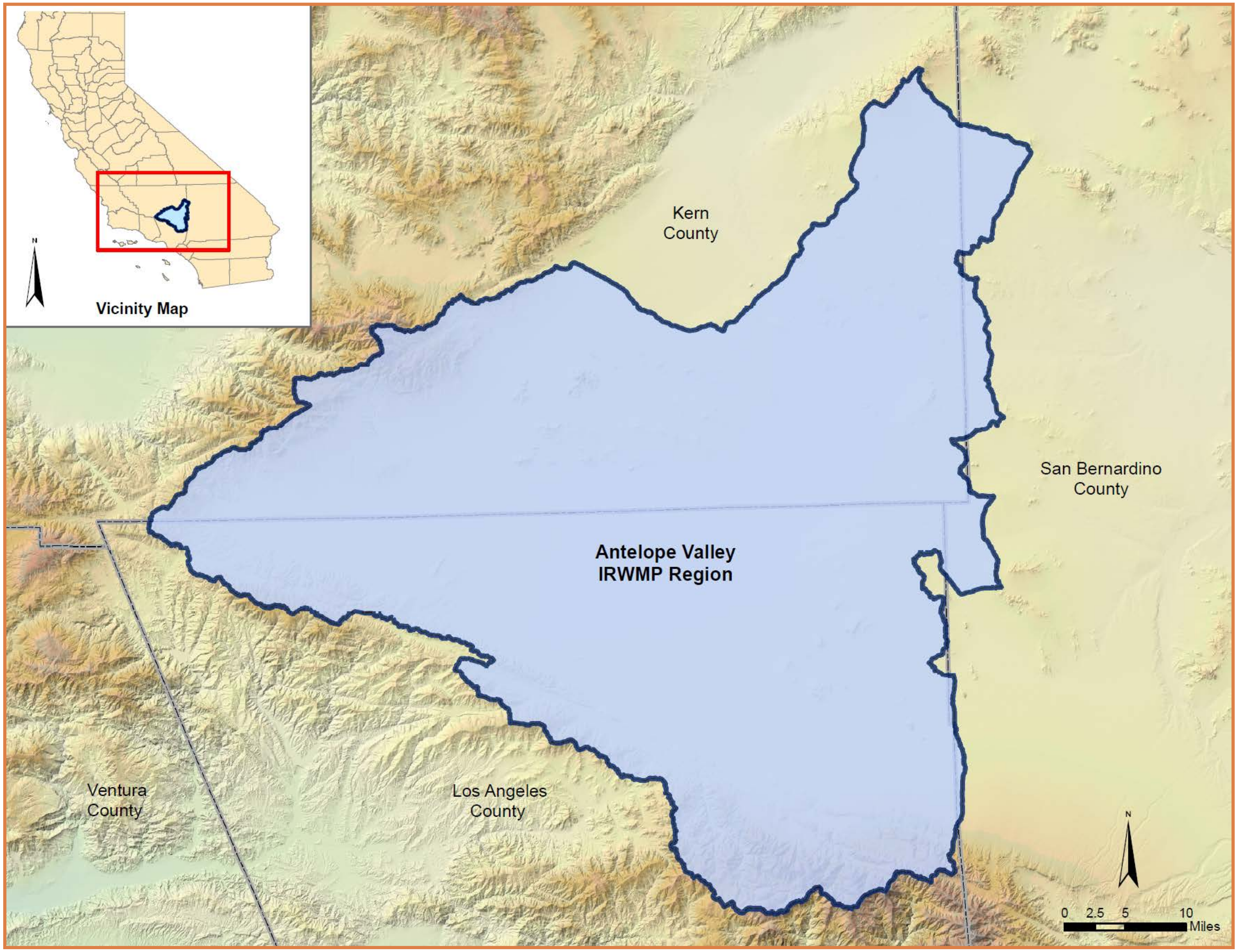
Surface flows (i.e., storm water runoff) from the surrounding San Gabriel Mountains, Tehachapi Mountains, and hills cross alluvial fans and flow through deeply excised washes. The flows make their way from the wash headwaters, filling vernal pool clay pan depressions and wetlands such as Piute Ponds, before either percolating into sand dune areas where water is sequestered for summer use or flowing to the lowest points in the Valley at Rosamond, Buckhorn, and Rogers dry lakebeds. As the surface flow makes its way to the lakebeds it allows the larger sediments to settle out first and transports smaller silty clay further into the Valley interior. The surface flow and silty clay helps to fill in and re-establish the soil surface structure, which protects the lakebed areas from wind erosion, sustains the surficial strength of the lakes (important to the operational mission of EAFB), and sustains local habitats. Some surface flows ultimately evaporate.

Historically, water supplies within the Antelope Valley Region had been used primarily for agriculture; however, due to population growth beginning in the mid-1980s, water demands from residential and industrial uses have increased significantly and this trend is expected to continue. Projections indicate that nearly 535,000 people will reside in the Antelope Valley Region by the year 2040, an increase of approximately 38 percent.

The expected continuation of growth in the Antelope Valley Region will affect water demand and increase the need for management of additional imported water, recycled water and urban runoff. More residents will also lead to higher demand for water-based recreation. Increasing demands coupled with periodic curtailments of SWP deliveries have intensified the competition for available water supplies. This competition has often limited the water available for natural habitats within the Antelope Valley. In addition, growth in the Valley will likely be influenced by climate change.

Thus, these potential impacts could affect most residents within the Antelope Valley Region. In order to establish a viable action plan, a broad representation of stakeholders throughout the Antelope Valley must be maintained to update this IRWM Plan.

**Figure 1-1: Antelope Valley IRWM Region**



## 1.2 Stakeholder Participation

An extensive stakeholder outreach process is crucial to ensure that this IRWM Plan reflects the needs of the entire Antelope Valley Region, promotes the formation of partnerships, and encourages coordination with state and federal agencies. One of the benefits of this planning process is that it brings together a broad array of groups into a forum to discuss and better understand shared needs and opportunities. Residents of the Antelope Valley Region are facing changing conditions that increase the likelihood of serious disruption in water-related services or long-term degradation of water supply or environmental resources. Agencies and planning jurisdictions must work closely together in order to assure the delivery of good quality, reliable water while maintaining the quality of life in the Antelope Valley Region.

**The Stakeholder process was started during the original formation of the Antelope Valley RWMG. This is a Stakeholder meeting held on August 7, 2019.**

The 2007 IRWM Plan benefited from active participation by a wide range of stakeholders. Members of the RWMG and other stakeholders participated in fifteen stakeholder meetings, reviewed draft document materials, and provided extensive collaborative input to shape the 2007 IRWM Plan. For those topics that required further discussion during Plan development, stakeholders engaged in smaller, focused group dialogue to ensure that all stakeholder concerns were being considered. Through participation in stakeholder meetings, stakeholders were exposed to a variety of opportunities for discovering and establishing mutually beneficial partnerships.

The 2013 updates to the Plan also benefited from extensive stakeholder participation. A total of 12 stakeholder meetings were held between February 2012 and December 2013. In addition, numerous special committee meetings were held to address specific topics (e.g., Advisory Team, integrated flood management, DAC outreach, climate change, salt and nutrient management). The 2013 updates continued to support the collaboration and partnerships that originated during the 2007 Plan development.

The IRWM Plan was revisited in 2017 and updated in two phases. The first phase (referred to as the 2018 update) revised the Plan to meet the IRWM Plan requirements described in the 2016 IRWM Grant Program Guidelines. Stakeholder meetings were held between September 2017 and February 2018 to discuss Plan updates and program guidelines. The second phase finalized in 2019 and referred to as the 2019 update, involved an extensive update of the IRWM Plan so that the Plan is reflective of the current conditions in the Region and met the updated 2019 IRWM Grant Program Guidelines. Stakeholder meetings were scheduled in 2018 and 2019 to involve the RWMG, stakeholder groups, DACs, and the general public in the IRWM Plan update process. The full Plan update is necessary to identify pertinent water management issues and adjust IRWM Plan objectives to better address existing Regional needs.

### 1.2.1 Regional Water Management Group

As described earlier, agencies in the Antelope Valley Region recognized the need for, and benefits of, regional cooperation and planning. In an effort to adequately represent the Antelope Valley Region, the RWMG was formed in 2007 through an MOU (Appendix A). By signing the MOU, the agencies agreed to contribute funds to help develop the original 2007 IRWM Plan, provide and share information, review, and comment on drafts of the IRWM Plan, adopt the final 2007 IRWM Plan, and assist in future grant applications for the priority projects selected.

The MOU was amended in April 2009 to establish the organization and responsibilities of the IRWM governance structure, including the RWMG, the Advisory Team, and the Stakeholder Group. The MOU was amended and restated again in 2018 to outline the amount of new funding to be provided by each of the participating entities of the RWMG.

The RWMG includes AVEK, the Antelope Valley State Water Contractors Association (AVSWCA), the City of Lancaster (Lancaster), the City of Palmdale (Palmdale), Littlerock Creek Irrigation District (LCID), LACSDs 14 and 20, Los Angeles County Waterworks District No. 40 (LACWD 40), Palmdale Water District (PWD), Quartz Hill Water District (QHWD), and Rosamond Community Services District (RCSD). These participants' roles and responsibilities for managing water, natural resources, and land use within the Antelope Valley Region are discussed below:

#### 1.2.1.1 Antelope Valley-East Kern Water Agency

AVEK is a wholesale supplier of SWP water to the Antelope Valley Region. AVEK's service area encompasses nearly 2,400 square miles in northern Los Angeles and eastern Kern Counties as well as a small portion of Ventura County. AVEK was granted charter by the State in 1959 and became an SWP contractor in 1962.

AVEK is the third-largest SWP contracting agency with a current contractual Table A amount of 144,844 AFY. Table A water is a reference to the amount of water listed in "Table A" of the contract between the SWP and the contractors and represents the maximum amount of water a contractor may request each year. This volume includes both agricultural and M&I SWP water, which AVEK distributes in the Antelope Valley Region. AVEK currently provides water to a population of approximately 307,000 people through twenty-five retail water agencies and water companies. As of 2015, AVEK customers utilized approximately 47,500 AFY of the Table A Amount. In addition, AVEK provides a small amount of SWP water to areas outside of the Antelope Valley. The agency is also a partner in the Joint Powers Authority (JPA) for the AVSWCA.

AVEK began pumping groundwater during 2014. Prior to 2014, AVEK did not utilize groundwater as a source of supply and did not have groundwater production wells. The agency also operates a water bank, the Water Supply Stabilization Project No. 2 (Westside Water Bank), that started operations in 2010. The Westside Water Bank includes a 1,500-acre groundwater recharge and extraction field that recharges SWP water delivered to the Antelope Valley Region's Westside during wet years when supplies exceed demands. The maximum recharge capacity is estimated to be 36,000 AFY and the maximum recovery volume is the same. The project currently includes 9 groundwater recovery wells, but up to 20 new wells may be constructed as part of the Westside Water Bank Project.

AVEK also added the Eastside Water Banking and Blending Project, which started operations in 2016. Three 2-acre recharge basins and three groundwater wells have been constructed as a part of the project. The Eastside Water Banking and Blending Project allows for the recharge of raw water, which is later recovered and blended for delivery to the Eastside Water Treatment Plant. The Eastside Water Bank has a total withdrawal capacity of 5,700 AF per year. AVEK does not provide recycled water.

#### 1.2.1.2 Antelope Valley State Water Contractors Association

The AVSWCA is a JPA of the three local SWP contractors of the Antelope Valley (AVEK, LCID, and PWD) that was formed in May 1999.

The AVSWCA has a declared "Statement of Principles and Objectives" to frame its roles and responsibilities as follows:

- to make optimum use of available water supplies to meet current and anticipated demands;
- to confirm that the AVSWCA will not take away any water rights within the Antelope Valley;
- to develop plans for maximum cooperative use of the available water resources;
- to establish an equitable means of apportioning the benefit and burdens of water resource management;
- to prevent the export of native surface water and groundwater from the Antelope Valley and to develop reasonable limitations upon the export of any other water from the Antelope Valley;
- to provide a mechanism for the storage and recovery of water;
- to encourage the protection and preservation of surface water and groundwater quality;
- to develop conservation plans to promote reasonable beneficial use of water;
- to respect existing jurisdictional authority of the public agencies and water suppliers in the Antelope Valley;
- to solicit and welcome the advice, council and support of interested parties and the public in the implementation of these principals and objectives; and
- to conduct regularly scheduled meetings to advance these principles and objectives and discuss other matters of common interest.

In August 2006, the AVSWCA accepted responsibility as the facilitator for groundwater banking projects in the Antelope Valley.

The Westside Water Bank, described in Section 1.2.1.1, is one of the groundwater basin banking projects that was selected for implementation during development of the 2007 IRWMP.

#### 1.2.1.3 City of Lancaster

The City of Lancaster is a highly acclaimed, award-winning municipality with a thriving community of nearly 161,000 (SCAG 2019a). Located approximately one hour north of Los Angeles, Lancaster's clean air, attainable housing, wide open spaces, and close-knit community make it the ideal place for families. The City serves as a commercial, cultural and educational center for the Antelope Valley, as well as for northern Los Angeles County.

Lancaster's potential for growth, along with a strong commitment to business from local leaders, earned Lancaster the "Most Business-Friendly" Eddy Award from the Los Angeles Economic Development Corporation in 2007. Additionally, Lancaster has received twenty League of California Cities Helen Putnam Awards of Excellence; seventeen 3CMA Awards; numerous awards for its accomplishments in the areas of parks, recreation & arts, financial reporting, economic development, public works, and public safety. The City's most recent accolade hailed from the National Energy Globe Award committee, which recognized Lancaster's advancements in the solar energy arena.

The Planning Department is responsible for the development and implementation of a variety of short-, mid-, and long-range plans, including the City's General Plan, various specific plans, and the

City's zoning and subdivision ordinances. The Public Works Department has received National Awards for Economic Development Programs and innovative Public Works projects, and it is responsible for various environmental compliance and conservation projects, as well as flood control and stormwater management. The Parks, Recreation and Arts Department manages twenty City parks and facilities covering more than 450 acres, including athletic fields, swimming pools, playgrounds, and walking trails.

Lancaster is a Charter City, incorporated in 1977, and operates under a Council-Manager form of government. The City government provides various municipal services related to water and natural resources management. Utility services within Lancaster are provided by several public and private agencies. Water service is primarily provided by Los Angeles Waterworks District (LACWD) 40; and sewer service is provided by the City of Lancaster and LACSD 14.

#### 1.2.1.4 City of Palmdale

Palmdale, the first community within the Antelope Valley to incorporate as a city in 1962, is located in the northeast reaches of Los Angeles County, separated from Los Angeles by the San Gabriel Mountain range. As of 2018, the population is estimated at approximately 159,000, making Palmdale the sixth-largest city in Los Angeles County and the largest "desert city" in California (SCAG 2019b). With 105 square miles of land in its incorporated boundaries, Palmdale is in the top 100 largest cities in the U.S. in geographic area.

The Palmdale government provides various municipal services related to water and natural resource management. The Planning Division is responsible for the development and implementation of a variety of short-, mid-, and long-range plans, including the City's General Plan, various specific plans, and the City's zoning and subdivision ordinances. The Public Works Department is responsible for the development and maintenance of the City's public infrastructure, including flood control and stormwater management facilities. The Recreation and Culture Department's responsibilities include the administration, management and implementation of programs that maintain and beautify Palmdale's parklands and recreational facilities.

Utility services within Palmdale are provided by several public and private agencies. Water service is primarily provided by PWD and LACWD 40; sewer service is provided by LACSD 20; and refuse pickup and disposal service is provided by Waste Management, Inc. of the Antelope Valley under a franchise agreement with the City. In 2012, the City of Palmdale created the Palmdale Recycled Water Authority (PRWA) in collaboration with PWD. The purpose of PRWA is to manage recycled water resources created by the Los Angeles County Sanitation District numbers 14 and 20 for any and all reasonable and beneficial uses. The City of Palmdale has an existing agreement with the LACSD for 2,000 AFY of recycled water to provide to customers throughout the City's service area. However, projects to maximize use of the available recycled water are still being developed.

#### 1.2.1.5 Littlerock Creek Irrigation District

LCID is the smallest of the three SWP Contractors within the Antelope Valley. LCID's service area comprises approximately 17 square miles within the southeastern region of the Antelope Valley. The majority of LCID consists of unincorporated land east of the City of Palmdale, though a small portion of the city is within LCID's boundaries.

LCID receives raw water from the SWP, local surface water from Littlerock Reservoir and pumps groundwater. LCID's SWP contractual Table A amount is 2,300 AF and the agency provides water to approximately 1,200 active service connections for domestic and irrigation use (personal communication with James Chaisson, LCID, October 1, 2019).

LCID is a partner in the JPA for the AVSWCA and also participates in a joint use agreement with PWD for shared use of Littlerock Dam for treated water. LCID's surface water source is from surface runoff collected in Littlerock Reservoir. Littlerock Reservoir, which is co-owned with PWD, is fed by the runoff from the San Gabriel Mountains and has a useable storage capacity of 3,500 AF of water. PWD and LCID jointly have long-standing water rights to 5,500 AFY from Littlerock Creek flows (PWD 2015). LCID has an agreement with PWD to treat LCID's SWP and Littlerock Creek water when it is needed for potable use. LCID has one groundwater well for agriculture, four groundwater wells producing potable water and five (5) one-million gallon tanks to store potable water for residential use (personal communication with James Chaisson, LCID, October 1, 2019).

#### 1.2.1.6 Los Angeles County Sanitation District Nos. 14 and 20

LACSD is a confederation of independent special districts serving about 5.6 million people in Los Angeles County. LACSD's service area covers approximately 850 square miles and encompasses 78 cities and unincorporated territory within the County. The agency is made up of 24 separate Sanitation Districts working cooperatively under a Joint Administration Agreement with one administrative staff headquartered near the City of Whittier. Each Sanitation District has a separate Board of Directors consisting of the Mayor of each city within that District and the Chair of the Board of Supervisors for county unincorporated territory. Each Sanitation District pays for its proportionate share of joint administrative costs. The Antelope Valley is served by the LACSD 14 and 20.

SANITATION DISTRICTS OF LOS ANGELES COUNTY

LACSD 14 was formed on August 31, 1938, to provide wastewater management services in the Antelope Valley. LACSD 14, whose service area is 59 square miles, serves a large portion of Lancaster as well as portions of Palmdale and adjacent unincorporated areas of Los Angeles County. LACSD 20 was formed on August 7, 1951, to provide wastewater management services for the Palmdale area. Its service area is approximately 41 square miles and serves the majority of residents within Palmdale, as well as adjacent unincorporated Los Angeles County areas.

The LACSD owns, operates, and maintains over 1,400 miles of main trunk sewers and 11 wastewater treatment plants with a total permitted capacity of 650.8 million gallons per day (mgd). The LACSD sewerage system currently conveys and treats approximately 390 mgd of wastewater. Approximately 135 mgd of the treated wastewater is available for reuse after receiving a tertiary treatment. Operation of LACSD facilities influence the community and environment in the Antelope Valley by providing effluent to landscape and agricultural irrigation, industrial process water, recreational impoundments (i.e., Apollo Lakes), wildlife habitat maintenance (i.e., Piute Ponds), and groundwater replenishment. The expansion of recycled water use in the Antelope Valley continues.

#### 1.2.1.7 Los Angeles County Waterworks District No. 40

LACWD

LOS ANGELES COUNTY WATERWORKS DISTRICTS

LACWD 40 is a public water agency that serves portions of the Cities of Lancaster and Palmdale, and several small communities in the eastern portion of the Antelope Valley. LACWD 40 was formed in accordance with Division 16 Sections 55000 through 55991 of the State Water Code to supply water for urban use throughout the Antelope Valley. It is governed by the Los Angeles County Board of Supervisors with the Waterworks Division of the

County Department of Public Works providing administration, operation and maintenance of LACWD 40's facilities.

LACWD 40 provides water service to approximately 208,068 residents with water that is imported to the Antelope Valley through the State Water Project and then treated at AVEK's Quartz Hill Water Treatment plant and Eastside Water Treatment Plant. This supply is supplemented by groundwater pumped from the Antelope Valley Groundwater Basin by approximately 50 wells owned and operated by the LACWD 40. LACWD 40's service area encompasses approximately 554 square miles which is comprised of eight regions serving customers in the communities of Lancaster (Region 4), Pearblossom (Region 24), Littlerock (Region 27), Sun Village (Region 33), Palmdale (Region 34), Northeast Los Angeles County (Region 35), Lake Los Angeles (Region 38), and Rock Creek (Region 39). It is noted that Regions 4 and 34 are integrated and operated as one system. Similarly, regions 24, 27, and 33 are also integrated and operated as one system.

In an effort to ensure supply reliability, LACWD 40 is undertaking projects to store excess imported water in the ground during wet years so that it can be extracted and used during dry years. LACWD 40 is also working with AVEK to store water at their Water Supply Stabilization Project No. 2 water bank.

Municipal wastewater is generated from a combination of residential and commercial sources. The Cities of Lancaster (District 14) and Palmdale (District 20) own, operate, and maintain the wastewater collection systems in their respective service areas. The majority of the wastewater currently collected from within the LACWD 40 service area is treated and discharged outside the LACWD 40 service area. However, recycled water from the Palmdale and Lancaster Water Reclamation Plants (WRPs) is projected to be a potential source of supply for LACWD 40. The Antelope Valley Backbone project will provide the necessary distribution infrastructure to convey recycled water to users, and thereby offset potable water demands in the Antelope Valley. To date, only a portion of the Antelope Valley Backbone has been constructed. As future funding sources are identified, the Antelope Valley Backbone will be connected to the Lancaster WRP and the Palmdale WRP and serve the proposed Palmdale Hybrid Power Plant and the Antelope Valley Country Club. This will ensure a reliable source of supply so that the recycled water service area can expand to serve additional recycled water demands.

#### 1.2.1.8 Palmdale Water District

PWD is a wholesaler and retailer of potable water. PWD was established in 1918 as the Palmdale Irrigation District (PID). The name was changed in 1973 to reflect the absence of agricultural water service. As stated above, PWD is also a partner in the JPA for the AVSWCA. PWD boundaries encompass approximately 187 square miles. Approximately 46 square miles are directly served by PWD and an additional two square miles are served through agreements with AVEK (the majority of the remaining area falls within the Angeles National Forest).

PWD has three sources for water: (1) imported water from SWP, of which it has a contractual Table A amount of 21,300 AFY, (2) local groundwater, and (3) surface water (Littlerock Reservoir, which is jointly owned by LCID, and PWD). Littlerock Reservoir has a storage capacity of 3,500 AF of water. Palmdale Lake stores the SWP water and any Littlerock Reservoir discharges until treatment and distribution. Groundwater wells produce approximately 50 percent of PWD's water supply. PWD is also a member of the PRWA, which manages recycled water within the PWD service area. Recycled water available for use within the PWD service area is supplied from the LACSD Palmdale WRP. Recycled water production and use is projected to grow within the PWD service area and described further in Section 1.2.1.4.

In general, PWD serves the eastern half of the City of Palmdale and adjacent unincorporated areas of Los Angeles County, and maintains over 27,000 service connections.

#### 1.2.1.9 Quartz Hill Water District

QHWD is an independent special district that was incorporated in 1954, with a service area of about 4.5 square miles located in the southwest end of the Antelope Valley at the north end of Los Angeles County.

QHWD's service area includes portions of the Cities of Lancaster and Palmdale as well as unincorporated County land. Water service is provided to residential, commercial, industrial, and agricultural customers, as well as for environmental and fire protection uses. QHWD is a retailer of imported water from AVEK and produces local groundwater to meet local water demands.

#### 1.2.1.10 Rosamond Community Services District

RCSD was formed in 1966 under the Community Services District Law, Division 3, Section 61000 of Title 6 of the Government code of the State of California. RCSD's service area boundary encompasses approximately 31 square miles of unincorporated residential, industrial, and undeveloped land. The majority of the land located within the RCSD service area is undeveloped. The developed property focuses around central Rosamond, with the exception of the Tropico Hills.

RCSD provides water, sewer, and lighting services to residential, commercial, industrial, and agricultural customers, as well as water for environmental and fire protection uses.

RCSD is a retailer of imported water from AVEK and produces local groundwater.

**Table 1-1: Participating Entities**

| Agency | Roles and Responsibility |
|---|---|
| AVEK | Wholesaler of imported water to the Antelope Valley Region, water banking |
| AVSWCA | Members provide imported water to the Antelope Valley |
| City of Lancaster | Provides land-use planning, environmental, flood management, and parks and recreation services |
| City of Palmdale | Provides land-use planning, environmental, flood management, and parks and recreation services |
| LCID | Supplies surface and imported water to the Antelope Valley Region |
| LACSD 14 | Provides collection and treatment of wastewater and supplies recycled water to portions of the Antelope Valley Region |
| LACSD 20 | Provides collection and treatment of wastewater and supplies recycled water to portions of the Antelope Valley Region |
| LACWD 40 | Supplies water to portions of the Antelope Valley Region in Los Angeles County |
| PWD | Supplies water to portions of Palmdale and adjacent unincorporated areas of Los Angeles County |
| QHWD | Supplies water to portions of the southwest end of the Antelope Valley |
| RCSD | Supplies water to portions of unincorporated Kern County |

#### RWMG Summary

The composition of the RWMG provides a good cross-sectional representation of all water/natural resource and land-use management activities for the Antelope Valley Region. Table 1-1 provides a summary of participating agencies' roles and responsibilities specific to this IRWM Plan development and implementation.

### 1.2.2 Stakeholder Group

In addition to the RWMG, this IRWM Plan has received the input of many other interested agencies and organizations. Membership in the stakeholder group has been broadly extended to a number of entities. Neither a financial contribution nor agency status are required to be part of the collaborative IRWM planning process. Through extensive outreach efforts, individuals from disadvantaged, small, and rural communities as well as other interested groups are continually encouraged to participate, and are being informed of IRWM Plan development efforts through presentations, media relations, and other outreach in their communities.

This IRWM Plan has been prepared through a collaborative process of many agencies and organizations with an interest in improving water supply reliability and sufficiency, water quality, water conservation, flood control, natural habitat, and land-use planning in the Antelope Valley


The Stakeholders are given a tour of the Rosamond Dry Lake bed by EAFB staff.

Region. This subsection lists all past and current stakeholders grouped into several categories and describes their roles in the planning process. The broad array of participants includes the agencies that comprise the RWMG as well as an extensive mix of other cities and regulatory, environmental, industrial, agricultural, and land-use planning agencies that represent all areas of the Antelope Valley Region. A brief discussion of coordination efforts with local planning, State, and Federal agencies is also provided where appropriate.

During the preparation of the 2013, 2017, and 2019 IRWM Plan updates, Stakeholder group meetings were held regularly to allow for discussion of issues facing the Antelope Valley Region. These meetings were open to the public and all other interested parties. Copies of the meeting agendas, minutes, and presentations are available on the project website (www.avwaterplan.org).

#### 1.2.2.1 State Water Project Contractors

The State Water Project Contractors include agencies that provide distribution of SWP water to the Antelope Valley. Each of these agencies is a member of the RWMG and was described in Section 1.2.1. These agencies include the AVSWCA, AVEK, LCID, and PWD and all are currently active participants in the Stakeholder group.

#### 1.2.2.2 Retail Water Purveyors

The retail water purveyors include agencies that have water management responsibilities in the Antelope Valley Region. A majority of these agencies are members of the RWMG and were described in Section 1.2.1. These agencies include LACWD 40, QHWD, and RCSD and all are currently active participants in the Stakeholder group.

#### 1.2.2.3 Local Jurisdictions/Land-Use Planning Agencies

Several land-use planning departments and agencies have been involved in the development and implementation of the projects and objectives of this IRWM Plan. Their participation provides valuable input in meetings, ensures accurate and consistent land-use planning information, and helps to incorporate local planning documents and goals into the IRWM Plan objectives. Historically, representatives of the Cities of Palmdale, Lancaster and Boron, and the Los Angeles and Kern County Departments of Regional Planning have participated in the stakeholder meetings. All land-use planning department and agencies are continuously invited to attend Stakeholder meetings via email, as described in Section 1.2.3. The Cities of Palmdale and Lancaster remain active participants in the Stakeholder group.

#### 1.2.2.4 Federal Agencies

Historically, several federal agencies have been involved in the development and implementation of the objectives and projects for the IRWM Plan. Coordination with federal regulatory agencies is essential to the development and implementation of all recommended projects due to the need for regulatory and environmental approval prior to implementation. The federal agencies that have historically been involved in the development and implementation of this IRWM Plan include: the United States Department of Agriculture, Natural Resources Conservation District, United States Geological Survey, and EAFB. The role of EAFB is to ensure that their natural resource management and other mission goals are incorporated into the IRWM Plan. EAFB remains an active participant in the Stakeholder group.

#### 1.2.2.5 Regulatory Agencies/State Agencies

Several state regulatory agencies have been involved in the development and implementation of the objectives and projects for this IRWM Plan. Their participation has focused particularly on water quality issues pertaining to groundwater recharge within the Antelope Valley Region. Coordination with state regulatory agencies is essential to the development and implementation of all recommended projects due to the need for regulatory and environmental approval prior to implementation. The Lahontan Regional Water Quality Control Board (RWQCB) has participated in preparing and updating this IRWM Plan. Furthermore, these agencies have had the chance to address items of concern on these projects at the regularly scheduled stakeholder meetings. The roles and responsibilities of these agencies are to ensure that regulatory compliance standards and goals are incorporated in this IRWM Plan. The agencies include: DWR, the Lahontan RWQCB, the California Department of Public Health, the California State Parks, and the California State Department of Fish and Game. DWR specifically provided support during outreach calls with other Lahontan Regions. The Lahontan RWQCB remains an active participant in the Stakeholder group meetings.

#### 1.2.2.6 Environmental/Conservation Community

The role and responsibility of the environmental/conservation community is to ensure that goals for conservation and protection of natural resources and habitat within the Antelope Valley are incorporated in this IRWM Plan. The stakeholder groups that have historically been involved with the development of the IRWM Plan include the Antelope Valley Conservancy, the Antelope Valley Water Conservation Coalition, Antelope Valley Resource Conservation District and the Sierra Club. The Antelope Valley Resource Conservation District remains an active participant in the Stakeholder group.


Natural resources conservation is a priority for the Region.

#### 1.2.2.7 Building Industry

The Building Industry Association of Southern California – Los Angeles/Ventura Chapter's (BIA LA/V) role is to ensure land-use planning and growth management within the Antelope Valley is incorporated in this IRWM Plan. The building industry entities that have historically been involved with the development of this IRWM Plan include two chapters of the Building Industry Association, the Antelope Valley Chapter and the South Eastern Kern County Chapter.


The agricultural industry is integral to the Region's economy.

#### 1.2.2.8 Agricultural/Farm Industry

Agricultural and Farm interests for the Antelope Valley Region have historically been represented by the Los Angeles County and Kern County Farm Bureaus as well as individual farm and land owners. Their role is to ensure that agricultural and farm interests are incorporated in this IRWM Plan.

#### 1.2.2.9 Wastewater Agency

Wastewater management for the Antelope Valley is provided by RCSD and LACSD Nos. 14 and 20. The LACSD and RCSD are members of the RWMG and their roles and responsibilities are described in Section 1.2.1. Both RCSD and LACSD remain active members in the Stakeholder group.

#### 1.2.2.10 Mutual Water Companies

There are several mutual water companies in the Antelope Valley that provide water-related services to the Antelope Valley Region. Their role is to ensure that their water management goals are incorporated in to this IRWM Plan. Mutual water companies that have historically been involved include: Antelope Park Mutual Water Company, Edgemont Acres Mutual Water Company, El Dorado Mutual Water Company, Evergreen Mutual Water Company, Golden Valley Mutual Water, Land Projects Mutual Water, Little Baldy Water Company, Westside Park Mutual Water Company, and White Fence Farms Mutual Water Company.

#### 1.2.2.11 Media

Representatives of the Antelope Valley Press and the Mojave Desert News regularly attend RWMG stakeholder meetings in 2013 and informed their readership of the goals and objectives of this IRWM Plan. Progress was reported on in these two major area newspapers as well as other local newsletters.

#### 1.2.2.12 Others

Other agencies that have been historically involved in the planning process include the Antelope Valley Board of Trade, Boron Community Services District (Boron CSD), the Mojave Chamber of Commerce, California City Economic Development Commission, the Association of Rural Town Councils, and individual town councils throughout the Antelope Valley Region. The various town councils' roles are to ensure that their water, natural resource, fire suppression, flood control, and land-use planning goals are incorporated in this IRWM Plan. Other groups promote commercial activity in the Region. A copy of a sign-in sheet from one of the many Stakeholder meetings can be found in Appendix B.

### 1.2.3 Activities

This IRWM Plan was developed to evaluate and address regional issues while recognizing and honoring local conditions and preferences. In order to accomplish this delicate balance, an effective process to involve stakeholders and incorporate their input has been implemented. The process centers on regular stakeholder meetings open to the public where attendees are invited to participate in several ways. During the preparation of the 2013, 2017, and 2019 IRWM Plan updates, attendees were asked to participate in facilitated discussions of major items of interest, to review draft Plan chapters and other prepared documents, and to provide input on the agenda for upcoming stakeholder meetings. These meetings were announced to a broad distribution list via e-mail and all materials developed for use in stakeholder meetings were made available on the project website. The methods for stakeholder involvement and input are described below:

- Notification of Intent (NOI): An NOI to prepare an update to the 2013 IRWM Plan was published in the Antelope Valley Press, a local newspaper, on August 20, 2019 and again on August 27, 2019. A copy of the notice is provided in Appendix C. The published NOI contained the following language:

> "Notice of Intent to update the Antelope Valley Integrated Water Management Plan 2019
>
> The Antelope Valley Integrated Regional Water Management (IRWM) group is updating the Antelope Valley IRWM plan in response to State integrated planning requirements. The update is designed to improve collaboration in water resources management among potable water wholesalers and retailers, wastewater agencies,

stormwater managers, watershed groups, private businesses, agriculture representatives and non-profit stakeholders.

For additional information, please contact Evelyn Ballesteros at eballesteros@dpw.lacounty.gov or visit avwaterplan.org"

- This public notice is being published in accordance with section 10543 of the California Water Code. Review of Plan Sections: This IRWM Plan synthesizes and extends a significant body of work related to water supply, water quality, flood management, environmental resources, and open space for the Antelope Valley Region. Stakeholders were provided the opportunity to review the draft IRWM Plan, and 2013 and 2019 updates, and the material was adopted only after the stakeholders reached facilitated broad agreement on the material. The subjects of the sections include the introduction, Region description, issues and needs, objectives, resource management strategy development, project integration and objectives assessment, Plan and project evaluation and prioritization, and framework for implementation. These sections incorporate and integrate stakeholder-generated information and aggregate this information from across the entire Antelope Valley Region.
- Stakeholder Meetings: These meetings provide background on the planning process; identify issues, opportunities, and constraints; consider opportunities for project integration, and identify comments on the chapters and draft plans. They also provide a forum for a more detailed discussion of the issues related to the revision of this IRWM Plan, including the prioritization and selection of projects for IRWM grant funding.
- Project Website: A project website was developed (www.avwaterplan.org) to facilitate the distribution of project information to stakeholders. The website contains background information about Plan development, a schedule of meetings, and contact information. The website also includes a database tool through which stakeholders can submit or review projects or project concepts. A print out of the home page is included in Appendix C.
- Electronic and Written and Communications: Electronic mail was the main tool used to maintain a high level of stakeholder communication and engagement. All meetings and public notices were sent as far in advance as possible to stakeholders. Various stakeholder groups also forwarded these messages to their constituencies, thereby reaching additional stakeholders. Historically, written communications in the form of letters to cities and press releases to the media have also been utilized to expand awareness of, and participation in, this IRWM Plan development. Regular attendance at stakeholder meetings by members of the local press also allowed the residents of the Antelope Valley Region to be informed. Sample email notifications are provided in Appendix C.

### 1.2.4 Community Outreach

Community outreach within the Antelope Valley Region has been a key component to a successful IRWM Plan. Simply stated, a regional plan should have regional input, and should incorporate the widest variety of stakeholders possible. Initial outreach efforts began in 2007 and were targeted at improving overall stakeholder participation through increased agency and organized committee involvement, including disadvantaged, underserved, and smaller communities in the Region. A DAC Outreach Subcommittee had been formed to assist in outreach efforts. More information about these early efforts may be found in the 2007 IRWM Plan, Section 1.2.4.

Public Outreach Subcommittee members meet to discuss various opportunities to involve more Antelope Valley communities, including DACs.

For the 2013 IRWM Plan updates, outreach was focused on DAC areas but also extended to underserved and other rural communities. Efforts included presentations to the Antelope Valley Board of Trade and Quartz Hill Chamber of Commerce, as well as booths at the Thursday Night on the Square event and the Antelope Valley Fair and Alfalfa Festival. Outreach materials for these events can be found in Appendix C.

While DAC outreach efforts were underway, additional steps to better identify environmental justice problems, underrepresented, and rural populations within the Region were taken.

Outreach to DAC and to rural and isolated communities is now incorporated in the general outreach efforts. Stakeholders identified through the focused outreach performed for the 2013 IRWM Plan updates receive information regarding the Stakeholder group meetings and 2019 IRWM Plan update via electronic mail.

#### 1.2.4.1. Disadvantaged Communities

For the 2013 IRWM Plan updates, A DAC Outreach committee was formed to assist with data collection, outreach efforts, and project solicitation in DAC areas. The committee was composed of volunteer members representing a diverse cross-section of the active Antelope Valley IRWM Plan stakeholders including DACs, DWR, and mutual water companies. The members soon developed and implemented a multifaceted outreach campaign to support the IRWM Plan that would more actively address the needs of DACs. Overall, the two main goals of the committee were to:

- Encourage participation by DACs and solicit input into Antelope Valley IRWM Plan updates, and
- Educate target audiences in DAC areas about the purpose and benefits of the Antelope Valley IRWM Plan.

After DAC areas were identified using mean household income (MHI) data from the DWR website, a coordination effort to speak at DAC community meetings was initiated. Initial contact was made with representatives from Lake Los Angeles, Mojave Public Utility, Boron Community Services District, North Edwards Water District, Edgemont Acres Mutual Water Company, California City, and others. Subsequent presentations at local community meetings were also arranged. In addition to PowerPoint presentations, handouts were provided at each meeting that included detailed schedules, project eligibility criteria, IRWM Plan goals, plan objectives, and technical assistance listings with contact information. Table 1-2 contains a list of the DAC outreach meetings scheduled for the 2013 IRWM Plan updates.

**Table 1-2: DAC Outreach Meetings**

| Meeting/Event | Meeting Date |
|---|---|
| DAC Committee Meeting No. 1 | April 18, 2012 |
| Boron CSD | July 24, 2012 |
| Mojave Public Utility District | August 14, 2012 |
| North Edwards/Desert Lake CSD | August 14, 2012 |
| Lake Los Angeles Town Council | August 28, 2012 |
| DAC Committee Meeting No. 2 | March 20, 2013 |
| DAC Committee Meeting No. 3 | May 15, 2013 |
| Quartz Hill Chamber of Commerce | June 5, 2013 |
| Littlerock Creek Irrigation District | June 12, 2013 |
| Rosamond CSD | June 13, 2013 |
| Lake Los Angeles conference call | August 7, 2013 |
| Littlerock Creek Irrigation District | August 7, 2013 |

As defined by the IRWM Grant Program Guidelines-IRWM Plan Standards, DACs are defined as having an annual MHI that is equal to or less than 80 percent of the statewide annual median household income. In 2012, DACs were defined as communities with an MHI of $48,706 or less using Census 2010 data. In 2016, DACs were redefined to be communities with an MHI of $51,026 or less, and severely disadvantaged communities (SDACs) were defined to be communities with an MHI that is less than or equal to 60 percent of the statewide MHI, or $38,270. To confirm DAC areas in the Antelope Valley Region, committee members conducted an initial assessment of the Antelope Valley Region using DWR's online DAC map for Census "places", "tracts", and "blocks". Listed below are a number of DAC areas identified in the Region, as well as a summary of the general concerns and interests identified in 2013. The current DAC and SDAC areas are identified in Figure 1-2.

Boron, Unincorporated Los Angeles County

- Concerns regarding high arsenic levels in groundwater – would like to implement groundwater projects that reduce the concentration of arsenic.

Lake Los Angeles, Unincorporated Los Angeles County

- Interest in restoring Lake Los Angeles - could create reservoir for farming, fire usage, recreation, tourism/commercial, possible groundwater recharge site, possible use of recycled water.
- Provide flood control at Big Rock Creek Wash - heavy rains cause flooding along local roads.
- Transition from septic systems to sewer - they have some sewer lines installed but have not been used.

Littlerock, Unincorporated Los Angeles County

- Would like to see the creation and enforcement of xeriscaping ordinances designed for their community.
- Interested in opportunities for water recharge, banking, and conservation – although no specific examples were cited at the time.
- Concern about growth of communities vs. water reliability for the Region.

Mojave, Unincorporated Kern County

- Water conservation concerns. Specifically, the Mojave School District is interested in constructing two new high schools in a water-efficient manner. The DAC Outreach Subcommittee put the School District in contact with Mojave Utilities District and Environmental Justice Coalition for Water (EJCW) representative, Cindy Wise.

Portions of the City of Lancaster

- Critical water-related needs to be determined at scheduled community meetings.

Portions of the City of Palmdale (Desert View Highlands)

- Critical water-related needs to be determined at scheduled community meetings.

Roosevelt, Unincorporated Los Angeles County

- Primarily concerned with protecting their wells, protecting agricultural water rights, and preventing LACSD from "wasting water" on "new farms." An LACSD Outreach Subcommittee member followed up directly with community member concerns about the current and future LACSD water usage in their area.

A subset of disadvantaged communities are underrepresented communities. These communities are composed of minority communities living within disadvantaged communities. There are two areas within the Antelope Valley Region that were identified to meet this criterion, and they are both contained within the Cities of Lancaster and Palmdale. These areas are represented in the IRWM process by stakeholders from each of the two cities.

Refer to Appendix D of the IRWM Plan for larger DAC Census Block and Residential Area Maps and Census data printouts developed in 2013. In addition, two technical memoranda were prepared in 2013 to characterize DACs and to define issues related to DAC areas. These documents are included in Appendix D:

- DAC Water Supply, Quality and Flooding Data Final Draft TM
- DAC Monitoring Plan Final Draft TM

The 2019 IRWM Plan update process leveraged the contacts identified through the 2013 outreach effort to inform interested parties of updates to the plan, calls for projects, and details on Stakeholder group meetings.

#### 1.2.4.2 Rural/Isolated Communities

Many communities that do not face the economic constraints of disadvantaged communities must deal with obstacles due to limited resources and geographic location. Many smaller, rural communities in the Antelope Valley Region are isolated, both politically and physically, from the agency and organizational happenings in the Antelope Valley Region, and the committee agreed that these communities would also be incorporated into our IRWM Plan outreach efforts as a result of this isolation.

For the 2013 IRWM Plan update, outreach efforts were extended to all communities in the Region to take the IRWM Plan message to traditionally-isolated and more rural areas of the Antelope Valley, including the following communities :

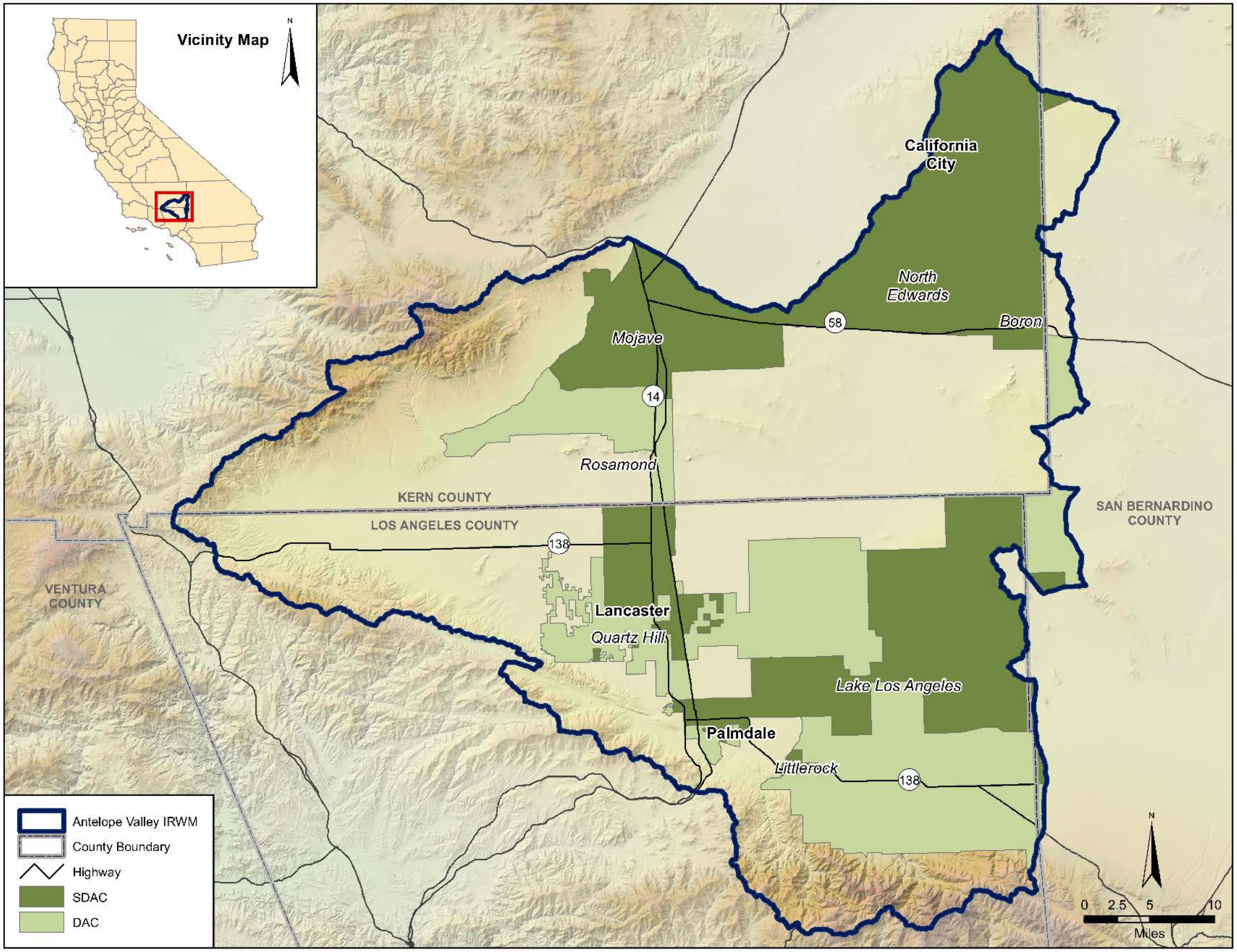
- Boron
- Lake Los Angeles
- Leona Valley
- Mojave
- Quartz Hill
- Sun Village
- The Lakes Community
- Three Points

Rural communities frequently face economic constraints that make it difficult to implement projects and programs.

Although they are not considered 'disadvantaged,' these are towns that are generally very small in population, have fewer resources, and thus, a smaller organizational structure. Most often, these towns are not able to participate in many of the larger projects that municipalities are engaging in with respect to water and environmental resource-related issues in the Antelope Valley Region. However, these communities are eager to participate in a Regional group that promotes a collaborative effort. Areas like Antelope Acres, Boron, Leona Valley, and Three Points have relatively high median household incomes but have been frustrated in trying to get specific projects implemented or tying into regional efforts because of the long distances which separate many communities in the Antelope Valley Region.

Outreach to rural and isolated communities has been integrated with the general outreach efforts. Stakeholders in these communities are invited to the Stakeholder group meetings and received information regarding the 2019 IRWM Plan updates via electronic mail.

**Figure 1-2: Antelope Valley IRWM Disadvantaged Communities as Defined by Census Blocks and Population Densities**



#### 1.2.4.3 Native American Tribal Identification

Research and outreach efforts were also made to identify and contact local Native American tribal communities through contacts with other Antelope Valley community groups and research. Previous efforts at outreach had determined that some Native American individuals within the Antelope Valley Region had been contacted, but reported that their lineage groups were not landholders and, therefore, not recognized as tribes or nations.

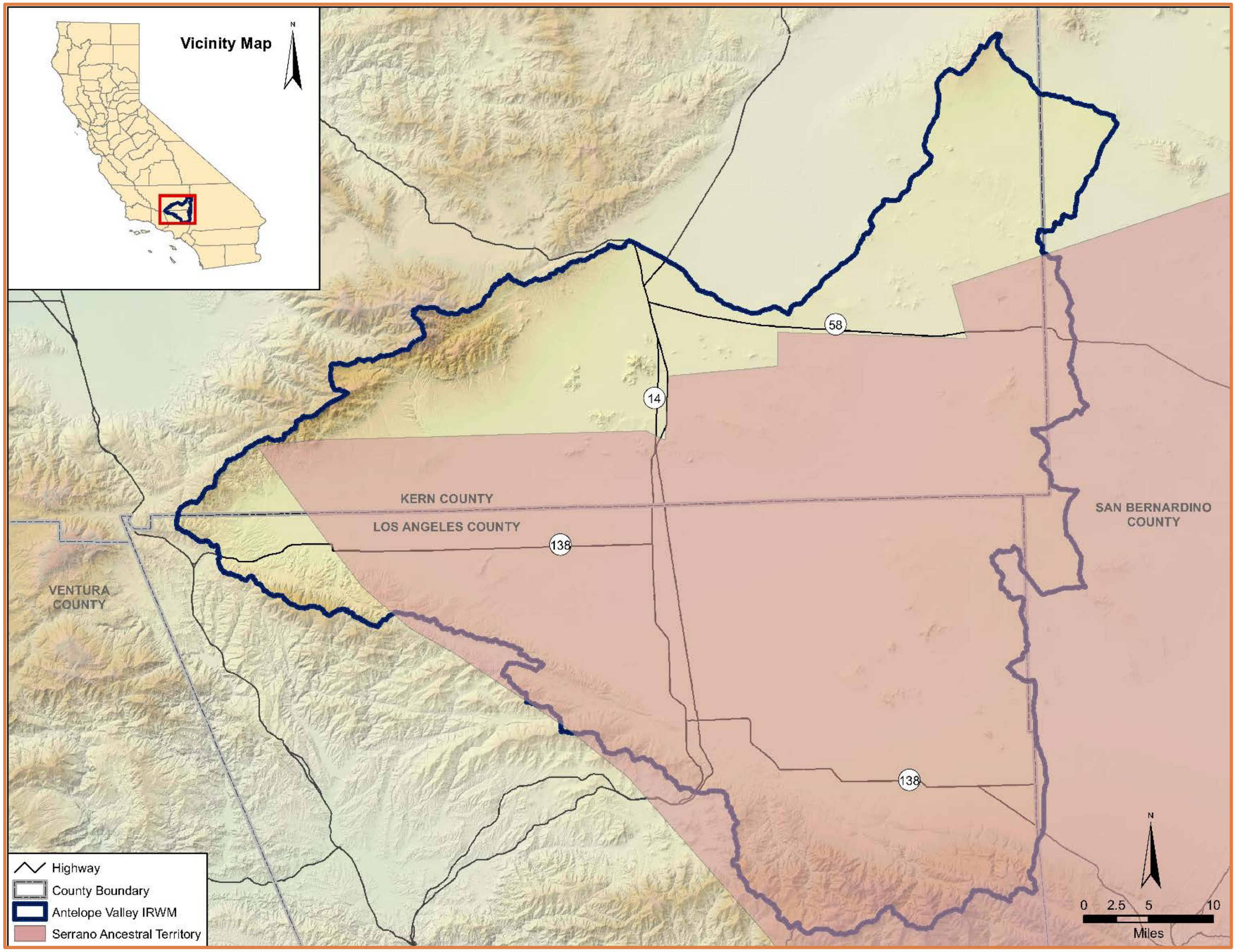
The Antelope Valley contacted the Native American Heritage Commission (NAHC) during the 2018 IRWM Plan update to obtain a Stakeholder contact list. The NAHC identified 12 organizations representing 7 tribes as potential stakeholders. The organizations, tribes, and outreach efforts are summarized in Table 1-3. Tribes are sovereign nations, and as such, coordination with Tribes is on a government-to-government basis. Representatives from the Serrano Tribe were invited to the stakeholder meetings after confirming interest and overlap between IRWM boundaries and ancestral territories, shown in Figure 1-3. There were no other tribal interests or water issues specific to Native American Tribal Communities identified through this outreach process.

The Antelope Valley Indian Museum further reports that during the late 19th and early 20th centuries, most American Indian residents remaining in the Antelope Valley integrated with the ever-expanding European culture in Southern California, and the binding group ties of earlier times began to erode the cultural base. As such, there are no formal reservations or rancherias in the Antelope Valley.

**Table 1-3: Antelope Valley IRWM Region Tribal Notification**

| Organization | Tribe | Date of Initial Outreach | Response |
|---|---|---|---|
| Gabrieleno Band of Mission Indians - Kizh Nation | Gabrieleno | 11/29/2017 | No response |
| Gabrielino /Tongva Nation | Gabrieleno | 11/29/2017 | No response |
| Gabrielino Tongva Indians of CA Tribal Council | Gabrieleno | 11/29/2017 | No response |
| Gabrielino-Tongva Tribe | Gabrieleno | 11/29/2017 | No response |
| Kitanemuk & Yowlumne Tejon Indians | Kitanemuk; Southern Valley; Yokut | 11/29/2017 | No response |
| Morongo Band of Mission Indians | Cahuilla; Serrano | 11/30/2017 | Confirmed no tribal interests in Region |
| San Fernando Band of Mission Indians | Kitanemuk; Serrano; Tataviam | 11/29/2017 | No response |
| San Manuel Band of Mission Indians | Serrano | 11/29/2017 | Confirmed overlap with Serrano ancestral territory |
| Santa Rosa Rancheria Tachi Yokut Tribe | Southern Valley; Yokut | 11/30/2017 | No response |
| Serrano Nation of Mission Indians | Serrano | 11/30/2017 | No response |
| Table Mountain Rancheria | Yokut | 11/30/2017 | Confirmed no tribal interests in Region |
| Tule River Indian Tribe | Yokut | 11/29/2017 | No response |

**Figure 1-3: Serrano Tribe Ancestral Territory**



#### 1.2.4.4 Environmental Justice Outreach

Environmental justice (EJ) is important to every community, and the Antelope Valley Region is no exception to this rule. The United States Environmental Protection Agency (EPA) defines environmental justice as the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Simply stated, this means that no group of people should bear a disproportionate share of negative environmental consequences resulting from industrial, governmental, and commercial operations or policies.

To begin identifying potential environmental justice issues facing the Antelope Valley, subcommittee members performed independent research and contacted the EJCW in 2013 for further documented information and expert advice. The EJCW was not aware of any water-related environmental justice concerns in the Antelope Valley Region.

The EPA's Environmental Justice Screening and Mapping Tool was used for the 2019 IRWM Plan update to identify places that may have higher environmental burdens and vulnerable populations. The EJ Index quantifies the combination of demographic information with one of 11 environmental indicators to identify a community's burden relative to the rest of the nation. Air quality, particularly fine particulate matter particles (PM 2.5), ozone, and cancer risk from inhalation of air toxics places a higher environmental burden on some communities in Palmdale, Lancaster, and Lake Los Angeles. Potential exposure to lead paint is also higher in some communities in Palmdale. Communities in Lancaster and Quartz Hill have higher proximity to facilities that are required to file Risk Management Plans, and few communities in northern Lancaster and in Palmdale have a higher proximity to hazardous waste sites. Wastewater discharge and toxic chemicals do not place an undue burden on vulnerable communities within the Region.

Guidelines for incorporating DACs into the IRWM Plan to help prevent environmental justice issues from developing are detailed in the 2007 IRWM Plan and are repeated here.

The major suggestions made by the EJCW in 2013 were the following:

- Provide technical assistance to facilitate participation and to assist with project development.
- Include an Environmental Justice Community representative on the governing body.
- Ensure that the on-going governance structure defined in the Plan includes a prominent role for Environmental Justice communities, including some influence over which projects are selected for future implementation grants.
- Ensure that there is a mechanism for Environmental Justice communities to participate in the evaluation of the plan over time.

These suggestions were incorporated into the overall outreach strategy for the IRWM Plan except for the second bullet. There is no governing body representative for environmental justice.

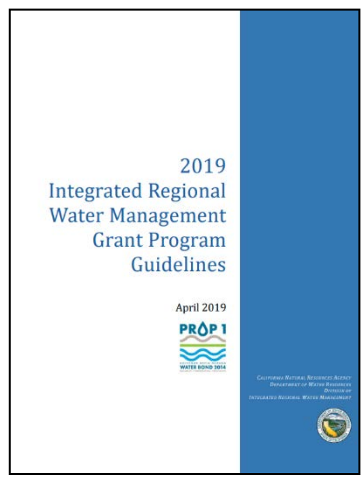
As the Antelope Valley communities expand and evolve, the IRWM Plan Stakeholder group will continue to assess environmental justice concerns through the implementation of the Plan.

#### 1.2.4.5 Media Coverage of Plan Preparation

Historically, IRWM Plan updates have been covered by the local media. Progress of the 2013 IRWM Plan updates were covered by reporters who attended stakeholder meetings representing the Antelope Valley Press and the Mojave Desert News. Committee members found that many residents were already aware of this IRWM Plan because of the coverage by these newspapers. Their exposure has greatly helped keep members of the general public and DACs informed about the 2013 IRWM Plan updates.

## 1.3 Plan Updates

This subsection provides a brief overview of the planning process utilized to update the IRWM Plan to comply with the 2016 and 2019 IRWM Grant Program Guidelines-IRWM Plan Standards.




### 1.3.1 Region Goals and Planning Objectives

The primary reason for this IRWM Plan is to develop a broadly supported water resource management plan that defines a meaningful course of action to meet the expected demands for water and other resources within the entire Antelope Valley Region through 2040. Region goals were originally developed in 2007 and were updated during the 2013 and 2019 IRWM Plan updates. This IRWM Plan will address:

- How to reliably provide the quantity and quality of water that will be demanded by a growing population;
- Options to satisfy agricultural users' demand for reliable supplies of reasonable cost irrigation water; and
- Opportunities to protect, enhance, and manage current water resources and the environmental resources for human and natural benefit within the Antelope Valley Region.

In order to achieve these goals, a list of planning objectives for the IRWM Plan was developed back in 2007. This list is reproduced below. The 2013, 2018, and 2019 IRWM Plan updates were completed in a fashion that preserves the original intent of these planning objectives.[3]

1. Develop and Adopt an Integrated Regional Water Management Plan for a planning period between 2005 and 2035[4] by December 31, 2007 that:
    a. is written to be a useful tool to a broad range of organizations within our region;
    b. describes reasonably foreseeable water demands for our region during the planning period;
    c. characterizes the available water supplies for our region during the planning period;
    d. describes and evaluates potential management actions that we can take to meet the expected water demand of everyone within the Region during the planning period;
    e. sets workable planning targets to be accomplished by specified future dates within the planning period;
    f. identifies potential and promising sources of money to pay to implement this IRWM Plan;
    g. sets priorities for implementation;
    h. is flexible and responsive to changing conditions;
    i. satisfies the guidelines published by DWR for IRWM Plans;
    j. satisfies the requirements published by DWR for AB 3030 groundwater management plans[5]; and
    k. qualifies entities within our region to apply for water related grant funds from State sources such as Proposition 50, and Proposition 84, and Proposition 1E[6].
2. Discuss and describe how all broad-based regional planning efforts are related and how they will be coordinated:
    a. IRWM Plan;
    b. Adjudication;
    c. Water Storage District Proposal;
    d. Water Banking JPA; and
    e. others.
3. Establish cooperative relationships, new partnerships, and an optimistic approach to create a useful regional plan.
4. Each member of the RWMG will take ownership in this IRWM Plan and collaborate to produce, implement, and update a widely accepted plan.

[3] These planning objectives should not be confused with the Region Objectives in Section 4. Planning objectives apply to the IRWM Plan document itself. Region Objectives apply to the Antelope Valley.
[4] Planning period was extended through 2040 for the 2019 IRWM Plan Update.
[5] The 2019 IRWM Plan update does not satisfy AB 3030 as the basin was adjudicated in 2015.
[6] The IRWM Region is currently pursuing grant funds from Proposition 1.

5. Conduct strategic education and outreach to the public informing the target audiences of the following:
    a. the need for regional planning;
    b. benefits of a cooperative approach;
    c. the priorities for implementation;
    d. how the public can participate; and
    e. others?
6. Identify a back-up plan for meeting grant application deadlines.

Many of these objectives were reached by the end of 2007. Others are ongoing in nature and apply to the 2019 IRWM Plan updates. Again, it is the intent of these 2019 IRWM Plan updates to preserve the intent of the planning objectives.

### 1.3.2 Process for Subsequent IRWM Plan Updates

This planning process recognized the importance of three key elements to any successful public policy planning exercise: people, information, and action. It was designed to provide a forum for safe and effective dialogue among the various stakeholders. During the development of the 2007 IRWM Plan, the group agreed to the following steps for interaction through a professionally facilitated process. These steps were also implemented during the 2013 IRWM Plan updates and revisited during the 2019 IRWM Plan updates:

1. Adopt Specific Measurable Attainable Relevant Time-based (SMART) goals;
2. Create a safe place for interaction;
3. Establish a clear course of action;
4. Demonstrate tangible progress; and
5. Iterate until the group is satisfied.

The planning process was also designed to provide useful, broadly accepted information that supports clear action. The information gathering and generation portion of this process is summarized in Figure 1-4, Antelope Valley IRWM Plan Planning Process. It includes the following key steps that were repeated during the 2013 and 2019 IRWM Plan updates:

- Identify the Antelope Valley Region's issues and needs: Illustrate the issues and needs of the Antelope Valley Region related to water resources in a manner that reflects the majority of Stakeholder concerns. These issues and needs are what drive the Stakeholders into taking action, and are discussed in Section 3. The Region issues and needs were revised with more current information during the 2013 and 2019 IRWM Plan updates.
- Identify clear plan objectives: Collectively establish the quantifiable objectives that the regional entities will work together to accomplish between now and 2040. These Objectives and the Planning Targets that will be used to help measure their progress are discussed in Section 4. The Region Objectives and Planning Targets were revised during stakeholder meetings for the 2013 and 2019 IRWM Plan updates.
- Resource Management Strategy Development: Involves reviewing existing documents to identify projects within the following resource management strategies (RMS) that could satisfy these IRWM Plan Region Objectives: water supply, water quality, flood management, environmental management, land use management, and climate change. Resource

Management Strategy development is discussed in more detail in Section 5 and was revised during the 2013 and 2019 IRWM Plan updates.

- Integration: Includes intra- and inter- resource management strategy integration between projects. Integration is discussed in more detail in Section 6, and the integration process was revised during the 2013 and 2019 IRWM Plan updates.
- Evaluation and Prioritization: Includes identifying short-term and long-term regional priorities, evaluating and ranking Stakeholder-identified projects and management actions, and identifying which projects the group would take "action" on first. This step is presented in Section 7. This section also includes a discussion of the impacts and benefits of the IRWM Plan, and a discussion of the benefits and costs of the prioritized projects chosen for implementation. Project evaluation and prioritization were revisited during the 2013 and 2019 IRWM Plan updates.
- Plan for Implementation: Finally, this planning process must empower the entities within the Antelope Valley Region to take meaningful action. The implementation plan presented in Section 8 provides the linkage to local planning entities, the governance structure and framework for implementing the Plan, options for financing, sources of funding and a list of performance measures that will be used to gauge progress, data management tools, and a process for updating the Plan in the future. The implementation plan was updated during the 2019 IRWM Plan updates.

Throughout the development of the 2007 IRWM Plan and the subsequent 2013 and 2019 IRWM Plan updates, public comments and Stakeholder comments have been reviewed, evaluated, discussed amongst the Stakeholder group as necessary, and incorporated into the document as appropriate.

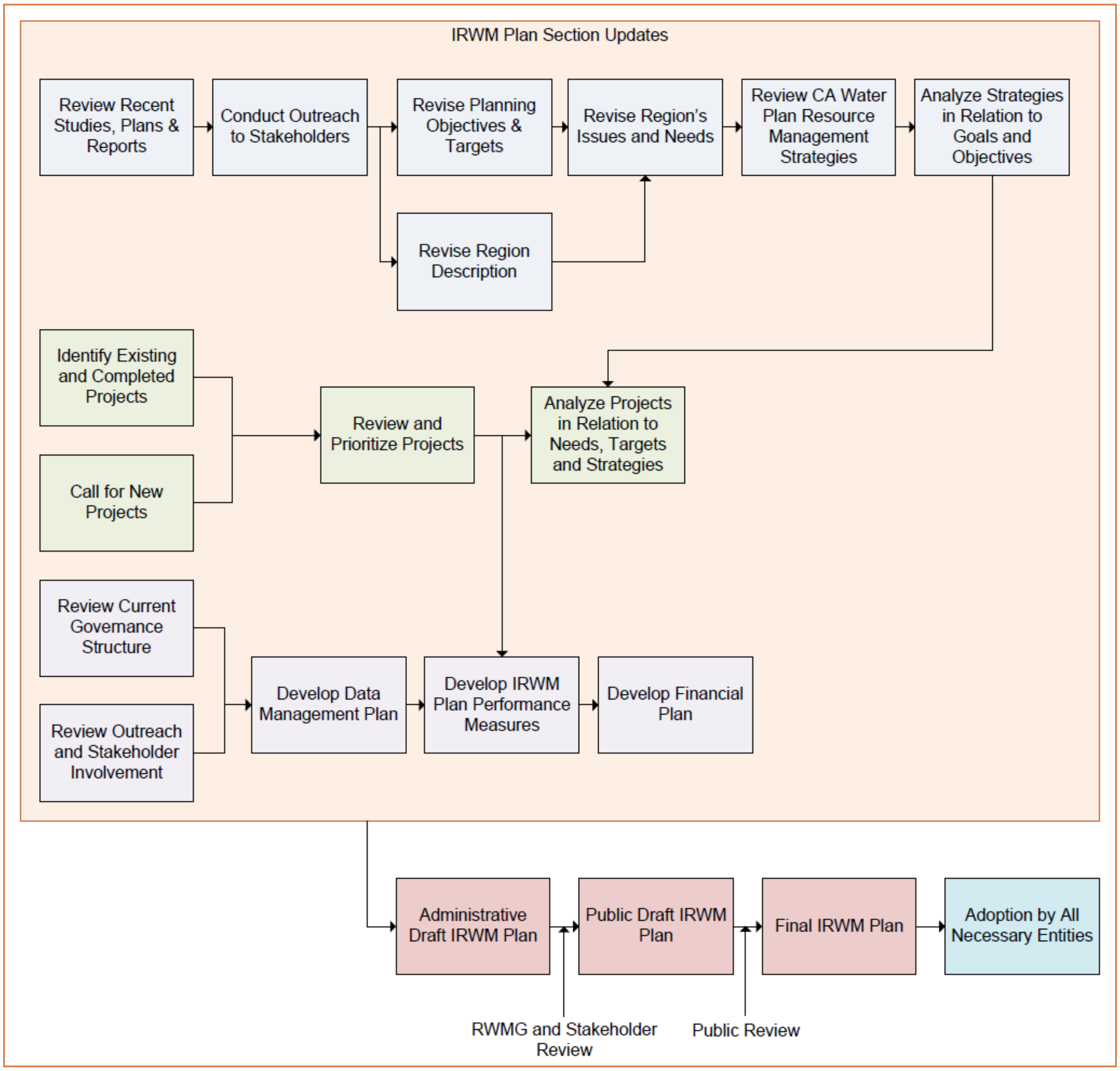
The 2019 Plan Updates were presented to the RWMG for review from October 3rd through October 17th, 2019. Comments received on the draft Plan were incorporated into a Final Plan that was completed by October 18th, 2019 and submitted to DWR. The comments for the Draft 2019 Plan updates have been summarized into a comment response matrix and can be found in Appendix E. After the Final IRWM Plan is approved by DWR, members of the RWMG plan to present the document (with 2019 updates) to their boards in the first quarter of 2019 for adoption during public meetings.[7]

### 1.3.3 Potential Obstacles to Plan Implementation

There are no potential obstacles identified for the implementation of the IRWM Plan. The Antelope Valley Groundwater Basin adjudication was finalized in December 2015 and is consistent with the overall purpose of the IRWM Plan. The objectives and planning targets in the 2013 IRWM Plan were revised in 2019 to support the adjudication framework outlined in the Judgment in order to sustainably manage the basin. The IRWM Plan's water supply analysis is also in-line with the adjudication as it is based on the native basin safe yield and production targets established by the Judgment. To date, the adjudication has not placed limitations on groundwater banking and recharge projects included in the IRWM Plan. However, the IRWM Plan is meant to be a dynamic planning document and as such will be updated at a minimum of every five years with the project priority list being kept up-to-date as discussed in Section 7.4.2.

[7] Other agencies/stakeholders that are not RWMG members may also adopt the 2019 IRWMP Update.

**Figure 1-4: Antelope Valley Integrated Regional Water Management Planning Process**




### 1.3.4 Groundwater Management Planning

This IRWM Plan defines a clear vision and direction for the sustainable management of water resources in the Antelope Valley Region through 2040. Inherent to this discussion is how groundwater will be managed to help meet the needs within the Antelope Valley Region now and into the future.

The Groundwater Management Act (California Water Code Part 2.75 Section 10753), originally enacted as Assembly Bill (AB) 3030 (1992) and amended by Senate Bill (SB) 1938 (2002), provided the authority to prepare groundwater management plans. The intent of AB 3030 was to encourage local public agencies and water purveyors to adopt formal plans to manage groundwater resources within their jurisdiction. Adoption of a Groundwater Management Plan was a prerequisite to obtaining funding assistance for groundwater projects from funds administered by DWR. Prior to the adjudication of the Basin in 2015, this IRWM plan served as a functional equivalent to a Groundwater Management Plan required in AB 3030 as it addressed all twelve technical components required in a Groundwater Management Plan.

The Sustainable Groundwater Management Act (SGMA) was enacted in 2014. Groundwater Management Plan requirements were largely replaced by SGMA and adoption of Groundwater Management Plans is no longer required under California law. Beginning January 1, 2015, no new Groundwater Management Plans can be adopted in medium and high-priority basins. Rather, in accordance with SGMA, Groundwater Sustainability Plans (GSPs) are required in their place. SGMA, however, does not apply to several adjudicated areas listed in Water Code Section 17820.8. As a result of the Antelope Valley Groundwater Basin Adjudication Judgment in 2015, the Antelope Valley Groundwater Basin is currently designated as a very low-priority basin and is not subject to SGMA requirements. Nothing in this IRWM Plan will supersede the Judgment.

### 1.3.5 Integrated Flood Management Planning

Integrated flood management (IFM) is an approach that varies from traditional flood protection by maximizing the efficient use of a floodplain while promoting public safety. IFM is a process that promotes an integrated, rather than fragmented, approach to flood management; and it recognizes the connection between flood management and water resources management, land use planning, environmental stewardship, and sustainability. Flood risk management balances current needs with future sustainability to enhance the performance of a watershed system as a whole.

The Region developed a set of comprehensive integrated flood management guidelines that identify the AV IRWM Region’s flood protection needs. The guidelines prioritize opportunities to capture and utilize stormwater recharge in addition to mitigating flood impacts. The guidelines were developed in coordination with the Flood Management Committee formed from the AV IRWMP Stakeholder Group and AV RWMG. This group assisted with the technical development of the guidelines and provided recommendations for future flood management governance and funding strategies. Findings from this needs evaluation were then used to consider strategies for managing flood issues in the Region, and consider how flood management projects should be evaluated. A set of recommended actions for flood management in the Region was developed, including the recommendation that the Region take part in the National Flood Insurance Program (NIFP) Community Rating System (CRS) to better map the Region’s flood plains, and become eligible for flood insurance discounts. Finally, an assessment of existing and potential flood protection activities versus water quality enhancement activities was completed in order to make recommendations for more integrated flood management. The findings of these tasks culminated in the development of the Integrated Flood Management Summary Document.

The Integrated Flood Management Summary Document is included with this Plan in Appendix F.

### 1.3.6 Climate Change

As part of the update of this IRWM Plan, the Region incorporated climate change considerations into various chapters, as shown below in Figure 1-5.

**Figure 1-5: Incorporation of Climate Change into the Antelope Valley IRWM Plan**

**Chapter 2: Region Description**
- Climate change effects and impacts

**Chapter 3: Issues and Needs**
- Climate change vulnerabilities

**Chapter 4: Objectives**
- Climate change related objective

**Chapter 5: Resource Mangement Strategies**
- Strategies to adapt to and mitigate against climate change

**Chapter 6: Project Integration and Objectives Assessment**
- Evaluation of how proposed projects will meet the Region's climate change related objective

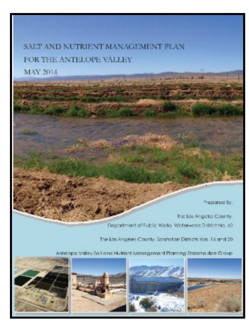
**Chapter 7: Project Submittal, Review, and Prioritization**
- Climate change adaptation and mitigation included as part of prioritization

**Chapter 8: Implementation**
- Plan for further data gathering and analysis of vulnerabilities

A climate change committee was established in order to provide input on the Region's vulnerabilities and strategies for responding to climate change. Three meetings were conducted between September 2012 and November 2012 to vet climate change impacts, determine and prioritize vulnerabilities of the Region's water resources to climate change, assess strategies for responding to climate change and mitigating greenhouse gases (GHGs), incorporate climate change considerations into objectives and targets, and incorporate climate change adaptation and mitigation into the project prioritization process. The climate change vulnerabilities of the Region were revisited during the 2019 IRWM Plan update but no changes were identified. Meeting agendas, notes, and presentation materials are available on the project website (www.avwaterplan.org).

### 1.3.7 Salt and Nutrient Management Plan

The AV IRWM Region developed a regional Salt and Nutrient Management Plan (SNMP) to manage salts and nutrients from all sources within the basin, maintain regional water quality objectives and support beneficial uses. The SNMP was developed under the guidance of the SNMP committee who are also active participants in the IRWM stakeholder group. A copy of the SNMP can be located in Appendix G and is available on the www.avwaterplan.org website.



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# Section 2 | Region Description

*This section presents a regional description for the Antelope Valley Region, including location, climate, hydrologic features, land uses, water quality, population and demographic information, regional growth projections, and climate change information. The Antelope Valley Region Description emphasizes the combination of increasing population growth, the lack of adequate water-related infrastructure, the need to maintain existing water levels in the groundwater basin, and the opportunity to create a proactive growth strategy for the developing Antelope Valley Region. This description sets the stage for the issues and needs discussed subsequently in Section 3.*

## 2.1 Region Overview

The 2,400 square miles of the Antelope Valley Region lie in the southwestern part of the Mojave Desert in southern California. Most of the Antelope Valley Region is in Los Angeles County and Kern County, and a small part of the eastern Antelope Valley Region is in San Bernardino County. Figure 2-1 provides an overview of the Antelope Valley Region. For the purposes of this IRWM Plan, the Region is defined by the Antelope Valley's key hydrologic features; bounded by the San Gabriel Mountains to the south and southwest, the Tehachapi Mountains to the northwest, and a series of hills and buttes that generally follow the San Bernardino County Line to the east, forming a well-defined triangular point at the Antelope Valley Region's western edge. The drainage basin (or watershed) was originally chosen as the boundary for the IRWM Plan because it has been used in several older studies such as "Land Use and Water Use in the Antelope Valley" by the United States Geological Survey (USGS) and "The Antelope Valley Water Resource Study" by the Antelope Valley Water Group. The area within the boundary also included key agencies dealing with similar water management issues such as increasing population, limited infrastructure, and increasing pumping costs with shared water resources and, therefore, it was an appropriate boundary to define the Antelope Valley Region for this IRWM Plan.

On November 23, 2009, the Antelope Valley Region successfully completed the Region Acceptance Process (RAP) with DWR. The RAP was the first step in becoming eligible for Prop. 84 grant funding and the process helped to further define certain aspects of the Region. Specifically, the RAP provides documentation of contact information, governing structure, RWMG composition, stakeholder participation, DAC participation, outreach, stakeholder decision-making, geographical boundaries and other features, water management issues, water-related components, and relationships with adjacent Regions. The Region boundary shown in Figure 2-1 was determined during the RAP and represents the Antelope Valley watershed. Water demands within the Antelope Valley Region are supplied by a variety of water purveyors, including large wholesale agencies, irrigation districts, special districts providing water primarily for M&I uses, investor-owned water companies, mutual water companies, and private well owners. Water supply for the Antelope Valley Region comes from five sources: the SWP, local surface water runoff that is stored in Little Rock Reservoir, the Antelope Valley Groundwater Basin, recycled water, and captured stormwater. Development demands on water availability and quality, coupled with the potential curtailments of SWP deliveries due to prolonged drought periods and other factors, have intensified the competition for available water supplies. Consensus is needed to maintain a water resource management plan and strategy that addresses the needs of the M&I purveyors to reliably provide the quantity and quality of water necessary to serve the continually expanding Antelope Valley Region, while concurrently addressing the needs of agricultural users to have adequate supplies of reasonably-priced irrigation water.

**Highway 14 connects Los Angeles to the expanding communities of the Antelope Valley.**

## 2.2 Location

As discussed above, the Antelope Valley Region encompasses most of the northern portion of Los Angeles County and the southern region of Kern County. The Region is located within the Lahontan DWR Funding Area. Bordered by mountain ranges to the north, south, and west and the hills and buttes along the east, the Antelope Valley Region is composed of the following major communities: California City, EAFB, Lancaster, Mojave, Palmdale, and Rosamond. Smaller communities include Boron, Lake Los Angeles, North Edwards, Littlerock and Quartz Hill. The communities are predominantly located in the eastern portions of the Antelope Valley Region.

The Lahontan Funding Area is bordered by the Tulare/Kern, Los Angeles-Ventura, Santa Ana, and Colorado River Funding Areas. Other Regions within the Lahontan Funding Area and adjacent Funding Areas are currently represented by IRWM Plans. These consist of the Mojave Water Agency IRWM Plan in the Lahontan Funding Area; the Fremont Basin IRWM Plan in the Lahontan Funding Area; the Upper Santa Clara River IRWM Plan in the Los Angeles-Ventura Funding Area; the Los Angeles IRWM Plan in the Los Angeles-Ventura Funding Area; and the Watersheds Coalition of Ventura County IRWM Plan, which includes the Ventura River, lower Santa Clara River and Calleguas Creek watersheds, also within the Los Angeles-Ventura Funding Area. These areas are shown in Figure 2-1 and Figure 2-2. “Funding areas” are large areas across the State that are designated by DWR; they are made up of smaller self-defined “Regions”.

The Fremont Basin IRWM Plan was developed in early 2019 in coordination with other Regions in the Lahontan Funding Area. The Fremont Basin IRWM Region boundaries were originally created to fill the existing void created by neighboring IRWM regions. During the development of the Fremont

Basin IRWM Plan, the Fremont Basin IRWM boundary was modified to reflect an overlap of two key hydrogeologic features: the Fremont Valley Groundwater Basin and the Fremont Valley Watershed. The Fremont Basin IRWM boundary modification caused an approximately 106,400-acre overlap with the Antelope Valley IRWM Region. Following discussions between key RWMG members, the two Regions decided to allow the overlap to remain. Additional coordination will occur, as needed, if any projects in the overlapping areas seek funding through the IRWM Program. Though the service areas for Mojave Public Utilities District and California City span across both IRWM Regions, the majority of the water supplies and demands are in the Fremont Basin IRWM Region. To avoid overestimating water supplies and demands, these projections were accounted for in the Fremont Basin IRWM Plan and excluded from the AV IRWM Plan. A letter of Support and Agreement between the two IRWM Regions was submitted to DWR in 2018.

Similarly, the relatively small portions of the Antelope Valley that are located in San Bernardino County are served by the Mojave Water Agency (MWA) and were included in the MWA IRWM Plan. Thus, demands from these areas and any proposed projects serving these areas were not accounted for in this IRWM Plan to avoid significant overlap with the MWA IRWM Plan. The MWA has submitted a letter of support for the Region boundary. Additionally, the AVRWMG submitted a letter of agreement which acknowledges both the AV IRWM and Kern IRWM regional boundary overlap and the respective RWMG's for the IRWM regions will work collaboratively to address any issues of common interest in this area. Letters of Support and Agreement may be found at the www.avwaterplan.org website (under "Grants"). These IRWM Regions nearly surround the Antelope Valley Region, which means that the Antelope Valley IRWM Plan will play an integral role in completing watershed analyses for the Lahontan Funding Area and provide an important link to the neighboring Los Angeles-Ventura Funding Area. The collective efforts of these interconnected IRWM Plans will not only benefit their respective regions, but the watersheds of Southern California as a whole.

**Figure 2-1: Neighboring IRWM Regions**

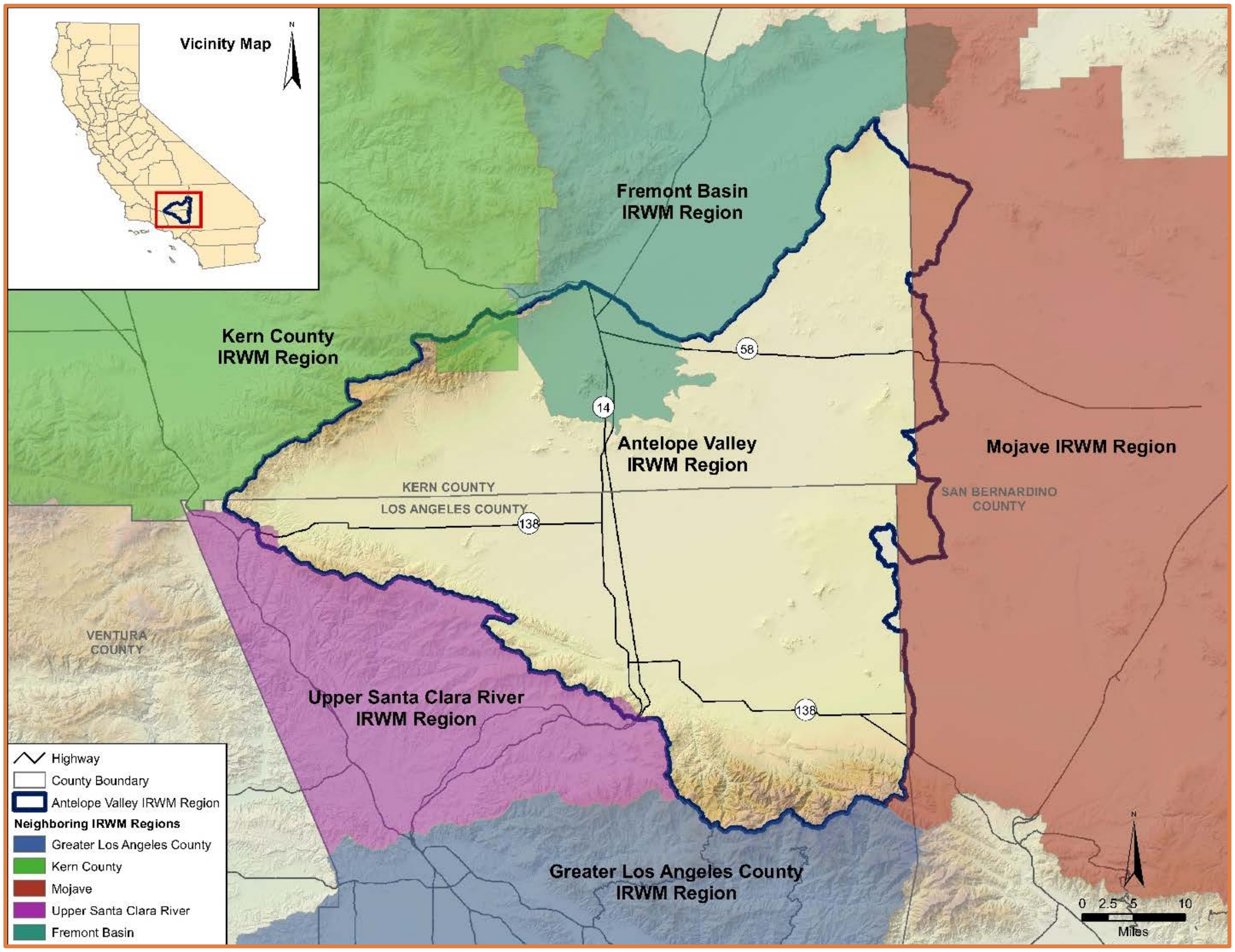
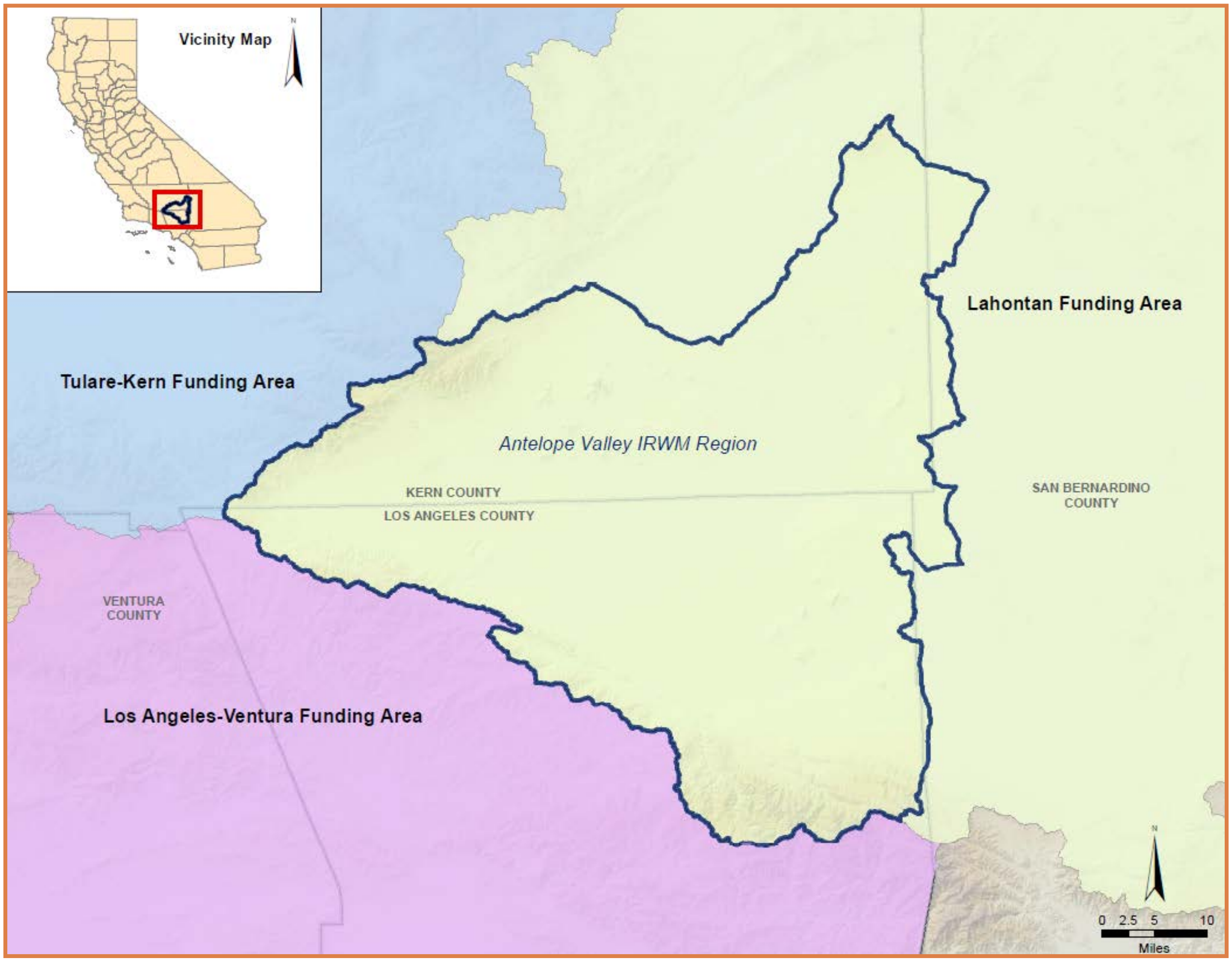


Figure 2-2: DWR IRWM Funding Areas




Four major roadways traverse the Antelope Valley Region. The Antelope Valley Freeway (State Route 14) and Sierra Highway both bisect the Antelope Valley Region from north to south. The Pearblossom Highway (Highway 138) traverses the southeastern and central-western portions of the Antelope Valley Region in an east-west direction. Highway 58 traverses the northern portion of the Antelope Valley Region in an east-west direction. Figure 2-3 shows the main Antelope Valley Service Districts, including counties, AVEK, EAFB, LACWD 40, LCID, PWD, Boron CSD, Mojave Public Utilities District, North Edwards Water District, West Valley County Water District, QHWD, RCSD, and mutual water companies. Figure 2-4 shows the Antelope Valley city boundaries, towns, flood control districts and sanitation districts. Both figures include the locations of the major roads, county lines, city lines, and Antelope Valley Region boundary.

## 2.3 Climate Statistics

Located in the southwestern portion of the Mojave Desert, the Antelope Valley Region ranges in elevation from approximately 2,300 feet to 3,500 feet above sea level. Vegetation native to the Antelope Valley Region is typical of the high desert and includes Joshua trees, saltbush, mesquite, sagebrush, and creosote bush. The climate is characterized by hot summer days, cool summer nights, cool winter days, and cool winter nights. Typical of a semiarid region, mean daily summer temperatures range from 64 degrees Fahrenheit (◦F) to 96◦F, and mean daily winter temperatures range from 35◦F to 60◦F. The growing season is primarily from April to October, though vegetation may begin to grow as early as January as the ground temperature increases.

Native vegetation includes the regal joshua tree.

Precipitation ranges from less than 4 inches on the valley floor to 20 inches in the mountains, running off the surrounding mountains through a number of canyons and watersheds. Most rainfall occurs between December and March, with little to no precipitation falling in summer months, meaning cultivated crops and non-native plants must rely heavily on irrigation. Annual variations in precipitation are important to the annual variations in applied water required for crop production and landscape maintenance. Rainfall records indicate that some runoff may be available for artificial groundwater recharge use (USGS 1995).

Figure 2-5, Annual Precipitation, summarizes the historical annual precipitation for the Antelope Valley Region, based on the data from EAFB. Table 2-1 and the following charts provide a summary of the Antelope Valley Region's climate. Climatic data is based on data collected from January 1982 to May 2019. Figure 2-5 present the average maximum and minimum temperature and the average rainfall and monthly evapotranspiration (ETo) in the Antelope Valley Region, while Figure 2-6 presents average rainfall throughout the valley.

**Table 2-1: Climate in the Antelope Valley Region**

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sept | Oct | Nov | Dec | Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Standard Monthly Avg. ETo (inches)[(a)]** | 2.27 | 3.01 | 4.91 | 6.49 | 7.89 | 9.20 | 9.66 | 8.84 | 6.45 | 4.53 | 2.96 | 2.05 | 68.25 |
| **Avg. Rainfall (inches)[(b)]** | 1.34 | 1.71 | 1.04 | 0.35 | 0.10 | 0.04 | 0.10 | 0.06 | 0.18 | 0.40 | 0.45 | 1.22 | 6.99 |
| **Avg. Max Temperature (°F)[(b)]** | 59.9 | 63.3 | 69.7 | 76.0 | 83.9 | 92.2 | 97.9 | 97.7 | 92.0 | 81.0 | 67.5 | 58.2 | 78.3 |
| **Avg. Min Temperature (°F)[(b)]** | 34.3 | 37.1 | 41.3 | 45.8 | 52.8 | 60.0 | 66.5 | 65.3 | 59.4 | 49.7 | 39.5 | 33.5 | 48.8 |

Sources:
(a) CIMIS Data for Palmdale No. 197 Station from April 2005 to May 2019.
(b) Western Regional Climate Center, Palmdale Station (046624) from January 1982 to April 2019.

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**Figure 2-3: Antelope Valley Service Districts**

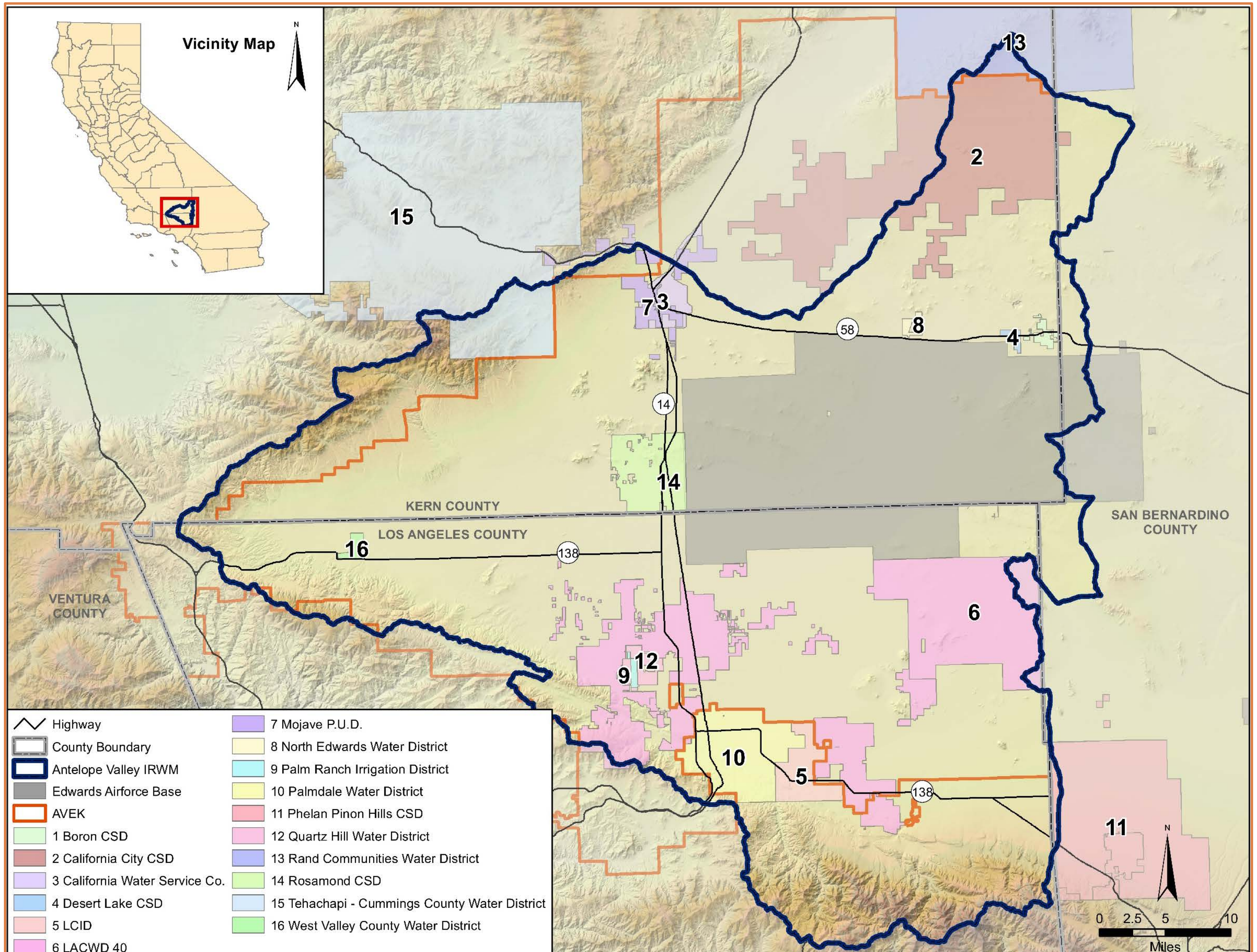


**Figure 2-4: Antelope Valley City Boundaries and Special Districts**

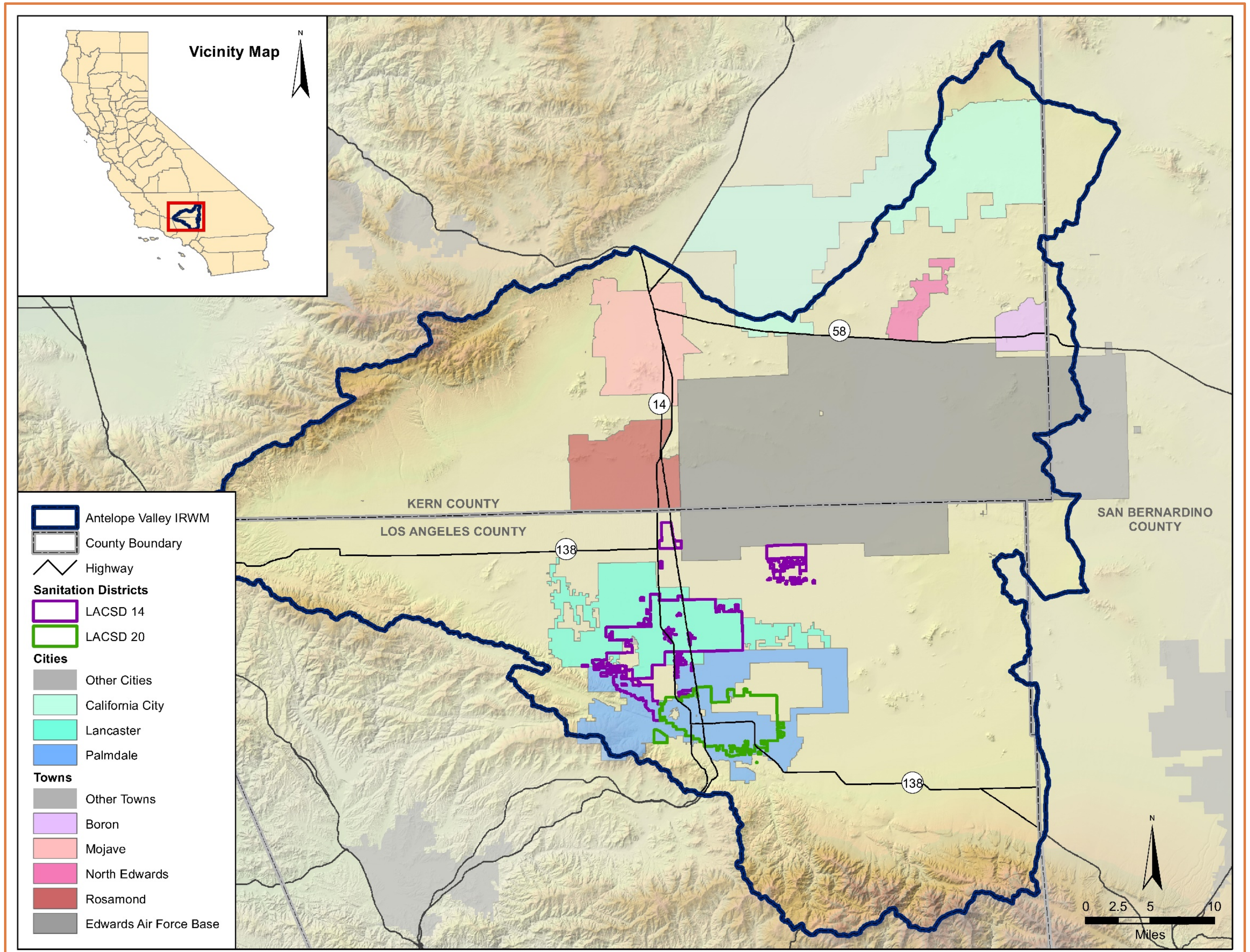
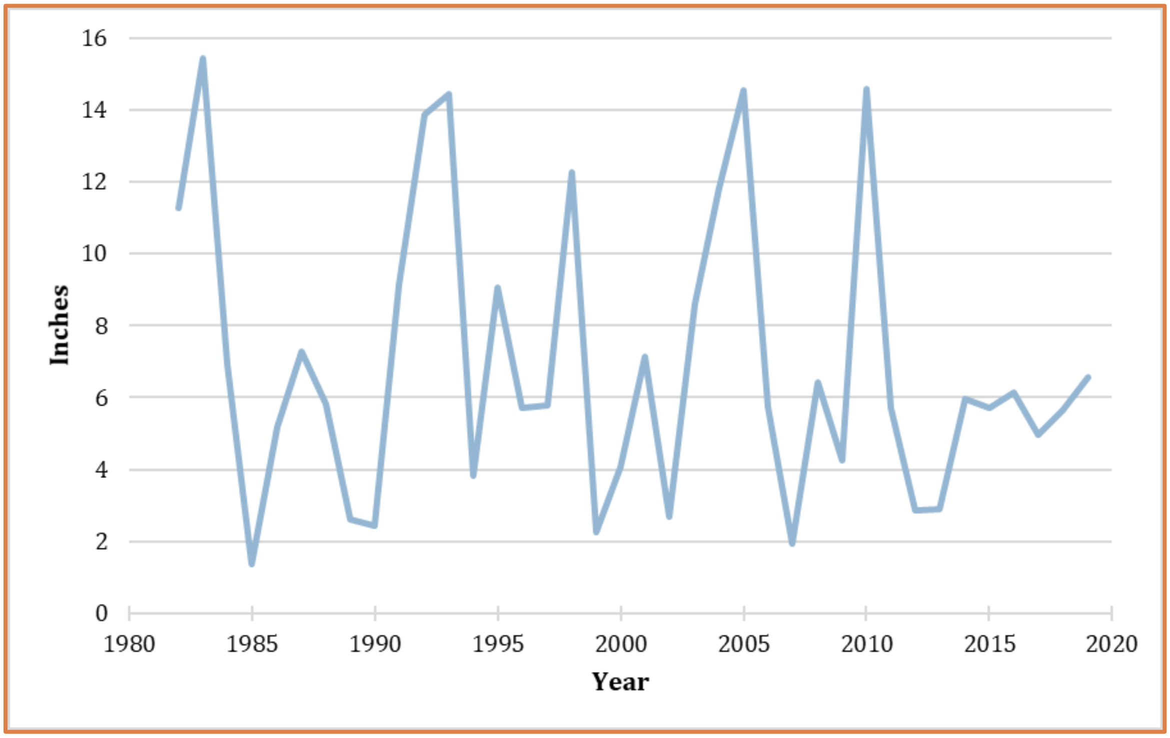
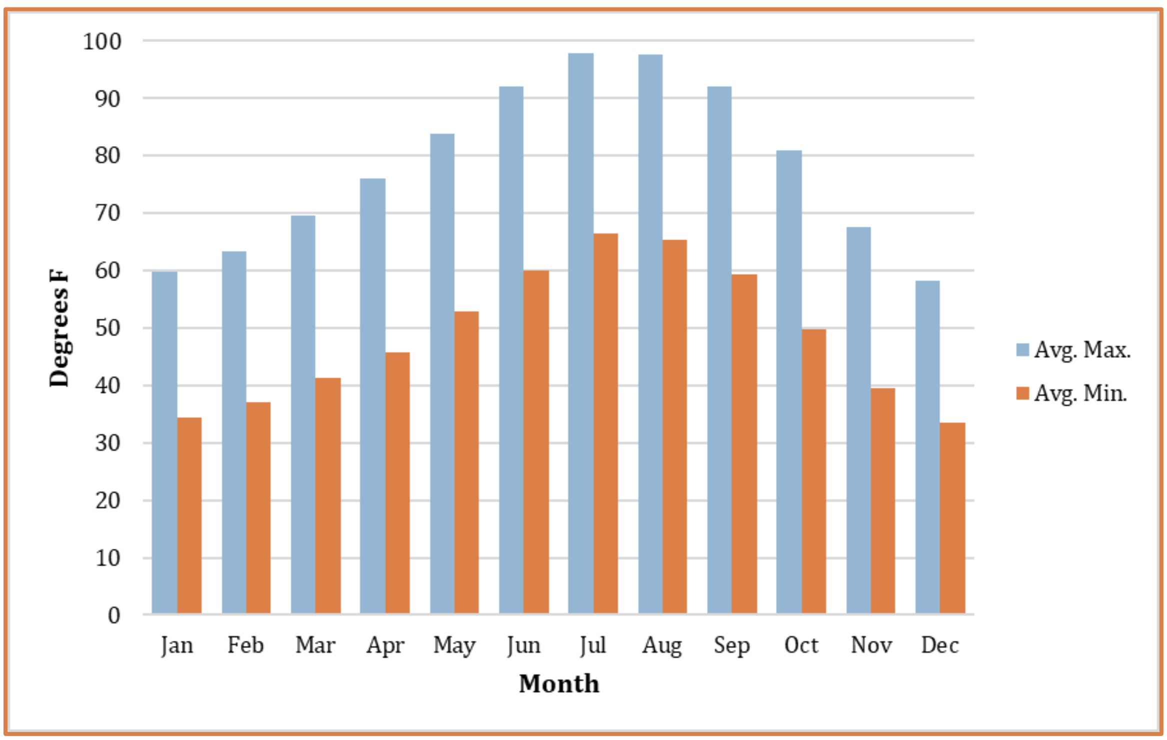


**Figure 2-5: Annual Precipitation**



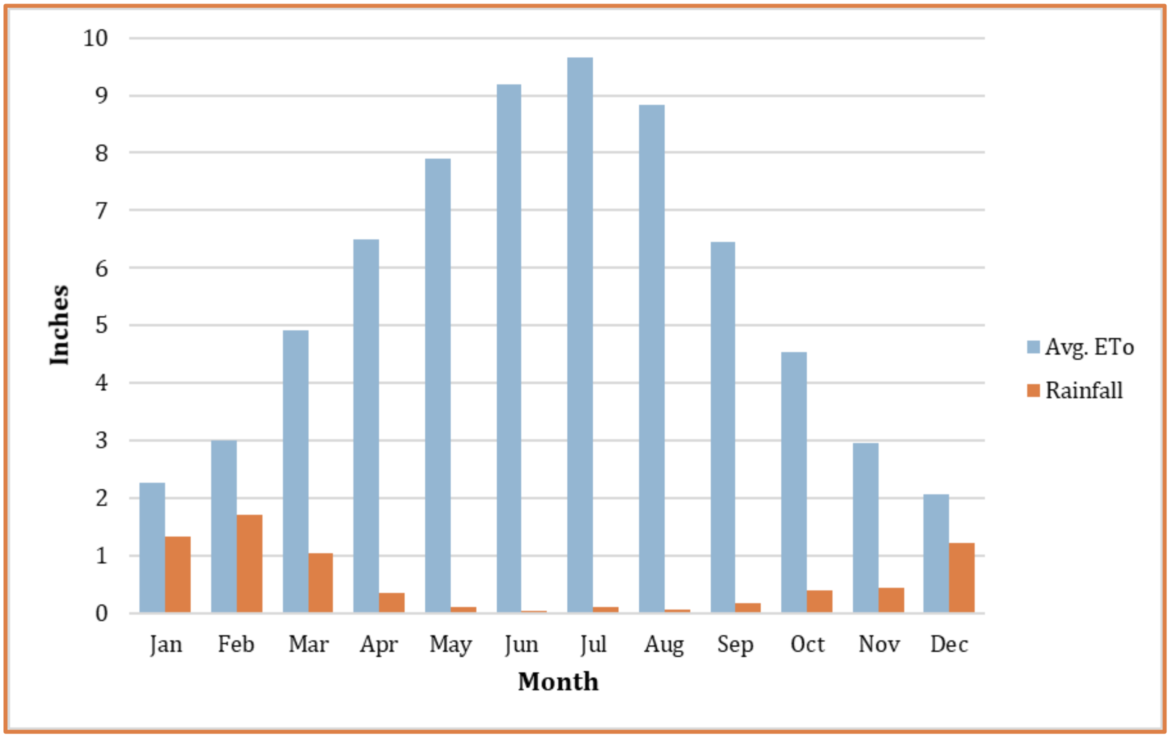

Source: Western Regional Climate Center, Palmdale Station (046624) from January 1982 to May 2019

**Figure 2-6: Average Maximum and Minimum Temperature in the Antelope Valley Region**



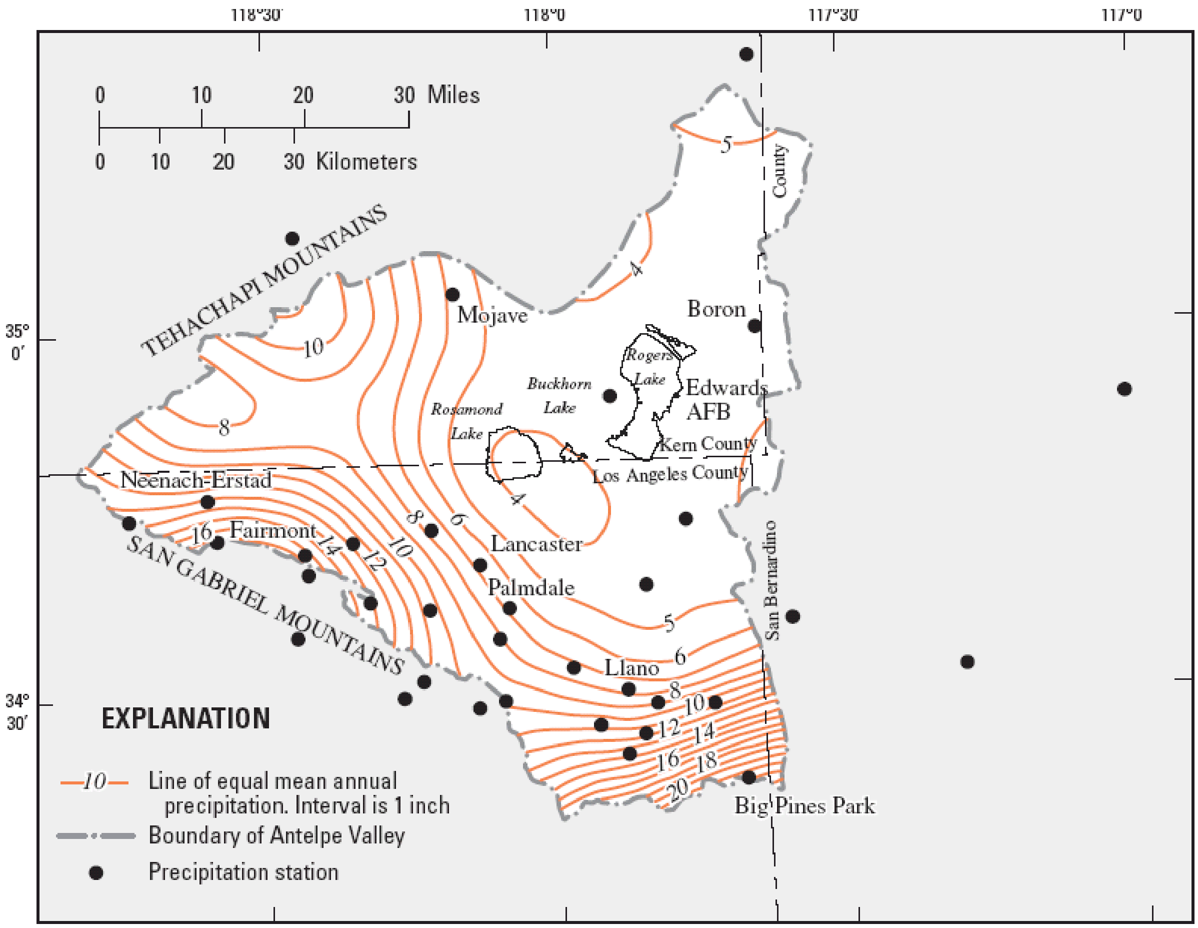

Source: Western Regional Climate Center, Palmdale Station (046624) from January 1982 to May 2019

**Figure 2-7: Average Rainfall and Monthly Evapotranspiration (ETo) in the Antelope Valley Region**




Source: CIMIS Data for Palmdale No. 197 Station from April 2005 to May 2019; Western Regional Climate Center, Palmdale Station (046624) from January 1982 to May 2019

**Figure 2-8: Map of Annual Precipitation for the Antelope Valley Region**




Source: "Precipitation depth-duration and frequency characteristics for Antelope Valley, Mojave Desert, California" Author(s): Blodgett, J. C., Los Angeles County (Calif.), Geological Survey (U.S.) Sacramento, Calif. : U.S. Geological Survey ; Denver, CO : Earth Science Information Center, Open-File Report Section [distributor], 1996.

## 2.4 Hydrologic Features

The Antelope Valley Region is a closed topographic basin with no outlet to the ocean. All water that enters the Valley Region either infiltrates into the groundwater basin, evaporates, or flows toward the three dry lakes on EAFB: Rosamond Lake, Buckhorn Lake, and Rogers Lake. In general, groundwater flows northeasterly from the mountain ranges to the dry lakes. Due to the relatively impervious nature of the dry lake soil and high evaporation rates, water that collects on the dry lakes eventually evaporates rather than infiltrating into the groundwater (LACSD 2005). The surface water and some groundwater features of the Antelope Valley Region are discussed in more detail below and are depicted in Figure 2-9.

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**Figure 2-9: Antelope Valley Hydrologic Features**

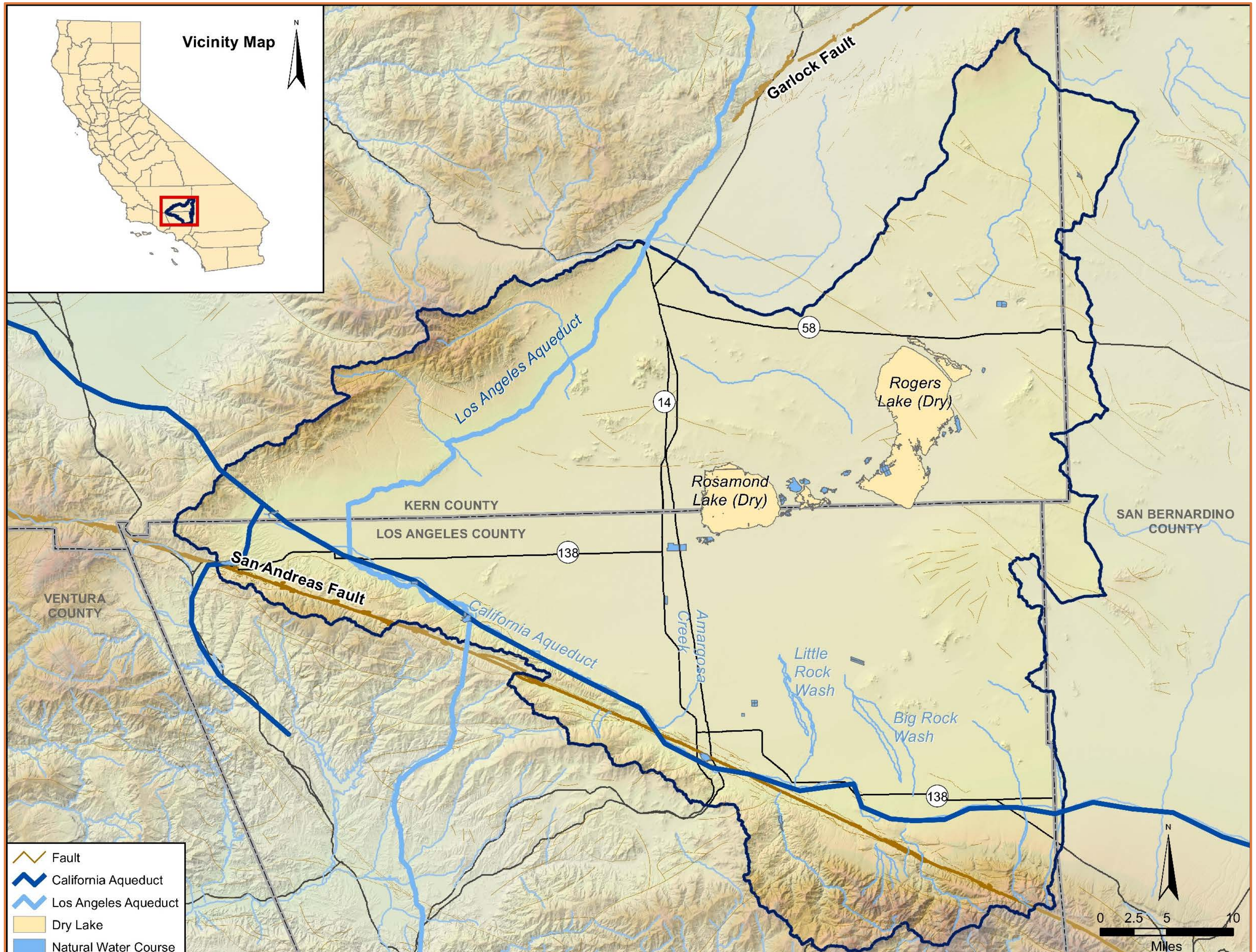
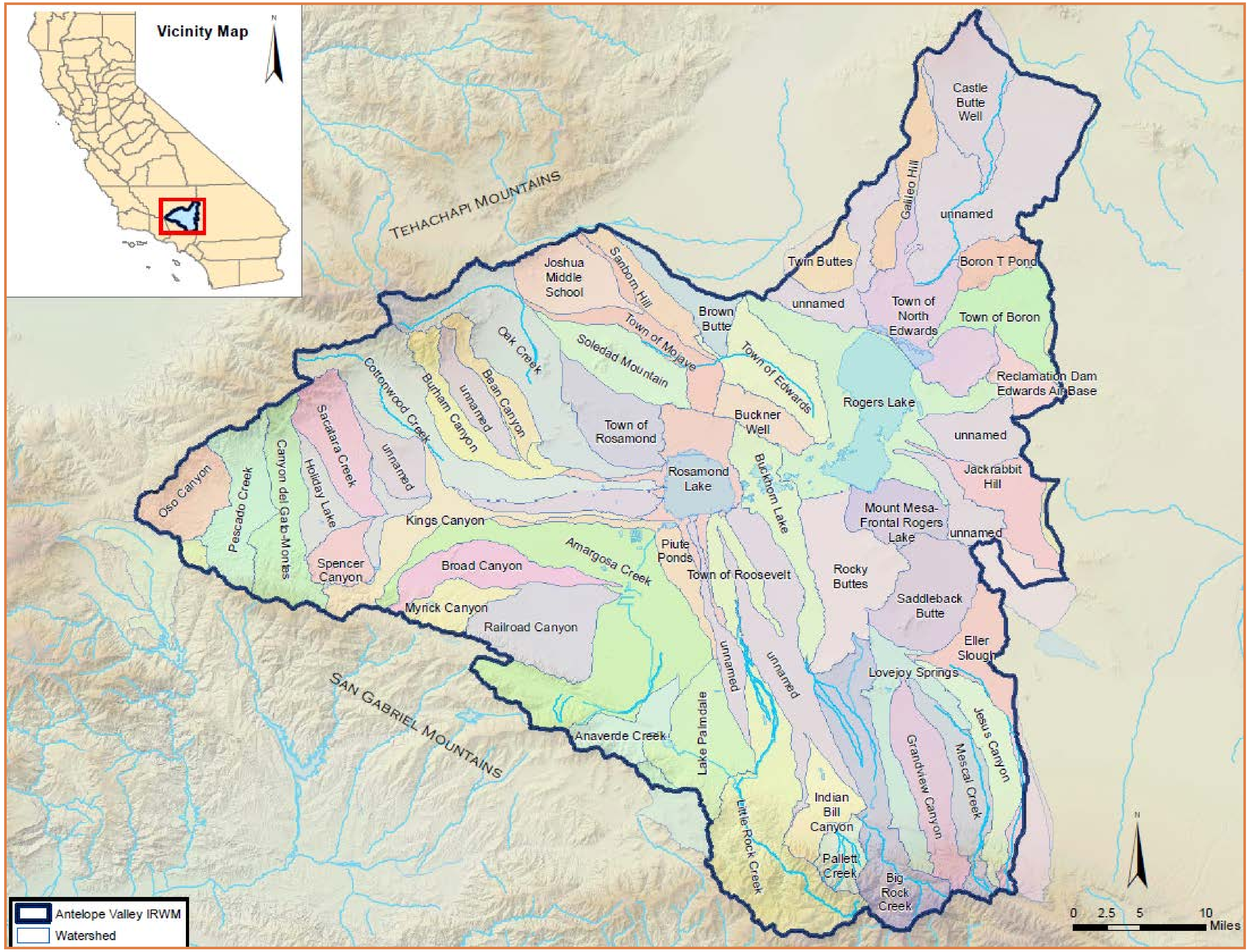


**Figure 2-10: Antelope Valley Watersheds**



## 2.4.1 Surface Water

Surface water flows are carried by ephemeral streams. The most hydrologically significant streams begin in the San Gabriel Mountains on the southwestern edge of the Antelope Valley Region and include Big Rock Creek, Little Rock Creek and Amargosa Creek from the San Gabriel Mountains; and Oak Creek and Cottonwood Creek from the Tehachapi Mountains. In addition, the fault lines surrounding the Valley form the Region's groundwater basin. These hydrologic features are shown on Figure 2-9.

### 2.4.1.1 Watersheds

The Antelope Valley's watersheds feed numerous ephemeral streams that originate in the surrounding mountains and meander across the alluvial fans that make up the valley floor. Stormwater runoff that doesn't percolate into the ground eventually ponds and evaporates in the dry lake beds on the Valley floor. There are a number of canyons and watersheds in the Valley, including Osos Canyon, Pescado Creek, Canyon del Gato-Montes, Sacatara Creek, Spencer Canyon, Kings Canyon, Cottonwood Creek, Burham Canyon, Bean Canyon, Oak Creek, Amargosa Creek, Railroad Canyon, Anaverde Creek, Little Rock Creek, Indian Bill Canyon, Pallett Creek, Big Rock Creek, Grandview Canyon, Mescal Creek, and Jesus Canyon. The most significant streams in the Valley begin in the San Gabriel Mountains on the southwestern edge of the Valley, and include Big Rock Creek, Little Rock Creek, and Amargosa Creek. Together, these streams drain an area of approximately 330 square miles. Surface water flows in Little Rock Creek are captured at Little Rock Reservoir, which is discussed further below. Big Rock Creek and Amargosa Creek are not diverted for supply at this time. The two major watersheds that begin in the Tehachapi Mountains, Oak Creek and Cottonwood Creek, drain an area of about 160 square miles. The Valley's watersheds are shown in Figure 2-10 and collectively drain the entire 2,400 square miles of the Region.

### 2.4.1.2 Little Rock Reservoir

Little Rock Creek is the only developed surface water supply in the Antelope Valley Region. The Little Rock Reservoir, jointly owned by PWD and LCID, collects runoff from the San Gabriel Mountains. As of 2005, the reservoir's useable storage capacity was estimated at 3,500 AF of water, reduced from its original design capacity of 4,300 AF due to the deposition of sediment. It is assumed that on average, 54,000 cubic yards of sediment are deposited in the reservoir per year (Aspen Environmental Group, 2005.) One of the priority projects in the 2019 IRWM Plan proposes to remove 1,165,000 cubic yards of accumulated sediment from behind the dam, adding approximately 500 AF of storage. Construction of a grade control structure at the sediment removal area to prevent erosion and other excavation-related impacts to the channel bed upstream has already begun (see Section 7).

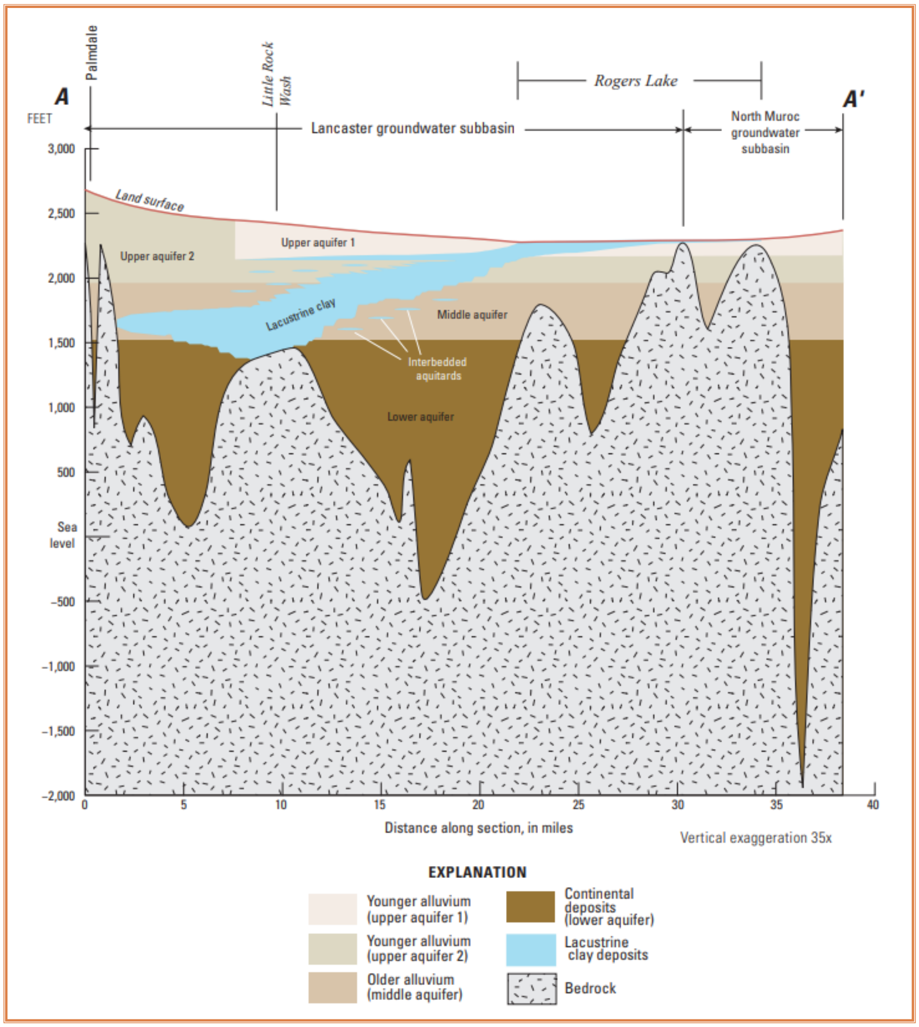
Historically, water stored in the Little Rock Reservoir has been used directly for agricultural uses within LCID's service area and for M&I uses within PWD's service area following treatment at PWD's water purification plant. PWD and LCID jointly hold long-standing water rights to divert 5,500 AFY from Littlerock Creek flows per an agreement between the two districts. In 1992, a renegotiation of the agreement gave PWD the authority to manage the reservoir as well as ownership of LCID's water rights for a 50-year period in-lieu of PWD contributing financial resources for the rehabilitation of the dam. The project was completed in 1995. LCID is currently entitled to purchase from PWD, in any one calendar year, 1,000 AF of water or 25 percent of the yield from Littlerock Dam Reservoir, whichever is less. On average, PWD has taken approximately 4,000 AF per year from Littlerock Dam Reservoir (PWD, 2016).

### 2.4.1.3 Dry Lakes and Percolation

Surface water from the surrounding hills and from the Antelope Valley Region floor flows primarily toward the three dry lakes on EAFB. Except during the largest rainfall events of a season, surface water flows toward the Antelope Valley Region from the surrounding mountains, quickly percolates into the stream bed, and recharges the groundwater basin. Surface water flows that reach the dry lakes are either used by the natural vegetation on the lake beds, or are lost to evaporation. It appears that little percolation occurs in the Antelope Valley Region other than near the base of the surrounding mountains due to impermeable layers of clay overlying the groundwater basin, though further investigations would be necessary to confirm the locations of impermeable areas. See Figure 2-11 for a sample cross-sectional illustration of the clay layer as it is positioned between the upper and lower aquifers in the Antelope Valley Region.

Previous USGS estimates indicate that approximately 5 percent of the precipitation that falls in the Antelope-Fremont Valley each year percolates to the groundwater basins, while the remaining water is lost to evaporation (USGS, 1987).

**Figure 2-11: Cross Sectional View of the Clay Layer Between the Upper and Lower Aquifers in the Antelope Valley Region**




Source: USGS 2014

#### 2.4.1.4 Geology and Soils

The Antelope Valley represents a large topographic area and groundwater basin in the western part of the Mojave Desert in southern California. It is a prime example of a single, undrained, closed basin, and it is located at an approximate elevation of 2,300 to 2,400 feet above mean sea level. These elevations represent the surface areas overlying the groundwater basin only and do not include the larger area overlying the entire watershed (i.e., Region). In other words, the watershed has a larger "footprint" than the groundwater basin. The Antelope Valley Region occupies part of a structural depression that has been downfaulted between the Garlock, Cottonwood-Rosamond, and San Andreas Fault Zones. The Antelope Valley Region is bounded on the southwest by the San Andreas Fault and San Gabriel Mountains, the Garlock Fault and Tehachapi Mountains to the northwest, and San Bernardino County to the east. Consolidated rocks that yield virtually no water underlie the basin and crop out in the highlands that surround the basin. They consist of igneous and metamorphic rocks of pre-Tertiary age that are overlain by indurated continental rocks of Tertiary age interbedded with lava flows (USGS 1995).

Alluvium and interbedded lacustrine deposits of Quaternary age are the important aquifers within the closed basin and have accumulated to a thickness of as much as 1,600 feet. The alluvium is unconsolidated to moderately consolidated, poorly sorted gravel, sand, silt, and clay. Older units of the alluvium are somewhat coarser grained, and are more compact and consolidated, weathered, and poorly sorted than the younger units. The rate at which water moves through the alluvium, also known as the hydraulic conductivity of the alluvium, decreases with increasing depth.

During the depositional history of the Antelope Valley Region, a large intermittent lake occupied the central part of the basin and was the site of accumulation of fine-grained material. The rates of deposition varied with the rates of precipitation. During periods of relatively heavy precipitation, massive beds of blue clay formed in a deep perennial lake. During periods of light precipitation, thin beds of clay and evaporative salt deposits formed in playas or in shallow intermittent lakes. Individual beds of the massive blue clay can be as much as 100 feet thick and are interbedded with lenses of coarser material as much as 20 feet thick. The clay yields virtually no water to wells, but the interbedded, coarser material can yield considerable volumes of water.

Soils within the area are derived from downslope migration of loess and alluvial materials, mainly from granitic rock sources originating along the eastern slopes of the Tehachapi and San Gabriel Mountains. Additional detailed information on soil types and their distribution can be found in the Lancaster Water Reclamation Plant (WRP) 2020 Plan Final Environmental Impact Report (EIR). Figure 2-12 provides a soil map of the Antelope Valley Region.

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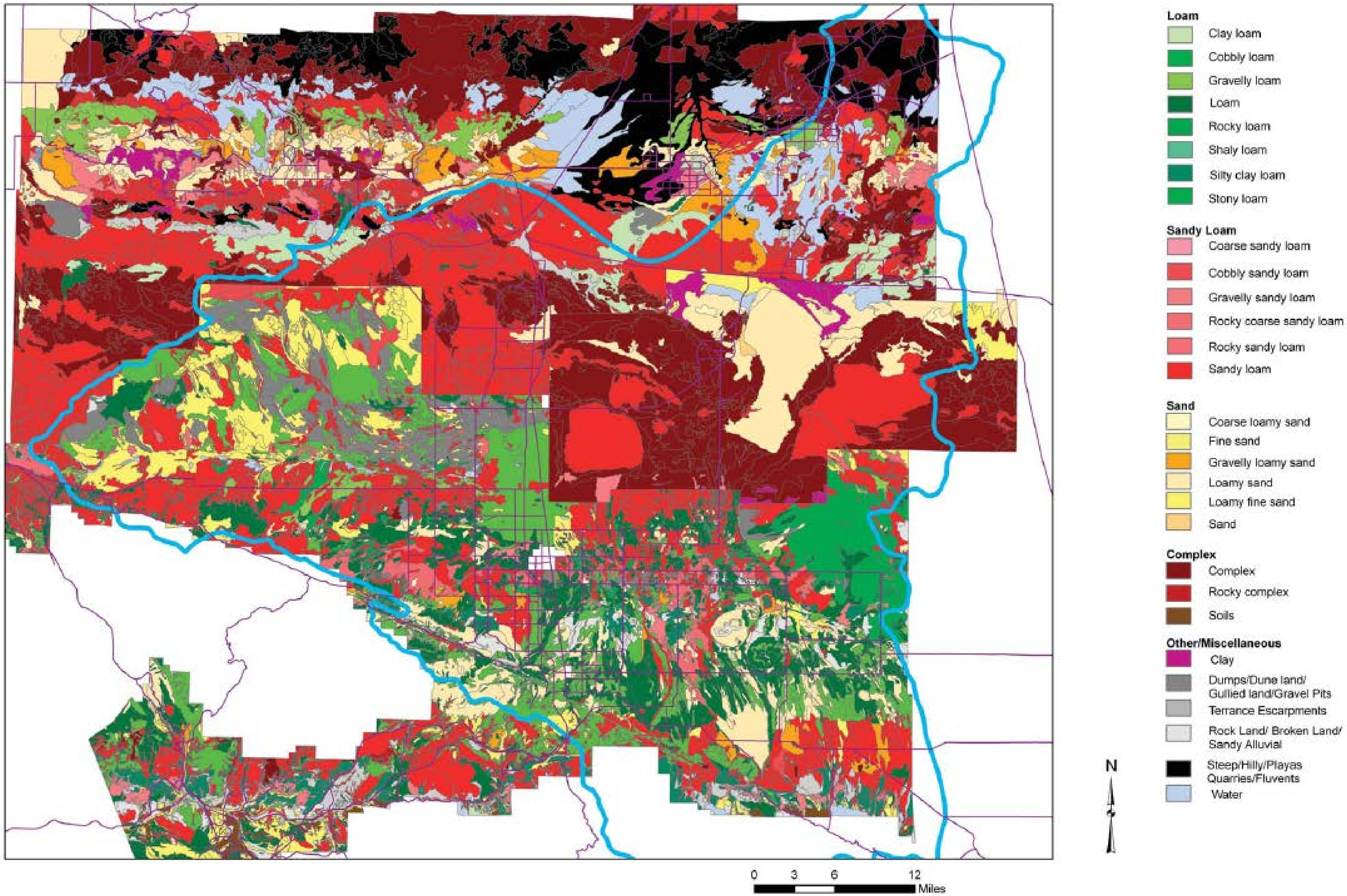
**Figure 2-12: Antelope Valley Soils Map**



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## 2.4.2 Groundwater

The Antelope Valley Groundwater Basin is comprised of two primary aquifers: (1) the upper (principal) aquifer and (2) the lower (deep) aquifer. The principal aquifer is an unconfined aquifer and historically had provided artesian flows due to perched water tables in some areas. These artesian conditions are currently absent due to extensive pumping of groundwater. Separated from the principal aquifer by clay layers, the deep aquifer is generally considered to be confined. In general, the principal aquifer is thickest in the southern portion of the Antelope Valley Region near the San Gabriel Mountains, while the deep aquifer is thickest in the vicinity of the dry lakes on EAFB.

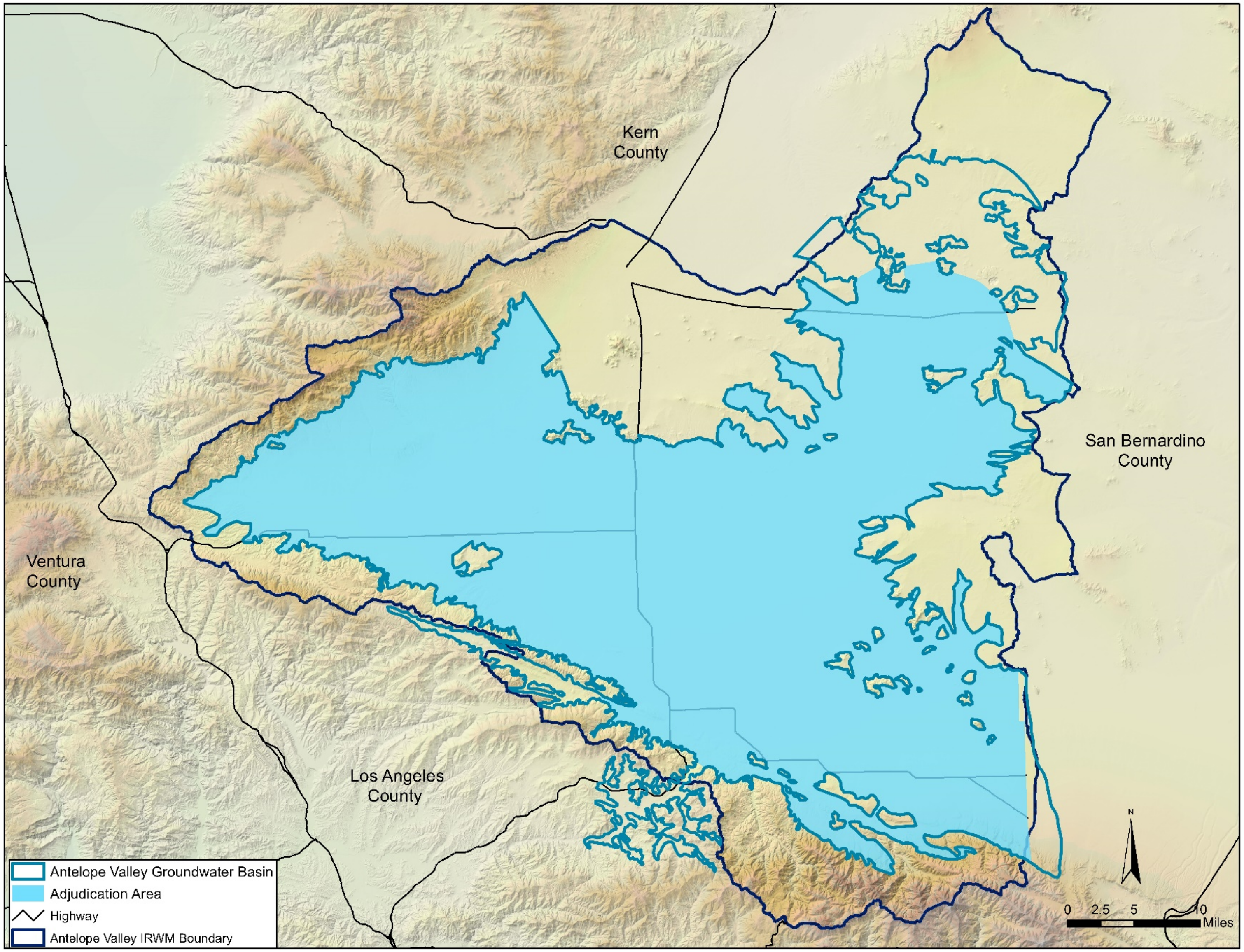
Groundwater has been, and continues to be, an important resource within the Antelope Valley Region. Prior to 1972, groundwater provided more than 90 percent of the total water supply in the Antelope Valley Region; since 1972, it has provided between 50 and 90 percent (USGS 2003). Groundwater pumping in the Antelope Valley Region peaked in the 1950s (USGS 2000a), and it decreased in the 1960s and 1970s when agricultural pumping declined due to increased pumping costs from greater pumping lifts and higher electric power costs (USGS 2000a). The rapid increase in urban growth in the 1980s resulted in an increase in the demand for M&I water and an increase in groundwater use. Projected urban growth and limits on the available local and imported water supply are likely to continue to increase the reliance on groundwater.

### 2.4.2.1 Antelope Valley Groundwater Basin Adjudication

The Antelope Valley Groundwater Basin was adjudicated in December of 2015 after 15 years of complex proceedings among more than 4,000 parties. The adjudication defined the Basin boundaries, considered hydraulic connection throughout the basin, established a safe yield, and quantified groundwater production. The Basin was determined to be in a state of overdraft as a result of these considerations.

Though the basin covers 1,580 square miles, the Adjudication Area only covers approximately 1,390 square miles. The Adjudication Area does not include the adjacent alluvial portions of the groundwater basin to the northeast and south because subsurface flows between these adjacent alluvial areas and the Adjudication Area are generally considered nominal. The Adjudication Area is also truncated at the Los Angeles-San Bernardino County Line in the southeast because the portion Basin that extends into San Bernardino County is within the Mojave Basin Area adjudication. The Adjudication Area is comprised of five management areas: Central Antelope Valley Subarea, West Antelope Valley Subarea, South East Subarea, Willow Springs Subarea, Rogers Lake Subarea. The Adjudication Area is shown in Figure 2-13. Under the Judgment, the Watermaster is required to report the changing hydrology of these management areas in annual reports to the Court.

**Figure 2-13: Antelope Valley Groundwater Basin Adjudication**



#### 2.4.2.2 Groundwater Subunits

The complex Antelope Valley Groundwater Basin is divided by the USGS into twelve subunits as shown on Figure 2-14. Groundwater basins are generally divided based upon differential groundflow patterns, recharge characteristics, and geographic location, as well as controlling geologic structures. The Antelope Valley Groundwater Basin's subunits are: Finger Buttes, West Antelope, Neenach, Willow Springs, Gloster, Chaffee, Oak Creek, Pearland, Buttes, Lancaster, North Muroc, and Peerless. The USGS mentions that groundwater levels in these subunits have improved in some areas due to the importation of SWP water to the Antelope Valley Region, and declined in others due to increased groundwater pumping. Each subunit has varying characteristics, and the current conditions in each subunit are briefly summarized below (USGS 1987).

Subunit Characteristics, listed generally from north to south and west to east (USGS 1987):

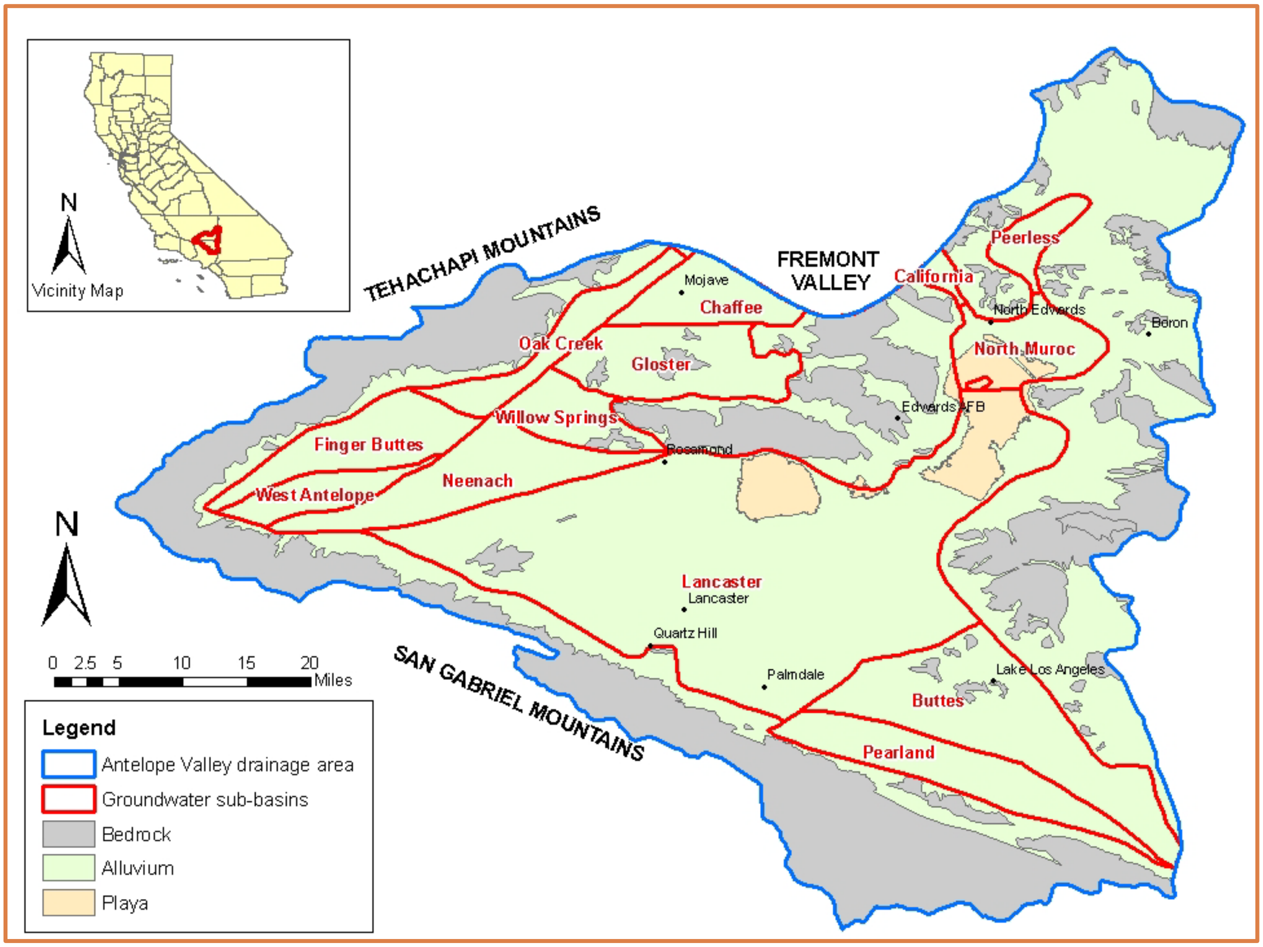
| | |
|---|---|
| Finger Buttes: | A large part of this subunit is in range and forest lands. Flow is generally from southwest to southeast. Depth to water varies, but is commonly more than 300 feet. |
| West Antelope: | Groundwater flows southeasterly to become outflow into the Neenach subunit. Depth to water ranges from 250 to 300 feet. |
| Neenach: | Groundwater flow is mainly eastward into the "principal" and "deep" aquifers of the Lancaster subunit. Depth to water ranges from 150 to 350 feet. |
| Willow Springs: | Groundwater flows southeast and ultimately enters the Lancaster subunit. This subunit receives recharge for intermittent surface flows from the surrounding Tehachapi Mountain area. Depth to water ranges from 100 to 300 feet. |
| Gloster: | Groundwater flows to the east and southeast as outflow to the Chaffee subunit. Depth to water levels for the southeast area of the subunit are 50 and 100 feet; other water level data is sparse. |
| Chaffee: | Groundwater moves into this subunit from Cache Creek, adjacent alluvial fans to the west and, in lesser amounts, from the Gloster subunit. Water moves eastward in the western part of the subunit, and northward in the southern part, generally toward the City of Mojave. Water levels range from 50 to 300 feet. |
| Oak Creek: | This unit is recharged by flows from the Tehachapi Mountains. Groundwater flows are generally to the southeast, with some southward flows toward the Koehn Lake area. Data for depth to water is not available. |
| Pearland: | Substantial recharge to this subunit comes from Littlerock and Big Rock Creeks. Groundwater generally moves from southeast to northwest, with outflow to the Lancaster subunit. Water levels range from 100 to 250 feet. |
| Buttes: | Groundwater generally moves from southeast to northwest, with outflow to the Lancaster subunit. Depth to water ranges from 50 to 250 feet. |
| Lancaster: | This is the largest and most economically important subunit, in both size and water use. Due to the use of this subunit, depths to water levels vary widely, being generally greater in the south and west. Pumping depressions can be observed in various locations. There are two major aquifers in the subunit, the "principal" and "deep" aquifers, separated by clay layers. As noted above, groundwater moves into the subunit from the Neenach, West Antelope and |

Finger Buttes subunits. Groundwater also moves into the principal aquifer from the Buttes and Pearland subunits. The Lancaster subunit underlies Lancaster, Palmdale, Quartz Hill, Rosamond, Antelope Acres and other smaller communities.

North Muroc: This unit underlies part of the Rogers Lake and EAFB area. Groundwater moves north and west, then north again and possibly into the Peerless subunit. Data on depth to groundwater is not available.

Peerless: Little information is available on this subunit, which cannot be clearly delineated, but represents the eastern limit of highly developed water-bearing deposits. As of the date of the USGS report, water levels had declined by as much as 150 feet and flow was toward a pumping depression.

**Figure 2-14: Antelope Valley Groundwater Sub-Basin Boundary Map**




Source: Salt and Nutrient Management Plan for the Antelope Valley 2014

### 2.4.2.3 Groundwater Quality

Groundwater quality is excellent within the principal aquifer but degrades toward the northern portion of the dry lake areas. Considered to be generally suitable for domestic, agricultural, and industrial uses, the water in the principal aquifer has a total dissolved solids (TDS) concentration ranging from 200 to 800 milligrams per liter (mg/L). The deeper aquifers typically have higher TDS levels. Hardness levels range from 50 to 200 mg/L and high fluoride, boron, and nitrates are problematic in some areas of the basin. Identification and characterization of salts and nutrients is necessary for assessing constituent loads and analyzing impacts on groundwater quality. Sources of salts and nutrients in the basin include imported water, recycled water, and several others. The following provides a brief description of some of the significant salts and nutrients in the Antelope Valley Watershed. Refer to Appendix G for a more detailed description of the constituents in the Antelope Valley Salt and Nutrient Plan.

Total Dissolved Solids: Salts in groundwater are typically measured by TDS, which is the overall mineral content. Most TDS sources are anthropogenic in nature and include agricultural runoff, point source water pollution, and industrial and sewage discharge. Inorganic sources include minerals commonly found in nature through the weathering and dissolution of rocks and organic material from decaying organisms, plants, and animals.

There are no known health effects associated with the ingestion of TDS in drinking water. However, high TDS concentrations can negatively impact sensitive crops and cause corrosion and scaling in pipes.

Chlorides: Chlorides are widely distributed in nature as salts of sodium (NaCl), potassium (KCl), and calcium ($CaCl_2$). Chlorides in groundwater are naturally occurring from weathering of rocks, negligible atmospheric deposition, and as result of human use and wastes. Sources of chloride from human use include food condiments and preservatives, potash fertilizers, animal feed additives, production of industrial chemicals, dissolution of de-icing salts, and treatment of drinking water and wastewater. Release of brines from industry processes, leaching from landfills and fertilized soils, discharge of wastewater from treatment facilities or septic systems affect chloride in groundwater.

As with TDS, there are no known health effects associated with the ingestion of chloride in drinking water. Chloride concentrations in excess of approximately 250 mg/L can affect taste. Also, elevated chloride concentrations have substantial negative impacts on sensitive crops and cause corrosion in pipes.

Nitrogen: Nitrogen is ubiquitous in the environment and an essential nutrient for crops. Nitrate is the primary form of nitrogen found in groundwater and is a principal by-product of fertilizers. Other sources of nitrate include land use activities such as irrigation farming of crops, high density animal operations, wastewater treatment, food processing facilities and septic tank systems.

Nitrogen in the nitrate/nitrite form poses health hazards for infants and pregnant women. High nitrate levels in drinking water can result in methemoglobinemia, commonly known as "blue baby syndrome" which is a condition characterized by a reduced ability of the blood to carry oxygen to organs and tissue.

Arsenic: Arsenic is an odorless and tasteless semi-metal element that occurs naturally in rocks and soil, water, air, and plants and animals. It enters drinking water supplies from natural deposits in the earth or from agricultural and industrial practices. Higher levels of arsenic tend to be found more in groundwater sources than in surface water sources. The demand on groundwater from municipal systems and private drinking water wells may cause water levels to drop and release arsenic from rock formations.

Arsenic is a concern in the Antelope Valley Region and has been observed in LACWD 40, PWD, and QHWD wells. Research conducted by the LACWD 40 and the USGS has shown the problem to reside primarily in the deep aquifer, and it is not anticipated that the existing arsenic problem will lead to future loss of groundwater as a water supply resource for the Antelope Valley Region.

Arsenic has been linked to cancer of the bladder, lungs, skin, kidney, nasal passages, liver, and prostate. Non-cancer effects of arsenic can include thickening and discoloration of the skin, stomach pain, nausea, vomiting; diarrhea; numbness in hands and feet; partial paralysis; and blindness.

Chromium: Chromium is an odorless and tasteless metallic element found naturally in rocks, plants, soil and volcanic dust, and animals. The most common forms of chromium that occur in natural waters in the environment are trivalent chromium (chromium-3) and hexavalent chromium (chromium-6).

Chromium-3 is an essential human dietary element and is found in many vegetables, fruits, meats, grains and yeast. Chromium-6 occurs naturally in the environment from the erosion of natural chromium deposits, and it can also be produced by industrial processes. There are demonstrated instances of chromium being released to the environment by leakage, poor storage or inadequate industrial waste disposal practices.

Drinking water standards have been set to protect consumers served by public water systems from the effects of exposure to chromium. In 2013, the California Department of Public Health (CDPH) adopted a maximum contaminant level (MCL) for chromium-6 of 10 ug/L (parts per billion). The MCL, however, was revoked in 2017 because it failed to consider the economic feasibility of compliance. The CDPH expects that the process for adopting a new MCL will be expedited given the large amount of data that was compiled between 2014 and 2017.

Perchlorate: Perchlorate is a naturally occurring contaminant that has been detected in arid environments in the Southwest United States. The chemical also forms naturally in the atmosphere. High levels of perchlorate can be attributed to the manufacturing or testing of solid rocket propellants, explosives, fireworks, road flares, and certain types of fertilizers. Common uses of perchlorate include leather tanning and electroplating. Perchlorate disrupts normal functions of the thyroid gland, interfering with the body's ability to regulate metabolism, blood pressure, body temperature, and physical growth. Fetuses and infants are most susceptible to perchlorate contamination because it can cause miscarriages or impaired central nervous system development.

Fluoride: Fluoride compounds are salts that form when the element, fluorine, combines with minerals in soil or rocks. Some fluoride compounds, such as sodium fluoride and fluorosilicates, dissolve easily into ground water as it moves through gaps and pore spaces between rocks. Most water supplies contain some naturally occurring fluoride. Fluoride also enters drinking water in discharge from fertilizer or aluminum factories. Also, many communities add fluoride to their drinking water to promote dental health.

Exposure to excessive consumption of fluoride over a lifetime may lead to increased likelihood of bone fractures in adults, and may result in effects on bone leading to pain and tenderness. Children aged 8 years and younger exposed to excessive amounts of fluoride have an increased chance of developing pits in the tooth enamel, along with a range of cosmetic effects to teeth.

Boron: Naturally-occurring boron is usually found in sediments and sedimentary rock formations and rarely exists in elemental form. Other forms of boron include boric acid, borax, borax pentahydrate, anhydrous borax, and boron oxide. The principal uses for boron compounds in the United States include glass and ceramics, soaps and detergents, algicides in water treatment, fertilizers, pesticides, flame retardants, and reagents for production of other boron compounds. The major sources of free boron in the environment are exposed minerals containing boron, boric acid volatilization from seawater, and volcanic material. Anthropogenic inputs of boron to the environment are considered smaller than inputs from natural processes and may include: agriculture, waste and wood burning, power generation using coal and oil, glass product manufacture, use of borates/perborates in the home and industry, borate mining/processing, leaching of treated wood, and sewage/sludge disposal. Contamination of water can come directly from industrial wastewater and municipal sewage, as well as indirectly from air deposition and soil runoff. Borates in detergents, soaps, and personal care products can also contribute to the presence of boron in water.

The available data for boron support its ubiquitous presence in the ambient environment. Based on the concentrations of boron in the groundwater compared to the health risk level, boron does not present a health risk (US EPA 2008).

#### 2.4.2.4 Groundwater Storage Capacity and Recharge

The total storage capacity of the Antelope Valley Groundwater Basin has been reported at 68 million acre-feet (MAF) (Planert and Williams 1995 as cited in DWR 2004) to 70 MAF (DWR 1975 as cited in DWR 2004). The groundwater basin is principally recharged by deep percolation of precipitation and runoff from the surrounding mountains and hills (see Figure 2-14 for a depiction of groundwater basin boundaries). Other sources of recharge to the basin include artificial recharge and return flows from agricultural irrigation, urban irrigation, and wastewater management activities. Depending on the thickness and characteristics of the unsaturated zone of the aquifer, these sources may or may not contribute to recharge of the groundwater. As previously stated, precipitation over the Antelope Valley Region floor is generally less than 8 inches per year and ETo rates (along with soil requirements) are high; therefore, recharge from direct infiltration of precipitation on the Valley floor is considered negligible (Snyder 1955; Durbin 1978 as cited in USGS 2003; Antelope Valley Watermaster 2018).

The Judgment defined a Native Safe Yield and a Total Safe Yield for groundwater production to bring the basin back into balance. The Native Safe Yield, set by the Court at 82,300 AFY, is based on estimates of natural groundwater recharge from the hydrologic system, infiltration from precipitation and streamflow, and return flows from basin pumping. The Judgment recognizes that the Native Safe Yield has embedded assumptions of land use and return flows, which were estimated at 27 percent based on 15 years of recent land use data. Because of this, the Watermaster may initiate a recommendation to change the Native Safe Yield of the Basin in year 17 of the Judgment. The Court also determined the Total Safe Yield of the Basin to be 110,000 AFY. The Total Safe Yield considers supplemental supply of imported water and associated return flows in addition to the Native Safe Yield. A more detailed description of the Total Safe Yield and Native Safe Yield as defined by the adjudication and a list of documents that reference estimates for safe yield, natural recharge, and return flows are included in Appendix I.

The basin has historically shown large fluctuations in groundwater levels. Data from 1975 to 1998 show that groundwater level changes over this period ranged from an increase of 84 feet to a decrease of 66 feet (Carlson and Phillips 1998 as cited in DWR 2004).

USGS currently monitors water levels in approximately 185 wells within and adjacent to the Antelope Valley Adjudication Area. Groundwater level data is examined to determine the groundwater conditions of the Basin annually and reported in the Antelope Valley Watermaster Annual Reports. Previous data collected by the USGS (2003) indicated that groundwater levels appeared to be falling in the southern and eastern areas of the Antelope Valley Region and rising in the rural western and far northeastern areas of the Antelope Valley Region. This pattern of falling and rising groundwater levels correlates directly to changes in land use over the past 40 to 50 years. Falling groundwater levels are generally associated with areas that are developed and rising groundwater levels are generally associated with areas that were historically farmed, but have been largely fallowed during the last 40 years. However, recent increases in agricultural production, primarily carrots, in the northeastern and western portions of the Antelope Valley Region may have reduced rising groundwater trends in these areas (LACSD 2005).

The Antelope Valley Watermaster 2017 Annual Report concluded that the water levels near the Westside Water Bank experienced an increase of more than 20 feet between 2017 and 2018. On average, the West Antelope Subarea experienced an average change in groundwater elevation of 2.4 feet. The Central Antelope Valley Subarea experienced both increases and declines in groundwater levels with an average increase of groundwater elevation of 0.4 feet, whereas the groundwater levels in the South East Subarea decreased an average of 2.2 feet (Antelope Valley Watermaster 2018).

#### 2.4.2.5 Groundwater Extraction and Subsidence

According to the USGS (2003), groundwater extractions have exceeded the estimated natural recharge of the basin during some periods since the 1920's. This overdraft has caused water levels to decline by more than 200 feet in some areas and by at least 100 feet in most of the Antelope Valley Region (USGS, 2003). Extractions in excess of the groundwater recharge can cause groundwater levels to drop and associated environmental damage (e.g., land subsidence). The Statement of Decisions for Phase Three Trial for the adjudication process has also determined that the groundwater basin is in overdraft and that overall, current extractions exceed recharge, though it also acknowledges that groundwater levels are increasing in some areas (Antelope Valley Groundwater Litigation (Consolidated Cases), Los Angeles Superior Court, Lead Case No. BC 325 201 (2011)).

Groundwater extractions are reported to have increased from about 29,000 AF in 1919 to about 400,000 AF in the 1950's, when groundwater use in the Antelope Valley Region was at its highest (USGS, 1995). Use of SWP water has since stabilized groundwater levels in some areas of the Antelope Valley Region. In recent years, groundwater pumping has resulted in subsidence and earth fissures in the Lancaster and EAFB areas, which has permanently reduced storage by 50,000 AF (DWR, 2004). Data estimates pertaining to groundwater production between 1951 and 2005 indicate that extractions were between 130,000 and 150,000 AFY (Antelope Valley Groundwater Litigation (Consolidated Cases), Los Angeles Superior Court, Lead Case No. BC 325 201 (2011)). The final Judgment determined that the Pre-Rampdown Production, or the amount of groundwater extracted for reasonable and beneficial use prior to the Judgment or Production Right, whichever is greater, is approximately 130,000 AFY.

In the Lancaster basin, the groundwater generally moves northeasterly from the San Gabriel and Sierra Pelona Mountains to Rosamond and Rogers dry lakes. Heavy pumping has caused large groundwater depressions that disrupt this movement (LACSD 2005). The historical decline of groundwater levels has been linked to land subsidence in the Basin. Water level declines cause a decrease in the aquifer pore pressure, allowing for re-arrangement and compaction of fined-grained units (i.e., clay) in the subsurface. As these sediments compact, the land surface sinks. Land subsidence from groundwater pumping has been documented by USGS and others in the Antelope Valley. Between 1930 and 1992, up to 6.6 feet of land subsidence occurred near Lancaster. At Edwards Air Force Base, land subsidence has caused cracked runways and accelerated erosion on Rogers lakebed. USGS reports that this subsidence has also permanently reduced groundwater storage capacity by about 50,000 AF. Land subsidence from groundwater level declines can be a relatively slow process and continue for years after the pore pressure changes have occurred (Antelope Valley Watermaster 2018).

## 2.5 Land Use

Figure 2-14 presents a map of major existing land use categories within the Antelope Valley Region, characterized and grouped together according to broad water use sectors. Land use is determined by the Region's counties and cities. The map was created with Los Angeles County and Kern County Planning Department Geographic Information System (GIS) parcel level data. Each major land use category is identified, below, including the types of "like water uses" assigned to each category.

- Agriculture: Agricultural uses includes areas devoted to the production of irrigated crops.
- Residential: Residential uses include a mix of housing developed at varying densities and types. Residential uses in the Antelope Valley Region include single-family, multiple-family, condominium, mobile home, low-density "ranchettes," and senior housing.
- Commercial/Office: This category includes commercial uses that offer goods for sale to the public (retail) and service and professional businesses housed in offices (doctors, accountants, architects, etc.). Retail and commercial businesses include those that serve local needs, such as restaurants, neighborhood markets and dry cleaners, and those that serve community or regional needs, such as entertainment complexes, auto dealers, and furniture stores. Also included in this category are government offices that have similar water duty requirements as a typical commercial/office use.
- Industrial: The industrial category includes heavy manufacturing and light industrial uses found in business, research, and development parks. Light industrial activities include some types of assembly work, utility infrastructure and work yards, wholesaling, and warehousing.
- Public and Semi-Public Facilities: Libraries, schools, and other public institutions are found in this category. Uses in this category support the civic, cultural, and educational needs of residents.
- Resources/Open Space: This category encompasses land used for private and public recreational open spaces, and local and regional parks. Recreational use areas also include golf courses, cemeteries, water bodies and water storage. Also included in this category are mineral extraction sites.
- Agriculture: Agricultural lands are those in current crop, orchard or greenhouse production, as well as any fallow lands that continue to be maintained in agricultural designations or participating in tax incentive agricultural programs.
- Rural/Vacant: Rural and vacant lands are undeveloped lands that are not preserved in perpetuity as open space or for other public purposes.

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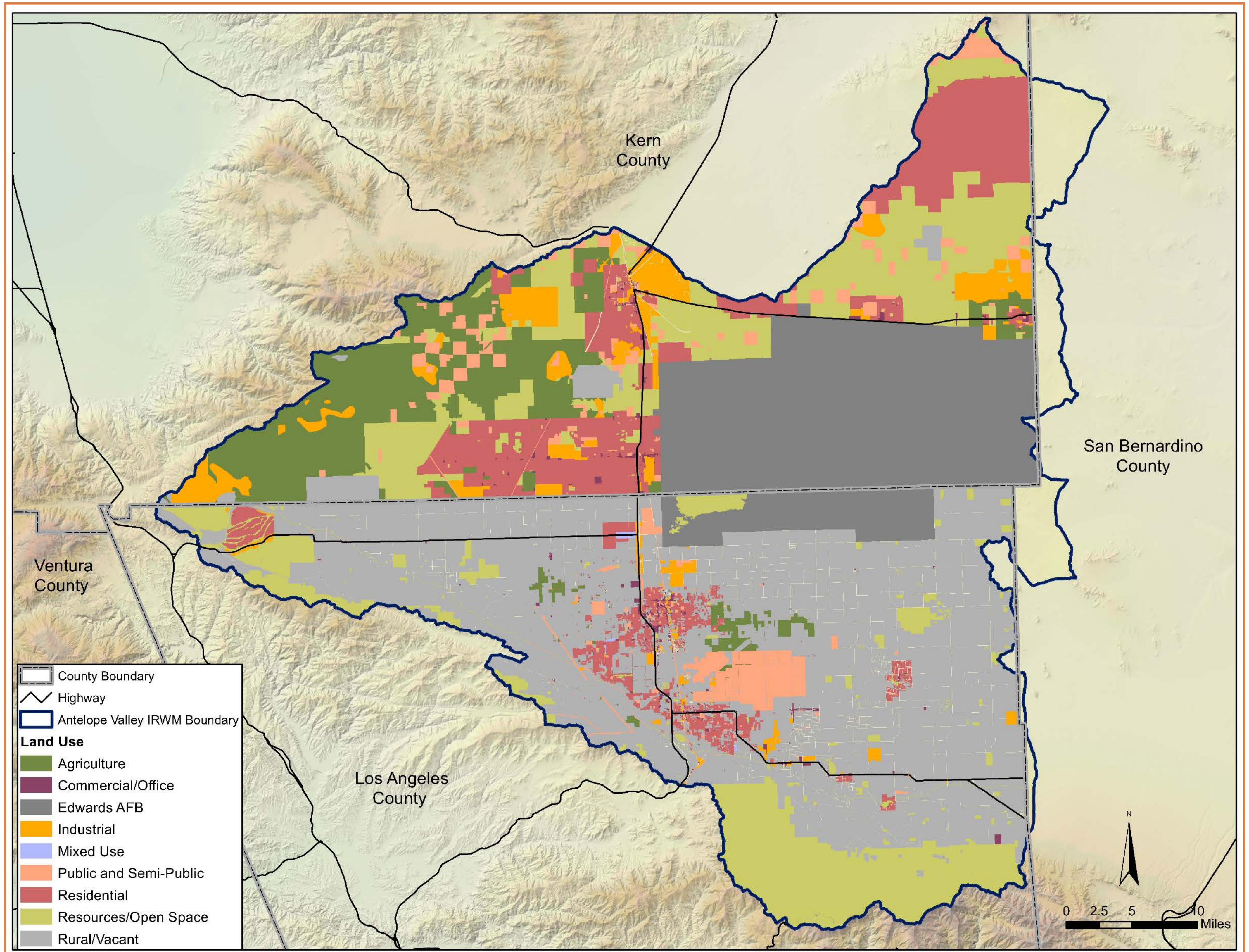
Figure 2-15: Current Land Use Designations for the Antelope Valley Region



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## 2.6 Flood Control

Flood control in the Region is managed at both the county level by Los Angeles County and Kern County, and at the municipal level by the cities. It should be noted that the Los Angeles County Flood Control District Boundary only extends as far north as Avenue S, as shown in Figure 2-4. Regional flood control facilities are limited and generally located in urban areas. The valley floor is essentially an alluvial fan, making much of it subject to inundation and shallow flooding with unpredictable flow paths. Additionally, "flashy" storms tend to occur in the area, leading to high stream flow volumes over short periods of time. Urban drainage facilities have limited hydraulic capacity which at times causes localized flooding problems. Urban drainage facilities generally consist of local detention basins, street drainage inlets, underground storm drain pipes, and culverts. There are no regional flood management facilities maintained in the Antelope Valley; however, a number of flood studies have been performed to assess the need for a more integrated, regional approach:

- Hydrologic Investigation for Feasibility Studies of the Los Angeles County Department of Public Works Master Drainage Plan, USACE, 1986.
- Antelope Valley Final Report on the Comprehensive Plan of Flood Control and Water Conservation, LACDPW, 1987.
- City of Palmdale General Plan, City of Palmdale, 1993.
- Flood Assessment for Rosamond Dry Lake, EAFB, 2004.
- Engineer's Report Relative to the Revised Master Plan of Drainage, City of Lancaster, 2005.
- Antelope Valley Integrated Regional Water Management Plan, AVSWCA, 2007.
- City of Lancaster General Plan 2030, City of Lancaster, 2009.
- General Plan Kern County, Kern County, 2009.
- Flood Assessment for Rosamond Dry Lake (Revision), EAFB, 2009.
- Surface Flow Study, Pre-Acquisition Report, EAFB, 2010.
- Quartz Hill Infrastructure Improvements Drain Alignment, LACDPW, 2011.
- Surface Flow Study, Technical Report, EAFB, 2012.
- Los Angeles County General Plan 2035, LACDPW, 2012.

Looking forward, flood management in the Region should incorporate urban needs as well as habitat needs, and dry lakebed management needs to remain consistent with IRWM Objectives. For example, Amargosa Creek does not drain directly to Rosamond Dry Lake, but flows through Piute Ponds. Piute Ponds stores a portion of the runoff volume if capacity is available and traps a portion of the sediment delivered. The wetlands also provide habitat for a number of species. EAFB relies on stormwater reaching the Valley's dry lake beds to maintain the surface of the lakes for operational and emergency landing use, to maintain habitat, and to provide dust mitigation. An Integrated Flood Management Summary Document was developed during the 2013 IRWMP Updates and is included in Appendix F.

**The Piute Ponds provide over 300 acres of wetlands and provide habitat for waterfowl.**

## 2.7 Wastewater and Recycled Water

Wastewater and recycled water in the southern portion of the Valley is managed primarily by LACSD, while in the northern portion of the valley wastewater and recycled water systems are managed by various local agencies including the RCSD. Wastewater service is primarily limited to urban areas, while rural areas of the Valley rely on septic systems.

The LACSD owns and operates the Lancaster WRP and Palmdale WRP which collect wastewater from the Cities of Palmdale and Lancaster, treating to tertiary levels that are suitable for non-potable uses and groundwater recharge. The RCSD treats wastewater at its Rosamond Wastewater Treatment Plant (WWTP). Rosamond WWTP currently produces secondary-treated water. In 2008, RCSD developed a plan to build a tertiary treatment plant with a potential for future expansion. Unforeseen events such as the economic recession, drought, and AVEK's banking projects caused RCSD to postpone the tertiary plant until production of tertiary water becomes economically viable, or the State mandates its production.

## 2.8 Social and Cultural Values

The story of the Antelope Valley Region's development helps to unveil the range of local cultural values that characterize the area. The continuing tradition of its historically rural character, combined with the emergent influence of the aerospace industry and metropolitan Los Angeles, give meaning to the diverse and, in some cases divergent, lifestyles and values that define the Antelope Valley Region's collective goals and challenges for the future.

### 2.8.1 Agriculture

**Historically, agriculture was the predominant land use in the Antelope Valley.**

Historically, agriculture was the Antelope Valley Region's predominant land use, characterized by dry wheat farming in the west, alfalfa on the Antelope Valley floor, and orchards on its southern fringes. The City of Palmdale was settled over 100 years ago as a residential community by Swiss and German migrants from the Midwest. At the time, land in the Antelope Valley Region sold for fifty cents an acre. The development of the Southern Pacific Railroad connected the Antelope Valley Region to Los Angeles and the Central Valley and spurred the first large influx of white settlers to the Antelope Valley Region. Most of the Antelope Valley Region's smaller communities emerged around this same time as agricultural settlements or local farm trade centers. Agriculture remains a significant industry in the Valley with approximately 16,000 acres actively farmed in the Region.

### 2.8.2 U.S. Military

In 1933, the U.S. Department of Defense established EAFB, (then called Muroc Army Airfield) east of Rosamond and roughly 60 kilometers northeast of Palmdale's current city limits. Because of the vast landing area provided by EAFB's dry lake beds, it was the original site of NASA space shuttle landings, as well as the site of other important aeronautical events. To this day U.S. military flight testing is a large and important part of EAFB operations.

As a result of increased governmental defense spending in the 1950's, the Antelope Valley Region underwent a dramatic change in character. In 1952, the aerospace industry officially took hold at U.S. Air Force Plant 42. Plant 42 in northeast Palmdale is home to Lockheed Martin, Boeing, and Northrop Grumman, among other significant aeronautical companies.

### 2.8.3 Housing Development

Increases in population and development bring more demand for cultural amenities.

Increasing development pressures in the 1980's were in part driven by the continuing appeal of the Antelope Valley Region's high desert climate as well as land values lower than those in the Los Angeles metropolitan area. As the Los Angeles population rapidly expanded into the Antelope Valley Region, the desire for more cultural amenities and new skills and resources increased and the Antelope Valley Region became more metropolitan in character. The increase in population and the development of tract housing, retail centers and business parks has altered the formerly low density, rural and agrarian character of many local communities. The Southern California Association of Governments (SCAG) 2019 Local Profiles Reports estimate that the number of occupied housing units has increased 28 percent in the City of Palmdale and 26 percent in the City of Lancaster since 2000.

Today, competing demands are placed on limited available resources. Many of these competing demands stem from the range of local cultural values that characterize the Antelope Valley Region. Decisions regarding future land use and the dedication of water resources will need to weigh varying agricultural, metropolitan, and industrial needs as they continue to develop and as the balance between these interests continues to change.

### 2.8.4 Alternative Energy

One growing and important industry in the Region is alternative energy production. Wind and solar power generation facilities can be found throughout the Valley, as shown in Figure 2-16. Cities and towns such as Lancaster, Palmdale and Rosamond have set goals to promote alternative energy sources while protecting natural resources. Encouraging the growth of alternative energy production helps to meet the common goal of protecting resources by promoting alternative energy use within the Valley and beyond.

#### Lancaster Choice Energy

The City of Lancaster is at the forefront of the renewable energy transformation as it was the first city in the nation to require new construction to incorporate solar components. In 2014, the City created Lancaster Choice Energy (LCE), the first municipal community choice aggregator in the State of California. LCE provides almost all of Lancaster's business and residents with clean, renewable energy.

#### Antelope North Solar Project

In 2018, the Sustainable Power Group submitted the final Environmental Impact Report for the Antelope Valley North Solar Project. This project proposes to construct and operate a 72-megawatt utility-sale solar generating facility (SGF) on 430 acres in the City of Lancaster. Solar electricity generated by the proposed project would be delivered to previously approved collector substations and ultimately to the existing Southern California Edison (SCE) Antelope Substation south of the proposed SGF. The proposed project would operate year-round and produce electricity during daylight hours.

#### Los Angeles County Renewable Energy Ordinance

In 2016, the Los Angeles County Board of Supervisors adopted the Renewable Energy Ordinance (REO) to help California meet its goals for renewable energy generation and greenhouse gas reduction, while minimizing environmental and community impacts. The REO incentivizes small-scale solar and wind projects that generate energy for on-site use, and structure mounted projects such as on rooftops and over parking lots through a streamlined review process. It also regulates ground-mounted utility-scale projects to better address community concerns and minimize environmental impacts. In addition, the REO prohibits ground-mounted utility-scale solar facilities in the Significant Ecological Areas (SEAs) and Economic Opportunity Areas (EOAs) designated in the Los Angeles County's General Plan and Antelope Valley Area Plan.

#### Solar Star Projects

BHE Renewables owns the Solar Star projects that span 3,230 acres in the Antelope Valley. Combined, the Solar Star projects are the world's largest utility scale solar project with the ability to generate enough electricity to power the equivalent of approximately 255,000 homes. The generated electricity is delivered to SCE service territory.

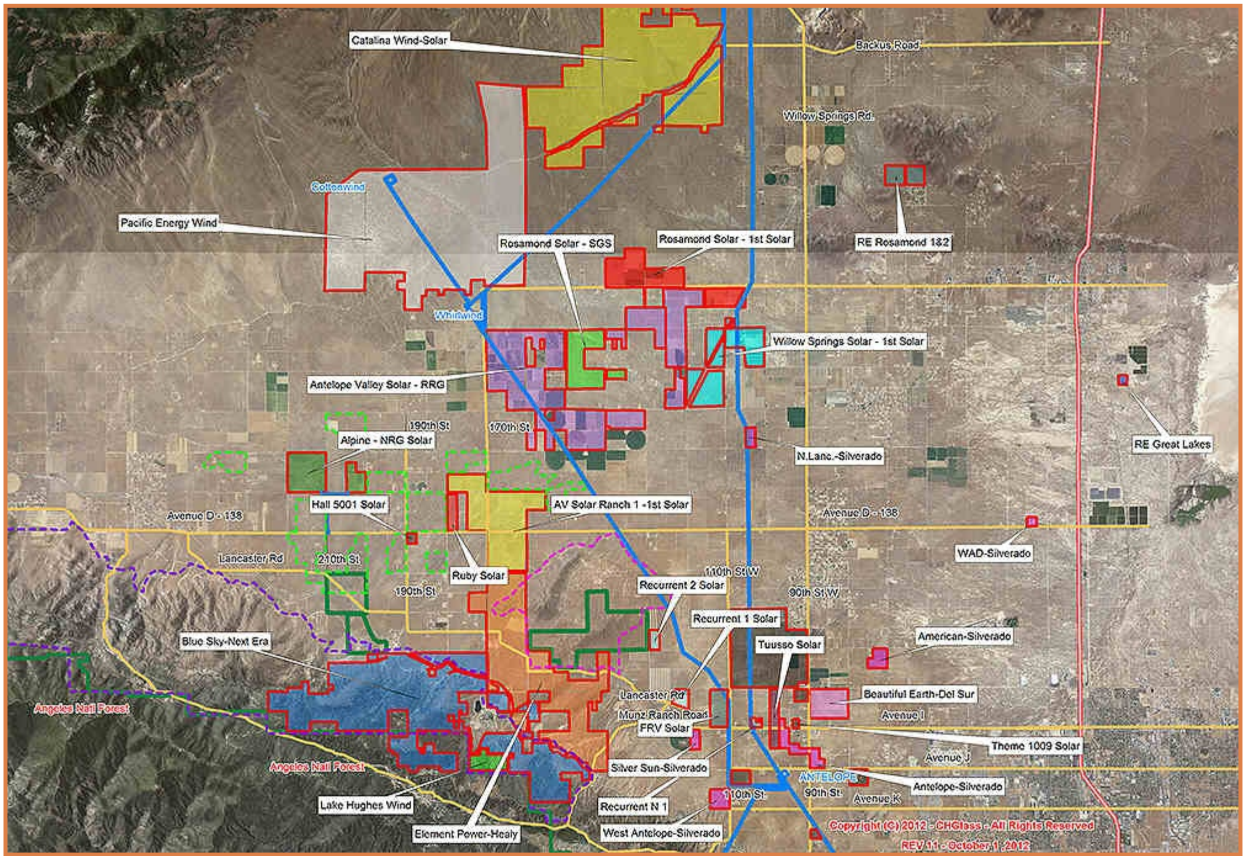
#### Tehachapi Renewable Transmission Project

SCE's Tehachapi Renewable Transmission Project (TRTP) is a series of new and upgraded transmission lines and substations that will supply renewable energy from the Tehachapi area to SCE customers in San Bernardino County. TRTP will strengthen SCE's electrical system and help meet California's renewable energy goals.

#### Clean Power Alliance

Established in 2017, the Clean Power Alliance is a locally operated electricity provider across Los Angeles and Ventura counties, offering clean renewable energy. Clean Power Alliance serves approximately three million customers and one million customer accounts across 31 communities throughout Southern California including unincorporated Los Angeles County. Customers can choose the percentage of renewable content in their energy. Clean Power Alliance purchases clean power that is then delivered by SCE.

**Figure 2-16: Solar and Wind Generation Facilities in the Antelope Valley Region**




Source: http://realestblog.com/wp-content/uploads/2014/10/2014.10.29_landbanking-map.jpg

## 2.8.5 Visioning Document

The Lancaster Community Visioning Report (2006) helps to shed light on the current interplay of these interests and how they may influence the direction of future planning and growth in the Antelope Valley Region-wide. The Visioning Report presents a common vision for the future of Lancaster and the Antelope Valley Region that is focused on the following priorities:

- Balancing growth
- Ensuring economic well-being
- Strengthening Community Identity
- Improving public safety
- Promoting Active Living
- Focusing on Education and Youth
- Supporting Environmental Conservation

Despite the need to ensure economic vitality and longevity by bringing new industry and employment opportunities to the Antelope Valley Region, residents of the Antelope Valley Region believe that preserving a hometown feel and developing a strong sense of neighborhood stability are critical to maintaining the identity of the community and, in turn, that of the Antelope Valley Region. The preservation of existing natural open space, achieved in part through a development strategy focused on infill and parcel redevelopment combined with environmental conservation, are key components of preserving the Antelope Valley Region's rural character and strengthening the health, vitality and security of growing urban areas.

## 2.9 Economic Conditions and Trends

Historically, the economy within the Antelope Valley Region has focused primarily on agriculture; and crops grown in the Antelope Valley Region have included alfalfa, wheat, barley, and other livestock feed crops. However, the area is in transition as the predominant land use shifts from agricultural uses to residential and industrial uses.

The increase in residential land use and its impact on the economy is evident from the population growth in the Antelope Valley Region, which is discussed in Section 2.7. With significantly lower home prices than in other portions of Los Angeles County, the Antelope Valley Region housing market has seen an increase as people choose to commute to the Los Angeles area. The SCAG 2019 Local Profiles estimate that approximately 18 to 24 percent of residents in Palmdale and Lancaster commute to the greater Los Angeles area. Even after acknowledging the recent slowing of the housing market, the California Building Industry Association recognized that the Antelope Valley Region is the last large available open space "opportunity" for development in Southern California, whether it be for residential, commercial/industrial/retail or agricultural land uses. This is supported by the SCAG 2012 Integrated Growth Forecast, which estimates that the number of households in Palmdale and Lancaster will increase between 27% and 40% from 2008 to 2035. The same forecast projects that employment will increase between 10% and 44% from 2008 to 2035.

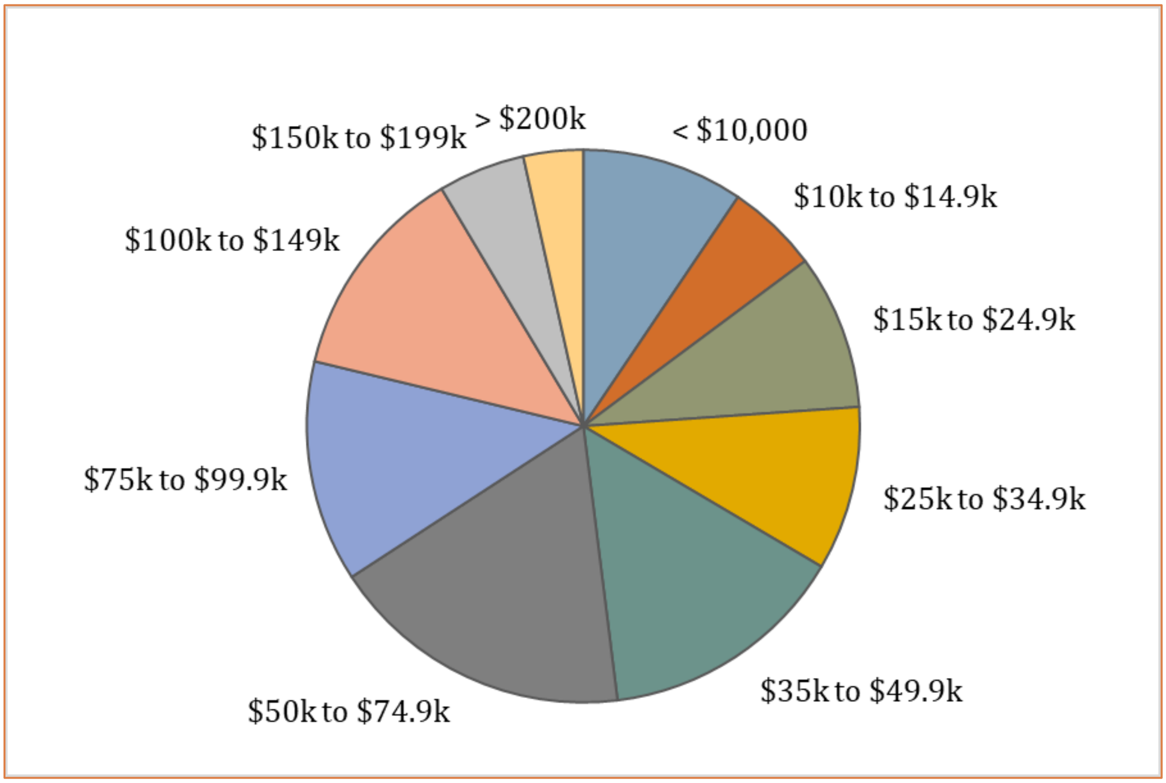
Industry in the Antelope Valley Region consists primarily of manufacturing for the aerospace industry and mining. EAFB and the U.S. Air Force Flight Production Center (Plant 42) provide a strong aviation and military presence in the Antelope Valley Region. Mining of borate in the northern areas and of salt extract, rock, gravel, and sand in the southern areas contribute to the Antelope Valley Region's industrial economy. Alternative energy is an emerging industry in the Region.

According to the SCAG 2019 Local Profiles, the education sector was the largest job sector in both the cities of Palmdale and Lancaster. Education accounted for approximately 20 to 35 percent of the total jobs in 2007 and 28 to 38 percent in 2017. Retail and leisure/hospitality were the second and third largest job sectors in the cities.

As previously mentioned, ensuring economic well-being is a key social and cultural value of the Antelope Valley Region's community.

As shown in Table 2-2 and Figure 2-17, approximately 48 percent of the Antelope Valley Region's population has a household income of less than $50,000, approximately 18 percent of the population has a household income between $50,000 and $74,999, and approximately 34 percent has a household income of $75,000 or higher.

Figure 2-17: Annual Income Levels for the Antelope Valley Region




## 2.10 Population

This subsection provides demographic information from the 2010 Census as well as the 2013-2017 American Community Survey and regional growth projections.

### 2.10.1 Demographics

Table 2-2 provides a summary of the human demographics for the Antelope Valley Region as determined by 2010 U.S. Census Bureau data and 2013-2017 5-year American Community Survey (ACS) data. Regional data was estimated from the data for the census tracts within the regional boundaries. Figure 1-2 shows several DACs throughout the Antelope Valley. DACs were defined as having an MHI less than $51,026 (80% of the statewide MHI according to 2012-2016 5-year ACS data). Severely Disadvantaged Communities (SDAC) are defined as having an annual MHI that is less than 60 percent of the statewide MHI. Approximately 71 percent of the population in the Antelope Valley Region meets the criteria for DACs. Of this, 40 percent of the population qualifies as an SDAC. Two technical memoranda were prepared for the 2013 IRWM Plan Update to characterize DACs and to define issues related to DAC areas. These documents are included in Appendix D:

- DAC Water Supply, Quality and Flooding Data Final Draft TM
- DAC Monitoring Plan Final Draft TM

Figure 2-17 shows the breakdown of the income levels in the Antelope Valley Region as laid out in Table 2-2 (U.S. Census Bureau, 2017).

## Table 2-2: Demographics Summary for the Antelope Valley Region

| Area | Lake Los Angeles | Lancaster | Littlerock | Palmdale | Quartz Hill | Sun Village | Unincorp. LA County | North Edwards | Boron | Mojave | Rosamond | Edwards AFB | Unincorp. Kern County | Antelope Valley Region |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Age Structure (by %)** | | | | | | | | | | | | | | |
| **under 5** | 7.1 | 6.2 | 9.4 | 8.5 | 5.3 | 9.1 | 6.3 | 1.4 | 6.5 | 10.1 | 6.9 | 20.4 | 8.2 | 7.3 |
| **5-9** | 9.0 | 6.4 | 7.0 | 8.8 | 5.7 | 6.8 | 6.1 | 6.7 | 6.4 | 11.4 | 7.4 | 12.9 | 8.4 | 7.5 |
| **10-14** | 9.3 | 6.5 | 10.2 | 8.5 | 7.8 | 8.0 | 6.2 | 5.8 | 9.5 | 3.1 | 7.4 | 5.9 | 8.0 | 7.4 |
| **15-19** | 8.2 | 6.6 | 16.1 | 8.3 | 9.7 | 8.9 | 6.6 | 4.6 | 7.2 | 4.1 | 6.3 | 3.6 | 7.5 | 7.4 |
| **20-24** | 5.0 | 7.0 | 2.9 | 7.1 | 6.4 | 9.7 | 7.5 | 1.4 | 7.4 | 9.5 | 8.4 | 8.1 | 7.9 | 7.1 |
| **25-34** | 13.0 | 13.7 | 8.2 | 13.2 | 13.5 | 14.5 | 15.7 | 15.0 | 11.2 | 14.1 | 15.1 | 28.8 | 15.2 | 13.8 |
| **35-44** | 10.5 | 12.7 | 15.5 | 12.3 | 9.6 | 9.2 | 13.9 | 11.0 | 6.2 | 11.5 | 14.4 | 16.9 | 12.5 | 12.5 |
| **45-54** | 14.4 | 13.4 | 10.6 | 14.2 | 14.7 | 10.8 | 13.7 | 17.1 | 16.1 | 12.0 | 13.1 | 3.4 | 11.8 | 13.6 |
| **55-59** | 7.1 | 6.7 | 6.7 | 6.2 | 8.4 | 7.0 | 6.2 | 9.9 | 8.3 | 6.8 | 7.4 | 0 | 5.5 | 6.5 |
| **60-64** | 5.9 | 6.0 | 5.7 | 4.5 | 6.5 | 6.7 | 5.3 | 4.8 | 4.4 | 6.5 | 4.9 | 0 | 4.7 | 5.3 |
| **65-74** | 7.0 | 8.6 | 4.7 | 5.1 | 7.2 | 5.4 | 7.0 | 17.0 | 10.7 | 7.1 | 5.7 | 0 | 6.1 | 6.8 |
| **75-85** | 2.5 | 4.4 | 1.0 | 2.6 | 3.2 | 3.0 | 3.7 | 5.5 | 5.0 | 2.4 | 2.6 | 0 | 3.0 | 3.4 |
| **85 and over** | 1.0 | 1.9 | 2.3 | 0.8 | 1.9 | 0.8 | 1.8 | 0 | 1.2 | 1.3 | 0.6 | 0 | 1.1 | 1.3 |
| **MHI** | $42,803 | $49,314 | $37,241 | $56,699 | $58,409 | $40,264 | $61,015 | $59,511 | $45,382 | $31,111 | $56,952 | $64,955 | $50,826 | $52,843 |
| **Income Levels (by %)** | | | | | | | | | | | | | | |
| **< $10,000** | 13.8 | 13.3 | 2.2 | 6.4 | 9.3 | 5.5 | 6.1 | 10.5 | 15.2 | 17.1 | 6.5 | 3.2 | 6.7 | 9.4 |
| **$10k to $14.9k** | 6.3 | 4.9 | 14.3 | 5.4 | 6.2 | 8.1 | 5.4 | 5.0 | 9.9 | 11.2 | 3.9 | - | 6.0 | 5.4 |
| **$15k to $24.9k** | 10.1 | 8.1 | 8.7 | 9.7 | 6.0 | 10.8 | 9.7 | 2.0 | 13.4 | 15.4 | 10.0 | 1.8 | 11.9 | 9.1 |
| **$25k to $34.9k** | 12.8 | 9.1 | 19.1 | 9.7 | 9.7 | 14.1 | 8.9 | 11.4 | 5.3 | 11.4 | 7.4 | 12.3 | 10.9 | 9.6 |
| **$35k to $49.9k** | 18.2 | 15.2 | 27.0 | 13.5 | 15.3 | 19.4 | 12.0 | 6.7 | 10.3 | 11.7 | 15.5 | 12.7 | 13.8 | 14.5 |
| **$50k to $74.9k** | 18.3 | 18.5 | 1.7 | 18.0 | 12.2 | 12.4 | 16.4 | 33.5 | 17.6 | 15.8 | 17.9 | 29.5 | 17.6 | 17.8 |
| **$75k to $99.9k** | 8.1 | 12.1 | 13.7 | 14.6 | 13.8 | 10.2 | 11.8 | 13.4 | 14.5 | 5.0 | 14.4 | 12.0 | 11.4 | 13.0 |
| **$100k to $149k** | 8.5 | 11.5 | 3.9 | 13.0 | 15.0 | 16.1 | 14.5 | 14.9 | 11.3 | 10.7 | 16.3 | 21.0 | 12.9 | 12.7 |
| **$150k to $199k** | 2.8 | 4.3 | - | 6.2 | 4.9 | 1.7 | 6.8 | - | 1.4 | 1.2 | 6.1 | 2.3 | 5.1 | 5.1 |
| **$200k or more** | 1.3 | 2.9 | 9.3 | 3.5 | 7.7 | 1.8 | 8.4 | 2.6 | 1.3 | 0.6 | 2.1 | 5.1 | 3.7 | 3.5 |

| Area | Lake Los Angeles | Lancaster | Littlerock | Palmdale | Quartz Hill | Sun Village | Unincorp. LA County | North Edwards | Boron | Mojave | Rosamond | Edwards AFB | Unincorp. Kern County | Antelope Valley Region |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Population Density (persons per sq. mile)** | 13.8 | 13.3 | 2.2 | 6.4 | 9.3 | 5.5 | 6.1 | 10.5 | 15.2 | 17.1 | 6.5 | 3.2 | 6.7 | 9.4 |

Source: 2013-2017 5-Year American Community Survey 5-Year Estimates

### 2.10.2 Regional Growth Projections

Growth in the Antelope Valley Region proceeded at a slow pace until 1985. Between 1985 and 1990, the growth rate increased approximately 1,000 percent from the average growth rate between the years 1956 to 1985 as land use shifted from agricultural to residential and industrial. The historical and projected population for the Antelope Valley Region is shown in Table 2-3. Historical population estimates up to the year 1980 were based on the Geolytics normalization of past U.S. Census tract data to 2000 census tract boundaries. This normalization allows for a direct comparison of the past U.S. Census tract population data. These Census tracts were then assigned to the individual jurisdictions in the Antelope Valley Region to determine the jurisdiction's population. Populations in the years 1990, 2000 and 2010 are based on census data for those years, and adjusted according to the percentage of area within the Region, rounded to the nearest thousand.

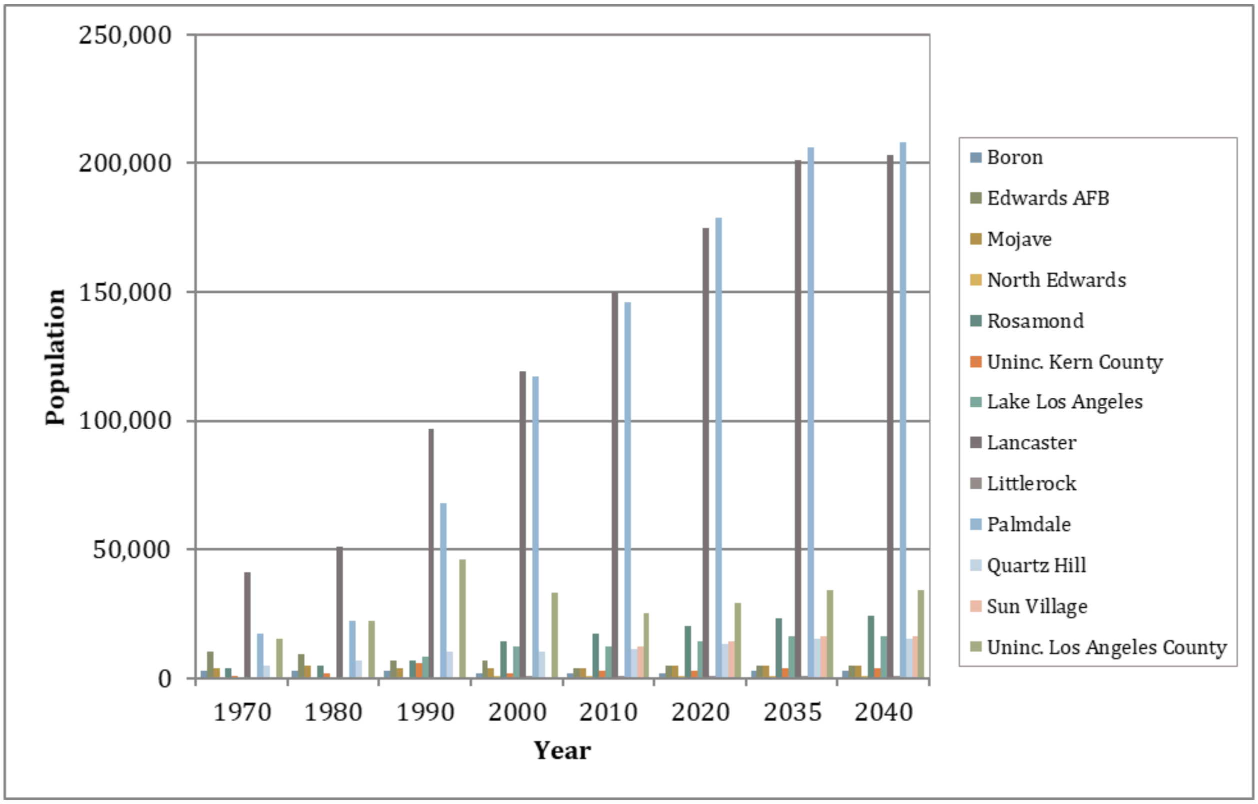
Projections for the Cities of Lancaster and Palmdale were derived from SCAG estimates. Population projections for the rest of the Antelope Valley Region assume an annual growth rate similar to the City of Lancaster, estimated as approximately 1.7 percent per year up to 2020, then 1.0 percent per year up to 2035 from SCAG projections. Population projections were extended through 2040 using California Department of Finance (DOF) data. It was assumed that the IRWM Region will have a similar growth rate to that of Kern County and Los Angeles County as a whole, which is estimated at approximately 6.3 percent in Kern County and 1.1 percent in Los Angeles County between 2035 and 2040 (CA Department of Finance 2019). Projections indicate that approximately 535,000 people will reside in the Antelope Valley Region by the year 2040. This represents an increase of approximately 38 percent from the 2010 population. Figure 2-17 below graphically depicts these population projections.

### Table 2-3: Population Projections

| | 1970[a] | 1980[a] | 1990[b] | 2000[c] | 2010[d] | 2020[e] | 2035[e] | 2040[f] |
|---|---|---|---|---|---|---|---|---|
| Boron | 3,000 | 3,000 | 3,000 | 2,000 | 2,000 | 2,000 | 3,000 | 3,000 |
| California City[g] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Edwards AFB | 10,000 | 9,000 | 7,000 | 7,000 | 4,000 | 5,000 | 5,000 | 5,000 |
| Mojave | 4,000 | 5,000 | 4,000 | 4,000 | 4,000 | 5,000 | 5,000 | 5,000 |
| North Edwards | n/a | n/a | n/a | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 |
| Rosamond | 4,000 | 5,000 | 7,000 | 14,000 | 17,000 | 20,000 | 23,000 | 24,000 |
| Uninc. Kern County | 1,000 | 2,000 | 6,000 | 2,000 | 3,000 | 3,000 | 4,000 | 4,000 |
| Lake Los Angeles | n/a | n/a | 8,000 | 12,000 | 12,000 | 14,000 | 16,000 | 16,000 |
| Lancaster | 41,000 | 51,000 | 97,000 | 119,000 | 150,000 | 175,000 | 201,000 | 203,000 |
| Littlerock | n/a | n/a | n/a | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 |
| Palmdale | 17,000 | 22,000 | 68,000 | 117,000 | 146,000 | 179,000 | 206,000 | 208,000 |
| Quartz Hill | 5,000 | 7,000 | 10,000 | 10,000 | 11,000 | 13,000 | 15,000 | 15,000 |
| Sun Village | n/a | n/a | n/a | n/a | 12,000 | 14,000 | 16,000 | 16,000 |
| Uninc. Los Angeles County | 15,000 | 22,000 | 46,000 | 33,000[h] | 25,000 | 29,000 | 34,000 | 34,000 |
| **Region** | **100,000** | **126,000** | **256,000** | **289,000** | **388,000** | **461,000** | **530,000** | **535,000** |

Notes: Projections Rounded to the nearest 1,000 people.
(a) Based on Geolytics Normalization of Past U.S. Census Tract Data to 2000 Census Tract Boundaries.
(b) Based on 1990 Census data, and normalized by percentage of area of Census Block Group or Census Place in the Region.
(c) Based on 2000 Census data, and normalized by percentage of area of Census Block Group or Census Place in the Region.
(d) Based on 2010 Census data, and normalized by percentage of area of Census Block Group or Census Place in the Region.
(e) Projections for Palmdale and Lancaster from the SCAG *Adopted 2012 RTP Growth Forecast*. For remaining areas, it is assumed the Antelope Valley Region would have a similar annual growth rate as the City of Lancaster, estimated as approximately 1.7 percent per year up to 2020, then 1.0% per year up to 2035.
(f) Based on DOF growth rates for Kern County and Los Angeles County.
(g) The portion of California City within the Antelope Valley Region has a population of less than 500 people, and therefore is rounded down to 0.
(h) Decrease in population in unincorporated Los Angeles County likely due to addition of Census Designated Places to the census County that had previously been counted as unincorporated area.

**Figure 2-18: Population Projections**




## 2.11 Climate Change

Climate change projections have shown that California's water resources will likely be impacted by changes to temperature, precipitation, and sea level rise. Even in the year 2019, California is beginning to experience these impacts. Water resource planners already face challenges interpreting new climate change information and determining which response methods and approaches will be most appropriate for their planning needs. However, in order for the Region to adapt to, or protect against, climate change, it must first identify the impacts. Knowing these changes will help to identify potential vulnerabilities in water resource systems, which can identify and inform planning measures. Future projects in the Region can be evaluated based on their ability to adapt to the anticipated climate change impacts and mitigate GHGs. These strategies will help the Region to be more robust in the face of a changing environment.

The following state-wide impacts are expected to impact local water resources in the Region (DWR, 2011):

- Temperature increases:
  - More winter precipitation falling as rain rather than snow (this includes precipitation for local and imported water sources), leading to reduced snowpack water storage, reduced long term soil humidity, reduced groundwater and downstream flows, and reduced imported water deliveries
  - Higher irrigation demands as temperatures alter evapotranspiration rates, and growing seasons become longer

    - Exacerbated water quality issues associated with dissolved oxygen levels, increased algal blooms, and increased concentrations of salinity and other constituents from higher evaporation rates
    - Impacted habitats for temperature-sensitive fish and other life forms, and increased susceptibility of aquatic habitats to eutrophication

- Precipitation pattern changes:
    - Increased flooding caused by more intense storms
    - Changes to growth and life cycle patterns caused by shifting weather patterns
    - Threats to soil permeability, adding to increased flood threat and decreased water availability
    - Reduced water supply caused by the inability to capture precipitation from more intense storms, and a projected progressive reduction in average annual runoff (though some models suggest that there may be some offset from tropical moisture patterns increasingly moving northward)
    - Increased turbidity caused by more extreme storm events, leading to increased water treatment needs and impacts to habitat
    - Increased wildfires with less frequent, but more intense rainfall, and possibly differently timed rainfall through the year, potentially resulting in vegetation cover changes
    - Reduction in hydropower generation potential

Although the extent of these changes is uncertain, scientists agree that some level of change is inevitable; therefore, it will be necessary to implement flexible adaptation measures that will allow natural and human systems to respond to these climate change impacts in timely and effective ways. In addition to adapting to climate change, the Region has the opportunity to mitigate against climate change by minimizing GHGs associated with provision of water and wastewater services. The following is a discussion of likely climate change impacts on the Region, as determined from a vulnerability assessment that was completed with a group of local stakeholders. Specific opportunities for adapting to and mitigating against climate change will be discussed in later chapters of this Plan.

### 2.11.1 Effects and Impacts of Climate Change on the Region

Estimating the impacts of climate change at a regional level is challenging due to the coarse spatial scale of the global models that project climate change impacts of temperature and rainfall. These global models also project estimates for the year 2100, which is well beyond typical planning horizons of 20 to 30 years. To incorporate climate change into water resources management, downscaled temperature and precipitation projections are input into hydrologic and water resources system models to project impacts to water supplies, water demand, snowpack, sea level rise, and wildfires.

To better comprehend climate change impacts at a local level, the California Energy Commission funded and advised the development of Cal-Adapt, a web-based resource for projecting local risks posed by climate change. Cal-Adapt projects climate change impacts under two potential GHG emissions scenarios outlined in the Intergovernmental Panel on Climate Change's (IPCC) Climate Change 2014 Synthesis Report, a leading international assessment of climate change. The first scenario, Representative Concentration Pathway (RCP) 4.5, assumes GHG emissions will peak around 2040 and then decline. The second scenario, RCP 8.5, assumes that GHG emissions will continue to rise through 2100. Cal-Adapt synthesizes robust scientific data under the two scenarios and applies four models selected by California state agencies as priority models for research contributing to California's Fourth Climate Change Assessment (California Energy Commission 2017).

Cal-Adapt climate change tools were used to project regional changes in temperature, precipitation, wildfire risk, and other impacts posed by climate change. The projections do not factor policy, technology, behavior, and other unidentified variables that influence the evolution of climate change in California. Climate change impacts were compared against historical annual means for 1961 to 1990, as was done by the IPCC when analyzing the global climate dataset. Where regional climate change impacts were not available through the Cal-Adapt website, other resources were utilized, including the Climate Change and Health Profile Report for Los Angeles County 2017 and the California Climate Change Center. Table 2-4 summarizes the impacts and effects of climate change on the Region by 2100 (unless otherwise indicated).

**Table 2-4: Projected Climate Change Effects on the Region**

| Effect | Ranges |
|---|---|
| Temperature change[1] | • 5°F (RCP 4.5) to 6°F (RCP 8.5) increase by 2050[(a)]<br>• 6°F (RCP 4.5) to 11°F (RCP 8.5) increase by 2100[(b)] |
| Extreme Heat Days[1(c)] | • Little change (RCP 4.5 and RCP 8.5) is projected above threshold by 2050[(d)]<br>• 34 (RCP 4.5) to 63 (RCP 8.5) additional days above threshold by 2100[(b)] |
| Wildfire Risk[1] | • 524 (RCP 4.5) to 413 (RCP 8.5) more hectares burned by 2050[(b)]<br>• 331 more (RCP 4.5) to 166 less (RCP 8.5) hectares burned by 2100[(c)] |
| Annual Average Precipitation[1] | • 1.6" (RCP 4.5) to 0.2" (RCP 8.5) increase by 2050[(d)]<br>• 0.2" (RCP 4.5) to 0.1" (RCP 8.5) increase by 2100[(a)] |
| Snowpack[2] | • March snowpack in San Gabriel Mountains decrease from 0.7 inches to zero |
| Demand | • *Increases expected, but not quantified* |
| Supply[3] | • SWP delivery decrease of 7-10% by 2050, and 21-25% by 2100<br>• *Changes to local supply not quantified, but could be reduced based on snowpack effects described above and on climate change impacts to imported water supplies* |

Sources: (1) Cal-Adapt Climate website http://cal-adapt.org/; (2) California Emergency Management & Natural Resources Agency 2012; (2) Climate Change and Health Profile Report Los Angeles County 2017; (3) California Climate Change Center 2009

Notes: (a) Average of 2045 to 2055 projections; (b) Average of 2095 to 2100 projections; (c) Impacts modeled for City of Palmdale; (d) 2050 projection only

For the Antelope Valley Region, climate change is expected to increase average temperature by at least 5 degrees Fahrenheit by 2100. The number of extreme heat days, which are the number of days when the daily maximum temperature is above the extreme heat threshold of 101.4 degrees Fahrenheit, may increase by at least 34 more days in a year by 2100 if greenhouse gas emissions peak around 2040 and then decline. Precipitation, however, is expected to remain relatively unchanged through 2100. Despite the minimal impact on total annual precipitation, climate change is expected to result in a larger proportion of precipitation coming in the form of intense single-day events (EPA 2017). High flow events will increase the risk of flooding as well as increase the difficulty of retaining water for flood attenuation and groundwater recharge (California Emergency Management & Natural Resources Agency 2012). Snowpack in the San Gabriel Mountains is expected to reduce slightly, while wildfire risk is expected to increase in mountainous areas. Imported water supplies feeding the Region are also anticipating delivery decreases as a result of climate change.

### 2.11.2 Climate Change Reporting and Registry Coordination

Individual agencies within the Region may individually decide whether to participate in the California Adaptation Strategy Process as part of further integrating the information derived from the local climate change studies being conducted and described above. Agencies that are part of the IRWM effort may consider joining the Climate Registry (Registry), http://www.theclimateregistry.org. The Climate Registry serves as a voluntary GHG emissions registry that has developed tools and consistent reporting formats which may aid agencies in understanding their GHG emissions and understanding ways to promote early actions to reduce GHG emissions. Both the State and the federal government require reporting of emissions for regulated entities of electricity and fuel use. These programs have reporting, certifying and verifying requirements that are separate from those under the voluntary programs.

# Section 3 | Issues and Needs

*The purpose of this section is to identify the issues, needs, challenges and priorities for the Antelope Valley Region through the year 2040 related to water supplies and other resources. The section will assess the current and projected water demands of the Antelope Valley Region, which include agricultural and M&I demands on groundwater, imported water, and recycled water as well as an analysis of the current and projected supplies[1] needed to meet those demands. In addition, an assessment of the water quality issues and challenges affecting these sources will be presented. A discussion of the flood management, environmental resource management, and land use planning issues will be presented, as these issues affect the water supply and demand requirements within the Antelope Valley Region. Finally, the issues and needs resulting from climate change are discussed.*

## 3.1 Water Supply Management Assessment

As development has increased the demand for both quantity and quality water in the Antelope Valley Region, the competition for available water supplies has also increased. Development of new water supplies and protection of existing water supplies, provision of proper infrastructure, and the need to maintain the groundwater levels are crucial to successfully meeting the future water demands within the Antelope Valley Region.

In order to assess the water supply for the Antelope Valley Region, a water budget was developed. Figure 3-1 presents a schematic of the water budget elements and their relationships. The main components of the water budget include demands, water entering, surface storage, groundwater

[1] The analyses provided in the IRWM Plan are strictly for long-term planning purposes and have not been conducted to answer the questions being addressed within the adjudication.

storage, direct deliveries, recycle/reuse, and water leaving. Each of these components is discussed in more detail below.

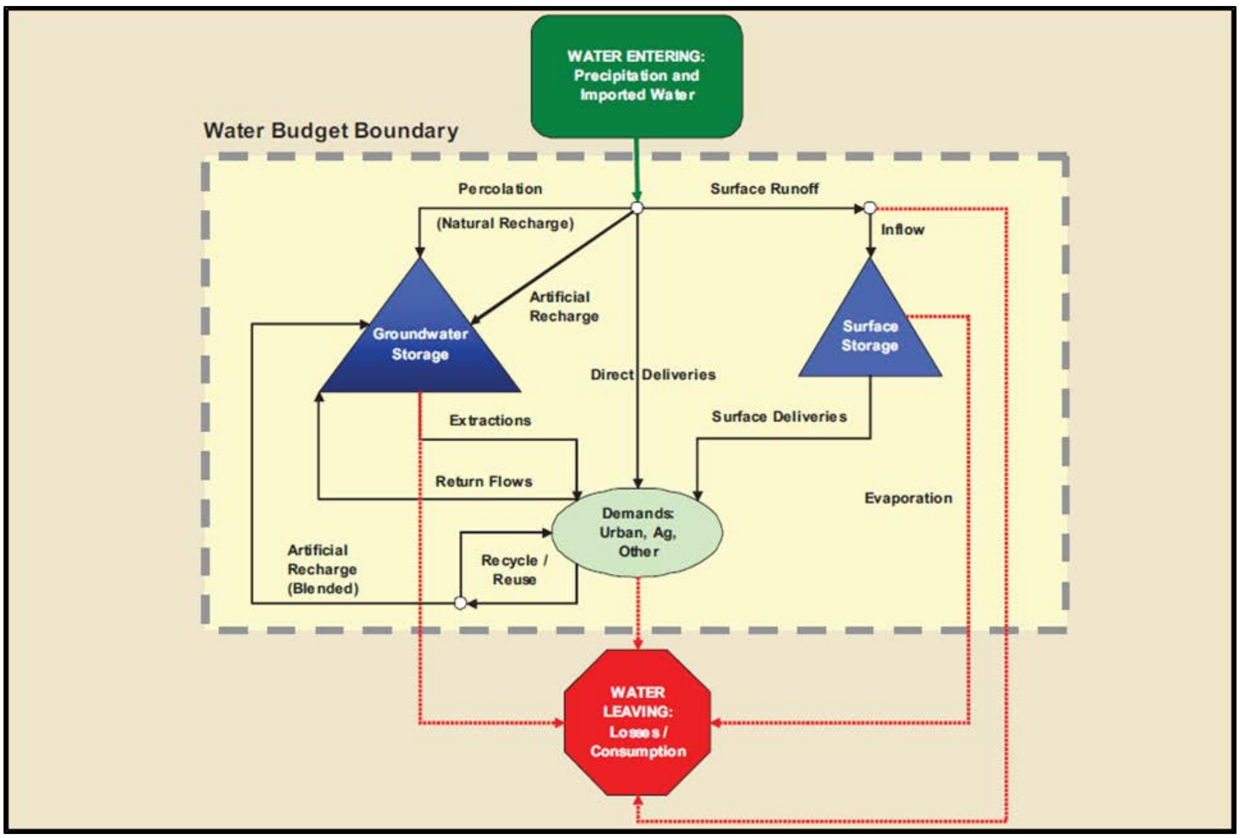
## 3.1.1 Water Supply

This component of the water budget includes sources of water from outside of the Antelope Valley Region entering the water budget boundary, such as precipitation and imported water.

### 3.1.1.1 Precipitation

As discussed in Section 2, the average annual precipitation for the Antelope Valley Region is approximately 7 inches per year. Precipitation entering the Antelope Valley Region is lost to evaporation (see Section 3.1.2.5), percolated to groundwater storage as natural recharge (see Section 3.1.1.5), or carried as runoff to surface storage (see Section 3.1.2.5).

**Figure 3-1: Water Budget Schematic**




Note: Some surface runoff provides water for environmental demands, including wetlands, clay pan/vernal pools, sand dune water sequestering, and dry lakebed resurfacing.

### 3.1.1.2 Imported Water

Imported water entering the Antelope Valley Region could come from a number of sources including the SWP, desalination, or transfers/exchanges with outside agencies. Currently, the only source of imported water to the Antelope Valley Region is SWP water. SWP water is used in the Antelope Valley Region for direct deliveries (see Section 3.1.1.2) or for artificial recharge to groundwater storage (see Section 3.1.1.5).

### Imported Water Infrastructure

Imported water to the Antelope Valley Region is generally SWP water that is released from Lake Oroville into the Feather River where it then travels down the river to its convergence with the Sacramento River, the state's largest waterway. Water flows down the Sacramento River into the Sacramento-San Joaquin Delta. From the Delta, water is pumped into the California Aqueduct. The Antelope Valley Region is served by the East Branch of the California Aqueduct. Water taken from the California Aqueduct by local SWP Contractors is then treated before distribution to customers.

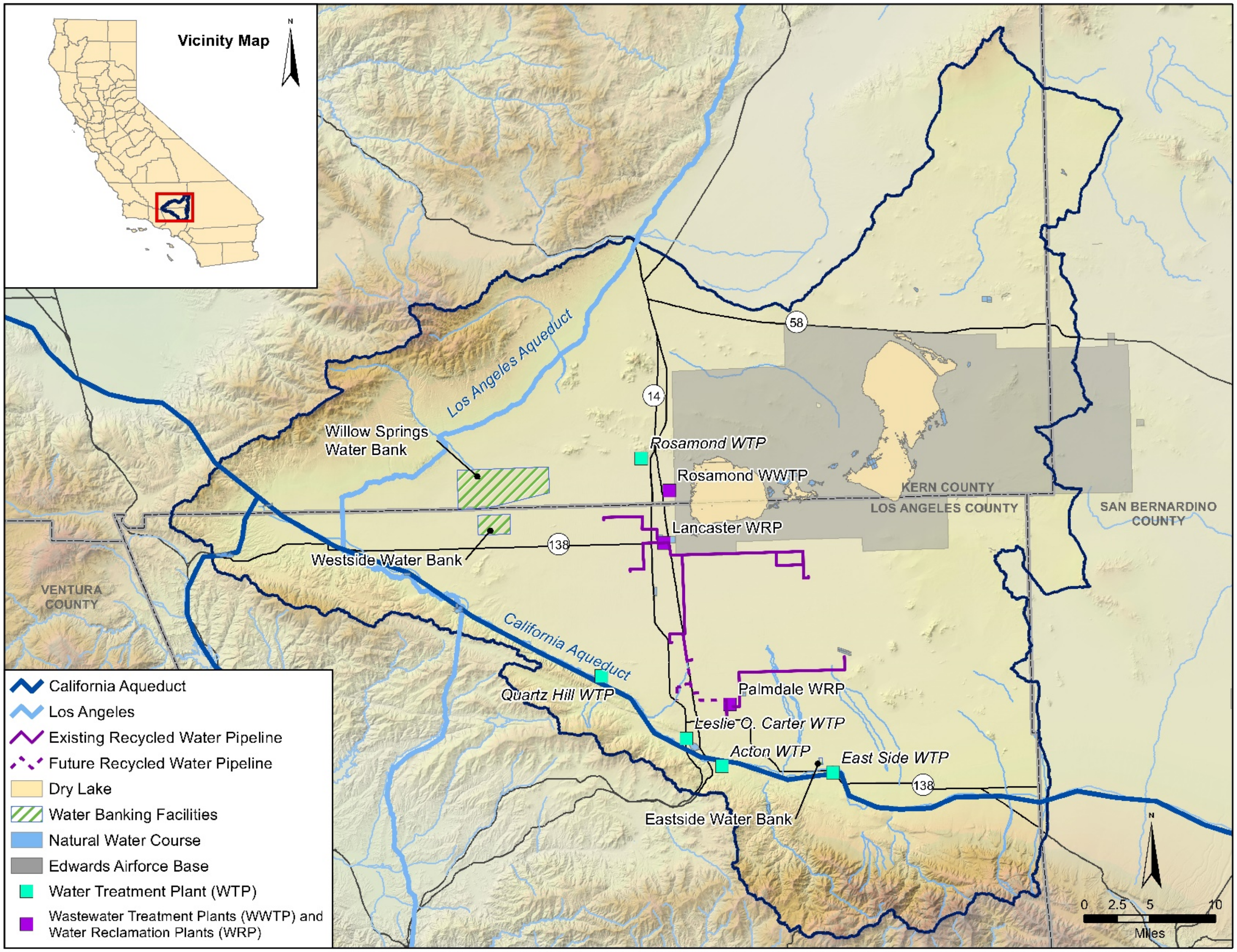
AVEK currently treats SWP water with four Water Treatment Plants (WTPs) that are capable of treating approximately 132,280 AFY of imported water. The main WTP, Quartz Hill WTP, is rated for 90 million gallons per day (mgd) (98,550 AFY). The Eastside WTP, expanded in 1988, provides a treatment capacity of 10 mgd (10,950 AFY). Rosamond WTP is a 14 mgd (15,330 AFY) capacity treatment plant. The fourth AVEK plant, Acton WTP, has a capacity of 4 mgd (4,380 AFY) and is located outside of the Antelope Valley Region boundaries. LACWD 40, QHWD, and RCSD all receive treated water from AVEK.

PWD's water treatment plant capacity is 35 mgd (39,205 AFY). Recent upgrades have improved nearly every phase of the treatment process. The most notable improvement has been the addition of granular activated carbon contactors that provide PWD with the capability to remove a wide range of naturally occurring and man-made contaminants from the water.

PWD has an arrangement with LCID to treat LCID's raw SWP water supply and then convey potable water to LCID customers.

Major water-related infrastructure in the Antelope Valley Region is shown on Figure 3-2.

**Figure 3-2: Major Infrastructure**



## Reliability

The amount of SWP supply that would be available for a given water demand is highly variable and depends on hydrologic conditions in northern California, the amount of water in SWP storage reservoirs at the beginning of the year, regulatory and operational constraints, and the total amount of water requested by contractors. The variability of SWP deliveries is described in the California DWR “Final SWP Delivery Capability Report 2017” (Capability Report), the intent of which is to assist SWP contractors in assessing the reliability of the SWP component of their overall supplies.

In the Capability Report, DWR presents the results of its analysis of the reliability of SWP supplies, based on model studies of SWP operations. In general, DWR model studies show the anticipated amount of SWP supply that would be available for a given SWP water demand, given an assumed set of physical facilities and operating constraints, based on 82 years of hydrology. The results are interpreted as the capability of the SWP to meet the assumed demand over a range of historic conditions for that assumed set of physical facilities and operating constraints. Although new facilities are planned to increase the water delivery capability of the SWP (such as delta improvements), the analyses contained in the Capability Report assume no additional facilities. The effects of climate change were factored into the modeled future conditions.

The Capability Report shows that existing SWP facilities will, on average, receive 62 percent of their full Table A Amount for current demand conditions. This means that the SWP, using existing facilities operated under current regulatory and operational constraints, and with all contractors requesting delivery of their full Table A Amounts in most years, could deliver 62 percent of total Table A Amounts on a long-term basis. The Capability Report also projects that SWP deliveries during multiple-year dry periods could range between 28 percent of total Table A amounts during a 2-year drought to 33 percent during a 6-year drought. SWP deliveries could possibly be as low as 11 percent during an unusually dry single year (the driest in 82 years of historical hydrology) according to DWR’s 2017 modeling results. (DWR 2018).

On August 31, 2007, a U.S. District Judge ruled that the SWP was in violation of the federal Endangered Species Act because it threatened the existence of the Delta smelt, a fish species living in the Sacramento Delta. To help protect the species, the Judge ordered water imports from the north to be cut by up to 35 percent from the SWP and the Central Valley Project, until the Biological Opinion for the species could be prepared. The U.S. Fish and Wildlife Service (USFWS) issued a Biological Opinion (BO) on the Long-Term Operational Criteria and Plan for the SWP and Central Valley Project on December 15, 2008, determining that the two water projects would likely jeopardize the continued existence of the species. The findings of this BO called for adaptively managed flow restrictions and have continued to influence pumping in the Delta despite ongoing debate and litigation. In 2009, the National Marine Fisheries Service (NMFS) issued a BO for winter-run and spring-run Chinook salmon and steelhead that put similar limits on pumping through part of the year and restrictions on total Delta exports during the months of April and May. In late 2016, USBR and DWR requested to reinitiate consultation with NMFS and USFWS on the operations of the CVP and SWP due to new information and science on declining listed fish species populations. During this reinitiated consultation that formally began in 2017, the CVP and SWP will continue to operate pursuant to the existing USFWS (2008) and NMFS (2009) BO requirements.

SWP reliability is expected to increase in the near future. The Bay Delta Conservation Plan, now known as the California “Water Fix”, was a project proposed by DWR and led by State and federal agencies to build two large tunnels to improve water system reliability in California. In 2018, DWR withdrew proposed permits for the California Water Fix as a result of nine appeals alleging that the California Water Fix was inconsistent with the Delta Plan’s coequal goals of providing a more reliable water supply for California and protecting, restoring, and enhancing the Delta ecosystem. DWR is now pursuing a new environmental review and planning process for the Delta Conveyance project, a single tunnel solution to modernize Delta conveyance. If constructed, the project would increase the reliability and resiliency of Table A deliveries for SWP contractors like AVEK.

The SWP supply estimates in this IRWM Plan rely on the projections made in DWR's 2017 Capability Report for future supply. DWR's projected supply estimates incorporate the restrictions set by both the USFWS and NMFS BOs, while acknowledging the challenge of accurately determining future water reliability as a result of adaptive management techniques and the potential for future changes in court rulings.

#### Direct Deliveries

Direct deliveries to the Antelope Valley Region consist of the SWP water contracted through AVEK, LCID, and PWD. The SWP is operated by DWR for the benefit of the SWP contractors. The SWP is the nation's largest state-built water and power development and conveyance system. The SWP includes approximately 700 miles of aqueduct and conveyance facilities from Lake Oroville in the north to Lake Perris in the south. It also includes pumping and power plants, reservoirs, lakes, storage tanks, canals, tunnels, and pipelines that capture, store, and convey water to 29 water agencies.

The SWP is contracted to deliver a maximum 4.17 million AFY of Table A water to the 29 contracting agencies. Table A water is a reference to the amount of water listed in "Table A" of the contract between the SWP and the contractors and represents the maximum amount of water a contractor may request each year. AVEK, which is the third-largest state water contractor, has a Table A Amount of 144,844 AFY as of 2018. Approximately five (5) percent of AVEK's Table A deliveries were supplied to AVEK customers outside of the Antelope Valley IRWMP Region boundary in 2015. Assuming 95 percent of AVEK's Table A allocation is delivered to the Antelope Valley Region, a maximum of about 137,600 AFY is available for AVEK customers inside the IRWMP Region boundary.

By October 1st of every year, each contractor provides DWR a request for water delivery up to their full Table A Amount for the next year. Actual delivery from DWR may vary from the request due to variances in supply availability resulting from hydrology, storage availability, regulatory or operating constraints. When supply is limited, water is allocated based on a percentage of full contractual Table A Amounts.

A summary of the historical deliveries of SWP to the Antelope Valley Region are provided in Table 3-1. The table illustrates the Antelope Valley Region's increasing dependence on SWP water.

**Table 3-1: Summary of Historical Wholesale (Imported) Supply (AFY) in the Antelope Valley Region**

| Year | AVEK Deliveries | AVEK Table A | PWD Deliveries | PWD Table A | LCID Deliveries | LCID Table A | Region Deliveries | Region Table A |
|---|---|---|---|---|---|---|---|---|
| **1975** | 8,068 | 35,000 | 0 | 5,580 | 520 | 520 | 8,588 | 41,100 |
| **1980** | 72,407 | 69,200 | 0 | 11,180 | 191 | 1,150 | 72,598 | 81,530 |
| **1985** | 37,064 | 40,000 | 1,558 | 14,180 | 0 | 1,730 | 38,622 | 55,910 |
| **1990** | 47,206 | 132,100 | 8,608 | 17,300 | 1,747 | 2,300 | 57,561 | 151,700 |
| **1995** | 47,286 | 138,400 | 6,961 | 17,300 | 480 | 2,300 | 54,727 | 158,000 |
| **2000** | 83,577 | 138,400 | 9,060 | 21,300 | 0 | 2,300 | 92,637 | 162,000 |
| **2005** | 59,831 | 141,400 | 11,712 | 21,300 | 0 | 2,300 | 71,543 | 165,000 |
| **2010** | 57,713 | 141,400 | 10,969 | 21,300 | 0 | 2,300 | 68,682 | 165,000 |
| **2015** | 26,727[a] | 144,844 | 2,446 | 21,300 | 460[b] | 2,300 | 29,862 | 168,444 |

Source: DWR 2018

Notes:

(a) Total delivery normalized for water districts within the IRWMP Region boundaries and excludes groundwater supplies and exchanges with LCID (AVEK 2016).

(b) LCID's allocation delivered to AVEK with return of water to LCID expected by 2025 (AVEK 2016).

Future availability of the SWP water was estimated by DWR in its 2017 Delivery Capability Report (2018). For an average water year, it is anticipated that 62 percent of the Table A Amount would be available for delivery to contractors. For a single dry water year, delivery of Table A water decreases to 8 percent. For a multi-dry water year, delivery of Table A water is estimated between 29 percent for a 2-year drought and 34 percent for a 4-year drought. Maximum Table A water that could be available for the Region includes 137,600AFY from AVEK (inside the IRWMP Region), 21,300 AFY from PWD, and 2,300 AFY from LCID. Projected imported water supplies are shown in Table 3-2 for an average year.

**Table 3-2: Projected Average Imported Water Supplies in the Antelope Valley Region (AFY)**

| Agency | 2020 | 2025 | 2030 | 2035 | 2040 |
|---|---|---|---|---|---|
| AVEK [(a)] | 75,565 | 75,609 | 75,503 | 75,399 | 75,459 |
| *California Water Service* | *119* | *143* | *167* | *191* | *215* |
| *LACWD 40* | *61,000* | *61,000* | *61,000* | *61,000* | *61,000* |
| *QHWD* | *3,064* | *2,994* | *2,983* | *2,972* | *2,972* |
| *RCSD* | *611* | *1,786* | *1,822* | *1,858* | *1,894* |
| *Remaining Service Area* | *10,771* | *9,686* | *9,531* | *9,378* | *9,378* |
| LCID [(b)] | 1,426 | 1,426 | 1,426 | 1,426 | 1,426 |
| PWD [(c)] | 19,400 | 19,100 | 19,100 | 19,100 | 19,100 |
| **Total** | **96,391** | **96,135** | **96,029** | **95,925** | **95,985** |

Notes:
(a) Projections from the California Water Service, LACWD 40, QHWD, RCSD, and AVEK 2015 UWMPs normalized for remaining water districts within the IRWMP Region. Projections for 2035 in the 2015 UWMPs are assumed to remain constant through 2040 for AVEK, LACWD 40, and QHWD.
(b) Assumes Table A allocation of 62% based on DWR 2018 Delivery Capability Reliability Report.
(c) PWD 2016.

In addition to SWP reliability constraints, AVEK is currently unable to beneficially apply its entire Table A amount of SWP water, even during years when the full Table A amount is available. This inability to fully use available supply is caused by the variability of demand during winter and summer and the limitations on existing infrastructure to receive, store, and deliver water to users. AVEK currently provides most water supply through direct deliveries to meet current demand (i.e., without storage). When demand is high during summer months, the aqueduct bringing water to AVEK has a conveyance capacity below the demand for water. Conversely, during the winter months, demand is much lower than aqueduct capacity.

To accommodate the need to store water during the winter months for use in the dry summer months, AVEK plans to use water banking projects to increase their ability to fully use the SWP allotment. AVEK and various partners completed the Water Supply Stabilization Project No. 2 (Westside Water Bank) in 2016 that allows storage of up to 36,000 AF of water in the ground per year with a total banking capacity of 120,000 AF. Currently, the maximum recovery volume in any one year is 36,000 AFY and plans are underway to increase that annual withdrawal capacity to approximately 40,000 AFY during dry years. Excess SWP water may be placed in the water bank during winter months when municipal and industrial demands are low.

AVEK also added the Eastside Water Banking and Blending Project to allow for recharge of raw water which is later recovered and blended for delivery to the Eastside WTP. The Eastside Water Banking and Blending Project started operations in 2016 and currently consists of three 2-acre recharge basins and three groundwater wells. Currently, the total withdrawal capacity is estimated at 5,700 AFY. (AVEK 2016). AVEK currently has approximately 73,750 AF of water banked in the Westside

Water Bank and approximately 2,000 AF banked in the Eastside Water Bank (personal communication with Matt Knudson, AVEK, August 6, 2019).

AVEK is also in the process of developing a High Desert Water Bank adjacent to the East Branch of the California Aqueduct, enabling water delivery and return without development of additional conveyance. The bank, which is currently in the preliminary design stage, is expected to have a total storage capacity of 280,000 AF and an annual recharge and recovery capacity of 70,000 AF. However, the bank will likely be used to store water for partners outside the Region and is not planned to supply the AV IRWM Region (personal communication with Matt Knudson, AVEK, August 7, 2019).

To determine the most reasonable amount of available SWP water for AVEK, this analysis assumes that SWP reliability is the limiting factor (i.e., not conveyance capacity). To amount of SWP water available is obtained by multiplying the SWP reliability factor of 62 percent to the available Table A amount of 137,600 AFY for AVEK customers inside the IRWMP Region (AVEK 2016; DWR 2018). These projections also assume that the Westside Water Bank will be replenished in average years, and that only one-third of the banked groundwater supplies will be used to supplement AVEK imported supplies in a dry year. Because AVEK is unable to determine the duration of a drought period until the drought ends, this assumption applies to both single-dry and multi-dry year projections. In comparison, the Eastside Water Bank is a smaller operation that will generally replenish and extract groundwater within the same year but does provide some additional water storage for the region.

Table 3-3 provides a summary of projected SWP availability to the Antelope Valley Region based on these assumptions. These projections include Table A allocations for AVEK, LCID, and PWD.

**Table 3-3: Summary of Imported Water Supply Reliability in the Antelope Valley Region**

| | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 |
|---|---|---|---|---|---|---|
| Maximum Table A[(a)] | 160,450 | 160,450 | 160,450 | 160,450 | 160,450 | 160,450 |
| **Average Year** | | | | | | |
| Reliability[(b)] | 62% | 62% | 62% | 62% | 62% | 62% |
| Supply[(c)] | 99,480 | 99,480 | 99,480 | 99,480 | 99,480 | 99,480 |
| **Single-Dry Year** | | | | | | |
| Reliability[(b)] | 8% | 8% | 8% | 8% | 8% | 8% |
| Supply[(c)] | 12,840 | 12,840 | 12,840 | 12,840 | 12,840 | 12,840 |
| **Multi-Dry Year (4-year period)** | | | | | | |
| Reliability[(b)] | 34% | 34% | 34% | 34% | 34% | 34% |
| Supply[(c)] | 54,550 | 54,550 | 54,550 | 54,550 | 54,550 | 54,550 |

Notes: Numbers rounded to nearest 10 AFY.

(a) Total Table A amounts for LCID, PWD, and AVEK, normalized by water deliveries within the IRWM Region boundaries.

(b) Determined from DWR's Final SWP Delivery Capability Report 2017 (DWR 2017).

(c) Assumes supply equivalent to the Antelope Valley Region's maximum Table A Amount available to the IRWM Region (160,452 AFY) multiplied by the SWP reliability of 62% for an average year, 8% for a single dry year, and 34% for a 4-year drought period. This assumption relies on another assumption that conveyance constraints can be overcome by using the Westside Water Bank to supplement small amounts of water during single-dry year and multi-dry year periods.

#### 3.1.1.3 Recycle/Reuse

**Recycled Water Sources**

Recycled water in the Antelope Valley is available from two primary sources: the Lancaster WRP and the Palmdale WRP. Both plants treat wastewater to a tertiary level. Only existing recycled water users are included in the Water Budget estimates for this Plan. Significant investments have been made to expand and upgrade the treatment plants to develop these recycled water supplies. Figure 3-3 shows the locations of the facilities and proposed infrastructure necessary to provide the recycled water quantities shown in Table 3-4.

EAFB has two treatment plants that distribute recycled water to the base. These include the EAFB Air Force Research Laboratory Treatment Plant which is a secondary wastewater treatment plant that discharges all its effluent to the evaporation ponds at the base.

The second plant is the EAFB Main Base WWTP which produces tertiary treated effluent for landscape irrigation at the base golf course with excess effluent discharged to the evaporation ponds when irrigation demand is low. Recycled water from these plants is not included in supply and demand calculations since all water is used on the base.

Table 3-4 provides a summary of the projected availability of the recycled water to the Antelope Valley Region from the Lancaster and the Palmdale WRPs through 2040.

**Table 3-4: Potential Availability of Recycled Water (AFY) to the Antelope Valley Region**

| | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 |
|---|---|---|---|---|---|---|
| **LA County District 40[(a)]** | 250 | 8,200 | 10,900 | 13,600 | 16,300 | 16,300 |
| **PWD[(b)]** | 100 | 500 | 1,000 | 1,500 | 2,000 | 2,000 |
| **Total Study Area** | **350** | **8,700** | **11,900** | **15,100** | **18,300** | **18,300** |

Sources:
(a) LA County District 40 2015 UWMP; 2035 projections assumed to remain through 2040
(b) Palmdale Water District 2015 UWMP; excludes volume available for Palmdale Regional Groundwater Recharge and Recovery Program

**Recycled Water Infrastructure**

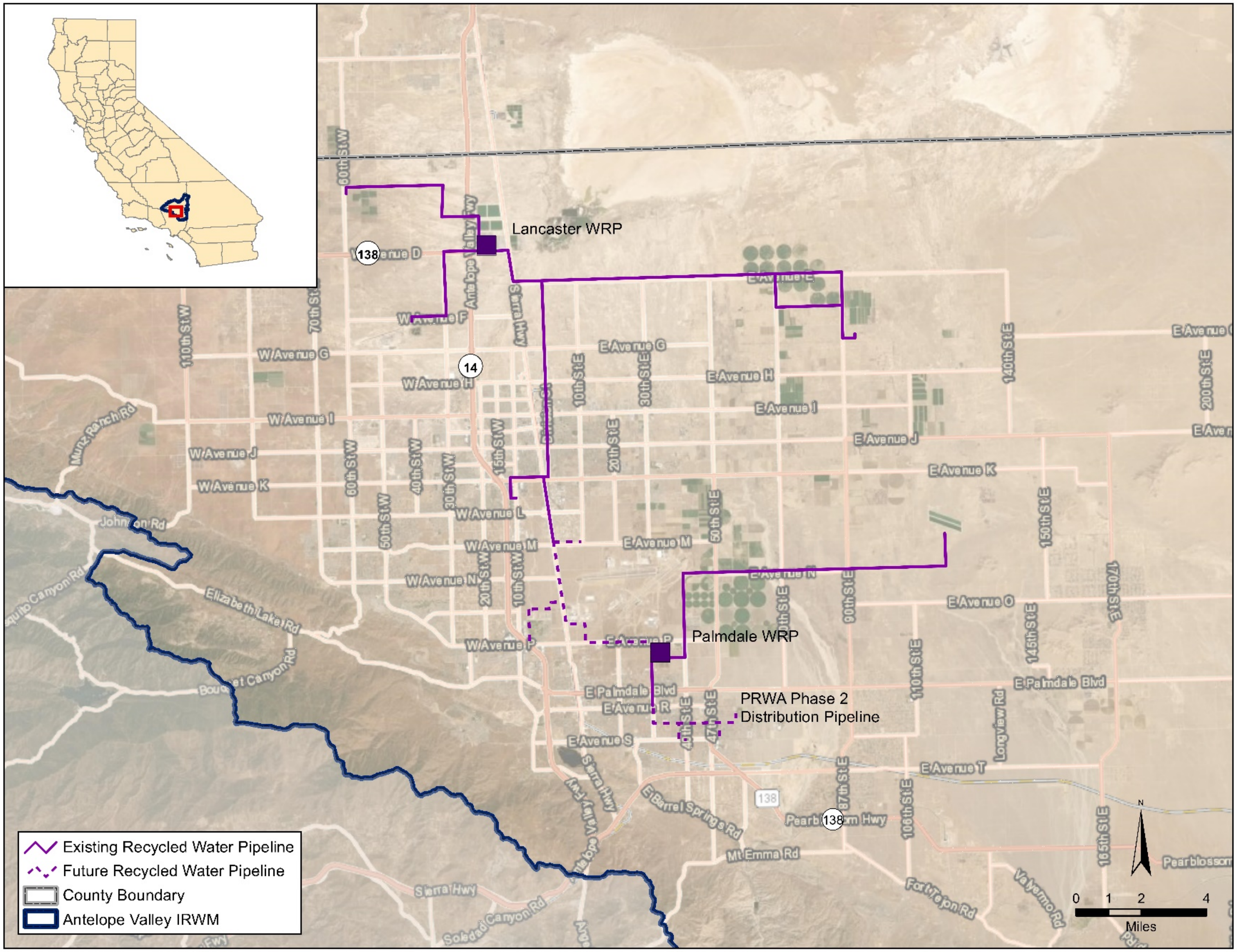
Distribution Pipeline: Figure 3-3 provides an overview of the existing and designed facilities providing (or that will provide) recycled water to the PRWA service area in the southeastern area of the City of Palmdale. The Lancaster WRP system maintains 200 acres of wetland wildlife refuge, preserves water levels in the Apollo Lakes Regional Park, and provides recycled water for irrigation of fodder crops through a pipeline primarily in Avenue E between Sierra Highway and 90th Street East. The Palmdale WRP provides recycled water for irrigation of fodder crops through a pipeline located primarily in Avenue N between 30th Street East and 120th Street East. Figure 3-3 also shows the LACWD 40 Recycled Water Backbone (Backbone) distribution pipeline which extends the system along Sierra Highway and East Avenue P to connect the Lancaster and Palmdale WRP systems, and is intended to further expand urban reuse in the Antelope Valley Region. Portions of the Backbone have already been constructed by the City of Lancaster and City of Palmdale. This expansion throughout the Antelope Valley Region is a direct result of the substantial coordination and cooperation between Kern and Los Angeles Counties.

Lancaster WRP: The Lancaster WRP, built in 1959 and located north of the City of Lancaster, is owned, operated, and maintained by Los Angeles County Sanitation District No. 14. The Lancaster WRP, which has a permitted capacity of 18.0 mgd, treated an average flow of 17,900 AF in 2015 to tertiary standards for agricultural and landscape irrigation, municipal and industrial (M&I) reuse, wildlife habitat, maintenance, and recreation. Recycled water produced at the Lancaster WRP is used for irrigation, agriculture, urban reuse, wildlife habitat, maintenance, and recreational impoundments.

Palmdale WRP: The Palmdale WRP, built in 1953 and located on two sites adjacent to the City of Palmdale, is owned, operated, and maintained by LACSD 20. Palmdale WRP, which has a permitted capacity of 12.0 mgd. The plant treated approximately 10,770 AF of wastewater in 2015 to tertiary standards. All tertiary treated water is used for agricultural and M&I reuse.

Rosamond WWTP: The Rosamond WWTP, located in the City of Rosamond, is owned, operated, and maintained by the RCSD. Rosamond WWTP has a permitted capacity of 1.27 mgd. RCSD is currently implementing a Wastewater Treatment Facility Wastewater Treatment Plant (WWTP) Rehabilitation and Groundwater Protection Project. The upgrade to the plant will allow it to treat raw wastewater to undisinfected secondary treated water with denitrification acceptable for percolation disposal. The Waste Discharge Permit was approved by the State Water Board on July 10, 2019.

**Figure 3-3: Existing and Designed Recycled Water Pipelines**



**Reliability**

Recycled water is assumed to be 100 percent reliable since it is based on a consistent water supply and is not expected to change for average, single-dry, or multi-dry year water conditions. Use of recycled water as a supply is limited more by recycled water infrastructure and demand for recycled water than reliability of such water as a supply.

#### 3.1.1.4 Surface Storage

**Runoff**

Surface water supplies in the Antelope Valley Region generally consist of runoff from Littlerock and Santiago Canyons in the Angeles National Forest that is intercepted by the Littlerock Dam and Reservoir. Littlerock Creek is a perennial stream supported by annual rainfall and snowmelt from the nearby slope of Mount Williamson. Inflow to Littlerock Reservoir is seasonal and varies widely from year to year depending on stream flows and snow melt from the Angeles National Forest. Littlerock Reservoir is co-owned by PWD and LCID. PWD and LCID jointly have long-standing water rights to divert 5,500 AFY from Littlerock Creek flows. Raw water is conveyed to Lake Palmdale for treatment and use via the Palmdale Ditch.

PWD is currently undergoing actions to increase the yield at Littlerock Reservoir. The initial design capacity of the Reservoir was 4,300 AF; however, this capacity has been substantially reduced over time by the deposition of sediment behind Littlerock Dam. PWD's Littlerock Creek Sediment Removal Project proposes to restore the reservoir capacity through the removal of 1,165,000 cubic yards of sediment from behind the dam to provide 500 AF of additional storage capacity and additional work to reduce sedimentation in the future.

**Surface Deliveries**

LCID is currently able to purchase 1,000 AFY, or 25 percent yield from the reservoir from PWD, whichever is less (PWD 2001). This amount is effective until the 1992 reservoir rehabilitation agreement between PWD and LCID ends in 2042. When the 50-year term of the agreement expires, LCID regains its water rights according to the 1922 agreement between PWD and LCID. The 1922 agreement states that LCID has the exclusive right to the first 13 cubic feet per second (cfs) measured at the point of inflow to the reservoir. Flows greater than 13 cfs will be shared by PWD and LCID, with 75 percent to PWD and 25 percent to LCID. In addition, each district is allotted 50 percent of the Littlerock Reservoir storage capacity (PWD 2016). Currently, water from Littlerock Reservoir is only used for M&I uses.

Table 3-5 provides a summary of the historical surface deliveries from Littlerock Reservoir.

**Table 3-5: Historical Surface Deliveries from Littlerock Reservoir (AFY)**

| Year | PWD Diversions | LCID Diversions | Total Diversions |
|---|---|---|---|
| 1975[(a)] | 1,586 | 1,513 | 3,099 |
| 1980[(a)] | 913 | 1,950 | 2,863 |
| 1985[(a)] | 1,460 | 1,375 | 2,835 |
| 1990[(a)] | 110 | 200 | 310 |
| 1995[(a)] | 3,771 | 0 | 3,771 |
| 2000[(a)] | 6,500 | 0 | 6,500 |
| 2005[(a)] | 6,900 | 0 | 6,900 |
| 2010[(b)] | 1,861 | 0 | 1,861 |
| 2015[(c)] | 500 | 0 | 500 |

Sources:
(a) PWD 2001.
(b) PWD 2010 UWMP.
(c) PWD 2015 UWMP.

#### Surface Water Infrastructure

The surface water storage facilities in the Antelope Valley Region include Littlerock Reservoir and Lake Palmdale. Littlerock Reservoir has an average seasonal inflow of approximately 3,500 AFY but an estimated storage capacity of only 2,765 AF due to sediment accumulation behind the dam. Calculations conducted by PWD indicate the Reservoir capacity has been further reduced by siltation at an annual rate of approximately 54,000 cubic yards of sediment amounting to a loss of approximately 35 AFY of water.

Littlerock Reservoir discharges into Lake Palmdale, which has a capacity of approximately 4,129 AF. Lake Palmdale stores both surface water runoff and SWP imported water until the water is conveyed from the lake through a 42-inch pipeline to PWD's water treatment plant.

#### Reliability

In the PWD 2015 UWMP, historical data were used to determine how the reliability of the Littlerock Dam and Reservoir surface water supplies would be affected for average, single-dry, and multi-dry water years. PWD expects to use 4,000 AFY of its diversion rights in average, dry, and multi-dry water years. This was calculated as 50 percent of the average available yield from the Reservoir of 8,000 AF.

According to the PWD 2016 Water System Master Plan, a reliability analysis was performed for the reservoir yield using actual hydrology from 1950 to 2013. This analysis estimated that Littlerock Creek surface water would decrease to a minimum of 200 AFY based on 1951 hydrology (PWD 2016).

### 3.1.1.5 Groundwater Production and Storage

#### Groundwater Infrastructure

LCID has four (4) groundwater wells that supplied approximately 1,350 AFY of water in Fiscal Year 2018 with half the supply going to agriculture. The wells have a maximum pumping capacity of 4,800 gpm (personal communication with James Chaisson, LCID, October 1, 2019). The 2015 Judgment, however, established an Allocation of Rights of the Native Safe Yield and assigned LCID a groundwater production right of 797 AFY. The Judgment allows LCID until 2023 to ramp down groundwater extractions to the new production right.

LACWD 40 has 50 active wells. The combined groundwater extraction capacity is estimated at 30,000 AFY (26.8 mgd). The 2015 Judgment ruled that LACWD 40 has a Pre-Rampdown Production and a production right of 6,789 AFY, therefore LACWD 40 will not have to ramp down groundwater production by 2023.

PWD has twenty-two (22) active groundwater wells throughout the Lancaster and Pearland groundwater subunits, and the San Andreas Rift Zone. The total instantaneous capacity for all PWD wells operating is approximately 16,000 gpm (25,958 AFY). Since 1994, the PWD has produced an average of approximately 9,500 AF of groundwater per year. PWD's total groundwater pumping in 2015 was 11,200 AFY. The 2015 Judgment, however, assigned PWD a groundwater production right of 2,770 AFY. Prior to the Judgment, PWD had an unquantified right to pump water for beneficial use, and assumed projected pumping volumes at 12,000 AFY based on pumping capacity (PWD 2016).

QHWD currently operates eleven (11) wells for a total maximum pumping capacity of 9,165 AFY (5,681 gpm) (LACWD 40 & QHWD 2011). As per the adjudication, QHWD has a Pre-Rampdown Production of 2,397 AFY and must ramp down groundwater production to its production right of 564 AFY by 2023.

RCSD has three (3) wells with a combined maximum pumping capacity of 2,825 gpm (4,557 AFY). RCSD relies on groundwater produced by two of these wells and the third is maintained as a standby/emergency source. . RCSD was allocated 404 AFY of Production Rights as a result of the adjudication and purchased an additional 150 AFY of Production Rights for a total of 554 AFY. RCSD will reduce groundwater production to its production right of 554 AFY by 2023, unless it purchases additional groundwater production rights through the Federal Reserve Water Rights, Carryover, Return Flows, and Transferred Production Rights (RCSD 2017).

#### Reliability

Since long-term recharge is expected to be stable, it is anticipated that groundwater pumping, and hence supply, will be reliable even in short-term and multiple year droughts. Thus groundwater is considered a very reliable supply for the Antelope Valley Region. However, how much groundwater can physically be supplied to the Antelope Valley Region in the future will decrease per the Judgment. It is important to note that the return flows are dependent upon anticipated demand and may fluctuate with changes in the anticipated demand. The return flow estimates are meant to indicate a sense of the impact of return flows to the groundwater basin.

#### Percolation

For purposes of this IRWM Plan, direct percolation from precipitation on the Antelope Valley Region floor is assumed to be negligible. However, indirect percolation from irrigation, conveyance system losses, wastewater discharge, and septic system return flows on the Antelope Valley Region floor do occur. There is the potential for direct percolation on the Antelope Valley Region floor to have an impact to the overall water budget. This component of the water budget is currently being studied in the Antelope Valley Region, and if new information is discovered that greatly differs from this assumption, this IRWM Plan may be amended to reflect this.

#### Native Safe Yield and Total Sustainable Yield

Safe Yield is the amount of annual extractions over time that equal the amount of water needed to recharge groundwater and maintain the Basin in equilibrium. The Basin's Native Safe Yield includes both natural recharge and return flows from unused groundwater that is pumped and then percolates back into the groundwater basin. Natural recharge can be variable and difficult to quantify. Historical estimates of natural recharge have ranged from 30,300 AFY to 81,400 AFY based on a variety of approaches (USGS 2003, USGS 1993). The earliest estimates of natural recharge ranged from 50,000 AFY to 81,400 AFY and were based on limited streamflow and rainfall data (USGS 1993). Later estimates were based on developing a relationship between rainfall and runoff and ranged from

40,280 AFY to 53,000 AFY (USGS 1993). An alternative method used a groundwater model, and found a natural recharge estimate of 30,300 AFY achieved a balance within the model (USGS 2003). The Judgment concluded that the Antelope Valley Groundwater Basin has an estimated natural recharge of 60,000 AFY. Estimates for return flows are typically calculated using a percentage of applied water used for M&I irrigation, agricultural irrigation, and agricultural irrigation with recycled water. These estimates are added to the natural recharge to get a total sustainable yield (TSY). Given the mix of land use practices observed over a recent 15-year period, an overall return flow of about 27.1 percent was estimated for the Basin. This resulted in a Native Safe Yield of 82,300 AFY.

TSY is defined in the Judgment as the amount of groundwater that may be safely pumped from the Basin on a long-term basis and is specified as the sum of the Native Safe Yield plus return flows from imported water. The Judgment concluded that return flows from imported water resulted in about 27,700 AFY of additional groundwater supply to the Basin. The TSY (i.e., recharge and return flows) was determined to be 110,000 AFY in the final Judgment. The 2017 Watermaster Report that references estimates for TSY, natural recharge, and return flows is included in Appendix I. This IRWM Plan is consistent with the adjudication finding for TSY (110,000 AFY). The TSY is used to determine the amount of water that may be sustainably pumped from the basin and represents the combination of natural recharge and return flows from M&I, agricultural, and agricultural reuse. Therefore, these components of TSY are not calculated separately. This Plan acknowledges that other estimates have been developed for TSY in the Valley as mentioned above.

The Production Right for groundwater users in the Basin was defined in the Judgment as a portion of the Native Safe Yield. Production Rights for specific parties are defined in the Judgment for both Non-Overlying and Overlying Producers. The Judgment determined that the sum of the individual production rights is approximately 82,300 AFY.

As determined by the Stakeholder Group at the May 1, 2019 stakeholder meeting, the discussions that follow in Sections 3 and 6 will utilize the NSY, TSY, and Production Rights for water balance and projection purposes. The projected water supplies also incorporate the rampdown schedule outlined in the Judgment to meet the determined Production Rights, shown in **Table 3-6**.

**Table 3-6: Current and Projected Groundwater Supplies**

| | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 |
|---|---|---|---|---|---|---|
| **Production Rights** (a) | 126,250 | 118,125 | 82,300 | 82,300 | 82,300 | 82,300 |
| **Return Flows** (b) | 18,581 | 27,700 | 27,700 | 27,700 | 27,700 | 27,700 |
| **Total Safe Yield** | **144,831** | **145,825** | **110,000** | **110,000** | **110,000** | **110,000** |

Notes:
(a) 2015 supplies are assumed to be "Pre-Rampdown Production" estimates in the Antelope Valley Watermaster 2017 Annual Report; 2020 is a linear extrapolation from 2015 and 2025; 2025-2040 is the sum of non-overlying and overlying producers and is equivalent to the Native Safe Yield.
(b) Assumed return flows from imported water per Antelope Valley Watermaster 2017 Annual Report.

### Artificial Recharge

One typical source of artificial recharge is water banking through spreading basins that allow the water to infiltrate into the ground. Several water banking projects have been proposed in the Region and are discussed in later Sections of this Plan. AVEK's Westside Water Bank project was completed in 2010 and can store up to 120,000 AFY. This project is a collaboration between several agencies. The partners can currently withdraw a maximum of approximately 40,000 AFY. AVEK also added the Eastside Water Banking and Blending Program which started operations in 2016. The Eastside Water Bank currently has a total estimated capacity of 5,700 AFY (AVEK 2016).

The Southern California Water Bank Authority (SCWBA) is in the process of expanding the Willow Springs Water Bank (WSWB) and Conjunctive Use Project approximately a mile from the AVEK West Feeder and 8 miles from the East Branch of the SWP California Aqueduct. The WSWB will provide 1 million AFY of storage in the Antelope Valley Groundwater Basin and the ability to recharge 280,000 AFY and to recover up to 225,000 AFY during dry periods (personal communication with Zachary Ahinga, Willow Springs, February 7, 2019). Releases are made from the WSWB to the East Branch to 1) provide "backstop" flows to mitigate potential SWP supply reductions; 2) to allow pulse flow releases from Oroville Reservoir for fishery enhancement, and 3) for improved water supply reliability (SCWBA 2017). A South North Intertie Pipeline (SNIP) connects the WSWB to AVEK and is currently available for use by either AVEK or WSWB to convey imported or banked groundwater. The existing connection to the AVEK SNIP Treatment System could potentially integrate up to 60 cfs of the extraction and return capacity with the AVEK system. Though this connection may allow exchanges to occur among SWP contractors and local AVEK customers in the future, the WSWB currently does not have an agreement with AVEK to provide an average annual supply from the WSWB. For the purposes of this IRWM Plan, WSWB supplies will be conservatively excluded from the water supply projections for the Antelope Valley IRWM Region until there is an agreement between the two parties (personal communication Zachary Ahinga, Willow Springs, August 13, 2019).

Another type of artificial recharge is through ASR projects. ASR projects involve the storage of water in an aquifer via artificial groundwater recharge when water is available (usually during spring runoff), and recovery of the stored water from the aquifer when water is needed (usually late summer). The source of water used for ASR can vary. Currently, the only source of ASR water available to the Antelope Valley Region is SWP water, but blended and non-blended recycled water are potential future sources. Although the Region plans to develop groundwater recharge projects with blended recycled water in the future, currently only SWP water is utilized for ASR in the Antelope Valley to a very limited extent.

LACWD 40 is the only agency within the Antelope Valley Region that has attempted to utilize ASR as a water supply management practice. Their program includes the use of new or existing wells for direct injection of water into the aquifer. LACWD 40's ASR program operated under a Conditional Waiver of Waste Discharge Requirements, for a period of 5 years with groundwater monitoring requirements stipulated in the waiver. The 2004 waiver stipulated that LACWD 40 could only inject water to fill the basin to the 2,150 feet groundwater contour interval. This groundwater depression has a radius of approximately 2 miles centered around the middle of Lancaster. As a condition of the waiver, LACWD 40 could only inject up to 6,843 AFY. For the first few years of the project, LACWD was only able to inject approximately 1,500 AFY. In 2010, another five-year Conditional Waiver was approved.

As of December 2010, all injection activities were halted as a result of operational and financial restraints.

For the purposes of this Plan, ASR extraction of banked water will be considered to be negligible since injection has been discontinued.

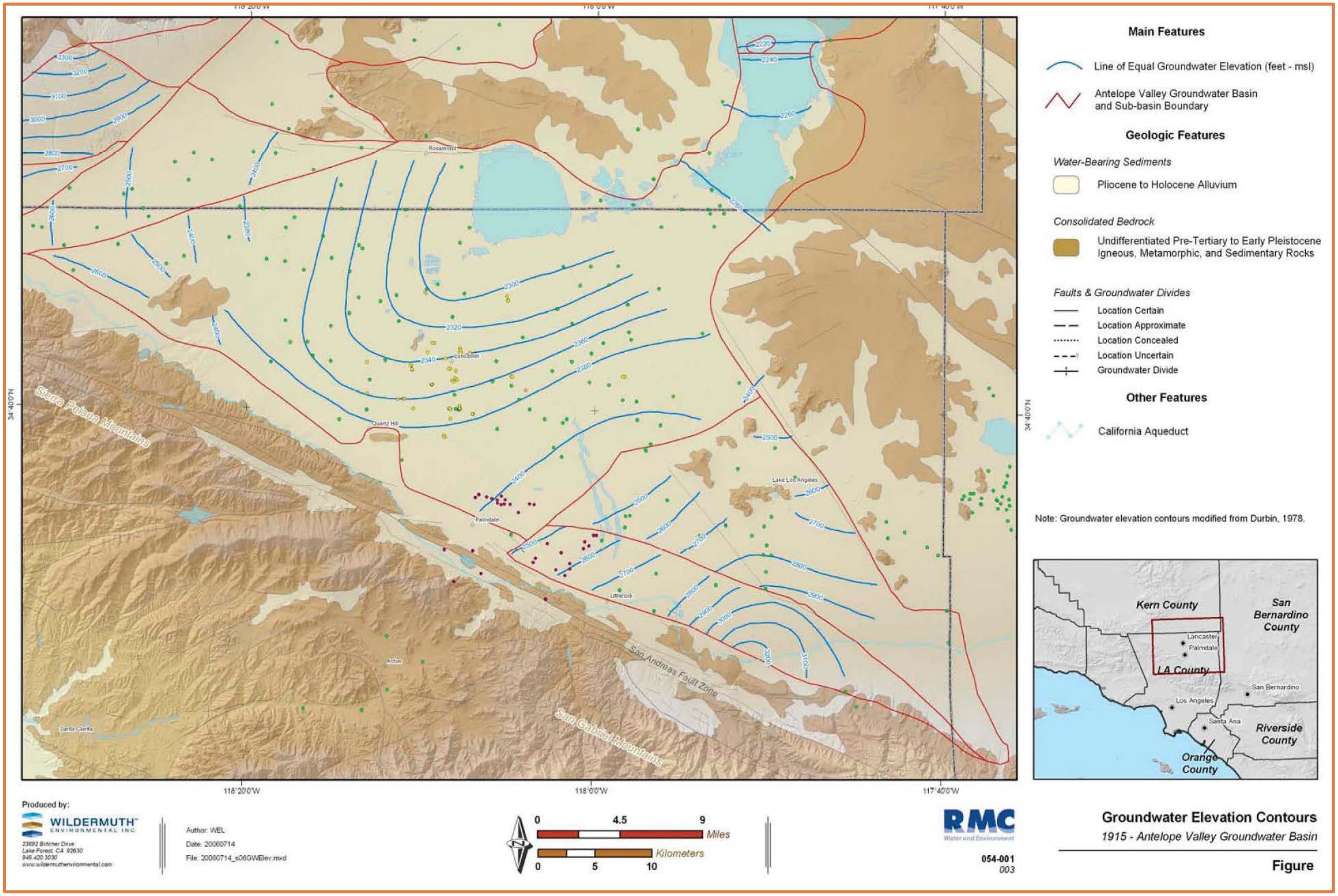
#### Extractions

Groundwater for the Antelope Valley Region is extracted from the Antelope Valley Groundwater Basin, as described in Section 2. Historically, groundwater has been the primary water supply source for the Antelope Valley Region.

When significant pumping in the Antelope Valley Region began (early 1900's), a decline in groundwater levels ensued in response to the change in the extraction versus recharge ratio. These changes varied spatially and temporally across the Antelope Valley Region. For instance, the eastern portion of the Buttes and Pearland subunits (described in Section 2.4.2.2) had relatively unchanged groundwater levels (declines of approximately 20 feet), whereas the western portion of these subunits had declines up to 100 feet. The groundwater level changes in the Lancaster subunit were more dramatic and varied with land use, with depressions of up to 200 feet in 1961 in areas with increased agricultural pumping (City of Lancaster 2007). With the introduction of SWP water and increasing urbanization, the water table depressions have either stabilized or increased in the Antelope Valley Region. Figure 3-4 to Figure 3-8 provide a set of contour maps of the groundwater levels for the Antelope Valley Region from 1915 to 2006.

The Judgment mandates annual reports to monitor groundwater extractions and changes in groundwater levels. According to the 2017 Watermaster report, water levels are the lowest in the Palmdale area and adjacent areas to the northeast; areas where much of the groundwater production occurs in the Basin. Relatively low groundwater levels were also observed in the Rogers Lake Subarea beneath EAFB in the north.

## Figure 3-4: 1915 Groundwater Level Contour Map of the Antelope Valley Region



## Figure 3-5: 1961 Groundwater Level Contour Map of the Antelope Valley Region

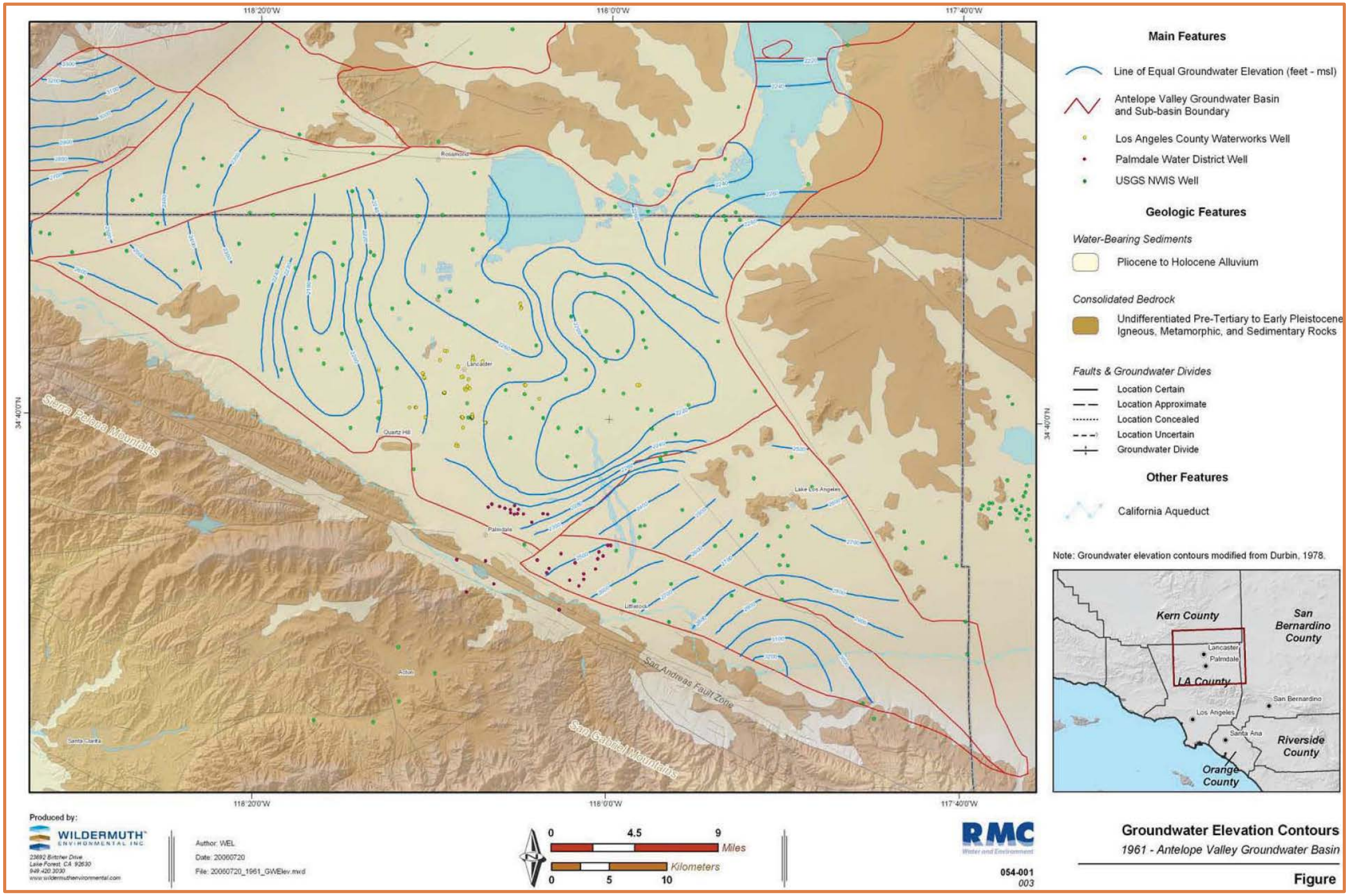
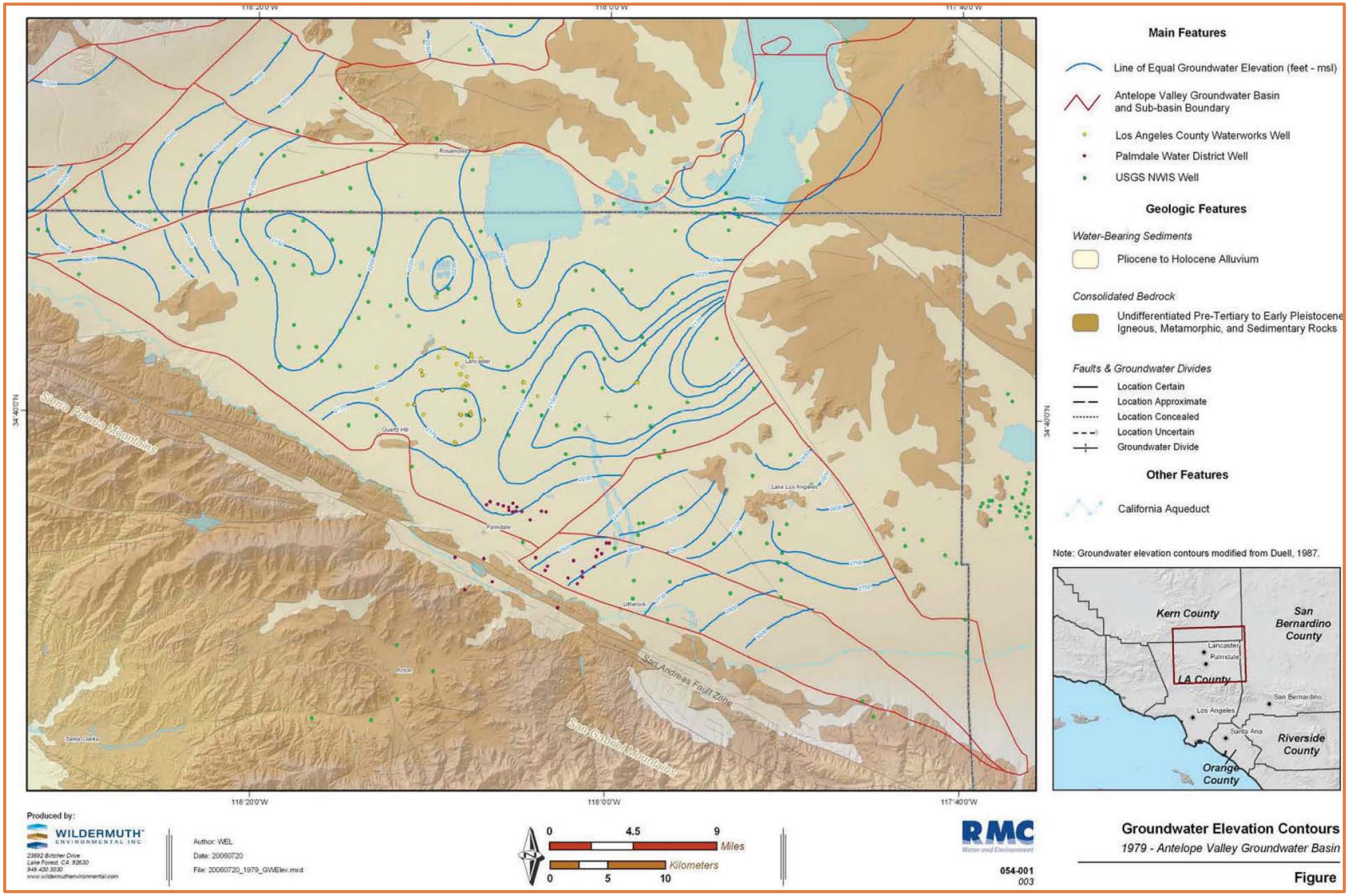


**Figure 3-6: 1979 Groundwater Level Contour Map of the Antelope Valley Region**



## Figure 3-7: 1988 Groundwater Level Contour Map of the Antelope Valley Region

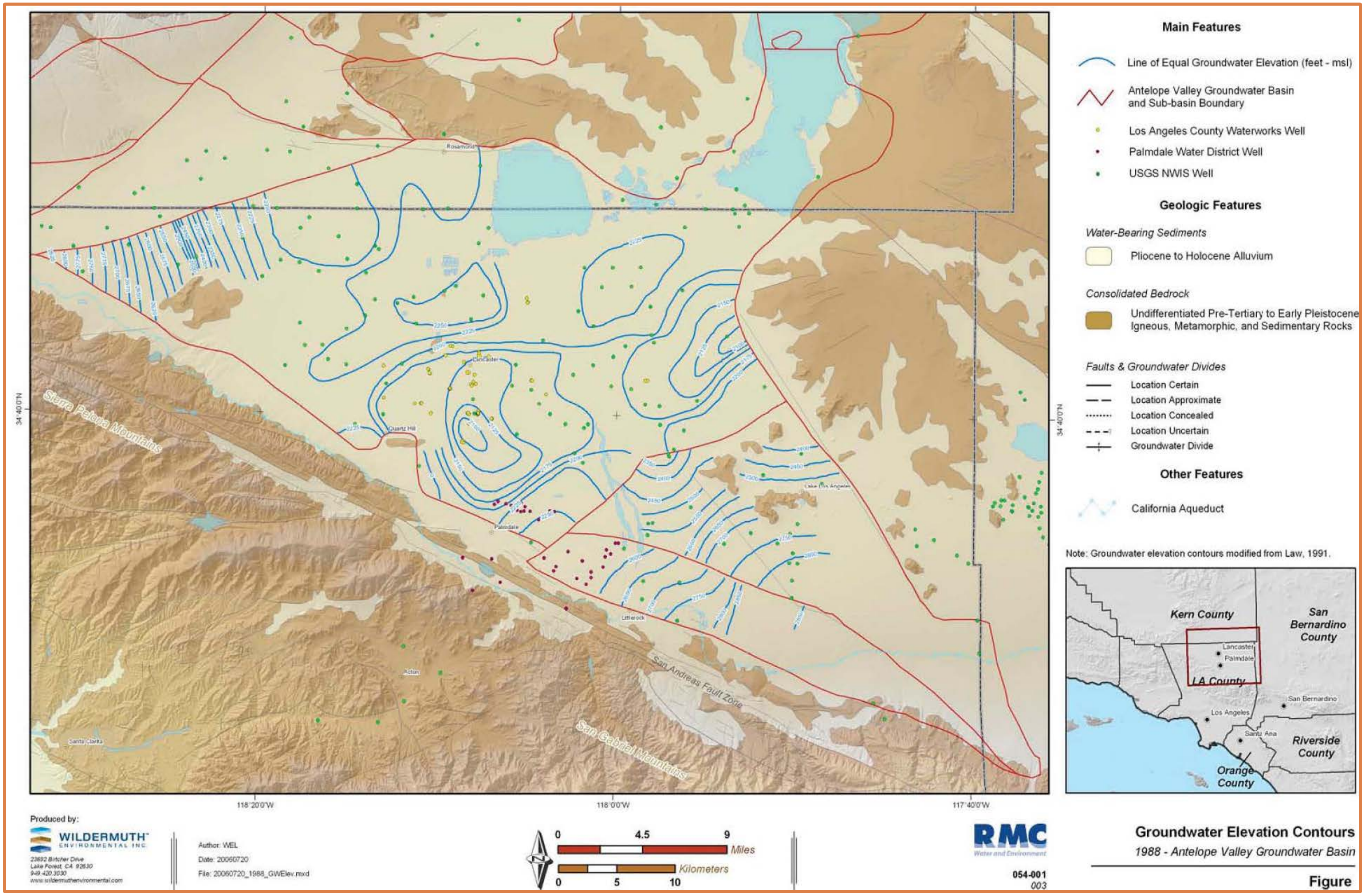
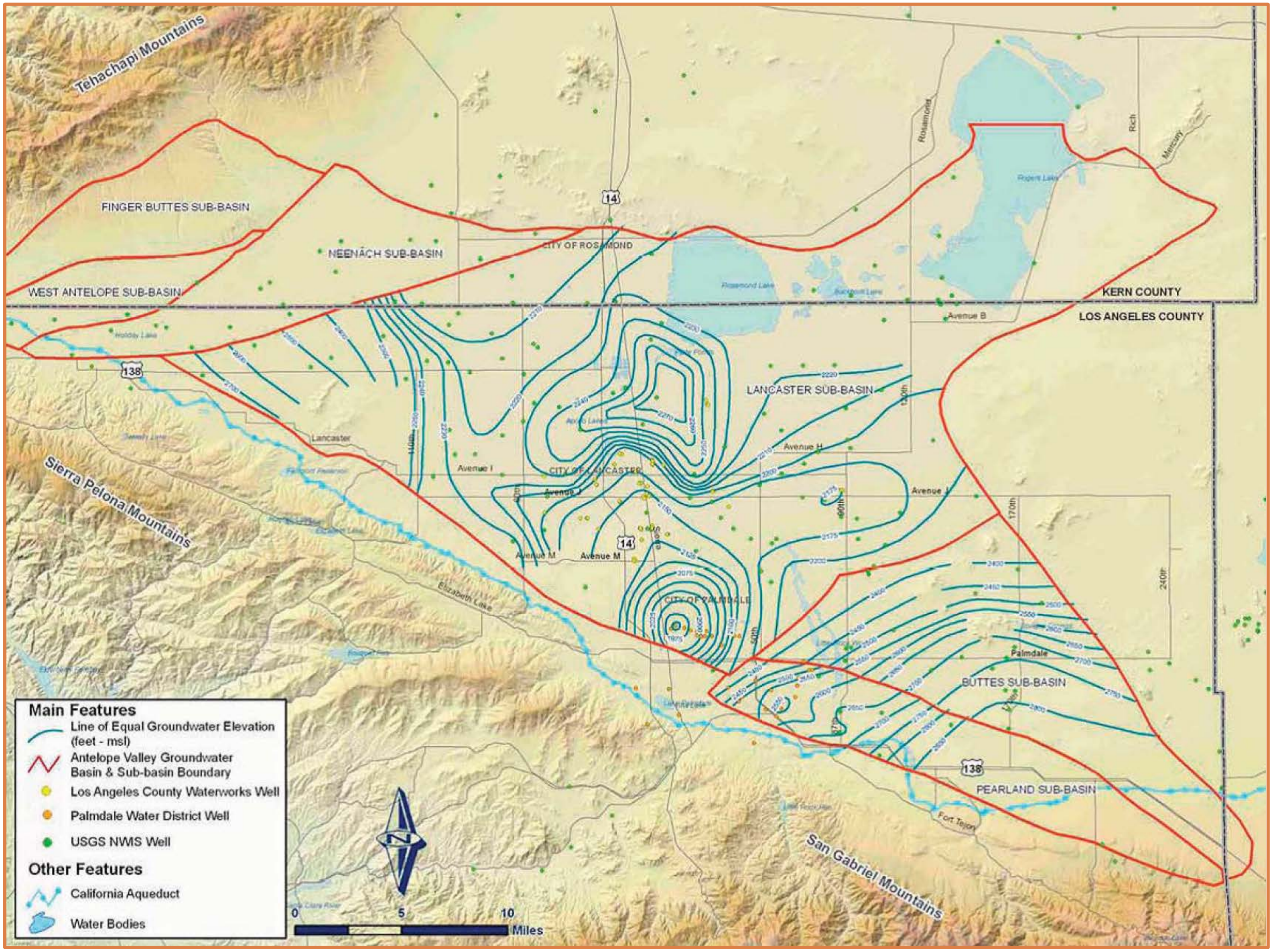


**Figure 3-8: 2006 Groundwater Level Contour Map of the Antelope Valley Region**



### 3.1.2 Water Demands

The following subsection discusses the current and projected water demands for the Antelope Valley Region. In the 2013 AV IRWM Plan, the demands were presented with urban demand (based on per capita estimates) and two agricultural scenarios (average and dry year estimates). The 2019 AV IRWM Plan Update reevaluated this methodology and updated the water demand projections to better reflect the existing conditions and planning efforts of the Region. Urban demands were updated to also include industrial demands from Rio Tino Minerals. Projected water demands for the Antelope Valley Region are presented in Table 3-7. Later in this Section, water budgets are developed for the Region that compare average water years, dry water years, and multi-dry water years.

**Table 3-7: Water Demand Projections (AF) for the Antelope Valley Region**

| | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 |
|---|---|---|---|---|---|---|
| **Urban Demand** | | | | | | |
| Boron CSD[a] | 400 | 400 | 400 | 500 | 500 | 500 |
| California City CSD[b] | 0 | 0 | 0 | 0 | 0 | 0 |
| California Water Service | 500 | 1,000 | 1,000 | 1,000 | 1,000 | 1,100 |
| LA County Waterworks District 40[c] | 38,700 | 96,500 | 108,000 | 119,400 | 130,800 | 132,200 |
| Rosamond CSD | 2,200 | 2,300 | 2,300 | 2,400 | 2,400 | 2,400 |
| Palmdale WD | 17,000 | 23,300 | 26,900 | 28,400 | 30,000 | 31,000 |
| Quartz Hill WD[c] | 4,700 | 5,400 | 6,100 | 6,800 | 7,600 | 7,700 |
| Rio Tinto Minerals | 1,100 | 1,400 | 1,400 | 1,400 | 1,400 | 1,400 |
| Remaining Areas[d] | 7,100 | 7,200 | 7,500 | 7,700 | 8,000 | 8,200 |
| **Total Urban Demand** | **71,700** | **137,500** | **153,600** | **167,600** | **181,700** | **184,500** |
| **Agricultural Demand** | | | | | | |
| Agricultural Demand Average Year | 73,000 | 73,000 | 73,000 | 73,000 | 73,000 | 73,000 |
| Agricultural Demand Dry Year | 84,000 | 84,000 | 84,000 | 84,000 | 84,000 | 84,000 |
| **Total Region Average Year Demand** | **144,700** | **210,500** | **226,600** | **240,600** | **254,700** | **257,500** |
| **Total Region Dry Year Demand** | **155,700** | **221,500** | **237,600** | **251,600** | **265,700** | **268,500** |

Notes: All numbers rounded to nearest 100. Based on values provided in the 2015 UWMPs.

(a) 2015 value provided by Boron CSD; projections based on Department of Finance (DOF) growth rates for the unincorporated Kern County.

(b) California City CSD has a population center outside the Region and only minimal population inside the Region.

(c) 2040 projections based on DOF population growth rates for Los Angeles County.

(d) Projections based on DOF growth rates for the unincorporated Los Angeles and Kern Counties.

#### 3.1.2.1 Urban (Municipal and Industrial) Demand

Urban water demands for 2015 were developed using the population projections presented in Table 2-3 (in Section 2) and utilizes a regional water use per capita estimate of 153 gallons per day (gpd) per person (or 0.17 AFY per person). This is a significant reduction from the 199 gallons per capita day (GPCD) estimated in the 2013 IRWM Plan. This per capita water use estimate was determined using a weighted average of total per capita water use estimates for the major water supply agencies in the Antelope Valley Region as shown in Table 3-8. As discussed in Section 2, growth rates within an agency are consistent and thus an average per capita water use is an appropriate estimate of demand. The rates of water use in areas that receive water from sources other than those included in Table 3-8 were assumed to have minimal impact on the average per capita rate and therefore were not included in the calculations to determine the average for the Region.

The per capita water use values could be reduced in the future with the implementation of more robust demand management measures. With the implementation of Senate Bill x7-7 in 2009, water suppliers have been required to reduce their average per capita daily water use rate by 20 percent from a baseline value by December 31, 2020. Indoor residential water use must also decrease to meet a target of 55 GPCD by 2025 and 50 GPCD by 2030 as mandated in California's Senate Bill 606 and Assembly Bill 1668. Each water purveyor may calculate their baseline per capita water use rate a number of ways. To meet these targets, many agencies have outlined and implemented water conservation programs to further reduce per capita consumption. The Region has already experienced significant reductions in GPCD in the past 5 years due to increased conservation in response to the severe state-wide drought and the associated mandatory water use restrictions. The current estimated regional water use is 46 GPCD lower than the GPCD estimates reported in the 2013 IRWM Plan. With the implementation of these programs, it is expected that the average per capita water use in the Region will continue to decrease

**Table 3-8: Per Capita Urban Water Use in the Antelope Valley IRWM Region**

| | 2015 Population | Percent of Region Population | 2015 Urban Water Demand (AF) | Average per Capita Water Use (GPCD) |
|---|---|---|---|---|
| **Boron CSD** | 2,300 | 1% | 400 | 152 |
| **California Water Service** | 3,400 | 1% | 500 | 139 |
| **LACWD 40** | 208,100 | 51% | 38,700 | 166 |
| **PWD** | 118,200 | 29% | 17,000 | 128 |
| **QHWD** | 18,400 | 5% | 4,700 | 227 |
| **RCSD** | 18,000 | 4% | 2,200 | 111 |
| **Total(a)** | **368,400** | **90%** | **63,500** | **153** |

Notes: All numbers rounded to the nearest 100. Numbers do not include private well owners. It is assumed that the demand and population numbers reported in the 2015 UWMPs provide an approximate per capita estimate for the Region.
(a) Antelope Valley Region per capita water use was determined by dividing total water demand by total population in the purveyor service areas. These numbers do not include private well owners.

#### 3.1.2.2 Private Pumping/Small Mutual Water Demand

Water demands from private pumping and from small mutual water companies in the Antelope Valley Region are difficult to quantify as accurate data is not readily available. These demands were accounted for in Table 3-7 since people served by private wells and by small mutual water companies were included in the population projections. The Antelope Valley Region average per capita water use that was estimated in Table 3-4 was assumed to represent these populations.

### 3.1.2.3 Agricultural Water Demand

Historical total applied agricultural water demand (1999 to 2005) for the Antelope Valley Region is summarized in Table 3-9. Historical agricultural demand was determined by multiplying estimated crop water requirements from the County Farm Advisors by the crop acreages provided by the Los Angeles and Kern County Agricultural Commissioners' Inspection Reports. The crop water requirements are discussed in more detail below.

Prior to 2000, an accounting of the agricultural acreage within the Kern County portion of the Antelope Valley Region was not available. For the 2007 IRWMP, it had been assumed that Kern County agricultural groundwater demand was 18 percent of Los Angeles County agricultural groundwater demand. The 18 percent was determined by the USGS in 2003 from land use maps and agricultural pumping data for Los Angeles County in 1961 and 1987. For the 2013 IRWMP Update, data from the Kern County Farm Bureau were used in the calculations in lieu of the 18 percent estimate. The 2019 IRMWP Update relied on 2016 data from both the Kern County Farm Bureau and the Los Angeles County Department of Agricultural Commissioner / Weights and Measures.

**Table 3-9: Historical Agricultural Water Use in the Antelope Valley Region**

| Year | Los Angeles County Ag Demand (AF) | Kern County Ag Demand (AF) | Total Ag Demand (AF) |
|---|---|---|---|
| **1999** | 97,000 | 35,000 | 132,000 |
| **2000** | 109,000 | 36,000 | 145,000 |
| **2001** | 101,000 | 37,000 | 138,000 |
| **2002** | 105,000 | 39,000 | 144,000 |
| **2003** | 110,000 | 34,000 | 144,000 |
| **2004** | 104,000 | 27,000 | 131,000 |
| **2005** | 98,000 | 29,000 | 127,000 |

Note: Numbers rounded to the nearest 1,000 AF and assume average water year crop requirements.

#### Crop Water Requirements

Crop water use in the Antelope Valley Region can vary significantly from State-wide averages due to the unique requirements presented by the Antelope Valley Region's climate and physical characteristics, including low rainfall, sandy soils, and heavy winds. Thus, it is appropriate to develop crop water requirements specific to the Antelope Valley Region.

The first step in determining the crop water requirements involves determining the evapotranspiration for each crop (ETc) using the following equation:

$$ETc = Kc * ETo$$

Where Kc is the crop coefficient and ETo is the reference evapotranspiration.

An estimate of the ETo for Lancaster was developed based on data from the California Irrigation Management Information System (CIMIS) weather station in Palmdale, CA and historical water use ETo values for Palmdale. The Kc varies with the crop, its stage of development, and the frequency of irrigation; but it is independent of the location. Crop coefficients were adapted from a variety of published reports. The crop coefficients are presented in Table 3-10.

**Table 3-10: Crop Coefficient (Kc) Estimates**

| Date | Pasture | Alfalfa[(a)] | Sudan[(b)] | Sod | Onions | Deciduous Fruit Trees[(c)] | Carrots | Potatoes | Pistachios |
|---|---|---|---|---|---|---|---|---|---|
| 1-Jan | 1.0 | 0.40 | | 1.0 | | | | | |
| 15-Jan | 1.0 | 0.40 | | 1.0 | | | | | |
| 1-Feb | 1.0 | 1.00 | | 1.0 | | | 0.31 | | |
| 15-Feb | 1.0 | 1.15 | | 1.0 | | | 0.31 | | |
| 1-Mar | 1.0 | 1.15 | | 1.0 | 0.30 | 0.25 | 0.31 | 0.55 | |
| 15-Mar | 1.0 | 1.05 | | 1.0 | 0.30 | 0.54 | 0.55 | 0.61 | 0.04 |
| 1-Apr | 1.0 | 1.05 | | 1.0 | 0.30 | 0.60 | 0.82 | 0.88 | 0.08 |
| 15-Apr | 1.0 | 1.05 | | 1.0 | 0.53 | 0.66 | 1.03 | 1.16 | 0.20 |
| 1-May | 1.0 | 1.05 | | 1.0 | 0.83 | 0.72 | 1.11 | 1.21 | 0.32 |
| 15-May | 1.0 | 1.05 | | 1.0 | 1.14 | 0.79 | 1.13 | 1.19 | 0.47 |
| 1-Jun | 1.0 | 1.05 | | 1.0 | 1.14 | 0.84 | 1.05 | 0.87 | 0.55 |
| 15-Jun | 1.0 | 1.05 | 0.3 | 1.0 | 1.14 | 0.86 | 1.00 | 0.55 | 0.51 |
| 1-Jul | 1.0 | 1.05 | 0.85 | 1.0 | 1.04 | 0.92 | | | 0.38 |
| 15-Jul | 1.0 | 1.05 | 1.10 | 1.0 | 0.92 | 0.94 | | | 0.28 |
| 1-Aug | 1.0 | 1.05 | 0.85 | 1.0 | 0.80 | 0.94 | | | 0.37 |
| 15-Aug | 1.0 | 1.05 | 1.10 | 1.0 | 0.68 | 0.94 | | | |
| 1-Sep | 1.0 | 1.05 | 0.85 | 1.0 | | 0.94 | | | |
| 15-Sep | 1.0 | 1.05 | 1.00 | 1.0 | | 0.91 | | | |
| 1-Oct | 1.0 | 1.05 | 1.10 | 1.0 | | 0.85 | | | |
| 15-Oct | 1.0 | 1.05 | 1.10 | 1.0 | | 0.79 | | | |
| 1-Nov | 1.0 | 1.05 | | 1.0 | | 0.70 | | | |
| 15-Nov | 1.0 | 0.40 | | 1.0 | | | | | |
| 1-Dec | 1.0 | 0.40 | | 1.0 | | | | | |
| 15-Dec | 1.0 | 0.40 | | 1.0 | | | | | |

Sources: Hansen, B.R.; Shwannkl, L.; and Fulton, A. "Scheduling Irrigation: When and How much Water to Apply," Water Management Series Publication Number 3396, Department of Land, Air & Water Resources, University of California, Davis. Pruitt, W.O.; Fereres, E.; Kelta, K.; and Snyder, R.L., "Reference Evapotranspiration (ETo) for California," UC Bull. 1922.

Notes:

(a) Kc of 1.05 takes into account reduced ETo during the cuttings throughout the season.

(b) Sudan was cut on 7/1, 8/16, and 10/16. ETo reduced for 1 to 2 weeks after cutting.

(c) Deciduous Fruit Tree Crop Coefficient were adapted from Orloff, S.B., "Deciduous Orchard Water Use: Clean Cultivated Trees for a Normal Year in Littlerock," Local Extension Publication.

Table 3-11 provides the ETc estimates for the Antelope Valley Region. The ETc is an estimate of the net water requirements for a crop (i.e., the amount of water) that is required for proper plant growth. Additionally, there are net water requirements for the crop which occur outside of the growing season. These include water applied to prepare the soil for planting, fumigation, and to prevent wind erosion. The sum of the ETc and these non-growing water requirements consist of the overall net crop requirement. The net water requirement does not account for water losses from inefficient irrigation systems, deep percolation, or runoff. In order to determine the gross water requirement, or the total amount of water which must be applied to the crop, the following calculation is used:

Gross Water Requirement = Net Water Requirement/Irrigation System Efficiency

**Table 3-11: Crop Evapotranspiration (ETc) Estimates for the Antelope Valley Region**

| Date | Pasture/ Sod ETo[a] | Alfalfa | Sudan | Sod | Onions | Deciduous Fruit Trees | Carrots | Potatoes | Pistachios |
|---|---|---|---|---|---|---|---|---|---|
| 1-Jan | 0.90 | 0.36 | 0.00 | 0.90 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 15-Jan | 1.35 | 0.54 | 0.00 | 1.35 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1-Feb | 1.45 | 1.45 | 0.00 | 1.45 | 0.00 | 0.00 | 0.45 | 0.00 | 0.00 |
| 15-Feb | 1.63 | 1.87 | 0.00 | 1.63 | 0.00 | 0.00 | 0.50 | 0.00 | 0.00 |
| 1-Mar | 2.01 | 2.31 | 0.00 | 2.01 | 0.60 | 0.50 | 0.62 | 1.11 | 0.00 |
| 15-Mar | 2.99 | 3.14 | 0.00 | 2.99 | 0.90 | 1.61 | 1.64 | 1.82 | 0.12 |
| 1-Apr | 2.83 | 2.97 | 0.00 | 2.83 | 0.85 | 1.70 | 2.32 | 2.49 | 0.22 |
| 15-Apr | 3.87 | 4.06 | 0.00 | 3.87 | 2.05 | 2.55 | 3.99 | 4.49 | 0.78 |
| 1-May | 3.55 | 3.73 | 0.00 | 3.55 | 2.95 | 2.56 | 3.94 | 4.30 | 1.12 |
| 15-May | 4.71 | 4.95 | 0.00 | 4.71 | 5.37 | 3.72 | 5.33 | 5.61 | 2.22 |
| 1-Jun | 4.10 | 4.31 | 0.00 | 4.10 | 4.68 | 3.44 | 4.31 | 3.57 | 2.27 |
| 15-Jun | 5.08 | 5.33 | 1.52 | 5.08 | 5.79 | 4.37 | 5.08 | 2.79 | 2.60 |
| 1-Jul | 4.34 | 4.56 | 3.69 | 4.34 | 4.51 | 3.99 | 0.00 | 0.00 | 1.66 |
| 15-Jul | 5.21 | 5.47 | 5.73 | 5.21 | 4.79 | 4.90 | 0.00 | 0.00 | 1.47 |
| 1-Aug | 4.11 | 4.31 | 3.49 | 4.11 | 3.29 | 3.86 | 0.00 | 0.00 | 1.51 |
| 15-Aug | 4.64 | 4.87 | 5.11 | 4.64 | 3.16 | 4.36 | 0.00 | 0.00 | 0.00 |
| 1-Sep | 3.29 | 3.45 | 2.79 | 3.29 | 0.00 | 3.09 | 0.00 | 0.00 | 0.00 |
| 1-Sep | 3.26 | 3.42 | 3.26 | 3.26 | 0.00 | 2.97 | 0.00 | 0.00 | 0.00 |
| 1-Oct | 2.30 | 2.41 | 2.53 | 2.30 | 0.00 | 1.95 | 0.00 | 0.00 | 0.00 |
| 15-Oct | 2.24 | 2.35 | 2.46 | 2.24 | 0.00 | 1.77 | 0.00 | 0.00 | 0.00 |
| 1-Nov | 1.57 | 1.65 | 0.00 | 1.57 | 0.00 | 1.10 | 0.00 | 0.00 | 0.00 |
| 15-Nov | 1.38 | 0.55 | 0.00 | 1.38 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1-Dec | 0.99 | 0.39 | 0.00 | 0.99 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 15-Dec | 1.05 | 0.42 | 0.00 | 1.05 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| TOTAL (inches) | 68.84 | 68.89 | 30.58 | 68.84 | 38.93 | 48.45 | 28.18 | 26.17 | 13.98 |

Note:
(a) Pasture ETo from the California Irrigation Management Information System (CIMIS), Palmdale Station 197 from January 2008 to December 2018.

The irrigation system efficiency used in this study, 75 percent, was developed from field observations by the University of California researchers and the Natural Resources Conservation Service (NRCS). Irrigation efficiency is the ratio of irrigation water used in evapotranspiration to the water applied or delivered to a field or farm. Greater controls are utilized by agricultural operations that use recycled water that justify higher irrigation efficiencies (discussed later in this document).

A summary of the crop water requirements is presented in Table 3-12. The crop water requirements for a single dry year and multi-dry years are the same. It is assumed that approximately 7 inches of net water demand would be met by rainfall for average water years and thus average year water requirements include a reduction in the total net water requirements.

**Table 3-12: Crop Water Requirements for the Antelope Valley Region**

| Water Requirements | Pasture | Alfalfa | Sudan | Sod | Onions | Deciduous Fruit Trees | Carrots | Potatoes | Pistachios |
|---|---|---|---|---|---|---|---|---|---|
| Net ETo | 68.84 | 68.89 | 30.58 | 68.84 | 38.93 | 48.45 | 28.18 | 26.17 | 13.98 |
| Net Soil | | | | | 3.54 | | 4.46 | | |
| Net Non-Growing | 0.00 | 2.00 | 4.00 | 4.00 | 6.00 | 0.00 | 6.50 | 4.00 | 5.00 |
| Total Net Dry Years (in.) | 68.84 | 70.89 | 34.58 | 72.84 | 48.47 | 48.45 | 39.14 | 30.17 | 18.98 |
| Total Net Average Years[(c)] (in.) | 61.85 | 63.90 | 27.60 | 65.85 | 41.48 | 41.46 | 32.15 | 23.18 | 11.99 |
| Irrigation Efficiency (%) | 75% | 75% | 75% | 75% | 75% | 75% | 75% | 75% | 75% |
| Total Gross for Dry Years (in.) | 91.78 | 94.51 | 46.11 | 97.12 | 64.63 | 64.60 | 52.18 | 40.23 | 25.30 |
| Total Gross for Dry Years (AF/acre) | 7.65 | 7.88 | 3.84 | 8.09 | 5.39 | 5.38 | 4.35 | 3.35 | 2.11 |
| Total Gross for Avg. Years (in.) | 82.47 | 85.20 | 36.79 | 87.80 | 55.31 | 55.28 | 42.87 | 30.91 | 15.99 |
| Total Gross for Average Years (AF/acre) | 6.87 | 7.10 | 3.07 | 7.32 | 4.61 | 4.61 | 3.57 | 2.58 | 1.33 |

Notes:
(a) Assumes a 5-year life of an alfalfa stand. Includes the water requirement for pre-irrigation before field preparation and planning, and irrigation before and after application of herbicides.
(b) Includes water requirements for pre-irrigation before field preparation, fumigation, and "water capping" after fumigation.
(c) It is assumed that approximately 7 inches of net water demand would be met by rainfall for average water years and thus average year water requirements include a reduction in the total net water requirements.

## Crop Acreages

Data regarding crop acreages in the Antelope Valley Region was provided by the Los Angeles County Department of Agricultural Commissioner/Weights and Measures and Kern County Farm Bureau. Table 3-13 provides a comparison of historical crop acreages in the Antelope Valley Region.

**Table 3-13: Comparison of the Historical Crop Acreages**

| | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2010 |
|---|---|---|---|---|---|---|---|---|
| **Ag Commissioner[a]** | | | | | | | | |
| **Field Crops** | NA | NA | 11,592 | 11,234 | 11,305 | 10,624 | 11,975 | 13,080 |
| **Vegetable/Root Crops** | NA | NA | 12,282 | 15,804 | 14,763 | 13,312 | 10,760 | 4,906 |
| **Fruits/Nut/Grapes Crops** | NA | NA | 2,866 | 1,947 | 1,955 | 1,920 | 2,117 | 603 |
| **Misc. Nursery** | NA | NA | 621 | 617 | 599 | 608 | 675 | 450 |
| **Antelope Valley Region Total** | --- | --- | **27,361** | **29,602** | **28,622** | **26,464** | **25,526** | **19,040** |

Notes:

(a) Acreages for Kern County were estimated using the ratios of LA County Ag to Kern County Ag from the Inspection Reports (from 2007 IRWMP).

## Projected Agricultural Demand

Projected water year agricultural demand is summarized in Table 3-14. Projections assume that crop acreages will remain approximately the same as in 2016 with the understanding that some shifting of acreages between crops may occur, particularly during dry periods. Table 3-14 provides the estimates of agricultural water use for average and dry water years.

**Table 3-14: Agricultural Water Use in the Antelope Valley Region**

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

Notes: Totals rounded to the nearest 1,000 AF.

(a) Data from the Los Angeles Department of Agricultural Commissioner / Weights And Measures and the Kern County Farm Bureau. Acreage does not include land cultivated for recycled water purposes.

(b) From Farm Advisor gross crop water requirements specific to Antelope Valley Region.

(c) Acreage multiplied by crop water requirements.

#### 3.1.2.4 Recycled Water Demand

Table 3-15 summarizes the existing and projected recycled water demand as listed in the 2014 SNMP for the Antelope Valley (Appendix G) and the UWMPs prepared for water providers in the Region. While expanded recycled water use in the Antelope Valley Region is highly likely, only current recycled water uses are included in this IRWM Plan's supply and demand calculations to show the need for increased end use of recycled water supply. Recycled water used for environmental and recreational area maintenance at Piute Ponds and Apollo Community Regional Park is not included in demands since it was excluded from the recycled water availability in Table 3-15. The Palmdale WRP currently has a permitted capacity of approximately 13,440 AFY to provide recycled water for agriculture, irrigation, and maintenance, and the Lancaster WRP has a permitted capacity of 20,163 AFY to provide recycled water for irrigation, agriculture, urban reuse, wildlife habitat, maintenance, and recreational impoundments. Approximately 350 AFY of recycled water was used in 2015.

Current demands for recycled water include those for the North LA/Kern County Regional Recycled Water Project with approximately 700 AFY used in 2015. The Division Street Corridor uses an average of 2 AFY (personal communication with Aracely Jaramillo, LACWD 40, August 2013) with approximately 3 AFY used in 2010. The Palmdale Regional Recycled Water Authority's water line to McAdam Park in Palmdale uses about 110 AFY (personal communication with Gordon Phair, City of Palmdale, November 6, 2013), but the Palmdale water line was not built until after 2010.

Although the two plants have a combined permitted capacity to provide 33,500 AFY of recycled water, this is not an accurate estimate of future recycled water supply since distributions systems and end users are required to make use of that supply. Thus, while Table 3-15 provides the anticipated future recycled water demand to be served by the backbone system, those supplies not currently in use are not included in the Plan's supply and demand calculations.

Another future user of recycled water in the Region includes the Palmdale Hybrid Power Plant. The recycled water demand estimate for this project is included in Table 3-15. The Palmdale Hybrid Power Plant Project involves the construction of a 570 mega-watt (MW) natural gas and solar thermal electricity generating facility that would use recycled water for its cooling water demands. It should be noted that the Palmdale Hybrid Power Plant constitutes new uses of water, meaning that supplying these facilities with recycled water would not offset potable water that is currently being used.

The 2013 IRWM Plan included recycled water demand projections for the RCSD WWTP. These projections were removed in the 2019 IRWM Plan update because construction to upgrade the tertiary treatment capacity is on hold indefinitely due to lack of funding and other economic considerations. Expected demands for the eSolar Sierra Sun Tower Power Plant, a solar thermal pilot project in the City of Lancaster, were also removed because the plant is currently non-operational.

**Table 3-15: Summary of Current and Projected Recycled Water Use Demands (AFY) in the Antelope Valley Region**

| | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 |
|---|---|---|---|---|---|---|
| **North LA/Kern County Regional Recycled Water Project [(a)]** | 700 | 1,800 | 3,600 | 4,700 | 7,100 | 7,100 |
| **Palmdale Hybrid Power Plant [(b)]** | 3,200 | 3,200 | 3,200 | 3,200 | 3,200 | 3,200 |
| **Palmdale Regional Groundwater Recharge and Recovery Project [(c)]** | --- | 2,000 | 4,000 | 4,000 | 4,000 | 4,000 |
| **Total Recycled Water Demand** | **3,900** | **7,000** | **10,800** | **11,900** | **14,300** | **14,300** |

Note: Demands do not include recycled water use for environmental maintenance.
Source:
(a) Salt and Nutrient Management Plan for the Antelope Valley, Table 3-4 (portion). 2035 projections are assumed to remain constant through 2040.
(b) PRWA 2015. 2035 projections are assumed to remain constant through 2040.
(c) PWD 2016.

#### 3.1.2.5 Water Leaving

The final component to the Water Budget is water leaving the Antelope Valley Region. This includes water lost (either to evaporation or from subsurface flow) and water consumed. Total losses in the Antelope Valley Region have been estimated at approximately 10,000 AFY (USGS 1993). This estimate includes losses attributed to streambed wetting, riparian evapotranspiration, surface and soil evaporation, and diversions. However, further investigation and study are needed to more accurately determine the water losses in the Antelope Valley Region.

**Surface Storage Evaporative/Conveyance Losses**

There is an estimated conveyance loss of 9 percent for surface water deliveries (PWD 2001). Additionally, there are evaporative losses at the reservoir site. In the PWD 2001 Water Master Plan, evaporative loss was estimated using monthly data for the Antelope Valley Region and reservoir area-capacity curve. Evaporative losses were incorporated into the expected annual surface deliveries and therefore do not need to be accounted for separately.

**Groundwater Storage Losses/Subsurface flow**

Losses from evaporation and riparian evapotranspiration are discussed in Section 3.1.2.5 and have been included in the overall estimate of water loss for the water budget. Since the basin is a closed basin, losses from subsurface flow are assumed to be negligible for the purposes of this IRWM Plan.

### 3.1.3 Water Budget Comparisons

#### 3.1.3.1 Average Water Year

Figure 3-9 and Table 3-16 provide a comparison of the supply and demand for the Antelope Valley Region for an average water year. It is assumed that water banks will only be replenished in average or wet years, and no banked groundwater supplies in the Westside Water Bank will be extracted to mitigate a mismatch in an average water year (if demand exceeds supply). It is assumed that Eastside Water Bank will provide supply reliability in an average year as groundwater will be replenished and extracted within the same year. For an average water year, supplies are projected to exceed demands through 2025. However, demands are projected to exceed water supplies beyond 2025 as a result of increased population growth coupled with reduced groundwater Production Rights prescribed in the Judgment. The reduction in Production Rights is shown as “Groundwater Reduction” in Figure 3-9 and does not represent an additional supply source. The range of mismatch between supply and demand is 5,800 AFY to 19,500 AFY. Because of the uncertainty in several supply and demand estimates, including SWP deliveries and projected demand, there is still potential for a larger deficit to occur.

Water purveyors are currently exploring opportunities to utilize new sources of water to augment the available water supplies in the Region. Developers in the Region are also required to secure additional imported water supplies to meet increased demands as a result of population growth. They may pay a fee for AVEK to increase their SWP Table A allocation, or developers may secure more imported water themselves. SWP water supplies would be conveyed using AVEK's distribution system. Alternatively, entities such as PWD and LACWD 40 may enter agreements for short-term and long-term water transfers (personal communication with Matt Knudson, AVEK, September 24, 2019). Water conservation measures may also be implemented to reduce regional water demands and bridge the mismatch between water supplies and demands. Additional projects and management actions to remedy any potential supply deficits are discussed in Section 5, Resource Management Strategies, and Section 6, Project Integration and Objectives Assessment.

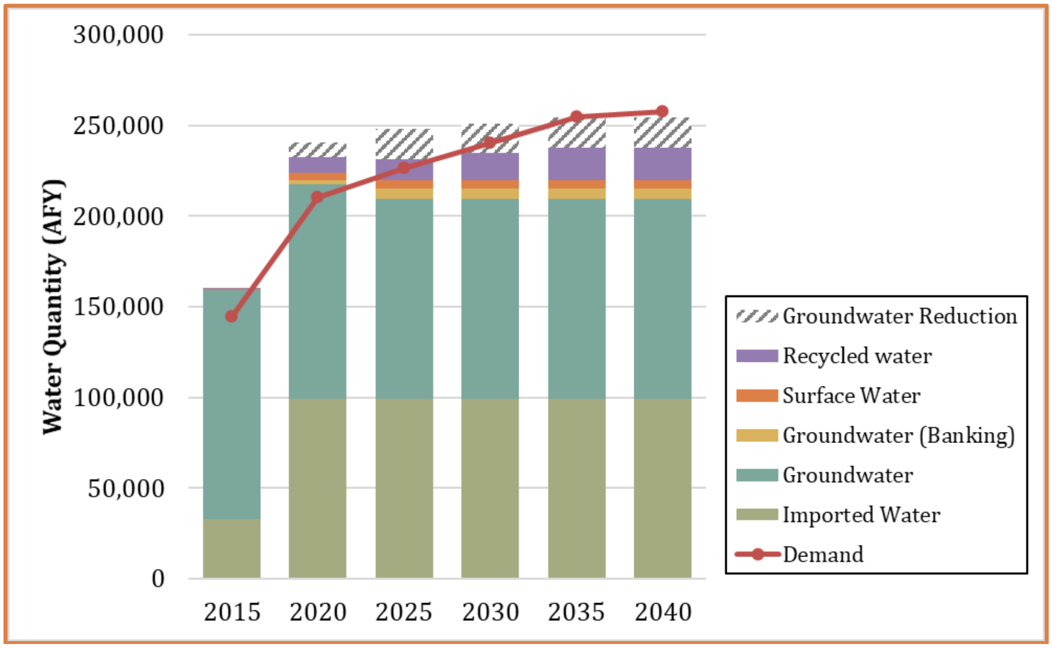
#### 3.1.3.2 Single-Dry Water Year

Figure 3-10 and Table 3-17 provide a comparison of the supply and demand for the Antelope Valley Region for a single-dry water year. As shown by the comparison, future demand exceeds the existing and planned water supplies through 2040. For a single-dry water year, the range of mismatch between supply and demand is 51,300 AFY to 77,200 AFY. Though the Westside Water Bank currently has 73,750 AF of banked groundwater, this Plan assumes that a sufficient amount of wet years or water transfers will have occurred between dry year periods to keep the bank at full capacity of 120,000 AF by 2025 prior to a single-dry year. Because the duration of drought periods are unknown until the drought ends, AVEK estimates that the maximum withdrawal in any one year will only be one-third of the total banked supplies. It is also assumed that Eastside Water Bank will improve supply reliability in a single-dry year. Figure 3-10 assumes 26,600 AFY of water bank supply in 2020 and 45,700 AFY thereafter. It is possible that banked water will not be available during dry years, in which case the mismatch would be more severe (up to 122,900 AFY). Additional projects and management actions to remedy these supply deficits are discussed in Section 5, Resource Management Strategies, and Section 6, Project Integration and Objectives Assessment. These findings for a single dry year indicate the need to secure additional water supplies for the Region.

#### 3.1.3.3 Multi-Dry Water Year

Figure 3-11 provides a comparison of the supply and demand for the Antelope Valley Region for a multiple-dry water year, and Table 3-18 provides a comparison of the supply and demand for the Antelope Valley Region for a multi-dry water year. Each year shown is assumed to be the average of a 4-year dry period. As shown by the comparison, future demand exceeds the existing and planned water supplies through 2040. For multi-dry water years the range of mismatch between supply and demand is 17,200 AFY to 49,700 AFY. It is assumed that the Eastside Water Bank will only provide supply reliability the first year of a 4-year drought. Though the Westside Water Bank currently has 73,750 AF of banked groundwater, this Plan assumes that a sufficient amount of wet years or water transfers will have occurred between dry year periods to keep the bank at full capacity of 120,000 AF by 2025 prior to a four-year dry period. The maximum banking capacity in the Westside Water Bank is currently 120,000 AFY; therefore it is assumed that approximately one-third of this amount would be used each year of the first three years of the 4-year dry period (40,000 AFY) and no banked groundwater supplies would be available for the fourth year of the 4-year dry period. Therefore, the Eastside and Westside water banks are assumed to provide, on average, 18,900 AFY in 2020 and 31,400 AFY thereafter in a 4-year drought. It is possible that banked water will not be available during a multi-dry year, in which case the mismatch would be more severe (up to 81,100 AFY). Additional projects and management actions to remedy these supply deficits are discussed in Section 5, Water Management Strategies, and Section 6, Project Integration and Objectives Assessment. These findings for a multi-dry year period indicate the need to secure additional water supplies for the Region.

**Figure 3-9: Water Supply Summary for an Average Water Year**




Note: "Groundwater Reduction" is the amount of groundwater production decreased as a result of the Judgment and therefore does not represent an additional supply source.

**Table 3-16: Water Budget Comparison for an Average Water Year**

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

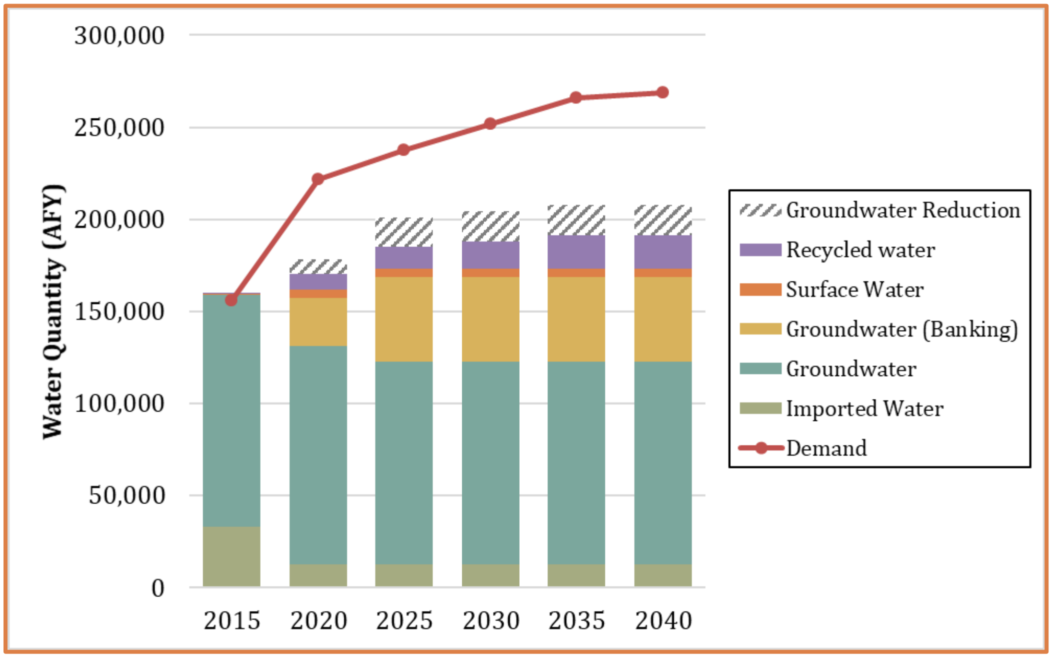
Notes: Values are rounded to the nearest 100.

(a) Assumes banked groundwater will not be used in an average year.

(b) Assumes banked groundwater supplies will be replenished and extracted the same year.

(c) 2015 deliveries represent actual deliveries in the Region; future projections assume the maximum Table A Amount available to the IRWM Region (160,452 AFY) multiplied by the SWP reliability of 62% for an average year.

**Figure 3-10: Water Supply Summary for a Single-Dry Water Year**



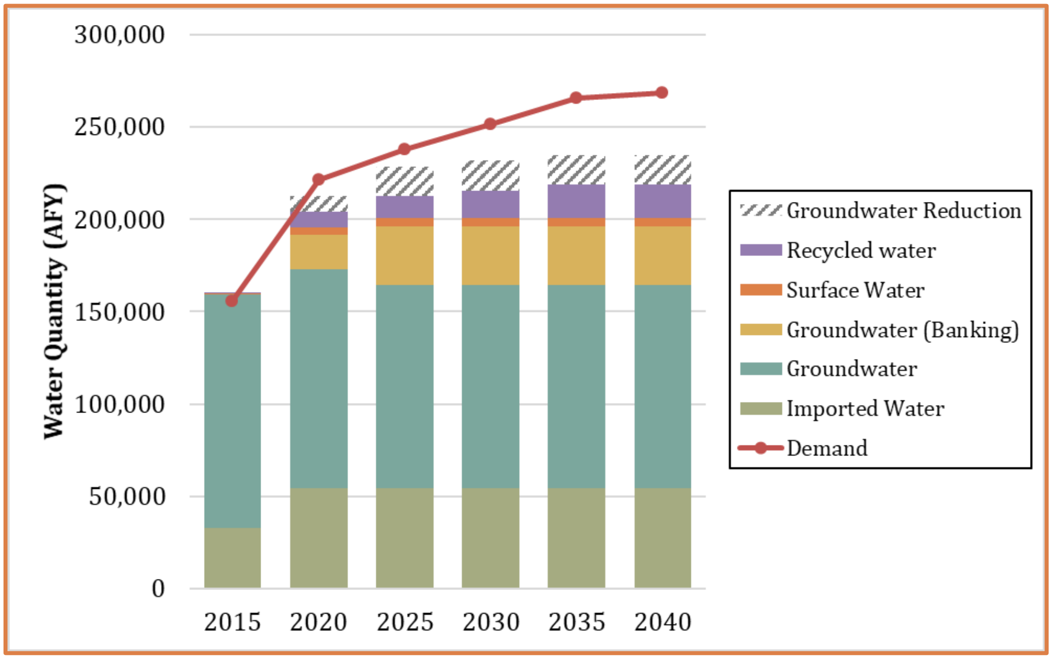

Note: "Groundwater Reduction" is the amount of groundwater production decreased as a result of the Judgment and therefore does not represent an additional supply source.

**Table 3-17: Water Budget Comparison for a Single-Dry Water Year**

| | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 |
|---|---|---|---|---|---|---|
| **Groundwater Storage** | | | | | | |
| *Recharge + Return Flows (TSY)* | 126,300 | 118,100 | 110,000 | 110,000 | 110,000 | 110,000 |
| *Westside Water Bank [(a)]* | 0 | 24,600 | 40,000 | 40,000 | 40,000 | 40,000 |
| *Eastside Water Bank [(b)]* | 0 | 2,000 | 5,700 | 5,700 | 5,700 | 5,700 |
| **Direct Deliveries** [(c)] | 33,000 | 12,800 | 12,800 | 12,800 | 12,800 | 12,800 |
| **Recycle/Reuse)** | 300 | 8,700 | 11,900 | 15,100 | 18,300 | 18,300 |
| **Surface Water** | 500 | 4,000 | 4,500 | 4,500 | 4,500 | 4,500 |
| **Total Supply** | **160,100** | **170,200** | **184,900** | **188,100** | **191,300** | **191,300** |
| **Demands** | | | | | | |
| *Urban Demand* | 71,700 | 137,500 | 153,600 | 167,600 | 181,700 | 184,500 |
| *Ag Demand* | 84,000 | 84,000 | 84,000 | 84,000 | 84,000 | 84,000 |
| **Total Demand** | **155,700** | **221,500** | **237,600** | **251,600** | **265,700** | **268,500** |
| **Supply and Demand Mismatch** | **0** | **-51,300** | **-52,700** | **-63,500** | **-74,400** | **-77,200** |

Notes: Values are rounded to the nearest 100.
(a) Assumes periodic wet years have occurred to allow quantities of SWP deliveries above AVEK demands to fill the water bank.
(b) Assumes banked groundwater supplies will be replenished and extracted the same year.
(c) 2015 deliveries represent actual deliveries in the Region; future projections assume the maximum Table A Amount available to the IRWM Region (160,452) multiplied by the SWP reliability of 8% for a single-dry year.

### Figure 3-11: Water Supply Summary for a Multi-Dry Water Year




Note: "Groundwater Reduction" is the amount of groundwater production decreased as a result of the Judgment and therefore does not represent an additional supply source.

### Table 3-18: Water Budget Comparison for a Multi-Dry Water Year

| | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 |
|---|---|---|---|---|---|---|
| **Groundwater Storage** | | | | | | |
| *Recharge + Return Flows (TSY)* | 126,300 | 118,100 | 110,000 | 110,000 | 110,000 | 110,000 |
| *Westside Water Bank [(a)]* | 0 | 18,400 | 30,000 | 30,000 | 30,000 | 30,000 |
| *Eastside Water Bank [(b)]* | 0 | 500 | 1,425 | 1,425 | 1,425 | 1,425 |
| **Direct Deliveries [(c)]** | 33,000 | 54,600 | 54,600 | 54,600 | 54,600 | 54,600 |
| **Recycle/Reuse** | 300 | 8,700 | 11,900 | 15,100 | 18,300 | 18,300 |
| **Surface Water** | 500 | 4,000 | 4,500 | 4,500 | 4,500 | 4,500 |
| **Total Supply** | **160,100** | **204,300** | **212,400** | **215,600** | **218,800** | **218,800** |
| **Demands** | | | | | | |
| *Urban Demand* | 71,700 | 137,500 | 153,600 | 167,600 | 181,700 | 184,500 |
| *Ag Demand* | 84,000 | 84,000 | 84,000 | 84,000 | 84,000 | 84,000 |
| **Total Demand** | **155,700** | **221,500** | **237,600** | **251,600** | **265,700** | **268,500** |
| **Supply and Demand Mismatch** | **0** | **-17,200** | **-25,200** | **-36,000** | **-46,900** | **-49,700** |

Notes: Values assume 4-year dry period begins in the year shown and are rounded to the nearest 100.
(a) Assumes periodic wet years have occurred to allow quantities of SWP deliveries above AVEK demands to fill the water bank. Full bank storage is evenly distributed over the first three years of the 4-year dry period, rounding to 40,000 AFY the first three years and 0 AFY the fourth year. This is an average of 30,000 AFY over the 4-year dry period.
(b) Assumes banked groundwater supplies will be available only the first year of a 4-year dry period.
(c) 2015 deliveries represent actual deliveries in the Region; future projections assume the maximum Table A Amount available to the IRWM Region (160,452) multiplied by the SWP reliability of 34% for a multi-dry year.

## 3.1.4 Regional Water Supply Issues and Needs

The water management issues consider and incorporate information contained in local plans, including but not limited to local UWMPs, the SNMP, and the PWD Strategic Plan. Supplemental information from other plans, however, is limited since many local plans rely on this Antelope Valley IRWM Plan for guidance. The key issues, needs, challenges, and priorities for the Antelope Valley Region with respect to water supplies include the following, which are discussed in greater detail below:

- Regional reliance on imported water;
- Groundwater use has not been managed in the past;
- Mismatch between supplies and demands
- Existing facility limitations; and
- Land subsidence effects

### 3.1.4.1 Reliance on Imported Water

As shown from the supply and demand comparisons, the Antelope Valley Region relies on SWP for approximately 42 percent of its total supply in an average year, approximately 25 percent of its total supply in a multi-dry year, and approximately 7 percent of its total supply in a single-dry year.

The availability of SWP supply is known to be variable. It fluctuates from year to year depending on precipitation, regulatory restrictions, legislative restrictions, and operational conditions, and is particularly unreliable during dry years. The DWR Capability Report (2017) anticipates that water deliveries during dry years could range between 8 percent of full Table A Amounts in a single dry year with 1977 conditions up to 34 percent of full Table A Amounts during a 6-year drought, as experienced between 1929 and 1934. The Antelope Valley Region likely cannot meet expected demands without imported water, and the variable nature of the supply presents management challenges to ensure flexibility.

### 3.1.4.2 Groundwater has not been Managed Historically

One of the more prevalent concerns in the Antelope Valley Region relates to management of the Antelope Valley Groundwater Basin. Groundwater has and continues to be an important resource within the Antelope Valley Region. As discussed in Section 2, groundwater has provided between 50 and 90 percent of the total water supply in the Antelope Valley Region since 1972 (USGS 2003). Projected urban growth, coupled with limits on the available local and imported water supply, are likely to continue to increase the reliance on groundwater.

Groundwater use in the Antelope Valley Groundwater Basin was not managed prior to the Basin’s adjudication in 2015. As a result of years of unsustainable groundwater extractions, the Court determined that the Basin is in a state of overdraft. If the rampdown of groundwater production is not successfully implemented to meet the Native Basin Safe Yield, the basin will continue to be overdrafted and reduce the long-term viability of the groundwater supply.

### 3.1.4.3 Mismatch between Supplies and Demands

The population in the Antelope Valley is expected to increase through the planning horizon resulting in an increase in water demand. The 2013 IRWM Plan determined that decreases in estimated population growth had reduced the mismatch between supply and demand since the 2007 IRWM Plan. However, the recent groundwater use reduction mandated in the Judgment has once again reopened a gap between projected water supplies and demands for the Region. Water supply is still a limiting factor for the Region, especially during dry periods. In order to maintain supplies and meet the growing needs of the region, agencies will need to diversify the Region's water supply portfolio with additional imported sources, additional water conservation, additional recycled water, and groundwater recharge and recovery projects.

The Antelope Valley Region water agencies have typically relied on imported water and/or groundwater for their water supply needs. Currently, these water supplies are limited by SWP supply fluctuations, groundwater basin overdraft and the need for facility improvements. The water agencies and municipalities are pursuing various alternatives, such as recycled water and recharge programs, to decrease their vulnerability to short-term variances in imported water and groundwater sources.

SWP water reliability is a function of hydrologic conditions, state and federal water quality standards, protection of endangered species and water delivery requirements. Though the SWP contracts contain maximum Table A Amounts for each contractor, this is not a guarantee of how much imported water will be available for delivery each year.

Water agencies in the Antelope Valley Region cannot entirely rely on groundwater pumping because excessive pumping for many years has stressed the basin. According to the USGS, groundwater pumping in the Antelope Valley Region has exceeded the recharge rate in many years since the early 1920s (USGS 2003). As a result of the recent Judgment that established groundwater rights, groundwater users are expected to decrease groundwater pumping to meet the Basin's Native Safe Yield by the year 2023.

Additionally, as detailed below in Section 3.5, "Land Use Management Assessment" water is a limiting factor of the Antelope Valley Region's growth rate. In order to accommodate this projected growth, the supply of water in the Antelope Valley Region for dry and multi-dry year periods must be increased.

#### 3.1.4.4 Limitations of Existing Facilities

In order to address the deficiency in supply, the water supply agencies in the Antelope Valley Region will need to modify existing infrastructure to accommodate an increase in delivery and storage capacity for new supply.

AVEK has capacity constraints in the summer and limited demand for water during the winter months. Thus, additional storage or recharge in the winter months is required in order for them to beneficially use their full Table A amount in some years. It may also be possible for some AVEK customers to regulate their water supply deliveries such that more could be taken during winter months when demands are typically low.

LACWD 40's facilities improvements will include well efficiency and rehabilitation projects, and reservoirs and pipelines throughout its system to meet current and projected water supply requirements. LACWD 40 is pursuing the use of recycled water as alternative source for irrigation and recharge purposes.

PWD's plan for improvements and expansion of its existing infrastructure was developed in its 2010 Strategic Water Resources Plan and supported in its 2018 Strategic Plan. According to the 2018 Strategic Plan, PWD is identifying additional water sources and opportunities to increase the reliability of water supply by investigating the potential to increase the storage capacity of Littlerock Reservoir, establishing groundwater recharge and water banking facilities, maximizing the use of recycled water (tertiary treated recycled water for irrigation and industrial/commercial uses), and implementing water conservation programs while simultaneously implementing the Antelope Valley Groundwater Adjudication Judgment. It also outlines a strategic initiative to ensure that the PRWA is fully operational by year 2020. PRWA's 2014 Recycled Water Facilities Plan details construction and operation of distribution pipelines and pumping facilities for expanding recycled water as a water supply option.

To meet long-term water demands, QHWD purchased land for additional wells. QHWD also plans to increase capacity at existing wells. There are no plans for QHWD to invest in recycled water in the near future because tertiary treatment and recycled water pipelines are too costly.

RCSD is evaluating projects that will contribute to a reliable source of supply and meet projected demands. Future water supply project plans will focus on expanding conservation efforts, requiring developers to pay for the purchase of groundwater rights, acquiring additional groundwater rights following implementation of adjudication, creating a combination of local surface spreading facilities to percolate intreated SWP water, and adding groundwater extraction facilities to recover stored water.

Furthermore, the current planned regional recycled water distribution system would only deliver water to M&I users and groundwater recharge projects. Additional infrastructure would be required to deliver recycled water to any potential agricultural users other than the LACSD effluent management sites or adjacent users.

#### 3.1.4.5 Effects of Land Subsidence

Groundwater use in the Antelope Valley Region was at its highest in the 1950s and 1960s as a result of agricultural demands (USGS 2003). According to USGS, land subsidence in Antelope Valley Region was first reported by Lewis and Miller in the 1950s (USGS 1992). Since then, studies have shown subsidence levels of up to 7 feet occurring in some areas of Antelope Valley Region (see Figure 3-12). Conversations held with various agencies and companies indicate that within the Antelope Valley Region, the Lancaster and EAFB areas are currently experiencing problems or damages that appear to be related to land subsidence (see Figure 3-13). EAFB has been actively involved in projects aimed at preventing future land subsidence. The adjudication process has as one of its primary goals the permanent stabilization of groundwater levels and prevention of overdraft.

Land subsidence results in the following impacts:

- Development of cracks, fissures, sink-like depressions and soft spots.
- Change in natural drainage patterns often resulting in increased areas of flooding or increased erosion.
- Degradation of groundwater quality.
- Permanent reduction in groundwater storage capacity.
- Change in gradient in gravity pipelines (sanitary and storm sewers) or canals often resulting in lost capacity.
- Damage to well casings, pipelines, buildings, roads, railroads, bridges, levees, etc.
- Costs associated with repairs and rebuilding.
- Costs associated with construction of new facilities such as pumping stations for gradient changes.
- Reduction in land value.
- Legal actions.
- Increased pumping costs.

Table 3-19 lists land subsidence problems identified in Antelope Valley Region.

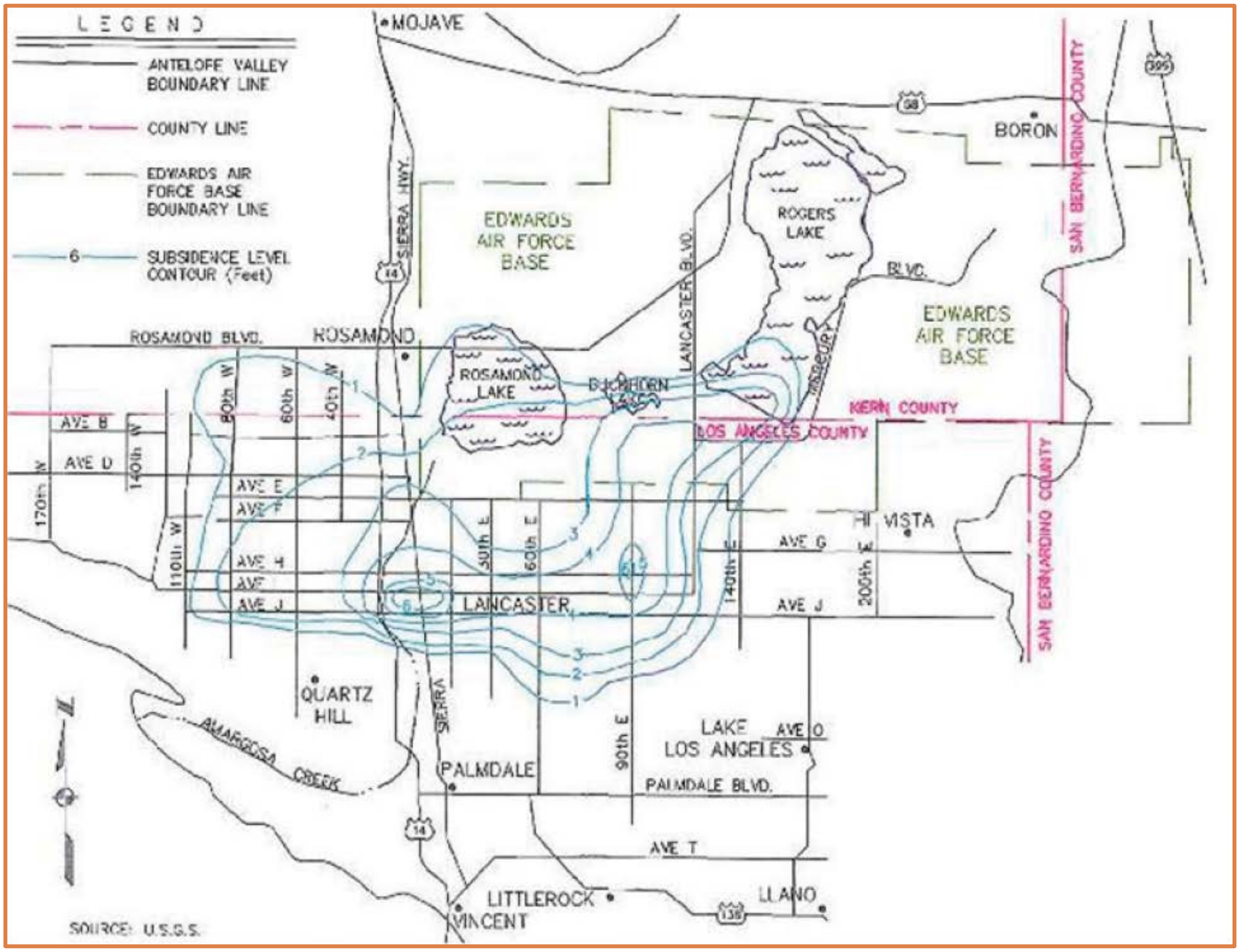
The following paragraphs present brief discussions on several studies done on land subsidence in the Antelope Valley Region.

**Geolabs, February 1991**. A study done by Geolabs - Westlake Village (1991) studied a 10 square mile area in Lancaster identified to have fissures and sink-like depressions (see Location 2 on Figure 3-15). The report identified fissures ranging in width from one inch to slightly over one foot. The lengths of the fissures ranged mainly between 50 to 200 feet, with the longest continuous fissures in the 600-700 foot range. Sinkholes ranged mainly between one to five feet deep and less than four feet in diameter. One sinkhole measured 20 feet long and 15 feet wide. The report concluded that the fissures were due to tensional forces created by subsidence, which may be related to groundwater withdrawal due to the correlation between areas of significant subsidence and areas of pronounced groundwater level decline. Areas of concern identified in the report are included in Table 3-19.

**USGS Report 92-4035**. USGS (1992) reported that as much as 2 feet of land subsidence had affected Antelope Valley Region by 1967 and was causing surface deformations at EAFB. Fissures, cracks and depressions on Rogers Lake were affecting the use of the lakebed as a runway for airplanes and space shuttles. In addition, depressions, fissures and cracks on the lakebed may not be detected until aircraft or space shuttles exceed the load capacity of the soil. Another concern was potential contamination of the water table through fissures which can provide direct access for toxic materials.

To determine the significance of land subsidence conditions, benchmarks were surveyed using a Global Positioning System (GPS) in 1989. Differential levels were surveyed for 65 benchmarks from 1989 to 1991. It was discovered that total land subsidence ranged from 0.3 to 3.0 feet.

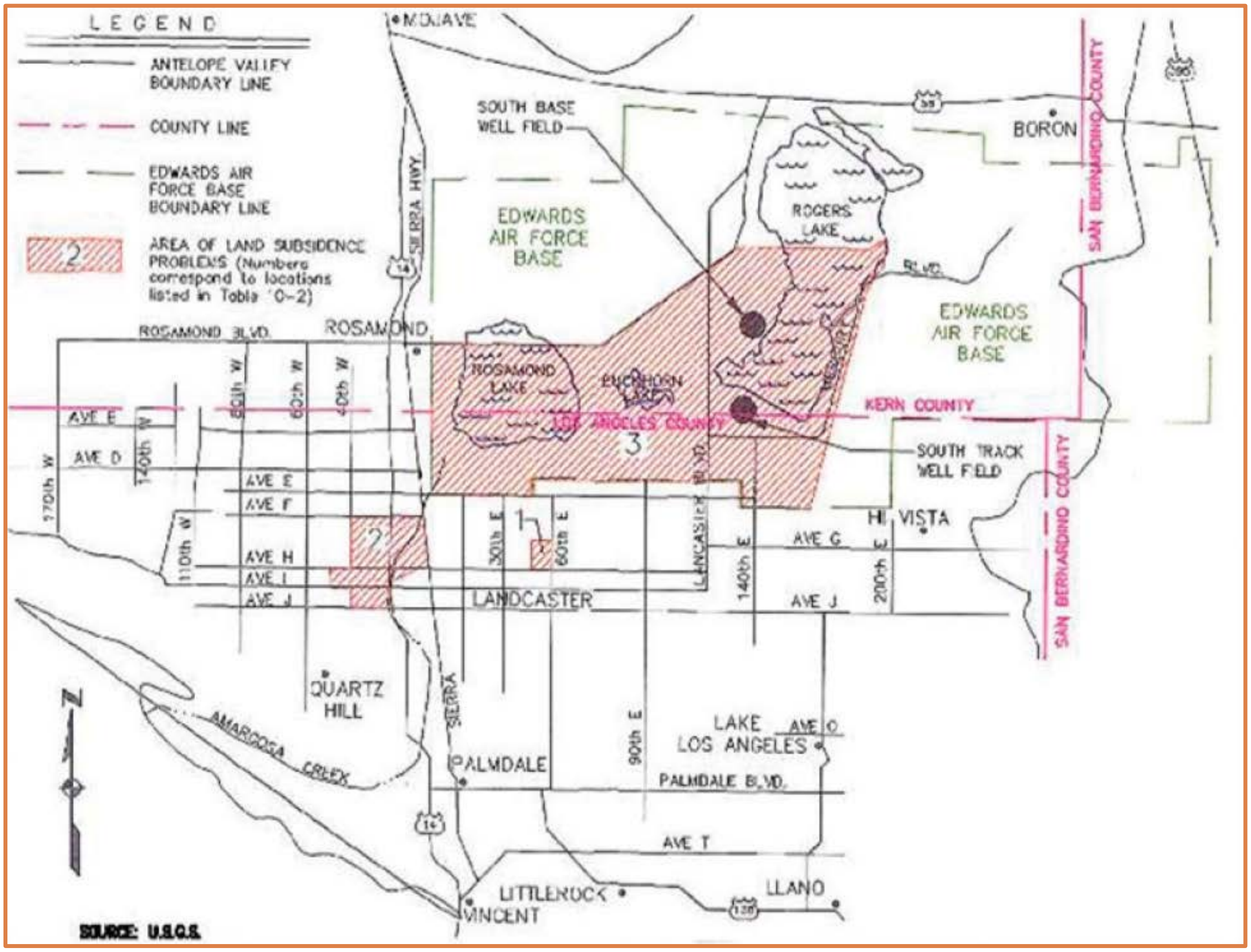
**Figure 3-12: Subsidence Levels in the Antelope Valley Region**




**USGS Report 93-4114**. USGS (1993b), reported that land subsidence effects had been noted on Rogers Lake in the form of depressions, fissures and cracks. The report identified pumping of groundwater as the cause of the land subsidence. As much as 90 feet of groundwater level decline has occurred in the South Base well field, and an average annual compaction rate of 5.57 x $10^{-2}$ feet was measured at the Holly site near the South Track well field (see Location 3 on Figure 3-15).

**USGS 1994 Draft Report**. USGS (1994) revealed that land subsidence throughout Antelope Valley Region has reached nearly 7 feet. As shown on Figure 3-15, USGS indicated that subsidence levels of 6.6 feet have occurred near Avenue I and Division Street, and Avenue H and 90th Street East. The draft report stated that there was a general correlation between groundwater level declines and the distribution and rate of subsidence. In addition, the report estimated a conservative loss of approximately 50,000 AF of storage in the groundwater subbasin in the area that has been affected by 1 foot or more of land subsidence.

**Figure 3-13: Areas of Potential Land Subsidence in the Antelope Valley Region**




**1995 Water Resource Study.** In addition to reviewing the reports summarized above, companies and agencies within the Antelope Valley Region were surveyed regarding potential damages attributable to groundwater level declines and field visits of affected areas were conducted. Companies and agencies surveyed include the following:

- AVEK
- Calnev Pipelines
- Lancaster, Redevelopment Center
- Lancaster, Road Maintenance Department
- Palmdale, Engineering Department
- Palmdale, Road Maintenance Department
- LACSD
- EAFB
- Kern County Flood Plain Management Section
- Los Angeles County Waterworks District, Sewer Department
- RCSD

- Southern California Gas Company
- Southern Pacific Railroad
- State Fire Marshall, Pipeline Safety Division

**2014 Groundwater-Flow and Land-Subsidence Model of Antelope Valley, California.** To project the future impacts of groundwater pumping in the Basin, the USGS developed a land-subsidence model of Antelope Valley in cooperation with the LACDPW, AVEK, PWD, and EAFB. Results of the model simulations indicated that simulated groundwater extractions exceeded recharge in most years, causing compaction of aquitards and resulting in land subsidence. The model demonstrated land subsidence occurred throughout almost the entire Lancaster subbasin between 1915 and 2005, with a maximum of about 9.4 ft in the central and eastern parts of the subbasin. The model simulated future pumping scenarios based on the Judgment and determined that land subsidence will persist in the study area, though artificial recharge may help reduce the magnitude and extent of land subsidence (USGS 2014).

**Antelope Valley Watermaster 2017 Annual Report.** An analysis of satellite-based interferometric synthetic aperture radar data indicated an additional 0.2 to 0.6 feet of land subsidence occurred between 1993 to 2005 in sections of the subsidence-prone area. This determined that land subsidence from groundwater level declines can be a relatively slow process and continue for years after the pore pressure changes have occurred (Watermaster 2018).

**Table 3-19: Land Subsidence Concerns for the Antelope Valley Region**

| Location | Description | Maximum Subsidence (ft) | Problems/Damages/Concerns |
|---|---|---|---|
| 1 | Area bounded by 50th and 60th Streets east and Avenues G and H (T7N-R11W-S3) | 3-4 | • Development of cracks and fissures |
| 2 | Northwest portion of Lancaster | 4-5 | • Development of cracks and fissures in the following areas of concern:<br>• In the vicinity of KAVL and KBVM radio towers near the proposed site for High Desert Hospital complex<br>• East of a residential project at the southeast corner of 30th St. West and Ave. "I"<br>• In the vicinity of LA County Detention Facility south of Ave. "I"<br>• The "H" Street Bridge over Amargosa Creek where up to 4" of lateral separation is present across the central expansion joint[(a)]. |
| 3 | EAFB | 3.3 | • Failure of several well casings.<br>• Increase in area subject to flooding.<br>• Structural damage to wastewater treatment plant building.<br>• Wells protruding above the ground.<br>• Development of cracks, fissures, sinkholes and softspots on Rogers Lakebed, affecting use of the lakebed as a runway for planes and space shuttles. |

Note:
(a) Geolabs reports that the separation may be due to differential settlement or, may be related to the same mechanism which is causing the fissuring in the area.

Other than the damages identified in the reports summarized above, structural damage to the wastewater treatment plant building on EAFB was the only other potentially significant damage identified and may or may not be attributable to land subsidence. Other minor existing damage that may or may not be attributable to groundwater level declines includes cracked sidewalks and pavement. To assess existing and potential degradation to the groundwater supply, an attempt was made to correlate typical stormwater runoff constituents and similar constituents in the groundwater supply. The hypothesis was that areas of fissuring should show higher degrees of contamination if runoff was reaching the aquifers through the fissures.

The Los Angeles County Watershed Management Division monitors surface water; however, it does not monitor typical stormwater constituents, only general minerals. Therefore, it is currently unknown whether groundwater degradation due to subsidence is occurring in the Antelope Valley Region. However, should fissuring continue, degradation to the groundwater supply could be a potential problem and should be investigated. Individual water purveyors servicing the area where fissuring is occurring may test for some of the constituents found in stormwater, from which data may be obtained.

In addition to subsidence-related problems, groundwater level declines of up to 200 feet in the Antelope Valley Region have resulted in increased pumping costs. USGS (1994) cites the increased pumping costs as the primary reason for a decline in agricultural production during the 1970s.

USGS has established a network of 85 elevation benchmarks for monitoring subsidence. In addition, three extensometers have been installed at EAFB to measure land subsidence directly. However, other than at EAFB, there is no formal subsidence monitoring program to analyze subsidence on an ongoing basis. The Watermaster Engineer is currently using the water level monitoring program as a proxy for subsidence monitoring. It is recommended that monitoring of subsidence levels groundwater levels continue in the Antelope Valley Region as indicators of future problems due to subsidence and current progress toward balancing groundwater use. Monitoring of groundwater quality for typical stormwater constituents in areas of fissures is recommended as an indicator of the degradation potential due to fissures.

## 3.2 Water Quality

Water quality is a major concern in the Antelope Valley Region. The Region's dependence on its groundwater source makes it vital that the quality of the groundwater be protected. With the increase of groundwater recharge projects, which are essential to ensuring the availability of groundwater and preventing land subsidence, it is crucial to monitor the quality of the recharged imported, local surface and recycled water. Water quality management in the Antelope Valley Region is therefore focused on maintaining and improving existing water quality and preventing future contamination.

### 3.2.1 Local Groundwater Quality

Groundwater quality in the Antelope Valley Region is excellent within the principal aquifer but degrades toward the northern portion of the dry lakes areas. The groundwater is typically characterized by calcium bicarbonate near the surrounding mountains and is characterized by sodium bicarbonate or sodium sulfate in the central part of the basin (Duell 1987 as cited in DWR 2004). In the eastern part of the basin, the upper aquifer has sodium-calcium bicarbonate type water and the lower aquifer has sodium bicarbonate type water (Bader 1969 as cited in DWR 2004). Considered to be generally suitable for domestic, agricultural, and industrial uses, the water in the principal aquifer has a TDS concentration ranging from 200 to 800 mg/L. The deep aquifer typically has a higher TDS level. Hardness ranges from 50 to 200 mg/L, and high fluoride, boron, nitrates, chromium and antimony are a problem in some areas of the basin. The groundwater in the basin is used for both agricultural and M&I purposes (SNMP 2014).

Arsenic is closely monitored in the Region. It is a naturally occurring inorganic contaminant often found in groundwater and occasionally found in surface water. Anthropogenic sources of arsenic include agricultural, industrial and mining activities. Arsenic can be toxic in high concentrations, and is linked to increased risk of cancer when consumed for a lifetime at or above the regulated MCL. Arsenic levels above the MCL of 10 ppb have been observed in the Antelope Valley Region, primarily in the northern and eastern areas of the Region. Twenty LACWD 40 wells have tested above the MCL. Of the twenty wells, one is not in use and the remaining are blended, with lower arsenic concentrated groundwater or surface water, to concentrations below 8 ppb or 80 percent of the MCL. QHWD has also observed levels above the MCL in a number of wells and utilizes the same blending method to manage arsenic levels. Similarly, RCSD has observed levels of arsenic in the range of 11 to 14 ppb in three (3) of its wells. RCSD is utilizing similar methods to LACWD 40 to manage arsenic levels so that delivered water meets the arsenic MCL. PWD has arsenic levels below 3 ppb or at Non-Detect (ND) concentrations. In total, there are 97 wells in the Basin that have reported concentrations above the arsenic MCL, reaching concentrations of up to 320 ppb near North Edwards. To date, most of the drinking water wells with elevated concentrations of arsenic have been shut down. The Salt and Nutrient Management Plan (SNMP) completed in 2014 does not anticipate that the existing arsenic problem will lead to future loss of groundwater as a supply for the Antelope Valley Region. Though arsenic is an issue in some DAC areas such as Boron, arsenic is generally expected to remain within an acceptable range over the next 25 years. Therefore, no new implementation measures are currently recommended to address the contamination.

An emerging contaminant of concern is hexavalent chromium or chromium-6. Chromium-6 can occur naturally in the environment from the erosion of natural chromium deposits, but can also be produced by industrial processes where it is used for chrome plating, dyes and pigments, and leather and wood preservation. This element has been known to cause cancer when inhaled and has also been linked to cancer when ingested. California set a public health goal (PHG) of 0.02 ppb for chromium-6 and adopted an MCL of 10 ppb in 2014. However, the chromium-6 MCL for drinking water was revoked in 2017 because the CDPH failed to consider the economic feasibility of compliance when adopting the MCL. More than 200 wells belonging to various agencies have tested in excess of the suggested PHG within the last ten years, with concentrations ranging up to 170 ppb in Willow Springs. These chromium-6 exceedances, however, cannot be attributed to specific anthropogenic emissions because hexavalent forms of chromium mainly originate from natural sources like rocks and soils in the Antelope Valley Groundwater Basin (LACWD and LACSD 2014). Because chromium-6 is a naturally occurring contaminant and there is no chromium-6 MCL to guide cleanup efforts, remediation projects are futile at this point. Nonetheless, these wells are and will continue to be monitored as the state moves forward with the adoption of a new MCL. Remediation actions to address the contamination will be identified in the future as new information and data becomes available (SWRCB 2017).

Perchlorate is also a pollutant of concern that is naturally occurring in some fertilizers and is used in the production of airbags, rockets, missiles, fireworks, matches, and other explosives. Levels above the MCL of 6 ppb present a public health concern as they can decrease production of the thyroid hormone, interfering with hormones needed for regulating heart rate, blood pressure, body temperature, and metabolism. Perchlorate can also affect prenatal and postnatal growth and development of the central nervous system. Within the past decade, two wells in the Region tested for perchlorate levels above the MCL of 6 ppb and 9 tested above the PHG of 1 ppb. Both MCL exceedances were reported at the Palmdale Regional Airport with one reporting a concentration of 17 ppb. Transportation, agricultural practices, and military activities have likely contributed to the elevated perchlorate levels (SWRCB 2017). Though there have been a few MCL exceedances in the Basin, perchlorate contamination is not a prevalent issue in the Antelope Valley Groundwater Basin as no MCL exceedances have been recorded within the last 5 years. Therefore, there is no need for additional remediation activities in the Basin.

In addition to arsenic, perchlorate, and chromium-6 issues, there have also been concerns with nitrate levels above the current MCL of 45 ppm and high TDS levels in portions of the Basin. Groundwater monitoring data from the mid-to-late 1990s indicate nitrate (as $NO_3$) concentrations periodically exceeding the primary MCL for drinking water of 45 ppm in two wells located in the southern portion of the groundwater basin near the Palmdale WRP. Six wells in Lancaster and Palmdale have also exceeded the nitrate (as N) MCL of 10 ppb within the past decade. Agricultural fertilization practices and discharge of treated wastewater has likely contributed to the elevated levels. Actions have already been implemented by LACSD to address these concerns and to minimize any impact from treated wastewater, including, treatment upgrades, a change in effluent management practices, the implementation of a recycled water distribution system, and performing groundwater remediation activities near the Palmdale WRP site.

## 3.2.2 Imported Water Quality

DWR must monitor the effects of diversions and SWP operations to ensure compliance with existing water quality standards, in particular the maintenance of salinity levels in key parts of the Delta to help maintain its natural ecosystem. DWR also regulates the quality of non-Delta water entering the SWP, known as “non-project turn-ins”. These non-project turn-ins typically originate as groundwater, and in particular “pump back” projects that store imported water in groundwater banks, though other waters include excess surface flows or flood waters. DWR requires the proponents of any turn-in proposal to demonstrate that the water is of consistent, predictable and acceptable quality and that the comingled water does not result in a diminution of SWP water quality (DWR 2012a).

The current water quality conditions in the California Aqueduct (data taken from Station KA024454, Check 29 near Lake Webb) are compared to the current federal primary and secondary drinking water standards and are provided in Table 3-20 . It is important to note that while some constituents do not have a primary MCL (bromide, total organic carbon, TDS, and chloride) high levels of these constituents can be of concern, especially with regard to potential treatment costs to downstream users.

### 3.2.2.1 Imported Water Quality Infrastructure

SWP water is treated by PWD’s treatment plant for use by PWD and LCID, and by the four AVEK facilities (Quartz Hill WTP, Eastside WTP, Rosamond WTP, and Acton WTP) prior to delivery to the other water purveyors.

PWD’s water treatment plant (the Leslie O. Carter Water Treatment Plant) is a conventional design plant using chlorine as the disinfectant and has a permitted capacity of 28 mgd. Screening and metering are provided at the outlet of Palmdale Lake and head of the plant, followed by treatment chemical addition, flash mixing, three-stage tapered energy flocculation, clarification utilizing plate settlers and sediment removal systems, multi-media filters, and disinfection. Treated water is stored in a 6 million-gallon reservoir, which supplies water into the distribution system. Decanted water from the solids removal process is returned to Lake Palmdale. The plant is currently undergoing a second phase of improvements designed to meet Stage II Disinfection-by-Products regulations. Improvements include additional filters and adding granulated activated carbon contactors to the processes. This will allow the continued use of chlorine as the disinfectant and increase the capacity to 35 mgd.

**Table 3-20: Comparison of SWP Water Quality Criteria (2019) to SWP Actual Data**

| Constituent | SWP Water Quality Data (Sta. KA030341)[a] | | | Current Drinking Water Standards (2019) |
|---|---|---|---|---|
| | Max. | Min. | Avg. | |
| Aluminum (ug/L) | 0.01 | <0.01 | <0.01 | 50 - 200 |
| Antimony (Dissolved) (ug/L) | <1 | <1 | <1 | 6 |
| Arsenic (Dissolved) (ug/L) | 8 | 1 | 2 | 10 |
| Barium (Dissolved) (ug/L) | 8 | 2 | 3 | 2000 |
| Beryllium (Dissolved) (ug/L) | <1 | <1 | <1 | 4 |
| Boron (Dissolved) (ug/L) | 400 | <100 | 110 | No standard |
| Bromide (Dissolved) (ug/L) | 370 | 30 | 184 | No standard |
| Cadmium (Dissolved) (ug/L) | <1 | <1 | <1 | 5 |
| Chloride (Dissolved) (mg/L) | 121 | 10 | 61 | 250[b] |
| Chromium (Total) (mg/L) | 0.005 | 0.001 | 0.002 | 0.1 |
| Copper (Dissolved) (ug/L) | 3 | <1 | 1.5 | 1,000 |
| Iron (ug/L) | 38 | 5 | 16 | 300[b] |
| Manganese (ug/L) | <5 | <5 | <5 | 50[b] |
| Mercury (inorganic) (ug/L) | <0.2 | 0 | <0.2 | 2 |
| Nickel (Dissolved) (ug/L) | 2 | <1 | 1.2 | No standard |
| Nitrate as N (mg/L) | 14.4 | <0.1 | 2.5 | 10 |
| Selenium (dissolved) (ug/L) | 1 | <1 | <1 | 50 |
| Silver (ug/L) | <1 | <1 | <1 | 100[b] |
| Specific Conductance (uS/cm) | 623 | 121 | 406 | No standard |
| Sulfate (Dissolved) (mg/L) | 109 | 9 | 34 | 250[b] |
| TDS (mg/L) | 363 | 75 | 229 | 500[b] |
| Total Organic Carbon (mg/L) | 6 | 0.8 | 3.5 | No standard |
| Zinc (dissolved) (ug/L) | <5 | <5 | <5 | 5,000[b] |

Notes:
(a) SWP Water Quality data collected by DWR between 1/1/2016 and 12/31/2018.
(b) Denotes secondary standard.

The Quartz Hill WTP was the first plant built by AVEK. The treatment plant receives water by gravity flow from the California Aqueduct. Screening and metering are provided at the head of the plant, followed by treatment chemical addition, flash mixing, tapered energy flocculation, clarification utilizing traveling bridges for sediment removal, dual media filters, and disinfection. Treated water is stored in a 9.2 million-gallon reservoir which supplies water by gravity into the distribution system. Decanted water from the solids removal process is returned to the plant influent. After the completion of a recent expansion, the Quartz Hill WTP became capable of producing 90 mgd of potable water for consumers.

Expansion of the Eastside WTP located between Littlerock and Pearblossom to 10 mgd was completed in late 1988. It can now serve the needs of about 44,000 consumers.

The 14 mgd Rosamond WTP was established to support the needs of consumers in southeastern Kern County, an area that includes Rosamond, Mojave, California City, EAFB and Boron. Rosamond WTP is capable of providing water for 60,000 consumers.

The 4 mgd Acton WTP was completed in 1989. Water is pumped from the plant site near Barrel Springs Road, on Sierra Highway, to Vincent Hill Summit. From there it is pumped into a Los Angeles County Waterworks pipeline for transport to the Acton area. The plant's capacity is sufficient to supply the needs of 17,000 consumers.

### 3.2.3 Wastewater and Recycled Water Quality

Tertiary treated effluent from the Region's three water reclamation plants will be of sufficient quality to meet unrestricted use requirements. It may then be used for irrigating landscapes of freeways, parks, schools, senior complexes and new home developments. The effluent will also meet all Waste Discharge Requirements (WDRs). Revised WDRs for the Lancaster WRP were issued in 2006 and in 2011 for the Palmdale WRP. For recharge of recycled water, blending or additional water quality requirements may be needed. The management of TDS and nutrients from recycled water is addressed by the SNMP for the Antelope Valley, which was developed in parallel with the 2013 IRWMP Update. Recycled water from the EAFB Air Force Research Laboratory Treatment Plant and the Main Base WWTP is not included in this discussion of recycled water quality since all water is used on the base.

### 3.2.4 Local Surface Water and Stormwater Runoff Quality

Littlerock Reservoir, jointly owned by PWD and LCID, is the only developed surface water source in the Antelope Valley Region. The reservoir discharges to Lake Palmdale via the Palmdale Ditch and the water is ultimately treated by PWD's WTP. Lake Palmdale also receives water directly from the SWP. The quality of the water in Lake Palmdale is considered good.

The Basin Plan for the Lahontan Region contains a specific ammonia objective for Amargosa Creek downstream of the LACSD 14 discharge point, and to the Piute Ponds and associated wetlands based on the USEPA 1999 freshwater criteria for total ammonia. This objective is pH and temperature dependent and shall not exceed the acute and chronic limits more than once every three years, on average. In addition, the highest four-day average concentration for total ammonia in a 30-day period cannot exceed 2.5 times the chronic toxicity limit.

The management of TDS and nutrients from imported water is addressed by the SNMP for the Antelope Valley.

### 3.2.5 Regional Water Quality Issues and Needs

The key issues, needs, challenges, and priorities for the Antelope Valley Region with respect to water quality include the following, which are discussed in greater detail below:

- Concern for meeting water quality regulations;
- Closed basin with no outfall for discharge;
- Must provide wastewater treatment for growing population;

#### 3.2.5.1 Concern for Meeting Water Quality Regulations

The Region has a number of concerns regarding water quality regulations, including: (1) meeting water quality regulations for groundwater recharge, (2) meeting ever-evolving regulations, and (3) contaminants of concern.

**Meeting Water Quality Regulations for Groundwater Recharge**

There are a variety of source waters that could be available for recharge into the groundwater of the Antelope Valley Region. They include, but are not limited to:

- State Water Project:
  - Treated potable water
  - Untreated raw water direct from the California Aqueduct

- Reclaimed Water (for spreading only or blending):
    - Tertiary treated
- Captured Stormwater

The water quality of the recharged water depends on which supply is used. There are restrictions to the quality of the water recharged as outlined in the Lahontan RWQCB Basin Plan. Recharge source water would need to meet these requirements before recharge could occur. Additionally, requirements are stricter for water that is injected versus water that is percolated. Water that LACWD 40 recharged through its ASR program met the RWQCB's water quality requirement.

**Meeting Evolving Regulations**

In response to groundwater quality concerns, the RWQCB Lahontan Region is revising the WDRs for WRPs in the Antelope Valley Region. For example, the WDR for Palmdale WRP has been amended (Board Order R6V-2011-0012) to limit the reuse of secondary-treated effluent to only certain agricultural sites, and to list effluent concentration limits for both secondary and tertiary treated effluent. The ability to comply with these evolving regulations has been both economically and technologically challenging.

**Contaminants of Concern**

Contaminants such as arsenic, nitrate, perchlorate, and potentially chromium-6 will require water suppliers, WRPs, and WTPs to conduct routine monitoring and sampling of their systems and could impact their treatment methods. The ability to remove these contaminants also has a positive economic impact on the agricultural community since it reduces the impact to crops. It also benefits the WRPs and WTPs striving for compliance with more stringent WDRs.

#### 3.2.5.2 Closed Basin with No Outfall for Discharge

As described in Section 2, the Antelope Valley Groundwater Basin is a closed topographic basin with no outlet to the ocean. Therefore, any treated effluent (recycled water) generated in the Antelope Valley Region must be percolated, reused, evaporated, or transpired by plants. This places great responsibility on the wastewater treatment providers in the Antelope Valley Region to provide alternative effluent management methods while still being compliant with their WDRs.

#### 3.2.5.3 Must Provide Wastewater Treatment for Growing Population

Population increases in the Antelope Valley Region will result in higher wastewater flow rates and the need to provide additional wastewater treatment and effluent management capacity. As mentioned above, the groundwater basin is a closed basin, so all treated effluent must be managed (e.g., reuse, evaporation, and percolation) and cannot simply be discharged to an ocean outlet. Wastewater projections through the planning period are indicated above in Section 3.1.4.

## 3.3 Flood Management

The Antelope Valley Region is a closed watershed without a natural outlet for storm water runoff (LACDPW 1987). Precipitation in excess of 12 inches in the surrounding mountains creates numerous streams that carry highly erodible soils onto the valley floor, forming large alluvial river washes (Rantz, 1969 as cited in USGS 1995). Larger streams, including Big Rock Creek, Littlerock Creek, Amargosa Creek, Cottonwood Creek, and Anaverde Creek then meander across the alluvial fans in poorly-defined flow paths that change from storm event to storm event.

Stormwater runoff that does not percolate into the ground eventually ponds and evaporates in the impermeable dry lake beds at EAFB near the Los Angeles/Kern County line (LACDPW 1987). The 60 square mile playa is generally dry but is likely to be flooded following prolonged precipitation. Fine sediments carried by the stormwater inhibit percolation as does the impermeable nature of the playa soils (LACDPW 1987). Historical flooding has shown surface water to remain on the playa for up to five months until the water evaporates (LACDPW 2006).

Portions of the Antelope Valley floor are subject to flooding due to runoff from the nearby foothills (City of Lancaster 1997). The flooding sometimes exceeds the capacities of the limited drainage facilities and engineered flood channels. Examples of existing flood control facilities include the engineered channels and retention basins on Amargosa Creek. Storms of a 20-year frequency or greater can overflow these facilities (LACSD 2005). There is also a flood retention basin along Anaverde Creek; and when this basin is overtopped, flooding occurs in the vicinity of 20th Street East, 30th Street East, and Amargosa Creek. Summer thunderstorms also increase the potential for flash floods, creating a yearlong potential problem.

Following severe flooding in the Antelope Valley Region in 1980, 1983, and 1987, the LACDPW prepared the "Antelope Valley Comprehensive Plan of Flood Control and Water Conservation." This plan proposed floodplain management in the hillside areas, structural improvements in the urbanizing areas and non-structural management approaches in the rural areas. In the hillside areas, the plan recommended restricting development to areas outside of entrenched watercourses. In the areas prone to flooding, the plan recommended improvements such as open channel conveyance facilities and storm drains through communities as well as detention and retention basins located at the mouths of the large washes (LACDPW 1987).

Both the City of Palmdale and the City of Lancaster have incorporated major elements of the LACDPW comprehensive plan into their own planning efforts; however, there are no identified funding mechanisms or schedule for major improvements except in the established areas of Palmdale, Lancaster, and along Amargosa Creek (City of Lancaster 2009, LACDPW 2004, City of Palmdale 2018). The cities have annexed portions of Los Angeles County, which coupled with a gradual decrease in housing construction since the early 1990s has limited County revenue from developer fees necessary to fund the construction of facilities in unincorporated areas of the Region.

In 1991, LACDPW teamed with the cities and unincorporated communities on a ballot measure whereby the portion of the Antelope Valley Region that lies within Los Angeles County would be included within the Los Angeles County Flood Control District, or a new Antelope Valley Flood Control District would be formed (LACDPW 2004). That measure failed as did a similar measure in Kern County; new measures proposed regionally in 2006 also failed. The lack of coordinated flood control is problematic and flooding will continue to increase in severity as urban development and associated impervious surfaces increase the potential amount of runoff and local flooding.

### 3.3.1 Regional Flood Management Issues and Needs

The key issues, needs, challenges, and priorities for the Antelope Valley Region with respect to flood management include the following, which are discussed in greater detail below:

- Lack of coordination throughout Antelope Valley Region;
- Poor water quality of runoff;
- Nuisance water and dry weather runoff;
- Difficulty providing flood control without interfering with groundwater recharge;
- Habitat and dry lakebed requirements to protect natural processes;
- Baseline flooding and sediment/erosion not well defined;
- No development guidelines for alluvial fans;

- Protection of habitat processes and sensitive habitats which rely on surface flow such as Antelope Valley Significant Ecological Areas (SEA), Piute Ponds, clay pans, mesquite woodlands, and dry lakes.

An Integrated Flood Management Summary Document was developed during the 2013 IRWMP Updates and is included in Appendix F.

#### 3.3.1.1 Flood Management Efforts are not Well Coordinated throughout Antelope Valley Region

Flood management efforts are currently performed by local jurisdictions within their particular area (e.g., City of Palmdale undertakes flood control within its boundaries), but there is no regional entity that coordinates flood control for the entire Antelope Valley Region. In the past, Los Angeles County prepared a regional plan for flood control, but its implementation has been hindered by a lack of funds. Ballot measures that would result in the creation of regional flood control districts have failed in the region.

Flood management activities also need to be coordinated with other agencies, such as water purveyors, to support a multi-use perspective. For example, the development of stormwater capture and infiltration basins in the upper watershed areas will not only reduce flooding in the lower watershed (urban) areas but also contribute to groundwater recharge during the winter months. This groundwater recharge provides additional water supply in the summer months. In a similar fashion, activities of the development community will also need to be coordinated with flood management. New impervious surfaces not only increase peak surface flows but also decrease groundwater recharge capability.

#### 3.3.1.2 Poor Water Quality of Runoff

Toxic pollutants are found within the Antelope Valley Region associated with the transport of sediment from the mountainous areas and mobilization of urban contaminants during storm events (Lahontan RWQCB 1994). Stormwater flows from the mountain areas to the Antelope Valley floor traverse highly erodible soils, which results in significant transport of sediments.

The sediment not only has the tendency to bulk peak flow and increase flood levels through sedimentation, but it also transports naturally-occurring contaminants such as arsenic and other heavy metals. Other contaminants, such as salts associated with de-icing of roads and parking lots are carried to the valley floor during rainfall events. In urban areas on the valley floor, contaminants such as pesticides, trash, oil, gasoline, radiator fluid, and animal wastes accumulate during dry months and are then mobilized at concentrated levels during storm events.

Runoff from urban areas is increasing as the Antelope Valley Region develops. The heavy sediment content and urban runoff contaminants make this storm water flow undesirable for many uses, and poorly planned urban development further upsets the natural system within a watershed as follows:

- Direct impacts such as filling of wetlands, riparian areas, drainages, and other natural waters;
- Generation of pollutants and sediment during and after construction;

- Alteration of flow regimes;
- Reduction of groundwater recharge by impervious surfaces and stormwater collector systems;
- Disruption of watershed-level aquatic functions including pollutant removal, flood water retention, and habitat connectivity.

These impacts typically degrade water quality, increase peak flows and flooding, and destabilize stream channels. The resulting condition then requires engineered solutions to the disrupted flow patterns which lead to near-total loss of natural functions and values in the affected basins. Impacts can be minimized through municipal stormwater programs that require use of Best Management Practices (BMPs) and conditions to be placed on new development proposals. Ideally stormwater programs would be developed through stakeholder involvement as part of an integrated program that would identify concepts and projects developed to maximize flood control benefits, water quality benefits, water supply benefits, and protection of natural surface flow routes and levels thereby protecting natural environments downstream.

#### 3.3.1.3 Nuisance Water and Dry Weather Runoff

Stagnant or "nuisance" water is standing water that ponds and fails to infiltrate even after prolonged periods. In the Antelope Valley Region there are several areas with impervious soils (including the dry lakes at EAFB) and perched clay layers prone to supporting nuisance water.

Dry-weather runoff is defined as urban runoff water that enters the drainage system due to human activities (e.g., car washing, lawn irrigation). Dry-weather runoff can also result from illicit connections to the storm water or sewer systems. This type of runoff concentrates contaminants in urban runoff and can negatively affect the water quality of receiving waters (e.g., groundwater).

Nuisance water and other dry weather flows need to be managed to prevent accumulation of contaminants by providing short and long term solutions through an integrated approach.

#### 3.3.1.4 Difficulty in Providing Flood Management without Interfering with Groundwater Recharge

The Antelope Valley Region is underlain by groundwater, which is a major source of water supply in the area. A poorly-designed flood management program could slow, limit, or direct groundwater recharge to unfavorable areas. In addition, groundwater recharge focused on recharge of stormwater flows could introduce urban runoff contaminants into the groundwater aquifer. Ideally, excess stormwater could be properly treated and directed to areas that allow recharge of groundwater through an integrated management program that combines flood management, water quality improvements, and water supply augmentation.

#### 3.3.1.5 Habitat and Dry Lakebed Requirements to Protect Natural Processes

Stormwater runoff within the Antelope Valley is carried by ephemeral streams. Between 0.36 inches and 0.56 inches of rainfall in the first 24 hours is required to saturate the soils and initiate surface flow runoff. As runoff moves from the headwaters to the lakebeds, some of the flow percolates into the stream beds and recharges the groundwater. Other portions flow through well-defined washes that change to braided alluvial fan washes and then top the channels and move as sheet flow across the lower valley floor, filling clay pan depressions (similar to vernal pools and potholes) and wetlands (most notable being Piute Ponds). Some of this water percolates into sand dunes where the water is sequestered for later use; the remainder flows down to the valley floor into the dry lakebeds at EAFB. The amount of flow depends on the size of the storm and how much rainfall has already occurred recently. It has been documented in the "Surface Flow Study Technical Report" (EAFB 2012) that a 5-year storm (approximately 2.5 inches) is sufficient to provide 946 +/- 189-acre feet of surface water flow to Rosamond Dry Lake with the peak discharge measured at 92 cfs. The total sediment discharge measured was 1,542 metric tons. However the error rate is high at +/- 30%. Rogers and Buckhorn Dry Lakes were not measured. Stormwater runoff is important to downstream habitats throughout the Valley. These habitats are seen at EAFB as particularly valuable to sustain the surface structure of the dry lakebeds for their operational missions, the overall air quality of the Antelope Valley, and the Piute Pond Complex's wetland functions and values (Deal 2013).

#### 3.3.1.6 Baseline Flooding and Sediment/Erosion Not Well Defined

Although the mechanisms of flooding and sediment transport and deposition are well known in the Antelope Valley Region, very little definitive information is available regarding flood extents, depths, velocities or areas of deposition and sedimentation. The Federal Emergency Management Agency (FEMA) conducted hydrologic and hydraulic analysis of the region starting in the early 1980s and ending in the late 1990s to prepare approved Flood Insurance Rate Maps (FIRM). The FEMA analysis was done at different times and to different levels of detail for different panels and does not include EAFB. The mapping FEMA provided for the different flooding zones should be viewed as approximate and is in need of an update.

#### 3.3.1.7 No Development Guidelines for Alluvial Fans

Alluvial fans are classified as high flood hazard areas according to FEMA and development on alluvial fans is discouraged. Although development is discouraged, there are engineering techniques that can reduce the risk of property loss or loss of life. A guidelines document could be developed that presents the risks of alluvial fan flooding along with mitigation techniques and approximate costs for the Antelope Valley Region.

#### 3.3.1.8 Protection of Habitat Processes and Sensitive Habitats which rely on Surface Flow such as Antelope Valley Significant Ecological Areas (SEA), Piute Ponds, Clay Pans, Mesquite Woodlands, and Dry Lakes

Habitat processes and sensitive habitats that rely on surface flow are discussed in more detail in Section 3.4.

## 3.4 Environmental Resources

The Antelope Valley Region is part of a subbasin within the Mojave Desert. The climate and physical environment is typical of the high desert with the exception of the southern edge of the Antelope Valley Region which includes a cooler upland area. The area has many unique environmental features and several plant and animal species are endemic to this desert area.

**Unique Habitats**

The Antelope Valley Region is generally flat and sparsely vegetated, but is interspersed with buttes, mountain ranges, and dry lakes (Bureau of Land Management [BLM] 2005). Rogers Lake is the largest and flattest playa in the world (BLM 2005). Freezing temperatures are limited to a few winter days but in the summer temperatures often exceed 100 degrees Fahrenheit. The Antelope Valley Region is characterized by creosote bush and saltbush plant communities which make up approximately 75 percent of the natural lands in the Western Mojave Desert. A small percentage of natural lands in the area can be characterized as Mojave mixed woody scrub community. A very small percentage of the Antelope Valley Region could be characterized as freshwater or alkali wetlands (BLM 2005). A comprehensive delineation of wetlands in the Antelope Valley Region has not been conducted. However, the Antelope Valley Region is home to numerous desert washes (Little Rock Creek, Big Rock Creek, Amargosa Creek, Cottonwood Creek System), as well as man-made lakes (Little Rock Creek Reservoir, Lake Palmdale), sag ponds (an enclosed depression formed where active or recent fault movement results in impounded drainage), and areas of rising groundwater. Freshwater marsh, wetland, and alkaline meadow habitat is present within the Piute Pond Complex. Wetland and wash areas are found within the Mesquite woodland. While wetland and riparian areas are limited in the Antelope Valley Region, these areas are important resources to birds migrating along the Pacific Flyway (LACSD 2004).

The unique habitat of the Antelope Valley Region means the Region is also home to several special status species, including plants, reptiles, birds, and mammals. Several regulatory protections and practices for these special status species are in place in the Antelope Valley Region, such as SEA designations by Los Angeles County, Desert Wildlife Management Area (DWMA) designations by USFWS, and development of a Habitat Conservation Plan (HCP) by the BLM.

#### Habitat Conservation

Habitat conservation activities in the Region include the establishment of SEAs and the development of habitat conservation plans such as the Antelope Valley Region Areawide Plan and the West Mojave HCP.

SEAs are defined by Los Angeles County and generally encompass ecologically important or fragile areas that are valuable as plant or animal communities and often important to the preservation of threatened or endangered species. Preservation of biological diversity is the main objective of the SEA designation. SEAs are neither preserves nor conservation areas, but areas where Los Angeles County requires development to be designed around the existing biological resources (Los Angeles County 2015). Design criteria in SEAs include maintaining watercourses and wildlife corridors in a natural state, set-asides of undisturbed areas, and retaining natural vegetation and open space (Los Angeles County 1986).

The three Significant Ecological Areas in the Antelope Valley Region according to the Los Angeles County General Plan Update include the Antelope Valley SEA, the Joshua Tree Woodland SEA, and the San Andreas SEA. (Los Angeles County 2012)

##### *Antelope Valley SEA*

The Antelope Valley SEA is located within the central portion of the Antelope Valley, primarily east of the cities of Palmdale and Lancaster, within a predominantly unincorporated area of Los Angeles County. This area includes tributary creeks to Littlerock and Big Rock Creeks downstream to the valley floor and floodplain zones of Rosamond, Buckhorn and Rogers dry lakes. Given the large area encompassed by this SEA, it has a highly diverse biota along with diverse desert habitats.

The watershed areas upstream of the dry lake beds provide wash, scrub, and desert riparian habitat for various plant, bird and burrowing mammal species. In particular, the South Fork of Big Rock Creek is part of the federally-designated critical habitat of the mountain yellow-legged frog, and serves as nesting area for bird species such as the gray vireo. The dry lake beds serve as habitat for many desert plants and wildlife species once found broadly across the Valley. The Piute Ponds and dry lakes have distributed habitat of marshy alkali grassland, alkali flats, and cattail and bulrush marsh augmented by wastewater treatment facilities that have additional ponds. The dry lake beds contain botanical features unique and limited in distribution, including the Mojave spineflower and the only healthy stands of mesquite in Los Angeles County.

The Desert-Montane area of this SEA, which centers on Mescal Creek, provides a combination of desert and montane habitats, making this one of the most diverse areas in the County. Beside creosote bush scrub, sagebrush scrub, and Joshua tree woodland found in the desert floor, this area also includes pinyon-juniper woodland, desert chaparral, and mixed conifer forest habitat. While some of these are considered common habitats, the area is valuable because this SEA is the only site where these communities are found in an uninterrupted band.

The Antelope Valley SEA also includes desert butte habitat which has increased biological diversity relative to surrounding areas. The steep slopes of buttes act as refuges for many biological resources. Desert buttes provide roosting and nesting areas for birds, den sites for mammals, and habitat for the desert wildflower and Joshua tree woodland areas. Suitable habitat for the Mohave ground squirrel (listed as "Threatened" under the California Endangered Species Act and "Special Concern" by the federal Endangered Species Act) is found in these butte areas.

#### *Joshua Tree Woodland SEA*

The Joshua Tree Woodland SEA is located in the western portion of the Antelope Valley in unincorporated Los Angeles County west and northwest of the Antelope Valley California Poppy Reserve. This SEA provides habitat to various plant and animal communities, particularly Joshua tree woodland. The scrubland, woodland and grassland habitats in this SEA provide foraging and cover habitat for year-round resident and seasonal resident song birds and raptors. In addition to Joshua trees, sensitive species in this SEA include the alkali mariposa lily, California horned lizard, golden eagle, Swainson's hawk, burrowing owl, loggerhead shrike, western mastiff bat, and Tehachapi pocket mouse.

#### *San Andreas SEA*

The San Andreas SEA is located in the western portion of the Antelope Valley in unincorporated Los Angeles County, and includes a small portion of the western Tehachapi foothills and then stretches in a southeasterly direction to include Quail Lake, the northern foothills of Liebre Mountain and Sawmill Mountain, large portions of Portal Ridge, Leona Valley, Ritter Ridge, Fairmont and Antelope Buttes, Anaverde Valley, Lake Palmdale, and terminating at Barrel Springs (a sag pond near the City of Palmdale). Vegetation in this SEA is extremely diverse, and includes desert scrub, chaparral, grassland, wildflower fields, southern willow scrub, foothill woodland, Joshua tree woodland, oak woodlands, southern cottonwood-willow riparian forest, freshwater marsh, alkali marsh, alluvial wash vegetation and ruderal vegetation. Given this variety of vegetation, wildlife within this SEA is diverse and abundant, and includes a number of sensitive species such as the California red-legged frog, California horned lizard, prairie falcon, southwestern willow flycatcher, Mohave ground squirrel, and the California condor.

#### *West Mojave Plan*

The *West Mojave Plan* is an HCP developed by the BLM with collaboration from multiple other jurisdictions and agencies, including the City of Palmdale, City of Lancaster, Los Angeles County, the California Department of Fish and Game, and the USFWS. The *West Mojave Plan* also acts to amend the California Desert Conservation Area Plan. The Planning Area for the *West Mojave Plan* includes the entire Antelope Valley Region. The objective of this HCP is to develop a comprehensive strategy to preserve and protect the desert tortoise, the Mohave ground squirrel, and over 100 other sensitive plants, animals and habitats. The HCP would establish additional conservation areas for the desert tortoise and Mohave ground squirrel and alter allowable motorized vehicle routes on BLM managed lands. Jurisdictions that have adopted the HCP must follow the selected conservation strategies, but benefit from a streamlined process when permitting activities that may affect endangered species covered by the plan (BLM 2005).

### Open Space Areas

The open space and rural character of the Antelope Valley Region is treasured by many of its residents. During a poll conducted as part of its General Plan Update, the City of Lancaster found that "open space," "views," and "desert environment" were commonly cited as key to the area's quality (City of Lancaster 2006). Typical population densities in southern California suburban areas generally range from roughly 2,500 persons per square mile and increase to more than 7,500 persons per square mile in urbanized areas. By comparison, the high desert area (Mojave Desert in general) only averages about 680 persons per square mile (BLM 2005). The Census Bureau utilizes a minimum threshold of 1,000 persons per square mile to denote an urbanized setting. The Antelope Valley Region is characteristic of a large rural environment.

#### Ecological Processes

The ecological integrity of the Antelope Valley Region includes a critical range of variability in its overall biodiversity, important ecological processes and structures, regional and historical context, and sustainable cultural practices. The ability to maintain biodiversity and ecosystem health while accommodating new growth is a challenge in the Antelope Valley Region, which is home to a variety of unique and sensitive species endemic to the area. An overriding consideration becoming more prevalent with the implementation of the West Mojave Plan is the promotion of ecosystem processes that sustain a healthy desert ecosystem. Knowledge to support management decisions will require improved understanding of desert ecology.

We need to understand processes that change ecosystem dynamics because they are the most effective tools available to land managers who are asked to maintain or restore the health of the natural environment. Important ecological processes in the Antelope Valley Region include competition (for nutrients, water, and light), fire, animal damage, nutrient cycling, carbon accumulation and release, and ecological genetics.

Understanding genetic structure is basic knowledge for implementing biologically sound programs dealing with breeding, restoration, or conservation biology, all of which is at the basis of the West Mojave Plan for endangered species in the Region (e.g., desert tortoise and Mohave ground squirrel). Genetic structure also determines responses to changing conditions regardless of whether change is induced by management, lack of management, fluctuating climatic gradients, or global warming.

## 3.4.1 Regional Environmental Resource Issues and Needs

The following is a list of the key issues, needs, challenges, and priorities for environmental management within the Antelope Valley Region, as determined by the stakeholders:

- Conflict among industry, growth, and preservation of natural areas and open space/Desire to preserve open space;
- Protection of threatened and endangered species; and
- Removal of invasive non-native species from sensitive ecosystems.

### 3.4.1.1 Conflict among Industry, Growth and Preservation of Natural Areas and Open Space/Desire to Preserve Open Space

As described earlier, because of its proximity to the Los Angeles Area, the Antelope Valley Region is subject to increasing demand for community development, recreation, and resource utilization. As described in Section 2.10, population in the Antelope Valley Region is expected to increase by 38 percent between 2010 and year 2040. Some of this growth will result in conversion of agricultural land, but more of this growth will occur in locations that are currently natural areas. Loss of both agricultural acreage and natural areas decreases the amount of open space in the Antelope Valley Region.

#### 3.4.1.2 Protection of Threatened and Endangered Species

Pressures for growth and recreational activities in the Antelope Valley Region have been linked to significant declines in desert species such as the desert tortoise, Mohave ground squirrel and burrowing owl. Growth of urban areas results in loss of available or suitable habitat for sensitive species. For example, studies of the desert tortoise have shown a significant downward decline in the population from 1975 to 2000 related to urban growth (USFWS 2006). The desert tortoise is currently listed as Threatened by USFWS and by the CDFW. The Mohave ground squirrel is also listed as Threatened by the CDFW as a result of similar anthropogenic pressures, and the Burrowing Owl is considered a Bird of Conservation Concern by the USFWS and a Bird Species of Special Concern by the CDFW (USFWS 2003).

Besides loss of habitat, proximity to human development can be harmful to sensitive species. Human development introduces roadway traffic, pesticides, urban runoff, and non-native species, which degrade habitat and food sources for sensitive species. Land use practices, such as cattle and sheep grazing and mining are also considered harmful to many species. Recreational uses, such as off-highway vehicle use, are known to conflict with sensitive species habitat. For example, a vehicle traveling over a tortoise burrow could cause a desert tortoise to be trapped inside the burrow or make the burrow unusable when they are needed to escape predation or extreme weather conditions (USFWS 2006). In recreational areas, sensitive wildlife may seek shelter in the shade of vehicles and be crushed when those vehicles are subsequently moved. Improper disposal of food wastes and trash by recreational users often attracts predators of the sensitive species, such as common ravens. Dogs brought onto public lands by recreational visitors can also disturb, injure, or kill sensitive species. Other factors affecting the continued existence of threatened and endangered species include animal collection for personal or commercial purposes, disease, inadequate regulatory mechanisms for species protection, and climate change (USFWS 2014).

#### 3.4.1.3 Removal of Invasive Non-native Species from Sensitive Ecosystems

Non-native species (such as arundo and tamarisk) are listed as 'A-1' invaders (the most invasive and widespread wildland pest plants) by the California Invasive Plant Council and as noxious weeds by the California Department of Food and Agriculture (CDFA). While the degree and specifics of problems associated with these species vary, general negative effects associated with the establishment of tamarisk within the Antelope Valley Region include the following:

- Water Quality: Reduction in the shading of surface water, resulting in reduction of bank-edge river habitats, higher water temperature, lower dissolved-oxygen content, elevated pH, and conversion of ammonia to toxic unionized ammonia.
- Water Supply: Loss of surface and groundwater through heavy consumption and rapid transpiration.
- Flooding: Obstruction of flood flows with associated damage to public facilities, including bridges and culverts, and to private property, such as farm land.
- Erosion: Increased erosion of stream banks, associated damage to habitats and farmlands due to channel obstructions, and decreased bank stability associated with shallow-rooted arundo.
- Fire Hazards: Substantially increased danger of wildfire occurrences, intensity, and frequency, and a decrease in the value that riparian areas provide as firebreaks or buffers when infested with arundo.
- Native Habitats: Displacement of critical riparian habitat through monopolization of soil moisture by dense monocultures of arundo and tamarisk (particularly near Piute Ponds).

- Native Wildlife: Reduction in diversity and abundance of riparian-dependent wildlife due to decreased habitat quality, loss of food and cover, and increased water temperatures.
- Threatened and Endangered Species: Substantial reductions in suitable habitat available for state and federally listed species such as the least Bell's vireo.

## 3.5 Land Use

Cities and counties (for unincorporated areas) are the regulatory agencies responsible for land use planning within the State of California. Land use regulations and policies such as general plans, zoning ordinances, California Environmental Quality Act (CEQA) compliance, and permit conditions can be valuable policy and implementation tools for effective water management. The California Government Code establishes requirements for the development of General Plans to guide land use decisions, of which water resources play an important role. "Water resources" is typically not an 'element' of a General Plan, but is discussed within the context of the General Plans required 'elements'; land use, circulation, housing, conservation, open space, noise, and safety.

Land uses within the Antelope Valley Region are provided for in local and regional policies and regulations, including the Los Angeles County General Plan (adopted October 2015), the Antelope Valley Area General Plan (adopted June 2015), Kern County General Plan (approved June 2004 and last amended September 2009), the City of Palmdale General Plan (last updated 1993, update pending) and the City of Lancaster General Plan (last updated 2009).

State legislation has also addressed the gap between land use planning and water resource management. In 2001, two water supply planning bills, Senate Bill 610 (SB 610) and Senate Bill 221 (SB 221), were enacted that require greater coordination and more extensive data to be shared between water suppliers and local land use agencies for large development projects and plans. SB 610, codified as Water Code sections 10910 and 10911, requires the public water system that may supply water to a proposed residential development project of more than 500 dwelling units (or a development project with similar water use), to prepare a water supply assessment for use by the lead planning agency in its compliance with CEQA. Such a water supply assessment (WSA) is performed in conjunction with the land use approval process associated with the project and must include an evaluation of the sufficiency of the water supplies available to the water supplier to meet existing and anticipated future demands. SB 221 requires projects which include tentative tract maps for over 500 dwelling units to obtain verification from the water system operator that will supply the project with water that it has a sufficient water supply to serve the proposed project and all other existing and planned future uses, including agricultural and industrial uses, in its area over a 20-year period, even in multiple dry years. SB 221 is intended as a "fail safe" mechanism to ensure that collaboration on finding the needed water supplies to serve a new large subdivision occurs before construction begins. Statutes making conservation a California way of life may also impact future land use development. As previously noted, Water Conservation and Drought Planning (SB 606 and AB 1668) mandates a target of 55 GPCD by 2025 and 50 GPCD by 2030. The two bills strengthen the state's water resiliency in the face of future droughts with provisions that include long-term standards for efficient water use that apply to retail water suppliers. Both urban and agricultural water supplies are required to set annual water budgets and prepare for future droughts. To meet these standards, water suppliers must consider future land uses and account for projected development in the Region. Also approved in 2018, the Landscape Water Use Efficiency bill (AB 2371) declared that approximately one-half of the urban potable water provided in California is used outdoors, primarily for landscape irrigation. AB 2371 enacted into law several measures to increase efficiency and sustainability of landscape water use. These outdoor water use efficiency measures may impact future landscape development in urban areas of the Region.

As growth in the Antelope Valley Region is rapidly increasing, and larger development projects are being proposed, the preparation of WSAs or written verifications pursuant to these bills is becoming increasingly more common, forcing water purveyors in the area to question their ability to provide service to these developments. If water supplies are deemed not available, developers in the Antelope Valley Region will be required to find water outside the Antelope Valley Region in sufficient quantities to serve their projects.

## 3.5.1 Regional Land Use Issues and Needs

The key issues, needs, challenges, and priorities for the Antelope Valley Region with respect to land use management include the following, which are discussed in greater detail below:

- Growing public demand for recreational opportunities;
- Pressure for growth in the Antelope Valley Region;
- Loss of local culture and values; and
- Dust control.

### 3.5.1.1 Growing Public Demand for Recreational Opportunities

The Antelope Valley Region offers many recreational opportunities. The Antelope Valley Region has over 410 acres of developed park land including 27 parks, 22 softball fields, five baseball fields, 21 soccer fields and 17 tennis courts. In addition there are over 3,000 acres of natural park land and approximately 5,600 acres of upland and wetland natural areas at Piute Ponds. The Antelope Valley Region is also home to the 1,700-acre California Poppy Reserve, the Arthur B. Ripley Desert Woodland State Park, and the Saddleback Butte State Park. The Antelope Valley Area Plan implemented the adopted Bikeway Plan for the Antelope Valley in cooperation with the cities of Lancaster and Palmdale to create a unified and well-maintained bicycle transportation system with safe and convenient routes for commuting, recreation, and daily travel. Many recreational activities take place in the eastern, less populated areas of the Antelope Valley Region. BLM has identified the following types of recreational activities in the high desert: motorcycle activities, four wheel drive exploring, sightseeing, target shooting, hunting, experimental vehicles/aircraft, model rocketry, dry land wind sailing, endurance equestrian rides, hiking, mountain biking, bird watching, botany, rockhounding, camping, and picnicking.

The Antelope Valley Region is located only 90 miles from downtown Los Angeles; the proximity allows residents to utilize the Antelope Valley Region as their "recreational backyard." The high desert Antelope Valley Region has attracted nearly 2 million visitor-trips a year for off-highway vehicle recreation and nearly 1.5 million visitors to State and National Parks in the area (BLM 2005). The Antelope Valley Poppy Reserve has become increasingly popular due to social media influences, particularly during the wildflower season when poppies cover the Reserve's hillsides. During the 2008 flower super bloom, approximately 65,000 people visited the Reserve during the entire season. In comparison, the 2017 flower super bloom attracted approximately 67,000 visitors between mid-March and early April, and a total of 164,000 visitors during the wildflower season (Cox 2017; Rosato 2019). BLM estimates that 85 percent of recreational visitors to the high desert are from the urban areas of Southern California. Demand for recreational resources in the Antelope Valley Region is particularly acute due to the lack of other similar resources near these urban areas and due to a decrease in recreational opportunities elsewhere. For example, since 1980 the number of acres of off-highway vehicle recreation areas has decreased by 48 percent in California. In the same time period off-highway vehicle registrations in California increased by 108 percent (BLM 2005). As population increases in Southern California and the Antelope Valley Region, there will be increasing pressure to maintain and expand the Antelope Valley Region's recreational opportunities.

#### 3.5.1.2 Pressure for Growth in the Antelope Valley Region

Historically, land uses within the Antelope Valley Region have focused primarily on agriculture. This is partly dependent on the types of soils found in the area, the majority of which have been classified by the U.S. Soil Conservation Service as prime soils, which are best for agricultural production. Coupled with lower water costs and favorable climatic conditions, productivity has been maintained throughout the years, although pressures for developable land have also increased (Los Angeles County 1993). Approximately 73,000 acres of land in the Antelope Valley Region were in agricultural production in the early 1950s (USGS 1995). There was a surge in irrigated acreage when AVEK introduced SWP water to the western Antelope Valley Region in 1972 at prices competitive with the costs of pumping ground water (LACDPW 1989). However, the overall trend for agricultural land use continued to decrease through the 1980s and 1990s. During the late 1980s, carrot farmers in the San Joaquin Valley undertook marketing efforts to assess the acceptability of a potential new product, "baby carrots," to the public. Response was so positive that within only a few years, an entirely new market was created. Demand for these new, smaller carrots was so high, and they were so profitable, that farmers expanded into the Antelope Valley Region and other desert regions in search of additional planting acreage. The profit margin of this crop is such that cost of water is not a limiting factor for carrot farmers.

Currently, land uses within the Antelope Valley Region are in transition as the predominant land use is shifting from agriculture to residential and industrial. The increase in residential land use is evident from the population growth in the Antelope Valley Region. As presented in Section 2.10, growth in the Antelope Valley Region was slow until 1985, but increased rapidly (approximately 1,000 percent of the average growth rate between the years 1956 to 1985) as these land uses shifted. Population projections for the Antelope Valley Region indicate that nearly 535,000 people will reside in the Antelope Valley Region by the year 2040, an increase of approximately 38 percent from the 2010 population (refer to Section 2.10.2 for population projections analysis). The two most populous cities in the Valley Region are Lancaster and Palmdale. As residential development continues to grow within the middle of the Antelope Valley Region, the agricultural operations are now found farther to the west and east than in previous decades.

The large migration of people to the Antelope Valley Region is primarily based on economics. With significantly lower home prices than in other portions of Los Angeles County, the Antelope Valley Region has become an attractive and affordable alternative to living in the congested and expensive Los Angeles area. Additionally, it was recognized that the Antelope Valley Region is the last large available open space "opportunity" for development in Los Angeles County, including residential, commercial/industrial, retail, and agricultural.

#### 3.5.1.3 Local Culture and Values Could be Lost

The Stakeholders of this IRWM Plan have expressed concerns about the changing land use trends in the Antelope Valley Region, and feel that with the tremendous pressure for growth in the Antelope Valley Region, local culture and values could ultimately be lost.

Currently, industrial land use in the Antelope Valley Region consists primarily of manufacturing for the aerospace industry and mining. EAFB and the U.S. Air Force Flight Production Center (Plant 42) provide a strong aviation and military presence in the Antelope Valley Region. Reductions or realignments in the defense industry could adversely affect this presence.

Mining operations also contribute to the Antelope Valley Region's industrial land uses. Mining, a large part of the history of the Antelope Valley, has been less prominent in recent years, yet there are several mines that still produce quantities of gold and silver. One such mine, the Golden Queen Mining Company (formerly known as the Silver Queen mine) began a full scale recovery of gold, silver and aggregate in 2015, and since then many jobs have been created from the mining operation. Golden Queen Mining Company uses conventional open pit mining methods to extract gold and silver at the Soledad Mountain Mine, which is located 5 miles south of Mojave. Activities at the site include construction of infrastructure to support exploration activities, drilling, and mining. Since 2006, Golden Queen Mining has also invested more than half a million dollars to cleanup illegal dumping and remnants from historical mining operations in the northern slopes of Soledad Mountain (Golden Queen Mining N.D.). Rio Tinto's Borax mine in the community of Boron is considered one of the largest employers in the Antelope Valley aside from the U.S. Government, employing over 600 workers (GAVEA 2016). Aside from these operations, rock and gravel quarrying is also conducted in the southeastern part of the Antelope Valley Region along the mountain foothills.

Land use shifts increase the demand for water supply and higher quality water, thereby increasing the competition for available water supplies. This change in land use and increase in supply competition affects the dependence on imported SWP and groundwater supply, impacts fluctuations in groundwater levels, and heightens concerns over the potential for contamination and reliability of these supply sources.

As the Los Angeles population rapidly expanded into the Antelope Valley Region, bringing with it the desire for more cultural amenities and new skills and resources, the Antelope Valley Region became more metropolitan in character. The increase in population and development of tract housing, retail centers and business parks has altered the formerly low density, rural and agrarian character of many local communities.

Today, competing demands are placed on limited available resources. Many of these competing demands stem from the range of local cultural values that characterize the Antelope Valley Region. Decisions regarding future land use and the dedication of water resources will need to weigh varying agricultural, metropolitan, and industrial needs as they continue to develop, and as the balance between these interests continues to change.

Stakeholders commonly expressed the need to develop a balance of resources, while preserving the area's natural environment and rural history. Despite the need to ensure economic vitality and longevity by bringing new industry and employment opportunities to the Antelope Valley Region, residents of the Antelope Valley Region believe preserving a "hometown" feel and developing a strong sense of neighborhood stability are critical to strengthening the identity of the community and Region. The preservation of existing natural open space, achieved in part through a development strategy focused on infill and parcel redevelopment combined with environmental conservation, are key components of preserving the Antelope Valley Region's rural character and strengthening the health, vitality and security of growing urban areas.

#### 3.5.1.4 Dust Control

Dust control is a particular issue in the Antelope Valley as more land is disturbed and voided of vegetation by activities such as solar farming and mining. Disturbance to the soil causes a loss of soil protection that initiates dust issues and causes excessive runoff of soil particles and contaminants. Water supply can be impacted by a reduction of plant material in the soil that reduces soil permeability and water storage.

Water quality impacts from soil disturbance activities stem from an increase in runoff and a decrease in soil protection. Excessive runoff increases sediment and contaminant loading to streams and natural areas. Disturbed vegetation cover can also degrade ecosystems and delay the reestablishment of natural stream areas, which further impacts water quality.

Other environmental impacts from soil disturbance and vegetation cover loss include increased dust storms and lifestyle disturbance. Dust storms can cause road closures, a decline of populations in rural areas, and loss of utility services. It can also cause Valley Fever, which is an illness caused by a fungus that lives in the soil and dirt. Valley Fever is often found in cities like Palmdale and Lancaster, and other areas throughout Kern County. As land use in the Antelope Valley changes impacts to these resources need to be considered and balanced. As flood control and surface flow runoff diversion projects are considered, impacts to the dry lakebeds also need to be considered. A lack of surface water flow to maintain the cryptobiotic surface layer will cause breakdown of the lakebed surface structure and add to regional dust storm issues.

## 3.6 Climate Change

### 3.6.1 Identification of Vulnerabilities

Understanding the potential impacts and effects that climate change is projected to have on the Region allows an informed vulnerability assessment to be conducted for the Region's water resources. A climate change vulnerability assessment helps a Region to assess its water resource sensitivity to climate change, prioritize climate change vulnerabilities, and to ultimately guide decisions as to what strategies and projects would most effectively adapt to and mitigate against climate change. DWR has recommended IRWM Regions use the Climate Change Handbook for Regional Planning (developed by USEPA, DWR, Army Corps, and the Resource Legacy fund) as a resource for methodologies to determine and prioritize regional vulnerabilities. The Climate Change Handbook provided specific questions that help to identify key indicators of potential vulnerability, including:

- Currently observable climate change impacts (climate sensitivity)
- Presence of particularly climate-sensitive features, such as specific habitats and flood control infrastructure (internal exposure)
- Resiliency of a region's resources (adaptive capacity)

The Region's Climate Change Subcommittee conducted an exercise to answer vulnerability questions taken from Box 4-1 of the Climate Change Handbook and associated the answers with potential water management issues/vulnerabilities. The assessment is consistent with climate change issues identified in local water plans. See Appendix H for the completed vulnerability question worksheet. Included in this analysis are qualitative vulnerability questions framed to help assess resource sensitivity to climate change and prioritization of climate change vulnerabilities within a region. Answers to vulnerability questions are given for the Region with local examples provided as justification for the answer. Vulnerability issues are prioritized in the next section.

The Climate Change Subcommittee discusses the vulnerabilities of the Region's water resources to climate change

### 3.6.2 Prioritization of Vulnerabilities

The vulnerability issues identified in the climate change analysis discussed above were reviewed by the Climate Change Subcommittee in 2013, and some of the language was refined to better articulate the vulnerability issues of the Region. The revised vulnerability issues were then prioritized into three tiers based upon the perceived risk and importance of the issue. Those vulnerabilities posing the greatest risk of occurrence and resulting in the greatest impacts upon occurrence were ranked as the highest priority. The vulnerability issues were revisited by the stakeholder Group in 2019 as part of the IRWMP update to reflect the evolving conditions of the Region, but the priority remained the same.

The list of prioritized vulnerabilities developed and revised by the stakeholders in the Region is shown in Table 3-21, and they are discussed further below. Note that the vulnerability issues shown in Appendix H do not exactly match those in Table 3-21 since refinements and edits were made to the vulnerabilities during the prioritization process.

**Table 3-21: Prioritized Regional Vulnerability Issues**

| Priority Level | Category and Vulnerability Issue |
|---|---|
| **High** | • Water Demand/Supply: Limited ability to meet summer demand and decrease in seasonal reliability<br>• Flooding: Increases in flash flooding, with particular attention paid to the balance of flood control with habitat and lakebed needs which EAFB depends on<br>• Water Supply: Lack of groundwater storage to buffer drought<br>• Water Supply: Decrease in imported supply<br>• Water Supply: Invasive species can reduce supply available<br>• Ecosystem and Habitat: Increased impacts to water dependent species and decrease in environmental flows<br>• Water quality: Increased constituent concentrations |
| **Medium** | • Water Supply: Decrease in local surface supply<br>• Water Quality: Increased erosion and sedimentation<br>• Water Supply: Sensitivity due to higher drought potential<br>• Ecosystem and Habitat: Decrease in available necessary habitat |
| **Low** | • Water Demand: Industrial demand would increase<br>• Water Demand: Crop demand would increase per acre<br>• Water Demand: Habitat demand would be impacted<br>• Flooding: Increases in inland flooding |

The justifications as to why the following vulnerability issues were classified as high priority are provided below:

- *Limited ability to meet summer demand and decrease in seasonal reliability*: The Region has high irrigation demands during summers. Increases in temperature due to climate change would likely increase this already high demand, as well as decrease supplies available.

- *Increases in flash flooding, with particular attention paid to the balance of flood control with habitat and lakebed needs which EAFB depends on*: As discussed previously, flooding is common in the Region, particularly in the foothill areas. The projected increase in storm intensity will likely increase the occurrence, amount, and intensity of flash flooding and runoff. These changes will need to be managed carefully in light of habitats that depend on these seasonal flash floods and the needs of EAFB.
- *Lack of groundwater storage to buffer drought*: Groundwater levels are a longstanding issue in the Region. The Region is limited in terms of the groundwater stored from year to year, and has issues with groundwater quality in some areas. Should a prolonged drought occur, this resource may not be available to buffer supply needs during additional drought years.
- *Decrease in imported supply*: The Region is heavily dependent upon imported water supplies which are very susceptible to the impacts of climate change given their reliance on seasonal snowpack. The Region could not be solely dependent upon local resources to sustain the current economy, so some imported water must be secured. The supply is highly vulnerable at its source given the dependence upon the stability of the California Bay Delta levee system. Climate change impacts to this area from higher sea level rise and higher storm surges could be catastrophic to the supply.
- *Invasives can reduce supply available*: Invasive species are becoming more common in the Region, and may increase with the projected changes to temperature and precipitation. Certain invasive species, such as Tamarisk and Arundo, may reduce the water supply available for native species.
- *Increased impacts to water dependent species and decrease in environmental flows*: A number of water dependent species are present in the Region that require certain stream flows to maintain habitats, such as those species dependent on the Piute Ponds. The projected changes to local temperature and precipitation may impact these environmental flows, and impact water dependent species, particularly since these species have limited opportunity for migration.
- *Increased constituent concentrations*: Decreases in stream flows may reduce the ability for these streams to dilute water quality constituents. Should stream flows decrease due to increases in temperature and decreases in annual precipitation, the water quality of local streams may be impacted. In addition, the projected increase in wildfires in the surrounding mountains may lead to increased erosion and sedimentation in local streams.

It is the intention of the stakeholder group to maintain an ongoing process to gather data and revisit the prioritized vulnerabilities every five years along with other updates to the Antelope Valley IRWM Plan. This data collection and analysis will be directed by the A-Team.

The RWMG adopted Objectives and Resource Management Strategies that respond to the high priority vulnerabilities identified in this assessment. The RWMG also addressed the high priority vulnerabilities through the prioritization and integration of Projects into the IRWM Plan. Like the vulnerability assessment, the Objectives, Resource Management Strategies, and Projects will also be regularly updated to reflect the evolving climate change threats to the Region.

## 3.7 DAC Issues and Needs

To help characterize DAC areas in the Region, identify DAC water resource issues, and develop implementation strategies (including a monitoring plan), two separate technical memoranda were prepared during the 2013 IRWMP Updates:

- *DAC Water Supply, Quality and Flooding Data Final Draft TM* (August 2, 2013) – This document explains the methodology used to identify DAC areas in the Region with census and Geographical Information System (GIS) tools; develops maps for DACs; documents the DAC outreach efforts undertaken as a part of the 2013 IRWMP Updates; and outlines specific issues for DACs related to water supply, water quality, and flooding. Maps are included that further illustrate the scope of these issues. The document also provides a preview of monitoring studies that are needed to address data gaps in these three water-related areas.

- *DAC Monitoring Plan Final Draft TM* (September 25, 2013) – This document summarizes the water supply, water quality, and flood protection issues for DACs in the Region; develops monitoring objectives; and provides guidance for data dissemination and reporting.

  The monitoring objectives developed in this TM may be summarized as:

  - Water supply
    - Track volume of supplies delivered to DACs by water source and supplier
    - Assess conditions of aging facilities (wells, treatment systems and pipelines) to determine need for new or improved infrastructure
  - Water quality
    - Track the quality of drinking water delivered to DACs
    - Map groundwater quality issues in DACs to determine areas of poor groundwater quality and need for treatment
  - Flood protection
    - Track flood incidents in DACs to determine need for flood infrastructure improvements (flood incident date and location, storm intensity, and flood depth.

For additional details on these topics, these documents are included in Appendix D.

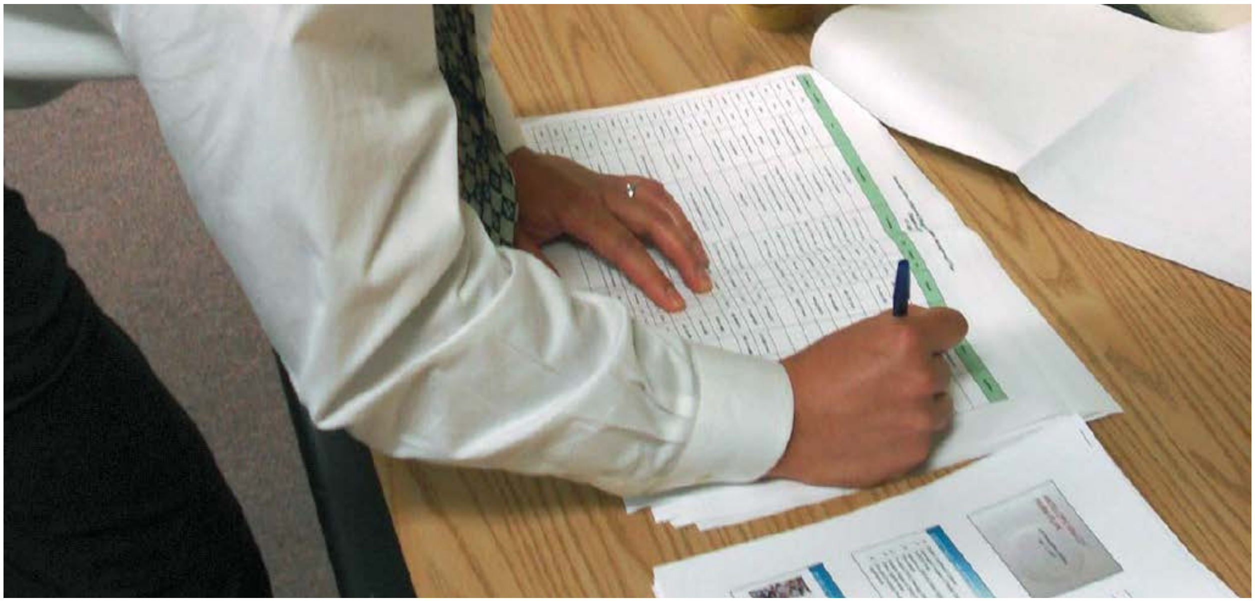
# Section 4 | Objectives

***The following section presents the Region's IRWM Plan objectives and establishes planning targets for the Antelope Valley Region that can be used to gauge success in meeting these objectives. Objectives refer to the general intent for planning within the Antelope Valley Region, whereas the targets refer to specific measurable goals intended to meet the objectives. These Objectives and Planning Targets were originally established in 2007 and were revised during the 2013 and 2019 IRWM Plan updates. This section describes how the objectives were developed, what information was considered, what groups were involved in the process, and how the final decision was made and accepted by the IRWM stakeholders.***

## 4.1 Objectives Development

The primary focus of this IRWM Plan is to develop a broadly-supported water resources management plan that defines a meaningful course of action to meet the expected demands for water and related resources within the Antelope Valley Region between now and 2040. Goals to meet this primary focus were originally established in 2007 and were revised during the 2013 and 2019 IRWM Plan updates. The goals constitute the most general statement of intent and include maintaining a plan that will address:

- How to reliably provide the quantity and quality of water that will be demanded by a growing population;
- Options to satisfy agricultural users' demand for reliable irrigation water supplies at reasonable cost; and
- Opportunities to protect, enhance, and manage current water resources and the other environmental resources for human and natural benefit within the Antelope Valley Region.



These general goals were developed by the Stakeholder Group to provide broad direction. Soon after, the Stakeholder Group developed objectives to help clarify how the issues and needs of concern for the Antelope Valley Region would be addressed. These objectives were designed to be more specific than the general goals mentioned above. The list of objectives was developed in 2007 and then revised again during discussions at stakeholder meetings in August and October of 2012. The objectives were revisited once more during the January 2018 and August 2019 stakeholder meetings and revised to comply with the 2016 IRWM Program Guidelines. During these revisions, stakeholders indicated broad consensus on the changes to the objectives during the meetings, and this was recorded in the meeting notes that are published to the www.avwaterplan.org website. The IRWM objectives consider all Lahontan Basin Plan objectives, 20x2020 water efficiency goals, and the CWC 10540(c) requirements as well as the specific needs of the Antelope Valley as represented by regional and local planning documents.

During the August and October 2012 stakeholder meetings, a discussion about prioritization of objectives was conducted. It was decided that for the Antelope Valley Region, objectives would not be prioritized with the understanding that each objective is equally important relative to the others given that the IRWM Plan is intended to be a truly integrated plan that incorporates all areas of water resource management. In addition, stakeholders feel that a more equal level of importance placed on each of the objectives contributes to the success of the stakeholder group interactions. The Antelope Valley Region may choose, however, to prioritize these objectives relative to grant requirements to enhance project prioritization and selection in the future. In those cases, the type of funding program will dictate which objective should be emphasized.

After objectives were established, even more specific planning targets were developed to establish quantified benchmarks for implementation of the IRWM Plan. The planning targets include deadlines and describe quantitative measurements where applicable. The IRWM Plan addresses the Antelope Valley Region’s water resource management needs, open space, recreation, habitat, and climate change related targets. The planning targets were originally established in 2007 and were revised by the Stakeholder group during the 2013 IRWM Plan updates at stakeholder meetings in August and October 2012. During these revisions, stakeholders indicated broad consensus on the changes to the planning targets during the meetings, and this was recorded in the meeting notes that are published to the www.avwaterplan.org website. In addition, objectives and targets related to climate change were developed by the Region’s Climate Change Committee in a workshop held in November 2012.

The new climate change related objectives and targets were presented and agreed upon by stakeholders in the December 2012 stakeholder meeting as recorded in the meeting notes published to the www.avwaterplan.org website.

The targets, including those related to climate change, were revised once more during the 2019 IRWM Plan updates by the Stakeholder group during a stakeholder meetings held on January 2018 and August 2019. Targets were updated to satisfy 2016 IRWM Program updates and remain representative of the Region.

It is important to note that planning targets do not stipulate who is responsible for performing activities that will meet the numerical targets, nor do they specify exactly what projects will be implemented. The objectives and planning targets are presented below (and are summarized in Table 4-1).

**Table 4-1: Antelope Valley Region Objectives and Planning Targets**

| Objectives | Planning Targets |
|---|---|
| ***Water Supply Management*** | |
| Provide reliable water supply to meet the Antelope Valley Region's expected demand between now and 2040; and adapt to climate change. | Maintain adequate supply and demand in average years. |
| | Provide adequate reserves (77,200 AFY) to supplement average condition supply to meet demands during single-dry year conditions, starting 2009. |
| | Provide adequate reserves (198,800 AF/ 4-year period) to supplement average condition supply to meet demands during multi-dry year conditions, starting 2009. |
| | Adapt to an additional 7-10% reduction in imported deliveries by 2050, and an additional 21-25% reduction in imported water deliveries by 2100. |
| Establish a contingency plan to meet water supply needs of the Antelope Valley Region during a plausible disruption of SWP deliveries. | Demonstrate ability to meet regional water demands over an average year without receiving SWP water for 6 months over the summer by 2025 |
| Stabilize groundwater levels. | Manage groundwater levels throughout the basin such that Production Rights defined in the adjudication Judgement are met by 2023. |
| ***Water Quality Management*** | |
| Provide drinking water that meets regulatory requirements and customer expectations. | Continue to meet Federal and State water quality standards as well as customer standards for taste and aesthetics throughout the planning period. |
| Protect and maintain aquifers. | Prevent unacceptable degradation of aquifer according to the Basin Plan throughout the planning period. |
| | Map contaminated sites and monitor contaminant movement, by 2017. |
| | Identify contaminated portions of aquifer and prevent migration of contaminants, by 2017. |

| Objectives | Planning Targets |
|---|---|
| Protect natural streams and recharge areas from contamination. | Prevent unacceptable degradation of natural streams and recharge areas according to the Basin Plan throughout the planning period. |
| Maximize beneficial use of recycled water. | Increase infrastructure and establish policies to use 33% of recycled water to help meet expected demand by 2015, 66% by 2025, and 100% by 2035. |
| ***Flood Management*** | |
| Reduce negative impacts of stormwater, urban runoff, and nuisance water, and adapt to climate change impacts in the future. | Coordinate a regional Stormwater Resource Plan and policy mechanism by the year 2025 and incorporate adaptive management strategies for climate change. |
| Optimize the balance between protecting existing beneficial uses of stormwater and capturing stormwater for new uses. | |
| ***Environmental Resource Management*** | |
| Preserve open space and natural habitats that protect and enhance water resources and species in the Antelope Valley Region. | Contribute to the preservation of an additional 2,000 acres of open space and natural habitat, to integrate and maximize surface water and groundwater management by 2025. |
| ***Land Use Planning/Management*** | |
| Maintain agricultural land use within the Antelope Valley Region. | Preserve 100,000 acres of farmland in rotation[1] through 2040. |
| Meet growing demand for recreational space. | Contribute to local and regional General Planning documents to provide 5,000[2] acres of recreational space by 2040. |
| Improve integrated land use planning to support water management. | Coordinate a regional land use management plan by the year 2025 and incorporate adaptive management strategies for climate change. |
| ***Climate Change Mitigation*** | |
| Mitigate against climate change. | Implement "no regret" mitigation strategies,[3] when possible, that decrease GHG's or are GHG neutral. |

## 4.2 Water Supply Management Objectives and Planning Targets

Water supply management objectives and planning targets are directly related to addressing the key issues and needs identified in the water supply assessment in Section 3, including water supply and groundwater management issues.

[1] The phrase "in-rotation" means that not all 100,000 acres will be in agricultural production at one time; instead, the land will be rotated in cycles to make most efficient use of the land.

[2] The City of Palmdale and City of Lancaster's General Plans provide a standard of 5 acres of parkland per 1,000 City residents. The Kern County General Plan provides a standard of 2.5 acres per 1,000 residents. The other local and regional General Plans do not provide a standard for "recreation or parkland" preservation. This planning target assumes a 2040 population of 535,000 residents in the Antelope Valley Region.

[3] No regret projects are projects that would still be considered beneficial even if climate change weren't happening.

Water Supply Management Objectives and Planning Targets address the following CWC 10540(c) requirements:

- Protection and improvement of water supply reliability, including identification of feasible agricultural and urban water use efficiency strategies
- Identification of any significant threats to groundwater resources from overdrafting

**Objective: Provide reliable water supply to meet the Antelope Valley Region's expected demand between now and 2040; and adapt to climate change.**

Reliability is defined herein as the likelihood that a certain amount of water will be delivered to a specific place at a specific time. Reliability depends on the availability of water from the source, availability and capacity of the means of conveyance, and the level and pattern of water demand at the place of delivery.

As discussed in Section 3, the Antelope Valley Region's expected demand between 2015 and 2040 will increase from 144,700 to 257,500 acre-feet per year (AFY) for an average water year. The planned water supply for an average water year is approximately 160,100 to 238,000 AFY, respectively. This indicates a potential surplus of between 5,000 and 21,800 AFY for the Region through 2025, but a deficit of up to 19,500 AFY through 2040. There is also a mismatch of 77,200 AFY for a single dry water year and 198,800 AF/4-yrs for a consecutive 4-year multi-dry year condition. This mismatch could be further exacerbated by climate change as projected changes in the amount, intensity, timing, and quality of precipitation in the Region could have adverse impacts on local water supply recharge. Water supply reliability is further threatened by climate change as the Region is heavily dependent on imported SWP supplies. Sea level rise jeopardizes the California Bay Delta levee system, and levee failures would cause saltwater intrusion on vital freshwater supplies. Sea level rise is expected to cause significant declines in SWP allocations.

In order to assure a reliable water supply, the following three planning targets have been identified based on the regional population estimates shown in Table 2-3. However, if actual growth is less than projected or if average annual water use per capita decreases due to conservation efforts, then the overall demand for the Antelope Valley Region would decrease as well. Any reduction in demand would reduce the mismatches. Similarly, this target assumes the supply from only currently planned sources presented in Section 3 and that groundwater extractions are limited to the TSY of 110,000 AFY. Limitations on imported water, local surface water, and/or recycled water could reduce the available supplies.

Note that the second and third targets have been revised to reflect changed conditions since 2013.

- Target: Maintain adequate supply and demand in average years.
- Target: Provide adequate reserves (77,200 AFY) to supplement average condition supply to meet demands during single-dry year conditions, starting 2009.
- Target: Provide adequate reserves (198,800 AF/4-year period) to supplement average condition supply to meet demands during multi-dry year conditions, starting 2009.
- Target: Adapt to additional 7-10% reduction in imported deliveries by 2050, and additional 21-25% reduction in imported water deliveries by 2100.[4]

These Planning Targets may be measured by using the supply and demand information in the various UWMPs developed for water suppliers in the Antelope Valley, along with the other information

[4] Estimated imported water delivery reduction from California Climate Change Center, 2009. Using Future Climate Projections to Support Water Resources Decision Making in California. CEC-500-2009-052-F.

sources for demand and supply numbers described in Sections 2 and 3. These numbers will be updated each time the IRWM Plan is updated.

**Objective: Establish a contingency plan to meet water supply needs of the Antelope Valley Region during a plausible disruption of SWP deliveries.**

Given the Antelope Valley Region's dependence on SWP water, as discussed in Section 3, all elements of its reliability should be considered. Fluctuations in SWP deliveries due to climatic changes have already been incorporated in the supply and demand comparisons for average, single-dry, and multi-dry year conditions, as provided in Section 3. However, impacts to the Antelope Valley Region in the event of an outage or disruption of SWP water due to emergency situations (e.g., a flood, earthquake, power outage, or other disaster) also need to be considered and a response planned. In the event of a temporary loss of SWP for 6 months over the summer, the Antelope Valley Region would be short an additional 65,000 AFY in an average water year. This estimate assumes that 33 percent (1/3) of demands occur during winter months (October through March) and 66 percent (2/3) occur in summer months (April through September); and it is based on the direct deliveries for AVEK discussed in Section 3.1.1.2.[5] This shortage would be in addition to the 19,500 AFY shortage already projected in an average year, as discussed in Section 3.1.3. The Antelope Valley Region needs to address and identify necessary actions to accommodate for such a loss and to ensure imported water supply; therefore, the following target has been identified.

- Target: Demonstrate ability to meet regional water demands over an average year without receiving SWP water for 6 months over the summer by 2025.

This Planning Target may be measured by using UWMPs and other capacity related planning documents to show that sufficient pumping capacity exists in the Region to provide 65,000 AFY of water over a six-month time period during the summer. This represents a "worst case scenario" since under dry year and multi-dry year scenarios, smaller allotments of imported water would be available to begin with. So 66 percent reductions in these smaller amounts would have less impact.

**Objective: Stabilize groundwater levels.**

As previously mentioned, a decrease in groundwater levels has led to incidences of land subsidence within the Antelope Valley Region, which may result in the loss of groundwater storage as well as a possible degradation of groundwater quality. Accordingly, maintaining groundwater levels is a key component to managing the groundwater basin and ensuring its reliability by preventing future land subsidence. The Antelope Valley Groundwater adjudication Judgment has already established groundwater production targets with the goal of achieving groundwater sustainability in an equitable manner. The objectives and targets set forth in this IRWM Plan support the adjudication Judgement.

- Target: Manage groundwater levels throughout the basin such that Production Rights defined in the adjudication Judgement are met by 2023.

This Planning Target may be measured by using the information provided in the Antelope Valley Watermaster Annual Reports. Under the Judgement, the Watermaster Engineer has the

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[5] An average water year for the Region has approximately 96,000 AFY of direct deliveries from imported water providers. AVEK typically delivers 400 AF/day between June 15th and September 30th in any given year. During other times of year, AVEK typically delivers 150 AF/day. These values dictate that approximately 33% of annual demands occur in winter months (October to March) and 66% occur in summer months (April to September). Therefore, approximately 66% of average year direct deliveries (65,000 AFY) would not be available during a 6-month disruption over the summer.

responsibility of preparing annual reports for the Court, which provide groundwater level data and analyses.

## 4.3 Water Quality Management Objectives and Targets

This IRWMP aims to assist the Antelope Valley Region in achieving the following water quality concerns : identification and management of wellhead protection areas and recharge areas; regulation of the migration of contaminated groundwater; construction and operation by local agencies of groundwater contamination cleanup, recharge, storage, conservation, water recycling, and extraction projects; development of relationships with State and Federal regulatory agencies; and review of land use plans and coordination with land use planning agencies to assess activities which create a reasonable risk of groundwater contamination.

Water Quality Management Objectives and Planning Targets were developed to address the following CWC 10540(c) requirements:

- Identification and consideration of the drinking water quality of communities within the area of the Plan
- Protection and improvement of water quality within the area of the Plan consistent with relevant basin plan
- Protection of groundwater resources from contamination

**Objective: Provide drinking water that meets regulatory requirements and customer expectations.**

As discussed in Section 3.2, water quality is generally good within the Antelope Valley except for the northeast portion of the dry lake areas. Groundwater in the principal aquifer generally meets the requirements for domestic, agricultural, and industrial uses. The exceptions to the good groundwater quality are some high concentrations of boron associated with naturally-occurring boron deposits, high nitrates associated with fertilizer use and poultry farming, and high arsenic levels that have been observed in water supply wells. The deeper aquifers typically have higher TDS levels.

In addition to meeting the Federal and State standards for water quality, other secondary standards (i.e., taste, color, and odor) may also affect a customer's overall satisfaction with the water. Although these constituents do not result in any health effects to the customer, they do impact the customer's desire to drink and use the water. Thus the following Planning Target has been identified.

- Target: Continue to meet Federal and State water quality standards as well as customer standards for taste and aesthetics throughout the planning period.

This Planning Target may be measured by using potable water quality data made available by the water purveyors in the Region through annual water quality reports, and using this information to track exceedances of drinking water quality standards.

**Objective: Protect and maintain aquifers.**

Groundwater is a main component of the Antelope Valley Region's water supply. Any loss of supply due to water quality degradation or contamination[6] would significantly hinder the Antelope Valley Region's ability to meet anticipated demands. As the Antelope Valley Region begins to reduce its exclusive dependence on imported water, utilize more recycled water, and implement additional recharge and storage projects, protecting the aquifer will become increasingly more important. All of

[6] For the purposes of this IRWM Plan, any increase in constituent levels over naturally occurring levels is considered "degradation"; any increase in constituent levels over the State or Federal standards is considered "contamination".

these non-groundwater sources can potentially cause degradation to the existing groundwater supply during recharge, possibly to the point of contamination. Identifying sources of degradation and taking appropriate measures to reduce or eliminate the potential for contamination is crucial to ensuring a reliable water supply. Where contamination has occurred, programs and projects must be implemented to prevent migration to other areas of the Basin. In some cases, treatment or remediation may be required to prevent migration. An area of the Basin that has been identified as contaminated is the portion of the aquifer near the Los Angeles World Airport where the spreading of wastewater effluent has resulted in a decline in water quality.[7] Other sources of potential degradation are from wells no longer in service that that have not been properly abandoned. These wells are suspected of drawing on water of a lesser quality from the deep aquifer to intermix with the water of the upper aquifer, degrading its quality. These areas and others should be identified, mapped, and monitored to prevent any future migration. The mapped information should include constituent concentrations in areas of concern, including TDS, nitrogen species (ammonia, nitrate, and nitrite), chloride, arsenic, chromium, fluoride, boron, and constituents of emerging concern (CECs; e.g., endocrine disrupters, personal care products or pharmaceuticals) consistent with the actions by the State Water Resources Control Board (SWRCB) taken pursuant to the Recycled Water Policy. Accordingly, the following Planning Target has been identified, which will involve monitoring these recharge sources to ensure they have negligible impacts to the groundwater supply.

- Target: Prevent unacceptable degradation of aquifer according to the Basin Plan throughout the planning period.
- Target: Map contaminated sites and monitor contaminant movement by 2017.
- Target: Identify contaminated portions of aquifer and prevent migration of contaminants by 2017.

These Planning Targets may be monitored by mapping data from SWRCB's Groundwater Ambient Monitoring and Assessment (GAMA) program which collects groundwater quality data from a number of sources to track changes in groundwater quality over time. The SWRCB is responsible for administering and maintaining the GAMA data. The Planning Targets to 1) map contaminated sites and monitor contaminant movement by 2017, and 2) identify contaminated portions of aquifer and prevent migration of contaminants by 2017, are both addressed in the 2014 SNMP for the Antelope Valley. These efforts are ongoing and will be revised with future SNMP updates.

#### Objective: Protect and maintain natural streams and recharge areas.

In addition to protecting the aquifer, it is also important to protect the surface water areas of the Antelope Valley Region from degradation and contamination[8]. Natural streams feed the Littlerock Creek, Amargosa Creek, Anaverde Creek, Cottonwood Creek, and others as well as recharge areas in the Antelope Valley Region. Thus, any degradation in water quality in the streams could result in contamination of this surface water supply as well as degradation in the recharge areas. Thus the following Planning Target has been identified.

- Target: Prevent unacceptable degradation of natural streams and recharge areas according to the Basin Plan throughout the planning period.

This Planning Target may be monitored by agencies already monitoring local surface waters, including PWD (which monitors Littlerock Creek), and the Los Angeles County Watershed

[7] As required by the November 2003 Cleanup and Abatement Order, and October 2004 Cease and Desist Order issued to LACSD by the Lahontan Region RWQCB.
[8] For the purposes of this IRWM Plan, any increase in constituent levels over naturally occurring levels is considered "degradation"; any increase in constituent levels over the State or Federal standards is considered "contamination".

Management Division and Kern County which monitor general surface water quality of surface waters (general minerals).

**Objective: Maximize beneficial use of recycled water.**

As discussed in Section 3, approximately 18,300 AFY of recycled water will be available for use by 2040, assuming treatment plant upgrades and distribution system development occur as planned. This estimate does not include current environmental maintenance uses. However, only approximately 350 AFY were utilized as of 2015. Beneficial use of additional recycled water would require additional infrastructure to treat and deliver the recycled water, as well as development of policies to encourage or require recycled water use for irrigation for existing beneficial uses or for groundwater recharge. The Los Angeles County and Antelope Valley Area General Plans currently identify general goals and policies to encourage groundwater recharge and reuse of recycled water. Moreover, the reuse of recycled water for municipal, industrial, and groundwater recharge end uses is critical for the long-term supply reliability of the Region. The development of this infrastructure and time to implement such policies is likely to occur in phases as resources are made available. Therefore, the following Planning Target has been identified.

- Target: Increase infrastructure and establish policies to use 33 percent of recycled water to help meet expected demand by 2015, 66 percent by 2025, and 100 percent by 2035.

This Planning Target may be measured by monitoring programs maintained by LACSD to record the amounts of recycled water delivered to customers. Documents such as annual reports for the Lancaster WRP and Palmdale WRP may be used to obtain the information.

## 4.4 Flood Management Objectives and Targets

Flood Management Objectives and Planning Targets address the following California Water Code (CWC) 10540(c) requirements:

- Protection, restoration, and improvement of stewardship of aquatic, riparian, and watershed resources within the region

**Objective: Reduce negative impacts of stormwater, urban runoff, and nuisance water, and adapt to climate change impacts in the future.**

**Objective: Optimize the balance between protecting existing beneficial uses of stormwater and capturing stormwater for new uses.**

As described in Section 3.3, the Antelope Valley is prone to flash flooding, and this situation is aggravated by the lack of a coordinated and comprehensive drainage infrastructure system for managing stormwater and urban runoff. Stormwater tends to be of poor quality and high in sediment, and is further degraded by urban runoff. The Region recognizes that it may be vulnerable to potential increases in flooding due to projected changes in the amount, intensity, timing, quality, and variability of precipitation caused by climate change.

Extensive growth in the Antelope Valley has occurred in both major cities as well as unincorporated County areas. This growth both increases the amount of impervious surfaces in the Valley and the number of homes and businesses subject to the negative impacts of flooding and in need of flood protection. Flood waters are necessary to provide benefits in natural areas of the Region. One example of the importance of maintaining natural flood flow areas is Rosamond Dry Lake at the lowest elevation in the watershed. This lake requires significant flooding to maintain the biological crust that protects the lakebed surface from breaking down during high wind events. By protecting the lakebed surface, the air quality in the Antelope Valley is protected, and the operational mission of EAFB is protected by providing a suitable surface to test experimental aircraft and processes, which in turn provides jobs to Antelope Valley residents.

To adequately address the need for maintained flood effects, and to limit flood damage in a cost-effective manner, flood management efforts should take place on a regional scale and should be coordinated across jurisdictions. This scope and level coordination would also provide some consistency both in costs associated with flood prevention and mitigation, and in permitting requirements for Antelope Valley residents, businesses and developers. With the Antelope Valley Region having a great water supply need there is the added incentive for the flood management systems to convey waters of suitable quality to recharge systems to augment groundwater supply for the benefit of multiple communities. Additionally, as discussed in Sections 2 and 3, changes in precipitation brought on by climate change are predicted to increase flash flooding in the Valley. To help respond to this, the Region can implement adaptive flood management that will allow for the continued multi-benefit use of flood water while maintaining flood protection.

Furthermore, urban development and revitalization efforts implemented on a regional scale that can protect natural and man-made amenities, while avoiding severe hazard areas such as flood prone areas, would be consistent with the goals and policies of the various land use authorities including incorporated cities and Kern and Los Angeles counties. New development is encouraged to protect drainage courses in as natural a state as possible, while minimizing modification of the natural carrying capacity or production of excessive siltation. Flood Zones are identified within the Antelope Valley Area General Plan, and include areas that are subject to a high risk of flooding during storm events such as Amargosa Creek, Anaverde Creek, Big Rock Creek, Little Rock Creek, the frontal canyons on the north slope of the San Gabriel Mountains, drainages from the north face of Portal Ridge, and the upper reaches of the Santa Clara River through Acton. Development is regulated within these areas by either not permitting the development (due to extreme hazard) or by requiring new development to conform to special performance requirements in the flood fringe areas adjacent to a waterway.

While optimizing the balance between protecting existing beneficial uses of stormwater and capturing stormwater for new uses, it is important to acknowledge that the natural habitats downstream (e.g., Piute Ponds) are very dependent on the natural flows. Although some natural habitats have been sustained through the years by recycled water, the dramatic stormflows are still a major component of the system. The magnitude of these stormflows provides needed clearing of vegetation, sediment, and water to wetland and wet meadow areas. A major alkali mariposa lily population exists in the Piute Pond Complex and requires surface water flow to maintain.

The local and regional General Plan policy documents pertaining to flood management within the Antelope Valley Region can be found in Table 8-1 in Section 8.

Effective storm water planning and management on a watershed basis involves collaboration of local and regional governments, utilities, and other stakeholder groups to analyze the hydrology, storm drain/runoff conveyances systems, opportunity sites, and other habitat or community needs within sub-watersheds. Development of a regional Storm Water Resource Plan (SWRP) could facilitate inter-agency efforts to maximize the beneficial use of storm water by establishing guidance for project implementation and providing a high-level analysis of the overall benefits and impacts of each project and program implemented in accordance with the SWRP.

Accordingly, the following Planning Target has been identified:

- Target: Coordinate a regional Storm Water Resource Plan and policy mechanism by the year 2025 and incorporate adaptive management strategies for climate change.

This Planning Target may be measured by the incorporation of regional integrated stormwater management strategies, including adaptive management strategies for climate change, into the 2019 IRWMP Update. The Update may also include recommendations for a policy mechanism.

## 4.5 Environmental Resource Management Objectives and Targets

Environmental Resource Management Objectives and Planning Targets address the following CWC 10540(c) requirements:

- Protection, restoration, and improvement of stewardship of aquatic, riparian, and watershed resources within the region

**Objective: Preserve open space and natural habitats that protect and enhance water resources and species in the Antelope Valley Region.**

As described earlier, due to its proximity to the Los Angeles area, the Antelope Valley is subject to increasing demand for community development, recreation, and resource utilization. Population in the Antelope Valley is expected to increase by 38 percent between 2010 and year 2040. Some of this growth will result in the conversion of agricultural land, while some of this growth will occur in areas that are currently natural and undeveloped. Loss of both agricultural acreage and natural areas decreases the amount of open space in the Valley. Open space can mean natural open space, passive and active recreation which may or may not be compatible with natural habitats, or natural open space preservation. As an example, open space can mean soccer fields, playgrounds, etc. that should not be considered natural habitat. This growth and the associated loss of open space could adversely affect local water resources through the loss of wetland areas and the watershed functions these areas provide (e.g., filtration of surface water, stormwater detention, habitat), and the loss of groundwater recharge areas.

Also of concern is the negative effect of urban growth on the unique biological resources of the Antelope Valley. As discussed in Section 3, besides a direct loss of habitat, increasing proximity to urban development is harmful to sensitive desert species, several of which are found only in the Antelope Valley Region. Examples of species that are impacted include the desert tortoise, Mohave ground squirrel, Arroyo toad, burrowing owl, alkali mariposa lily, and Joshua tree.

Thus, the following Planning Target has been identified to preserve open space and natural habitats that protect and enhance water resources and species in the Antelope Valley Region.

- Target: Contribute to the preservation of an additional 2,000 acres of open space and natural habitat, to integrate and maximize surface and groundwater management by 2025.

This Planning Target needs to be consistent with local planning objectives such as those identified in the Antelope Valley Area General Plan, the Kern County General Plan, and other management plans approved for the Antelope Valley Region, some of which are discussed below. This target is not limited to 2,000 acres, and conservation of acreages greater than 2,000 acres is encouraged. For future consideration, it may be useful to set a Planning Target regarding the inventory, mapping, and protection of a minimum number of acres/linear area of remaining natural areas that are dependent on flooding and their connectivity to the headwaters.

This Planning Target will be measured using land acquisition information (including acreage of open space preserved and number of parcels acquired) obtained through the Los Angeles County Department of Regional Planning, the Kern County Planning and Community Development Agency, and the Antelope Valley Conservancy.

Policies within the Antelope Valley Area General Plan implement Los Angeles County's General Plan, and further specify objectives and goals specific to that Antelope Valley Region. The Antelope Valley

Area General Plan identified several priority areas for conservation and protection to promote biodiversity, including significant ecological areas (SEAs) such as the Joshua Tree Woodlands, wildlife corridors, and other sensitive habitat areas. Potential development in these areas is limited, and new development is required to consider all potential environmental impacts.[9] Educational, observational, and light recreational uses could be allowed in these preserves and the preserves would also act as open space areas, enhancing the rural character of the Antelope Valley.

Through the identification and designation of SEAs within the Los Angeles County General Plan and the Antelope Valley Area General Plan, new urban growth or encroaching uses and activities would be controlled to ensure protection of ecological resources and habitat areas by regulating and establishing compatible land uses, and requiring design and performance criteria to be met. Although SEAs are neither preserves nor conservation areas, requiring development to be located around the existing biological resources would help to ensure protection of sensitive species and their habitats as well as helping to make the location and size of the preserved area scientifically defensible.

The Kern County General Plan does not identify specific open space or habitat areas to be preserved (Kern County 2008). The Kern County General Plan does, however, state that “The County will seek cooperative efforts with local, state, and federal agencies to protect listed threatened and endangered plant and wildlife species through the use of conservation plans and other methods promoting management and conservation of habitat lands.” Additionally, the open-space element of the Kern County General Plan contains measures for preserving open-space for natural resources.

The West Mojave Plan covers 9.4 million acres in the western portion of the Mojave Desert, including portions of Los Angeles and Kern counties. This habitat conservation plan and federal land use plan amendment presents a comprehensive strategy to conserve and protect the desert tortoise, the Mohave ground squirrel and over 100 other sensitive plants and animals and the natural communities of which they are a part. The West Mojave Plan accomplishes this by: designating 14 new Areas of Critical Environmental Concern (ACEC), adjusting four existing ACEC boundaries, and establishing other special management areas specifically designed to promote species conservation; designating allowed routes of travel on public lands to reduce species mortality from off-road vehicles; and, establishing other management prescriptions to guide grazing, mineral exploration and development, recreation, and other public land uses (BLM 2006). The West Mojave Plan is consistent with the existing conservation plans in the area, and would further the preservation of important species and their habitats that protect and enhance the Antelope Valley Region’s watershed.

Conservation and protection of the desert tortoise, the Mohave ground squirrel and over 100 other sensitive plants and animals and the natural communities of which they are a part, as described within the West Mojave Plan[10], would help the area meet this Planning Target (BLM 2006). The Plan is consistent with conservation plans and local policies for furthering habitat protection by prescribing appropriate uses within protected ACEC areas that limit human and non-native animal interaction with sensitive species to reduce mortality and habitat degradation.

[9] The SEA program is a component of the Los Angeles County General Plan Conservation/Open Space Element. SEAs are ecologically important land and water systems that support valuable habitat that plants and animals, often integral to the preservation of rare, threatened or endangered species and the conservation of biological diversity in Los Angeles County. Source: Los Angeles County Department of Regional Planning, http://planning.lacounty.gov/sea

[10] “While many of the general conservation concepts and species accounts are valid in the West Mohave Plan the Plan relies heavily upon habitat protection within BLM lands as mitigation for impacted habitats from development occurring elsewhere, perhaps many miles away……. the Department of Fish and Game did not endorse the WMP as a habitat protection planning document (personal communication, S. Harris, Department of Fish and Game.)”

Preservation lands in other areas could also be targeted, based on qualities that maintain and enhance the watershed and aquifer.

## 4.6 Land Use Planning/Management Objectives and Targets

Land Use Planning/Management Objectives and Planning Targets address the following CWC 10540(c) requirements:

- Protection, restoration, and improvement of stewardship of aquatic, riparian, and watershed resources within the region

### Objective: Maintain agricultural land use within the Antelope Valley Region.

As discussed in Section 3, there is an estimated 16,000 acres of irrigated crop land in the Antelope Valley Region. Agriculture is an important industry for the Antelope Valley area. In addition to direct production of food and fiber, secondary employment is created by the agricultural production, including transportation and food manufacturing. In Kern County it is estimated that one out of every six jobs is tied to the agricultural industry (American Census Bureau 2013-2017). In addition, agriculture plays an important role in community identity. The types of crops grown in an area may be unique to that place. Community festivals are often planned around the commodities unique to a place, or for which a community is known. The physical landscape of a place can be defined by its agriculture as the crops create a distinct color mosaic and pattern. Residents also can take advantage of the open space and views allowed by nearby agriculture. In addition, some agricultural crops may provide wildlife habitat (e.g., nesting, temporary foraging).

As described in earlier sections of this IRWM Plan, demand for urban development is resulting in a conversion of agricultural land, and is introducing conflicts between agricultural and residential development. As a result, agricultural land is increasingly found only on the urban fringes. There is a desire to preserve agriculture as an industry and as a cultural asset. Both Los Angeles County and Kern County have adopted policies intended to preserve agricultural resources. These policies include right-to-farm ordinances, reduced property tax programs for farm businesses, and policies discouraging provision of urban services in agricultural areas. The Los Angeles County General Plan and the Antelope Valley Area Plan have designated "Agricultural Resource Areas," which consist of areas that have been historically farmed in the County, as well as farmland identified by the California Department of Conservation, that are protected by policies to prevent the conversion of farmland to incompatible uses. This is intended to be accomplished through use of incentives that establish a voluntary agricultural preserve. To encourage the retention and expansion of agricultural use both within and outside a potential agricultural preserve, the policies promote compatible land use arrangements and offer technical assistance in support of farming interests. In addition, expansion of agriculture into underutilized lands, such as utility rights-of-way and flood prone areas is encouraged. The Kern County General Plan also has policies in place to protect areas designated for agricultural use from incompatible residential, commercial, and industrial subdivision and development activities. The following Planning Target, which furthers these existing goals and policies, has been identified to maintain agricultural land use within in the Antelope Valley Region.

- Target: Preserve 100,000 acres of farmland in rotation[11] through 2040.

This Planning Target will be measured using farmland area shown in general plan map updates as compared to previous general plan maps.

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[11] The phrase "in-rotation" means that not all 100,000 acres will be in agricultural production at one time rather the land will be rotated in cycles to make most efficient use of the land.

### Objective: Meet growing demand for recreational space.

Demands for recreational space are similar to the demands for biological habitat and agricultural land. These demands for land uses are competing with one another due to an increasing population. Growth in the Antelope Valley threatens recreational lands and increases demands for recreational opportunities. However, population increases in Southern California as a whole also add to the pressure to maintain and expand the Antelope Valley Region's recreational opportunities, particularly since recreational resources found in the Antelope Valley, such as off-highway vehicle (OHV) use areas, are not found anywhere else in near proximity to Southern California population centers. Optimally, recreational resources could be preserved in a way that does not conflict with other land uses or resource protection.

Currently, recreation resources in the Antelope Valley are provided by multiple jurisdictions. Often recreational facilities are dedicated as part of a specific local development project or fees are paid in-lieu of providing recreational facilities. However, most local jurisdictions have policies in place that would encourage cooperation to develop, expand, or enhance regional recreation facilities. For example, several goals and policies within Los Angeles County's General Plan identify the need for development of community parks and recreational amenities within areas deficient in such resources, and suggest such could be accomplished through preserving large natural and scenic areas while focusing new urban growth into areas with suitable land. To achieve such a balance between increased intensity of development and the capacity of needed facilities to serve the population, the General Plan encourages use of open space easements and dedications, or recycling of "brownfield" sites (e.g., abandoned mineral extraction sites, remediated industrial or commercial areas, etc.) as a means of achieving recreational, open space and scenic needs.

Development of new regulatory controls, similar to those in place for SEAs to ensure compatibility of development adjacent to or within major public open space and recreational areas, including the Angeles and Los Padres National Forests are also encouraged.

Thus the following Planning Target has been identified to meet the growing demand for recreational resources in the Antelope Valley Region. It is the intent of this IRWMP to support and promote the preservation of recreational space in parallel with general plan efforts.

- Target: Contribute to local and regional General Planning documents to provide 5,000 acres of recreational space by 2040.

This Planning Target will be measured using current recreational area as provided through general plan maps and by cities, and tracking the increased acreage of recreational space created through implementation of projects.

### Objective: Improve integrated land use planning to support water management.

Coordination between land use planning agencies and water management agencies is crucial to implementation of a successful IRWM Plan. A regional land use management plan to guide the Antelope Valley Region's physical development would be a key step towards improving coordination and identifying future water needs throughout the Antelope Valley Region. Growth management, the protection of various land uses and the efficient use of natural resources such as land, water and energy are three of the principal goals of regional land use planning. A regional land use management plan that directs the Antelope Valley Region's growth towards existing centers will not only encourage natural resource efficiency and the preservation of surrounding agricultural land uses and recreational open space but will also improve the efficient use of economic resources dedicated towards utilities infrastructure improvements and expansions.

A regional land use management plan would identify the actions necessary in order to gauge success on meeting the land use management objectives. Ideally, a regional land use plan would serve as a master plan for the Antelope Valley Region's physical development. As such, it could provide the opportunity to conduct design studies to test the physical capacity of the Antelope Valley Region's urban areas and centers of development. Such a focus on physical design can help regional agencies to understand and visualize the impact of new structures on the natural and built environment, and thus to better understand the consequences of planning policy. Consideration of building codes, zoning laws, and other regulations affecting development should also be a central component of the regional land use plan. The plan should provide for the periodic review of its major elements, in order to remain a useful tool as the Antelope Valley Region undergoes various changes. Additionally, the potential need to adapt to climate change in the future should be considered through the inclusion of adaptive management strategies that will allow the Region to be flexible in the implementation of the land use management plan. Accordingly, the following Planning Target has been identified.

- Target: Coordinate a regional land use management plan by the year 2025 and incorporate adaptive management strategies for climate change.

This Planning Target may be measured by the incorporation of regional land use management strategies, including adaptive management strategies for climate change, into the 2019 IRWMP Update. The Update may also include recommendations for development of a land use management plan.

## 4.7 Climate Change Mitigation Objectives and Targets

### Objective: Mitigate against climate change

In addition to adapting to the effects of climate change (which have been incorporated into the above objectives and targets), the Region recognizes the need to mitigate against future climate change by implementing resource management strategies (to be discussed in Section 5) and projects (to be discussed in Section 6 and 7) that will increase energy efficiency, reduce greenhouse gas emissions, utilize renewable energy sources, and/or sequester carbon. In order to acknowledge the challenges of interpreting new climate change information and identify which response methods and approaches will be most appropriate for their planning needs, the Region has decided to target the implementation of "no regret[12]" mitigation strategies which are strategies that will provide benefits under current climate conditions, while also mitigating against future climate change impacts. This adaptation and mitigation target is consistent with strategies adopted by local water resources plans such as UWMPs and the SNMP.

Resource management strategies and projects adopted into the Plan are also consistent with the California Air Resources Board AB 32 Scoping Plan which aims to reduce GHG emissions in the State to 1990 levels by 2020. Project proponents are encouraged to consider the strategies adopted by CARB in its AB 32 Scoping Plan when developing projects to identify potential no regret strategies. The following Planning Target has been identified.

- Target: Implement "no regret" mitigation strategies, when possible, that decrease GHGs or are GHG neutral

This Planning Target will be measured by tracking the number of projects that involve climate change mitigation strategies and by tracking GHG emissions and energy usage by the Region's agencies.

[12] No regret projects are projects that would still be considered beneficial even if climate change weren't happening.

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# Section 5 | Resource Management Strategies

***The following section introduces a diverse menu of resource management strategies (RMS) available to meet the Objectives for the Antelope Valley Region, and it goes on to examine the impacts and benefits of these strategies.***

## 5.1 Consideration of Strategies

The State of California, through the 2016 California Water Plan[1], has identified 37 different RMS to improve regional water resource management. In order to determine what regional water management strategies should be included in the IRWMP, the Region considered the RMS listed and defined in Table 5-1 below in relation to the issues and needs determined by stakeholders and presented in Section 3 and the Region Objectives developed in Section 4. The RMS included as strategies in the IRWM Plan are those that have synergies with the Region's goals and objectives. Some RMS were not considered feasible or applicable for implementation in the Antelope Valley Region for the reasons listed below:

- Conveyance – Delta: Although this strategy could improve water supply reliability for the Region, it involves projects that would be implemented outside the Region and therefore it is not considered applicable.
- Desalination: There is no brackish groundwater or ocean water in the Region and therefore this strategy is not considered applicable.
- Precipitation Enhancement: This technology is unproven and was therefore not considered feasible for the Region.
- Surface Storage – CALFED Bay-Delta Program (CALFED): There are no CALFED storage facilities in the Region and therefore this strategy is not considered applicable.

[1] The 2018 California Water Plan did not provide further updates to the Resource Management Strategies.

- Dewvaporation or Atmospheric Pressure Desalination: Because this technology is unproven and there is no brackish water in the Region, this strategy was not considered feasible.
- Fog Collection: This technology is unproven and was therefore not considered feasible for the Region.
- Rainfed Agriculture: Because there is insufficient rainfall on the Valley floor to meet agricultural demands, this strategy was not considered feasible as a significant water supply measure. Rainfall is incorporated into the agricultural demand calculations in Section 3.
- Snow Fences: Because snow is extremely rare on the Valley floor, this strategy is unnecessary for the Region.
- Waterbag Transport/Storage Technology: This technology is not considered feasible because it is intended for use in coastal regions and has not been used in California.

**Table 5-1: 2013 California Water Plan Resource Management Strategies**

| Resource Management Strategy | Description | Included in IRWM Plan |
|---|---|---|
| **Reduce Water Demand** | | |
| **Agricultural Water Use Efficiency** | Agricultural water use efficiency is the use of incentives, public education, and other programs to achieve reductions in the amount of water used for agricultural irrigation. | Yes |
| **Urban Water Use Efficiency** | Urban water use efficiency is the use of incentives, public education and other programs to reduce potable water used for municipal, commercial, industrial, irrigation and aesthetic purposes. | Yes |
| **Improve Operational Efficiency and Transfers** | | |
| **Conveyance – Delta** | The Delta conveyance strategy seeks to improve existing Delta conveyance systems by upgrading aging distribution systems, as well as to increase system flexibility and reliability through the addition of interconnections among water resources systems. | No |
| **Conveyance – Regional/Local** | The local/regional conveyance strategy seeks to improve existing local and regional conveyance systems by upgrading aging distribution systems, as well as to increase system flexibility and reliability through the addition of interconnections among water resources systems. | Yes |
| **System Reoperation** | System reoperation allows for better management and movement of existing water supplies, and includes managing surface storage facilities to optimize the availability and quality of stored water supplies. | Yes |
| **Water Transfers** | Water transfers are temporary or long-term changes in the point of diversion, place of use, or purpose of use due to contracting. | Yes |
| **Increase Water Supply** | | |
| **Conjunctive Management and Groundwater** | Conjunctive management can help improve the long term and seasonal reliability of surface water supplies by recharging these supplies in groundwater basins when available, and recovering them through groundwater pumping when needed. | Yes |
| **Desalination** | Desalination is the removal of salts from saline waters, including ocean water and brackish groundwater. | No |
| **Precipitation Enhancement** | Precipitation enhancement artificially stimulates clouds to produce more rainfall or snowfall than they would naturally. | No |

| Resource Management Strategy | Description | Included in IRWM Plan |
|---|---|---|
| **Recycled Municipal Water** | Implementation of the recycled municipal water strategy develops usable water supplies from treated municipal wastewater. | Yes |
| **Surface Storage – CALFED** | CALFED surface storage increases imported water supply through the construction or modification of surface storage reservoirs to capture surface water to improve supply reliability to the Delta. | No |
| **Surface Storage – Regional/Local** | Regional and local surface storage increases local supply through the construction or modification of local or regional surface reservoirs or developing surface storage capabilities in out-of-region reservoirs. | Yes |
| **Water Quality Management** | | |
| **Drinking Water Treatment and Distribution** | Drinking water treatment and distribution includes improving the quality of potable water supplied to customers and improving conveyance systems to improve the quality of supplies delivered from treatment facilities. | Yes |
| **Groundwater and Aquifer Remediation** | Groundwater and aquifer remediation removes constituents or contaminants that affect the beneficial use of groundwater. | Yes |
| **Matching Water Quality to Use** | Matching water quality to use recognizes that not all water uses require the same quality of water. Agricultural, municipal, landscape and residential water uses have different water quality needs. | Yes |
| **Pollution Prevention** | Pollution prevention controls or reduces pollutants from point and nonpoint sources that can affect multiple environmental resources, including water supply, water quality, and riparian and aquatic habitat. | Yes |
| **Salt and Salinity Management** | Salt and salinity management encourages stakeholders to proactively seek to identify the sources, quantify the threat, prioritize necessary mitigation action, and work collaboratively with entities with the authority to take appropriate actions. | Yes |
| **Urban Runoff Management** | Urban runoff management includes strategies for managing or controlling urban runoff, such as intercepting, diverting, controlling, or capturing stormwater runoff or dry season runoff. | Yes |
| **Flood Management** | | |
| **Flood Risk Management** | Flood risk management focuses on protecting people, property and infrastructure from floods. | Yes |
| **Practice Resources Stewardship** | | |
| **Agricultural Lands Stewardship** | Agricultural lands stewardship protects and promotes agricultural production through integrating best management practices that conserve resources. | Yes |
| **Ecosystem Restoration** | Ecosystem restoration aims to return a selected ecosystem to a condition similar to its state before any disturbance occurred. | Yes |
| **Forest Management** | Forest management aims to implement forest management projects and programs to help support water resources. | Yes |
| **Land Use Planning and Management** | Land use planning and management uses land controls to manage, minimize, or control activities that may negatively affect the quality and availability of groundwater and surface waters, natural resources, or endangered or threatened species. | Yes |
| **Recharge Areas Protection** | Recharge areas protection focuses on protection of lands that are important locations for groundwater recharge. | Yes |

| Resource Management Strategy | Description | Included in IRWM Plan |
|---|---|---|
| **Sediment Management** | Sediment management seeks to both protect sediment as a valuable natural resource and address excess sediments in the watershed. | Yes |
| **Watershed Management** | Watershed management utilizes planning, programs, and projects to restore and enhance watershed functions. | Yes |
| **People and Water** | | |
| **Economic Incentives** | Economic incentives, in the form of loans, grants, or water pricing support, are important for successful implementation of projects as a lack of adequate funds can prevent a project from moving forward. | Yes |
| **Outreach and Engagement** | Outreach and engagement by water agencies facilitates contribution by public individuals and groups and provides insight to decision makers on the best approaches for water management. | Yes |
| **Water and Culture** | Water and culture links cultural considerations to water management by increasing awareness of how cultural values, uses, and practices affect and are affected by water management. | Yes |
| **Water-dependent Recreation** | Water-dependent recreation seeks to enhance and protect water-dependent recreational opportunities and public access to recreational lands through water resources management. | Yes |
| **Other Strategies** | | |
| **Crop Idling for Water Transfers** | Crop idling is the removal of lands from irrigation with the aim of returning the lands to irrigation at a later time to allow for the temporary transfer of water supplies for other uses. | Yes |
| **Dewvaporation or Atmospheric Pressure Desalination** | Dewvaporation is the process of humidification-dehumidification desalination where brackish water is evaporated by heated air, which deposits fresh water as dew on the opposite side of a heat transfer wall. | No |
| **Fog Collection** | Fog collection is the collection of water from fog using large pieces of material to make the fog condense into droplets and flow down to a collection trough. | No |
| **Irrigated Land Retirement** | Irrigated land retirement is the permanent removal of farmland from irrigated agriculture to free up water supplies for other uses. | Yes |
| **Rainfed Agriculture** | Rainfed agriculture is when all crop consumptive water use is provided directly by rainfall on a real time basis. | No |
| **Snow Fences** | Snow fencing is when fences are strategically placed in small openings to reduce drifting over roadways and improve watershed management. | No |
| **Waterbag Transport/Storage Technology** | The use of waterbag transport/storage technology involves diverting water in areas that have unallocated freshwater supplies, storing the water in large inflatable bladders, and towing them to an alternate coastal region. | No |

Table 5-2 shows the relationship between the RMS and the Regional Objectives. In many instances, regional strategies can address multiple IRWMP Objectives and Planning Targets. The remainder of this chapter describes the RMS selected for inclusion in the Plan according to Objective, and is organized into the following categories:

- Strategies for water supply management

- Strategies for water quality management
- Strategies for integrated flood management
- Strategies for environmental resource management
- Strategies for land use planning/management
- Strategies for climate change mitigation

These categories align with the groupings for Regional Objectives shown in Table 5-2.

## Table 5-2: Strategies that Support the Antelope Valley Region's Objectives

| | Antelope Valley Region Objectives | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Water Supply Management | | | Water Quality Management | | | | Flood Management | | Environ. Resource Mgmt. | | Land Use Planning/ Mgmt | | Climate Change |
| | Provide reliable water supply to meet the Region's expected demand between now and 2040; and adapt to climate change | Establish a contingency plan to meet water supply needs of the Antelope Valley Region during a plausible disruption of SWP deliveries | Stabilize groundwater levels | Provide drinking water that meets regulatory requirements and customer expectations | Protect and maintain aquifers | Protect natural streams and recharge areas from contamination | Maximize beneficial use of recycled water | Reduce negative impacts of stormwater, urban runoff, and nuisance water, and adapt to climate change impacts in the future | Optimize the balance between protecting existing beneficial uses of stormwater and capturing stormwater for new uses | Preserve open space and natural habitats that protect and enhance water resources and species in the Region | Maintain agricultural land use within the Antelope Valley Region | Meet growing demand for recreational space | Improve integrated land use planning to support water management | Mitigate against climate change |
| **Reduce Water Demand** | | | | | | | | | | | | | | |
| Agricultural Water Use Efficiency | • | • | • | | | | | | | | • | | | • |
| Urban Water Use Efficiency | • | • | • | | | | | | | | | | | • |
| **Improve Operational Efficiency and Transfers** | | | | | | | | | | | | | | |
| Conveyance – Regional/Local | • | • | • | | | | | | | | | | | • |
| System Reoperation | • | • | • | | | | | | | | | | | • |
| Water Transfers | • | • | • | | | | | | | | | | | • |
| **Increase Water Supply** | | | | | | | | | | | | | | |
| Conjunctive Management and Groundwater | • | • | • | | • | | • | | | | | | • | • |
| Recycled Municipal Water | • | • | • | | | | • | | | | | • | | • |
| Surface Storage – Regional/Local | • | • | • | | | | | • | | | | | • | • |
| **Water Quality Management** | | | | | | | | | | | | | | |
| Drinking Water Treatment and Distribution | | | | • | | | | | | | | | | |

| | Antelope Valley Region Objectives | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Water Supply Management** | | | **Water Quality Management** | | | | **Flood Management** | | **Environ. Resource Mgmt.** | | **Land Use Planning/ Mgmt** | | **Climate Change** |
| | Provide reliable water supply to meet the Region’s expected demand between now and 2040; and adapt to climate change | Establish a contingency plan to meet water supply needs of the Antelope Valley Region during a plausible disruption of SWP deliveries | Stabilize groundwater levels | Provide drinking water that meets regulatory requirements and customer expectations | Protect and maintain aquifers | Protect natural streams and recharge areas from contamination | Maximize beneficial use of recycled water | Reduce negative impacts of stormwater, urban runoff, and nuisance water, and adapt to climate change impacts in the future | Optimize the balance between protecting existing beneficial uses of stormwater and capturing stormwater for new uses | Preserve open space and natural habitats that protect and enhance water resources and species in the Region | Maintain agricultural land use within the Antelope Valley Region | Meet growing demand for recreational space | Improve integrated land use planning to support water management | Mitigate against climate change |
| Groundwater and Aquifer Remediation | ● | ● | | ● | ● | | | | | | | | | |
| Matching Water Quality to Use | | | | | | | ● | | ● | | | ● | | |
| Pollution Prevention | | | | ● | ● | ● | | ● | | ● | | | | |
| Salt and Salinity Management | | | | ● | ● | | | | | | | | | |
| Urban Runoff Management | ● | | ● | | ● | ● | | ● | ● | | | | ● | |
| **Flood Management** | | | | | | | | | | | | | | |
| Flood Risk Management | ● | ● | ● | | | ● | | ● | ● | ● | | | ● | |
| **Practice Resources Stewardship** | | | | | | | | | | | | | | |
| Agricultural Lands Stewardship | ● | | | | | | | | | ● | ● | | ● | ● |
| Ecosystem Restoration | | | | | ● | ● | | ● | ● | ● | | ● | ● | ● |
| Forest Management | | | | | | ● | | | | ● | | ● | ● | ● |
| Land Use Planning and Management | | | | | | | | ● | ● | ● | ● | ● | ● | |
| Recharge Areas Protection | | | ● | | ● | ● | | ● | | ● | | | ● | |
| Sediment Management | | | | ● | ● | ● | | ● | | ● | | | | ● |
| Watershed Management | | | | | ● | ● | | ● | ● | ● | ● | ● | ● | ● |
| **People and Water** | | | | | | | | | | | | | | |

| | Antelope Valley Region Objectives | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Water Supply Management** | | | **Water Quality Management** | | | | **Flood Management** | | **Environ. Resource Mgmt.** | | **Land Use Planning/ Mgmt** | | **Climate Change** |
| | Provide reliable water supply to meet the Region's expected demand between now and 2040; and adapt to climate change | Establish a contingency plan to meet water supply needs of the Antelope Valley Region during a plausible disruption of SWP deliveries | Stabilize groundwater levels | Provide drinking water that meets regulatory requirements and customer expectations | Protect and maintain aquifers | Protect natural streams and recharge areas from contamination | Maximize beneficial use of recycled water | Reduce negative impacts of stormwater, urban runoff, and nuisance water, and adapt to climate change impacts in the future | Optimize the balance between protecting existing beneficial uses of stormwater and capturing stormwater for new uses | Preserve open space and natural habitats that protect and enhance water resources and species in the Region | Maintain agricultural land use within the Antelope Valley Region | Meet growing demand for recreational space | Improve integrated land use planning to support water management | Mitigate against climate change |
| Economic Incentives | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| Outreach and Engagement | • | • | • | • | • | • | | | | | • | • | | • |
| Water and Culture | • | • | | • | | | | | | | • | • | | • |
| Water-dependent Recreation | | | | | | • | | | | • | | • | • | |
| **Other Strategies** | | | | | | | | | | | | | | |
| Crop Idling for Water Transfers | • | | • | | | | | | | | | | | |
| Irrigated Land Retirement | • | | • | | | • | | | | | | | • | |

## 5.2 Strategies for Water Supply Management

**Objective: Provide reliable water supply to meet the Region's expected demand between now and 2040; and adapt to climate change**

The following RMS help to meet this Region Objective in the following ways:

Outdoor uses such as irrigation account for most urban water demands in the Region.

- *Agricultural Water Use Efficiency* – reduces agricultural demands and therefore reduces the Regional gap between supply and demand; supports adaptation to climate change impacts that increase agricultural demands and/or reduce available supplies
- *Urban Water Use Efficiency* – reduces urban demands and therefore reduces the Regional gap between supply and demand; supports adaptation to climate change impacts that increase municipal demands and/or reduce available supplies
- *Conveyance - Regional/Local* – increases reliability and control of water movement between imported water turnouts, surface and groundwater storage supply locations, and demand locations; minimizes losses that occur in the conveyance system
- *System Reoperation* – increases reliability and control of water movement between imported water turnouts, surface and groundwater storage supply locations, and demand locations and therefore increases overall reliability of water supplies
- *Water Transfers* – increase the amount of imported water supplies available to the Region and therefore reduces the Regional gap between supply and demand; supports adaptation to climate change impacts that increase overall demands and/or reduce supplies
- *Conjunctive Management and Groundwater* – allows capture of previously unusable imported water, stormwater, and recycled water by providing storage capacity; increases the amount of overall supplies and therefore reduces the Regional gap between supply and demand; supports adaptation to climate change impacts that increase overall demands and/or reduce supplies
- *Recycled Municipal Water* – increases the amount of recycled water supplies available to the Region and therefore reduces the Regional gap between supply and demand; supports adaptation to climate change impacts that increase overall demands and/or reduce supplies
- *Surface Storage - Regional/Local* – increases the amount of surface water supplies (dry weather runoff and stormwater) available to the Region and therefore reduces the Regional gap between supply and demand; supports adaptation to climate change impacts that increase overall demands and/or reduce supplies
- *Groundwater and Aquifer Remediation* – increases the amount of groundwater supplies available to the Region (previously unavailable due to contamination) and therefore reduces the Regional gap between supply and demand; supports adaptation to climate change impacts that increase overall demands and/or reduce supplies

- *Urban Runoff Management* – increases the amount of surface water supplies (dry weather runoff and stormwater) available to the Region and therefore reduces the Regional gap between supply and demand; supports adaptation to climate change impacts that increase overall demands and/or reduce supplies
- *Flood Risk Management* – increases the amount of surface water supplies (stormwater) available to the Region by using integrated flood management and therefore reduces the Regional gap between supply and demand; supports adaptation to climate change impacts that increase overall demands and/or reduce supplies
- *Agricultural Lands Stewardship* – reduces agricultural demands and improves groundwater recharge using best management practices and therefore reduces the Regional gap between supply and demand; supports adaptation to climate change impacts that increase agricultural demands and/or reduce available supplies
- *Economic Incentives* – used to implement water supply and/or demand management projects and therefore reduce the Regional gap between supply and demand; this indirectly supports adaptation to climate change impacts that increase demands and/or reduce available supplies
- *Outreach and Engagement* – increases public awareness of where water comes from, as well as the value and importance of water conservation and water use efficiency to reduce regional water demand
- *Water and Culture* – helps project expected water demands for cultural activities and understand the perspectives that influence water conservation
- *Crop Idling for Water Transfers* – enhances water supply reliability by making water available for redistribution
- *Irrigated Land Retirement* – removes farmland from irrigated agriculture, decreasing agricultural water demands supplied by groundwater

**Objective: Establish a contingency plan to meet water supply needs of the Antelope Valley Region during a plausible disruption of SWP deliveries**

The following RMS help to meet this Regional Objective in the following ways:

**The operation of reservoirs may allow for increased water capture.**

- *Agricultural Water Use Efficiency* – decreases agricultural demands during a plausible disruption of SWP deliveries; demand management programs typically include tiered strategies that can be implemented as needed under a variety of circumstances
- *Urban Water Use Efficiency* – decreases urban demands during a plausible disruption of SWP deliveries; demand management programs typically include tiered strategies that can be implemented as needed under a variety of circumstances
- *Conveyance - Regional/Local* – increases reliability and ability to move water throughout the Region and minimizes losses that occur in the conveyance system; greater flexibility allows for increased use of alternate supplies during a SWP disruption

- *System Reoperation* – increases reliability and ability to move water throughout the Region; greater flexibility allows for increased use of alternate supplies during a SWP disruption
- *Water Transfers* – may increase access to stored SWP water that could be delivered during a SWP disruption
- *Conjunctive Management and Groundwater* – allows capture of previously unusable imported water, stormwater, and recycled water by providing storage capacity; increases the amount of overall supplies that are controlled within the Region and therefore increases availability of supplies during a SWP disruption
- *Recycled Municipal Water* – increases the amount of recycled water supplies available to the Region; increases the amount of overall supplies that are controlled within the Region and therefore increases availability of supplies during a SWP disruption
- *Surface Storage - Regional/Local* – increases the amount of surface water supplies (dry weather runoff and stormwater) available to the Region; increases the amount of overall supplies that are controlled within the Region and therefore increases availability of supplies during a SWP disruption
- *Groundwater and Aquifer Remediation* – increases the amount of groundwater supplies available to the Region (previously unavailable due to contamination); increases the amount of overall supplies that are controlled within the Region and therefore increases availability of supplies during a SWP disruption
- *Flood Risk Management* – increases the amount of surface water supplies (stormwater) available to the Region by using integrated flood management and therefore increases the availability of supplies during a SWP disruption
- *Economic Incentives* – used to implement water supply and/or demand management projects and therefore increase the availability of supplies during a SWP disruption
- *Outreach and Engagement* – instills water conservation and water use efficiency as a public ethic, decreasing regional demands during a potential disruption of SWP deliveries

**Objective: Stabilize groundwater levels**

The following RMS help to meet this Regional Objective in the following ways:

- *Agricultural Water Use Efficiency* – decreases agricultural demands and therefore reduces specific demands for agriculture that are supplied by pumped groundwater
- *Urban Water Use Efficiency* – decreases municipal demands and therefore reduces specific demands for municipal users that are supplied by pumped groundwater
- *Conveyance - Regional/Local* – increases reliability and ability to move water throughout the Region and minimizes losses that occur in the conveyance system; allows greater control of the draw and fill of water banks in relation to demands located throughout

Agricultural water use efficiency measures can reduce the Region's agricultural demand.

the Region and therefore allows for groundwater supplies to be obtained from areas that are managed

- *System Reoperation* – increases reliability and ability to move water throughout the Region; allows greater control of the draw and fill of water banks in relation to demands located throughout the Region and therefore allows for groundwater supplies to be obtained from areas that are managed
- *Water Transfers* – increases the amount of imported water supply that could be available for groundwater recharge or in-lieu supply
- *Conjunctive Management and Groundwater* – allows capture of previously unusable imported water, stormwater, and recycled water by providing storage capacity; these additional supplies could be available for groundwater recharge or in-lieu supply
- *Recycled Municipal Water* – increases the amount of recycled water supplies available to the Region that could be available for groundwater recharge or in-lieu supply
- *Surface Storage* - Regional/Local – increases the amount of surface water supplies (dry weather runoff and stormwater) available to the Region that could be used for groundwater recharge or in-lieu supply
- *Urban Runoff Management* – increases the amount of surface water supplies (dry weather runoff and stormwater) available to the Region that could be available for groundwater recharge or in-lieu supply
- *Flood Risk Management* – increases the amount of surface water supplies (stormwater) available to the Region, by using integrated flood management, that could be made available for groundwater recharge or in-lieu supply
- *Recharge Areas Protection* – maintains lands that are most suitable for groundwater recharge, thus contributing to the stabilization of groundwater levels
- *Economic Incentives* – used to implement water supply and/or demand management projects that either decrease groundwater pumping demands or increase the capacity to recharge groundwater supplies
- *Outreach and Engagement* – instills water conservation and water use efficiency as a public ethic, decreasing demands supplied by groundwater
- *Crop Idling for Water Transfers* – decreases agricultural water demand and increases water available for redistribution, decreasing the net demands supplied by groundwater
- *Irrigated Land Retirement* – removes farmland from irrigated agriculture, decreasing agricultural water demands supplied by groundwater

## 5.3 Strategies for Water Quality Management

**Objective: Provide drinking water that meets regulatory requirements and customer expectations**

The following RMS help to meet this Regional Objective in the following ways:

- *Drinking Water Treatment and Distribution* – allows water providers to produce the needed quality of drinking water and to move it to the appropriate locations
- *Groundwater and Aquifer Remediation* – allows the Region to treat compromised groundwater supplies to a level where they are available for beneficial uses, including drinking

- *Pollution Prevention* – prevents contaminants and/or undesirable constituents from entering drinking water supplies at the source
- *Salt and Salinity Management* – reduces and/or manages the accumulation of salinity in drinking water supplies
- *Sediment Management* – decreases turbidity and suspended sediment concentrations in surface waters that provide drinking water supplies
- *Economic Incentives* – used to implement water quality improvement projects and therefore help to meet regulatory requirements and customer expectations
- *Outreach and Engagement* – educates the public about the dangers associated with leaking contaminants, preventing pollutants from entering drinking water supplies at the source
- *Water and Culture* – identifies customer expectations for water quality as they relate to subsistence activities, recreational activities, spiritual activities, historic preservation, public art, and lifeways

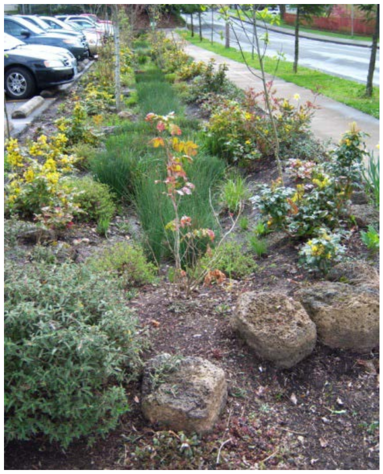
**Objective: Protect and maintain aquifers**

The following RMS help to meet this Regional Objective in the following ways:

- *Conjunctive Management and Groundwater* – allows capture of previously unusable imported water, stormwater, and recycled water by providing storage capacity; these additional supplies recharge groundwater, and high-quality sources can potentially improve or maintain water quality in the aquifer
- *Groundwater and Aquifer Remediation* – improves water quality in aquifers through groundwater treatment to restore beneficial uses
- *Pollution Prevention* – prevents contaminants and/or undesirable constituents from entering aquifers and degrading water quality
- *Salt and Salinity Management* – reduces and/or manages the accumulation of salinity in groundwater supplies
- *Urban Runoff Management* – reduces the amount of constituents from dry weather and stormwater runoff that move into groundwater and degrade aquifers
- *Ecosystem Restoration* – improves and protects water quality entering aquifers by restoring vegetation that act as a buffer and filter to many pollutants
- *Recharge Areas Protection* – maintains lands that are most suitable for groundwater recharge free of pollutants and therefore protects underlying aquifers from contamination
- *Sediment Management* – improves permeability of drainage areas by filtering water before it enters aquifers and reduces turbidity, suspended solids, nutrients, and concentrations of trace metals and organic contaminants present in the sediments before the water enters aquifers
- *Watershed Management* – protects ecosystem functions provided by natural systems including the natural filtration of runoff before it enters aquifers
- *Economic Incentives* – used to implement water quality improvement projects that protect and maintain aquifers
- *Outreach and Engagement* – educates the public about the dangers of leaking contaminants that can enter the aquifers

**Objective: Protect natural streams and recharge areas from contamination**

The following RMS help to meet this Regional Objective in the following ways:



- *Pollution Prevention* – prevents contaminants and/or undesirable constituents from entering streams and recharge areas
- *Urban Runoff Management* – reduces the amount of constituents from dry weather and stormwater runoff that move into streams
- *Flood Risk Management* – reduces erosion and sedimentation of natural streams and recharge areas through integrated flood management practices
- *Ecosystem Restoration* – restores and protects native habitats that can surround or encompass natural streams and recharge areas, many of which act as a buffer and filter to pollutants
- *Forest Management* – protects downstream water quality by maintaining upland forested areas and mesquite woodland areas which act as a buffer and filter to pollutants
- *Recharge Areas Protection* – maintains lands that are most suitable for groundwater recharge free of pollutants, protecting the areas from water quality degradation
- *Sediment Management* – protects water quality by reducing turbidity, suspended solids, nutrients, and concentrations of trace metals and organic contaminants present in the sediments
- *Watershed Management* – maintains and enhances ecosystem functions, including those provided by natural streams and recharge areas
- *Economic Incentives* – used to implement water quality improvement projects that reduce contaminant loading to natural streams and recharge areas
- *Water-dependent Recreation* – protects water quality in streams for recreational purposes
- *Outreach and Engagement* – educates residents of the dangers associated with leaking contaminants that harm streams and recharge areas
- *Water-dependent Recreation* - protects and maintains open space areas, both urban and natural, that have water-related recreational benefits
- *Irrigated Land Retirement* – improves water quality by reducing drainage volume in problem drainage areas

**Objective: Maximize beneficial use of recycled water**

The following RMS help to meet this Regional Objective in the following ways:

- *Conjunctive Management and Groundwater* – allows capture of previously unusable recycled water by providing storage capacity; recycled water that is percolated into groundwater supplies typically receives some level of water quality improvement from soil aquifer treatment

- *Recycled Municipal Water* – increases the amount of recycled water supplies available to meet demands in the Region
- *Matching Water Quality to Use* – recognizes the value of using lower quality recycled water for non-potable uses; increases the amount of recycled water supplies available to meet non-potable demands in the Region
- *Economic Incentives* – used to implement projects that expand the use of recycled water in the Region

**The Antelope Valley Region has set a target to reuse 100% of recycled water by 2035.**

## 5.4 Strategies for Integrated Flood Management

**Objective: Reduce negative impacts of stormwater, urban runoff, and nuisance water, and adapt to climate change impacts in the future**

The following RMS help to meet this Regional Objective in the following ways:

- *Surface Storage - Regional/Local* – increases capacity to capture and retain flows from storm events and therefore reduces the negative impacts of flooding.
- *Pollution Prevention* – prevents contaminants and/or undesirable constituents from entering stormwater at the source and therefore reduces negative downstream impacts of poor stormwater quality
- *Urban Runoff Management* – utilizes low impact development and best management practices to allow the capture of some peak stormwater flows onsite to reduce the risk of negative downstream flooding and poor stormwater quality
- *Flood Risk Management* – reduces the risks of flooding by utilizing capture, retention, infiltration, limitations on building in flood zones, and other integrated flood management techniques
- *Ecosystem Restoration* – enhances and maintains natural areas that can filter or infiltrate stormwater and urban runoff, thus providing some level of attenuation for peak flood flows including the preservation of existing wetland areas along natural watercourses
- *Land Use Planning and Management* – promotes land use planning that incorporates flood risk considerations to reduce the negative impacts of flooding
- *Recharge Areas Protection* – maintains lands that are most suitable for groundwater recharge; reduces downstream flooding by providing capacity for stormwater capture and infiltration, thus providing some level of attenuation for peak flood flows
- *Sediment Management* – reduces negative impacts of stormwater runoff by maintaining natural production of sediment and improving permeability of drainage areas by controlling sediment levels
- *Watershed Management* – promotes integrative projects and planning that enhance ecosystem functions such as stormwater capture and infiltration

- *Economic Incentives* – used to implement stormwater management projects that improve stormwater and urban runoff water quality

**Objective: Optimize the balance between protecting existing beneficial uses of stormwater and capturing stormwater for new uses**

The following RMS help to meet this Regional Objective in the following ways:

EAFB depends on stormwater flows to resurface the Rosamond Dry Lake Bed for operational and emergency landing uses.

- *Matching Water Quality to Use* – recognizes the beneficial use of stormwater for the maintenance of existing habitat, dust control, and lakebed resurfacing
- *Urban Runoff Management* – utilizes low impact development and best management practices to capture and use stormwater for recharge or reuse
- *Flood Risk Management* – utilizes capture, detention, and infiltration to minimize flooding and provide greater control over the fate and use of stormwater flows
- *Ecosystem Restoration* – enhances natural areas that can contribute to attenuation of peak flows, support habitat preservation, and provide greater control over the fate and use of stormwater flows
- *Land Use Planning and Management* – promotes land use planning that supports stormwater capture, diversion, reuse, or infiltration for beneficial uses
- *Sediment Management* – increases permeability of drainage areas, reducing the negative impacts of stormwater runoff and capturing stormwater
- *Watershed Management* – promotes integrative projects and planning that enhance ecosystem functions such as stormwater capture and infiltration
- *Economic Incentives* – used to implement projects that can provide multiple integrated flood management benefits

## 5.5 Strategies for Environmental Resource Management

**Objective: Preserve open space and natural habitats that protect and enhance water resources and species in the Antelope Valley Region**

The following RMS help to meet this Regional Objective in the following ways:

- *Pollution Prevention* – prevents contaminants and/or undesirable constituents from entering streams and degrading natural habitats
- *Flood Risk Management* – reduces erosion and sedimentation of natural streams and recharge areas through integrated flood management practices; restricts development in the floodplain which may allow natural habitats to redevelop or prevent damage to natural habitats
- *Agricultural Lands Stewardship* – promotes the conservation and improvement of open space and water resources through the use of agricultural best management practices

- *Ecosystem Restoration* – improves modified natural landscapes such as aquatic, riparian, and floodplain ecosystems that will impact water resources and species in the Region
- *Forest Management* – maintains upland forested areas to improve downstream water resources and species habitats
- *Land Use Planning and Management* – promotes planning that reduces the negative impacts of land use on flooding, water supply, water quality, and habitat; reduces development in the floodplain
- *Recharge Areas Protection* - maintains lands that are most suitable for groundwater recharge; conserves open space
- *Sediment Management* – protects sediment as a valuable resource for the restoration and renewal of stream habitats, wetlands, riparian vegetation, and floodplains and prevents excessive amounts from degrading water quality
- *Watershed Management* – promotes integrated projects and planning that enhance the water resources functions provided by ecosystems
- *Economic Incentives* – used to conserve, restore, and maintain natural habitats and open space
- *Water-Dependent Recreation* – protects and maintains open space areas, both urban and natural, that have water-related recreational benefits

## 5.6 Strategies for Land Use Planning/Management

**Objective: Maintain agricultural land use within the Antelope Valley Region**

The following RMS help to meet this Regional Objective in the following ways:

- *Agricultural Water Use Efficiency* – reduces agricultural water demands and therefore could potentially allow more land to stay in production in times of water scarcity
- *Agricultural Lands Stewardship* – maintains agricultural lands through the conservation of natural resources and watershed functions
- *Land Use Planning and Management* – promotes land use planning that balances other land uses with preservation of open space and agricultural lands
- *Watershed Management* - promotes integrative projects and planning that enhance the water resources functions including those provided by agricultural lands

Agricultural lands stewardship will help the Region to preserve existing agricultural land.

- *Economic Incentives* – used to support agricultural practices and stewardship projects
- *Outreach and Engagement* – identifies the needs of farmers and of the agricultural industry, and involves them in water resources and land use planning
- *Water and Culture* – preserves water resources for key cultural activities like ranching and agriculture

**Objective: Meet growing demand for recreational space**

The following RMS help to meet this Regional Objective in the following ways:

- *Recycled Municipal Water* – increases the amount of recycled water supplies available to the Region that could be used for park and field irrigation or for natural areas such as the Piute Ponds and lakebeds, therefore helping to maintain recreational space in times of water scarcity
- *Matching Water Quality to Use* – increases the amount of recycled water supplies available to the Region that could be used for park and field irrigation or for natural areas such as the Piute Ponds and lakebeds, therefore helping to maintain recreational space in times of water scarcity
- *Ecosystem Restoration* – improves and protects threatened natural landscapes such as aquatic, riparian, and floodplain ecosystems that can provide passive recreational benefits
- *Forest Management* – maintains forested and mesquite wooded areas with the intention of improving water resources; managed areas can be used for recreational purposes
- *Land Use Planning and Management* – promotes planning that balances the expansion of urban development with the preservation of open space areas
- *Watershed Management* – promotes integrative projects and planning that enhance ecosystem services
- *Economic Incentives* – used to implement projects that expand or enhance recreational space
- *Outreach and Engagement* – ensures the development of recreational spaces meets the needs of the community
- *Water and Culture* – preserves culturally significant spaces used for recreational activities that are dependent on water quality and quantity
- *Water-dependent Recreation* – protects and maintains open space areas that have water-related recreational benefits

**Objective: Improve integrated land use planning to support water management**

The following RMS help to meet this Regional Objective in the following ways:

- *Conjunctive Management and Groundwater* – allows the use of lands for groundwater recharge and recovery as well as other beneficial uses
- *Surface Storage - Regional/Local* – allows the use of lands for water resource needs, habitat preservation, and recreation
- *Urban Runoff Management* – allows the use of lands for supply, integrated flood management, and other beneficial uses with low impact development and best management practices to capture and infiltrate runoff
- *Flood Risk Management* – allows the use of lands for integrated flood management and beneficial water-dependent habitat uses
- *Agricultural Lands Stewardship* – promotes the conservation and improvement of open space and water resources through the use of agricultural best management practices

Spreading facilities will allow the Region to recharge the aquifer when imported, recycled, and storm waters are available.

- *Ecosystem Restoration* – improves modified natural landscapes to restore ecosystem uses and preserve natural areas; allows the preservation of habitats for recreation and other beneficial uses
- *Forest Management* – maintains upland forested and mesquite wooded areas to improve water resource conditions, preserve habitat, and provide other beneficial uses
- *Land Use Planning and Management* – promotes planning that balances the expansion of urban development with the preservation of open space, agricultural lands, habitats, and natural flood pathways; incorporates strategies to maintain water resources
- *Recharge Areas Protection* – maintains lands that are most suitable for groundwater recharge as well as other beneficial uses
- *Watershed Management* – promotes integrative projects and planning that enhance ecosystem services
- *Economic Incentives* – used to support land use planning projects
- *Water-dependent Recreation* – protects and maintains open space areas that have water-related recreational benefits
- *Irrigated Land Retirement* – removes farmland from irrigated agriculture and creates an opportunity to establish other beneficial uses of the land

## 5.7 Strategies for Climate Change Mitigation

**Objective: Mitigate against climate change**

The following RMS help to meet this Regional Objective in the following ways:

- *Agricultural Water Use Efficiency* – reduces agricultural demands and therefore reduces the Region's reliance on imported water; mitigates against climate change by reducing the energy use and greenhouse gas emissions associated with transporting water
- *Urban Water Use Efficiency* – reduces urban demands and therefore reduces the Region's reliance on imported water; mitigates against climate change by reducing the energy use and greenhouse gas emissions associated with transporting water
- *Conveyance* - Regional/Local – minimizes water losses in the conveyance system; reduces the energy use and greenhouse gas emissions associated with transporting water

Climate-friendly building design can reduce the Region's GHG emissions.

- *System Reoperation* – improves the efficiency of existing operation and management of existing reservoirs and conveyance facilities; reduces the energy use and greenhouse gas emissions associated with system inefficiency
- *Water Transfers* – reduces the energy use and greenhouse gas emissions associated with importing water when transfers originate from closer locations
- *Conjunctive Management and Groundwater* – increases local water supplies which mitigates against climate change by reducing the greenhouse gas emissions associated with the energy required to import water
- *Recycled Municipal Water* – increases the amount of recycled water supplies available to the Region; increases local water supplies which mitigates against climate change by reducing the greenhouse gas emissions associated with the energy required to import water
- *Surface Storage - Regional/Local* – increases local water supplies which mitigates against climate change by reducing the greenhouse gas emissions associated with the energy required to import water; however, the reduction in surface flow amplifies impacts to downstream natural areas
- *Agricultural Lands Stewardship* – promotes the conservation and improvement of agricultural lands through the use of agricultural best management practices; optimizes crop yield which may help to sequester carbon
- *Ecosystem Restoration* – increases local groundwater supplies by maintaining areas that allow for natural groundwater recharge, reducing the need to import water; restores and protects ecosystem processes in downstream areas
- *Forest Management* – maintains forested lands and mesquite woodlands which help sequester carbon
- *Sediment Management* – prevents GHG emissions from fossil fuel powered equipment utilized for continuous sediment removal
- *Watershed Management* – promotes integrative projects and planning that enhance ecosystem services such as groundwater recharge that increases local water supplies and reduces the need to import water; protects downstream surface water flows and habitats that can reduce GHGs
- *Economic Incentives* – used to encourage the use of renewable energy for water treatment and conveyance; may provide funds to develop more local supplies to offset imported water use
- *Outreach and Engagement* – increases climate change awareness and encourages public acceptance and investment in mitigation strategies, effectively reducing the communities' GHG emissions
- *Water and Culture* – provides financial and technical assistance to protect cultural resources while increasing a better understanding of carbon sequestration potential and water conservation and water use efficiency

## 5.8 Impacts and Benefits of Implementing Strategies

The Region has identified the IRWM Plan's potential impacts and benefits relative to the strategies discussed above. Given the integrated nature of the Region, it is difficult to determine what strategies would provide a benefit or disproportionate impact to DACs or create Environmental Justice (EJ) concerns. Identification of impacts and benefits to DACs and EJ concerns will improve as projects are closer to implementation, at which point a detailed project-specific impact and benefit analysis can occur as part of the NEPA and/or CEQA process. Updates to DAC/EJ project impacts and benefits will also be included during regular IRWM Plan updates that will occur every five years, as discussed in Section 8. Refer to Appendix D of the IRWM Plan for two technical memoranda that were prepared during the 2013 IRWM Plan update to characterize DACs and to define issues related to DAC areas:

- DAC Water Supply, Quality and Flooding Data Final Draft TM
- DAC Monitoring Plan Final Draft TM

Tables 5-3 through 5-10 below list each of the IRWM Plan strategies and their potential impacts and benefits that could occur over the next 20 years. Strategies are grouped consistent with the California Water Plan RMS as follows: reduce water demand; improve flood management; improve operational efficiency and transfers; increase water supply, improve water quality, practice resources stewardship.

**Table 5-3: Impacts and Benefits of Strategies that Reduce Water Demand**

| Strategy | Within IRWM Region | | Inter-regional | |
|---|---|---|---|---|
| | Potential Impacts | Potential Benefits | Potential Impacts | Potential Benefits |
| **Agricultural Water Use Efficiency** | Decreased flow to downstream users | Decreased potable water demand<br><br>Decreased dry weather runoff and pollutant loads to waterways<br><br>Reduced pumping costs<br><br>Improved ability to meet water supply needs and decreased dependence on imported supply | Loss of flow to downstream users | Increased available Bay-Delta supply and/or environmental flows<br><br>Improved air quality through decreased GHG and other emissions associated with imported water<br><br>Decreased energy consumption for water treatment and conveyance associated with imported water |
| **Urban Water Use Efficiency** | Loss of revenue to water agencies | Decreased potable water demand<br><br>Decreased dry weather runoff and pollutant loads to waterways<br><br>Reduced pumping costs<br><br>Improved ability to meet water supply needs and decreased dependence on imported supply | None identified | Increased available Bay-Delta supply and/or environmental flows<br><br>Improved air quality through decreased GHG and other emissions associated with imported water<br><br>Decreased energy consumption for water treatment and conveyance associated with imported water |

**Table 5-4: Impacts and Benefits of Strategies that Improve Operational Efficiency and Transfers**

| Strategy | Within IRWM Region | | Inter-regional | |
|---|---|---|---|---|
| | **Potential Impacts** | **Potential Benefits** | **Potential Impacts** | **Potential Benefits** |
| **Conveyance – Regional/ Local** | Increased short-term construction and site-specific impacts | Reduced system loss<br><br>Improved water system reliability<br><br>Improved ability to meet water supply needs and decreased dependence on imported supply | None identified | Increased available Bay-Delta supply and/or environmental flows<br><br>Improved air quality through decreased GHG and other emissions associated with imported water<br><br>Decreased energy consumption for water treatment and conveyance associated with imported water |
| **System Reoperation** | Increased short-term construction and site-specific impacts | Improved water system reliability<br><br>Improved ability to meet water supply needs and decreased dependence on imported supply<br><br>Decreased energy consumption and associated GHG emissions for water conveyance | None identified | Increased available Bay-Delta supply and/or environmental flows<br><br>Improved air quality through decreased GHG and other emissions associated with imported water<br><br>Decreased energy consumption for water treatment and conveyance associated with imported water |
| **Water Transfers** | Reduced return flows<br><br>Loss of agricultural land | Increased water supply in normal, drought and emergency conditions<br><br>Improved economic stability and environmental conditions | Reduced return flows<br><br>Loss of agricultural land | Financial (for seller of water)<br><br>Beneficial use of resources otherwise unused |

### Table 5-5: Impacts and Benefits of Strategies that Increase Water Supply

| Strategy | Within IRWM Region | | Inter-regional | |
|---|---|---|---|---|
| | Potential Impacts | Potential Benefits | Potential Impacts | Potential Benefits |
| **Conjunctive Management & Groundwater** | Increased short-term construction and site-specific impacts<br><br>Increased local energy and GHG emissions associated with pumping levels<br><br>Environmental impacts to natural habitats and open space from removing flood flows<br><br>Reduction in sediment for downstream needs<br><br>Increased air pollution from deteriorating lakebed surfaces | Improved ability to meet water supply needs and decreased dependence on imported supply<br><br>Improved water supply reliability<br><br>Increased available water supply to meet demand from growth<br><br>Improved groundwater basin yield and production flexibility<br><br>Increased water quality protection | Increased air pollution from deteriorating lakebed surfaces | Increased available Bay-Delta supply and/or environmental flows<br><br>Improved air quality through decreased GHG and other emissions associated with imported water<br><br>Decreased energy consumption for water treatment and conveyance associated with imported water |

| Strategy | Within IRWM Region | | Inter-regional | |
|---|---|---|---|---|
| | Potential Impacts | Potential Benefits | Potential Impacts | Potential Benefits |
| **Recycled Municipal Water** | Increased construction-related and site-specific impacts<br><br>Increased local energy use, and GHG emissions associated with higher treatment levels<br><br>Reduced effluent discharge available for in-stream flows<br><br>Increased need for recharge facility capacity<br><br>Increased need for brine disposal | Improved ability to meet water supply needs and decreased dependence on imported supply<br><br>Increased water quality and beneficial use of WWTP/ recycled water flows<br><br>Improved groundwater basin yield and production flexibility<br><br>Advancement of technology and application for use by other entities<br><br>Decreased long-term water costs | None identified | Increased available Bay-Delta supply and/or environmental flows<br><br>Improved air quality through decreased GHG and other emissions associated with imported water<br><br>Decreased energy consumption for water treatment and conveyance associated with imported water<br><br>Advancement of technology and application for use by other entities |
| **Surface Storage – Regional/ Local** | Increased short-term construction and site-specific impacts<br><br>Altered riparian flows and habitat quality<br><br>Increased evaporative losses<br><br>Increased air pollution from deteriorating lakebed surfaces | Increased system operational flexibility<br><br>Improved access to previously untapped local supply and increased reliability<br><br>Increased capacity for flood management | Increased air pollution from deteriorating lakebed surfaces | Increased available Bay-Delta supply and/or environmental flows<br><br>Improved air quality through decreased GHG and other emissions associated with imported water<br><br>Decreased energy consumption for water treatment and conveyance associated with imported water |

**Table 5-6: Impacts and Benefits of Strategies that Improve Water Quality**

| Strategy | Within IRWM Region | | Inter-regional | |
|---|---|---|---|---|
| | **Potential Impacts** | **Potential Benefits** | **Potential Impacts** | **Potential Benefits** |
| **Drinking Water Treatment and Distribution** | Increased short-term construction and site-specific impacts<br><br>Increased local energy use, and GHG emissions associated with higher treatment levels | Improved water quality and local water supply availability<br><br>Reduced drinking water-related health problems | None identified | Increased available Bay-Delta supply and/or environmental flows<br><br>Decreased energy consumption for water treatment and conveyance associated with imported water |
| **Groundwater and Aquifer Remediation** | Increased short-term construction and site-specific impacts<br><br>Increased local energy use, and GHG emissions associated with higher treatment levels | Improved water quality and local water supply availability<br><br>Reduced drinking water-related health problems | None identified | Increased available Bay-Delta supply and/or environmental flows<br><br>Decreased energy consumption for water treatment and conveyance associated with imported water |
| **Matching Water Quality to Use** | None Identified | Decreased water treatment costs<br><br>Improved ability to meet water supply needs and decreased dependence on imported supply | None Identified | Increased available Bay-Delta supply and/or environmental flows<br><br>Decreased energy consumption for water treatment and conveyance associated with imported water |

| Strategy | Within IRWM Region | | Inter-regional | |
|---|---|---|---|---|
| | **Potential Impacts** | **Potential Benefits** | **Potential Impacts** | **Potential Benefits** |
| **Pollution Prevention** | Increased short-term construction and site-specific impacts<br><br>Increased local energy, and GHG emissions associated with higher treatment levels | Improved water quality<br><br>Reduced need for other water management and treatment options<br><br>Enhanced recreation, water supply and habitat | None identified | Reduced pollutant loads<br><br>Enhanced recreation, water supply and habitat |
| **Salt & Salinity Management** | Increased brine/ salt disposal issues | Decreased damage to crop yields and farmland<br><br>Reduced corrosive damage to equipment<br><br>Improved water quality<br><br>Increased local water supply | None identified | Increased available Bay-Delta supply and/or environmental flows<br><br>Decreased energy consumption for water treatment and conveyance associated with imported water |
| **Urban Runoff Management** | Increased construction of individual projects<br><br>Reduced in-stream flows<br><br>Natural habitat and open space deterioration from reduced flows<br><br>Increased air pollution from deteriorating lakebed surfaces | Decreased urban runoff<br><br>Reduced pollutants to receiving waters<br><br>Improved habitat and recreation<br><br>Improved ability to meet water supply needs and decreased dependence on imported supply<br><br>Improved air quality through decreased GHG and other emissions relative to treated and pumped supplies | Increased air pollution from deteriorating lakebed surfaces | Increased available Bay-Delta supply and/or environmental flows<br><br>Improved air quality through decreased GHG and other emissions associated with imported water<br><br>Decreased energy consumption for water treatment and conveyance associated with imported water |

**Table 5-7: Impacts and Benefits of Strategies that Improve Flood Management**

| Strategy | Within IRWM Region | | Inter-regional | |
|---|---|---|---|---|
| | Potential Impacts | Potential Benefits | Potential Impacts | Potential Benefits |
| **Flood Risk Management** | Increased short-term construction and site-specific impacts<br><br>Changes in sediment loads and distribution<br><br>Natural habitat and open space deterioration from reduced flows<br><br>Increased air pollution from deteriorating lakebed surfaces | Reduced risk to property and life<br><br>Reduced flood insurance costs<br><br>Increased water supply, water quality, habitat and recreation<br><br>Advancement of integrated flood management engineering and application for use by other entities | Increased air pollution from deteriorating lakebed surfaces | Advancement of integrated flood management engineering and application for use by other entities |

**Table 5-8: Impacts and Benefits of Strategies that Practice Resources Stewardship**

| Strategy | Within IRWM Region | | Inter-regional | |
|---|---|---|---|---|
| | Potential Impacts | Potential Benefits | Potential Impacts | Potential Benefits |
| **Agricultural Land Stewardship** | Limited urban land use development | Increased water supply, quality, flood control, recreation and habitat benefits<br><br>Reduced soil erosion | None identified | None identified |

| Strategy | Within IRWM Region | | Inter-regional | |
|---|---|---|---|---|
| | Potential Impacts | Potential Benefits | Potential Impacts | Potential Benefits |
| **Ecosystem Restoration** | Increased short-term construction and site-specific impacts<br><br>Limiting urban land use development | Reduced invasive species, and increased native and endangered species<br><br>Improved passive recreation, education, water quality, water supply and flood control<br><br>Improved ability to increase or maintain habitat corridors | None Identified | None Identified |
| **Forest Management** | None identified | Improved water supply, water quality, flood control, habitat and recreation benefits | None identified | None identified |
| **Land Use Planning and Management** | None identified | Improved water supply, water quality, flood control, habitat and recreation benefits | None identified | None identified |
| **Recharge Areas Protection** | Increased short-term construction and site-specific impacts | Improved water supply, water quality, flood control, habitat and recreation benefits | None identified | None identified |
| **Sediment Management** | Increased short-term construction and site-specific impacts<br><br>Changes in sediment loads and distribution | Improved water supply, water quality, flood control, habitat and recreation benefits | None identified | None identified |
| **Watershed Management** | Increased short-term construction and site-specific impacts | Improved water supply, water quality, flood control, habitat and recreation benefits | None identified | None Identified |

**Table 5-9: Impacts and Benefits of Strategies to People and Water**

| | Within IRWM Region | | Inter-regional | |
|---|---|---|---|---|
| **Strategy** | **Potential Impacts** | **Potential Benefits** | **Potential Impacts** | **Potential Benefits** |
| **Economics Incentives** | None identified | Increased project implementation | None identified | None identified |
| **Outreach and Engagement** | None identified | Decreased water demand and increased water quality<br><br>Decreased energy consumption and associated GHG emissions with water transportation and treatment | None identified | Increased available Bay-Delta supply and/or environmental flows<br><br>Improved air quality through decreased GHG and other emissions associated with water treatment and conveyance |
| **Water and Culture** | None identified | Decreased water demand and increased water quality<br><br>Decreased energy consumption and associated GHG emissions with water transportation and treatment | None identified | Increased available Bay-Delta supply and/or environmental flows<br><br>Improved air quality through decreased GHG and other emissions associated with water treatment and conveyance |
| **Water-dependent Recreation** | Increased human activity in natural areas<br><br>Increased potential for water quality degradation<br><br>Increased potential impacts to cultural resources<br><br>Increased potential for disrupting or displacing wildlife | Increased water supply, water quality, flood control, habitat and recreation benefits<br><br>Reduced overuse and improved quality of existing recreation facilities, enhancing the recreational experience<br><br>Improved potential economic benefits to recreation-supporting businesses | None identified | None Identified |

**Table 5-10: Other Impacts and Benefits of Strategies**

| | Within IRWM Region | | Inter-regional | |
|---|---|---|---|---|
| **Strategy** | **Potential Impacts** | **Potential Benefits** | **Potential Impacts** | **Potential Benefits** |
| **Crop Idling for Water Transfer** | Loss of crop productivity<br><br>Loss of revenue to local community | Stable revenue to the agricultural sector<br><br>Decreased potable water demand<br><br>Decreased dry weather runoff and pollutant loads to waterways<br><br>Reduced pumping costs<br><br>Improved ability to meet water supply needs and decreased dependence on imported supply | None identified | Increased available Bay-Delta supply and/or environmental flows<br><br>Improved air quality through decreased GHG and other emissions associated with imported water<br><br>Decreased energy consumption for water treatment and conveyance associated with imported water |
| **Irrigated Land Retirement** | Loss of agricultural lands<br><br>Loss of revenue to local community | Decreased drainage-related problems<br><br>Improved water quality<br><br>Decreased potable water demand<br><br>Decreased dry weather runoff and pollutant loads to waterways<br><br>Improved ability to meet water supply needs and decreased dependence on imported supply | None identified | Increased available Bay-Delta supply and/or environmental flows<br><br>Improved air quality through decreased GHG and other emissions associated with imported water<br><br>Decreased energy consumption for water treatment and conveyance associated with imported water |

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# Section 6 | Project Integration and Objectives Assessment

***Resource management strategy integration is a process to design resource management strategy alternatives to maximize regional benefits by identifying potential synergies, linkages, and gaps between the projects, actions and studies subsequently identified in Section 7. The aim of this section is to assess whether the strategies identified in Section 5 and the projects identified in Section 7 are sufficient to meet the needs and objectives of the Antelope Valley Region as defined by Sections 3 and 4, respectively. In cases where needs and objectives may not be met, Section 6 identifies future planning actions that are needed to meet this purpose. Below is a discussion of the identified projects evaluated against their specific objectives and planning targets (i.e., projects benefiting water supply are compared to water supply objectives).***

It was important to the Stakeholder group to identify objectives that were SMART[1], and one way to be *Measurable* is to be quantifiable. Therefore, the objectives in Section 4 include quantifiable planning targets, where possible, to help gauge whether a particular objective has been met. For those projects that were far enough along in the planning stages to quantify the benefit, their benefit could be evaluated against its respective planning target. However, many of the projects submitted identified qualitative benefits only at this point because they are conceptual in nature. These projects were therefore evaluated according to whether they could contribute to the attainment of a particular objective qualitatively.

For example, one project concept submitted by Boron CSD for evaluation is the construction of an arsenic-removal treatment plant. Because this program was submitted as a project concept, with the number of potential users and other technical details not yet quantified, the water quality benefits from this program would have to be determined as the project scope was more clearly defined. However, it is logical to assume that the program would result in some reduction of arsenic loading

[1] A SMART objective is one that is Specific, Measurable, Attainable, Relevant, and Time-Based.

in groundwater supplies, which would allow Boron CSD to improve local groundwater quality and help achieve state and federal compliance guidelines for drinking water, and would therefore help to meet the water quality planning target of continue to meet Federal and State water quality standards as well as customer standards for taste and aesthetics throughout the planning period.

Gaps are areas where the suite of current and proposed projects identified in Section 7 fail to meet or contribute to the IRWM Plan objectives. In order to address these gaps, alternative project concepts and ideas are presented. As the AV IRWM Plan is updated and as project scopes are refined, opportunities exist to re-evaluate these projects, and evaluate whether this IRWM Plan is meeting the issues and needs of the Antelope Valley Region.

## 6.1 Water Supply Management

Issues and needs relating to the water supply for the Antelope Valley Region generally involve providing a reliable water supply to meet demands (primarily utilizing water banking, water transfers, conservation, and recycled water) and protecting the groundwater resource.

### Progress to Date and Revisions to Regional Objectives

Since the 2007 IRWM Plan was adopted, the Region's supply and demand estimates have changed due to a number of factors. First, various projects have been implemented to increase the Region's supply reliability and diversification and to reduce demand through conservation measures. Additionally, the Judgment determined that a total sustainable yield for the groundwater basin would be used to determine pumping rights. Therefore, supply projections were updated to incorporate total sustainable yield in lieu of the previous numbers in the Regional water balance. Given these developments, the Region updated its supply related objectives from the 2013 IRWM Plan update which resulted in a increase in the Region's 2040 supply mismatch Water banking projects such as the Willow Springs Water Bank and the Westside Water Bank have also been implemented with the intention to store up to approximately 650,000 AF of imported water. The data presented in Section 3 still indicate mismatches between supply and demand in single dry and multiple dry years. The Region's water supply targets were adjusted accordingly in Section 4. In addition, it was recognized that water supplies may be impacted by climate change in the future. Therefore, climate change adaptation was included as a part of the water supply objectives.

### Assessment of IRWM Projects' Potential to Meet Water Supply Objectives

As detailed in Section 3, the Antelope Valley Region will need to maintain supplies and demand management measures for average water years between 2015 and 2040. The Region will need to implement supply and demand management projects in order to reduce the mismatch between supply and demand during single dry and multiple dry years. Section 4 presented objectives and planning targets identified by the Stakeholder group in order to address this deficit.

Most of the water supply projects proposed by the stakeholders involve the implementation of recharge projects, water banking programs, conservation programs, water transfers, and recycled water projects. For these supply-related projects, it should be noted that in some cases many project components have to come together to realize a supply benefit. For example, recycled water does not provide supply benefits until a treatment plant source is identified (and in some cases, upgraded), conveyance pipelines are constructed, and some kind of end use is established (e.g., a customer conversion or a groundwater recharge project). The necessary components for each type of supply-related project are described in Table 6-1.

**Table 6-1: Projects with Water Supply Benefits**

| Type of Project | Necessary components to realize water supply benefit |
|---|---|
| **Recycled water** | 1. Water reclamation plant construction, expansion, and/or upgrades AND<br>2. Conveyance pipelines (backbone and smaller laterals) AND<br>3a. Site conversions (industrial, environmental, irrigation customers) OR<br>3b. Groundwater recharge sites (considered part of potable water supply once introduced to aquifer) |
| **Imported Water** | 1. Transfer opportunity, Article 21, or increase in Table A amount must be identified AND<br>2a. Water banking facility, including recharge and recovery capability OR<br>2b. Distribution facilities to make use of increased volume of imported water |
| **Stormwater** | 1. Facilities to capture and route storm water AND<br>2. Facilities to infiltrate storm water |
| **Conservation** | 1. No additional measures required |

These supply projects, shown in Table 6-2, demonstrate that the stakeholders view conjunctive use operations and recycled water use as essential in order to meet the water supply needs in the Antelope Valley Region and to lessen the gap between supply and demand for single dry and multiple dry years. Several of the submitted projects will also help the Region to develop its local supplies and reduce the Region's reliance on the Delta.

A number of water conservation projects were also submitted by the stakeholder group. These projects aim to reduce the gap between supply and demand by managing the demand side of the water balance equation. Thus, integration of those projects that manage the supply side with those that manage the demand side is essential for meeting the Region objectives for supply.

*Water Supply Objective 1*. Provide reliable water supply to meet the Antelope Valley Region's expected demand between now and 2040; and adapt to climate change.

- *Target:* Maintain adequate supply and demand in average years.
- *Target:* Provide adequate reserves (77,200 AFY) to supplement average condition supply to meet demands during single-dry year conditions, starting 2009.
- *Target:* Provide adequate reserves (198,800 AF/4-year period) to supplement average condition supply to meet demands during multi-dry year conditions, starting 2009.

**Table 6-2: Projects with Water Supply Benefits**

| Project | Supply Created | Status |
|---|---|---|
| **Recycled Water Production** | **Amount Produced** | |
| Lancaster WRP Stage V | 16,000 AFY | Complete |
| Palmdale WRP Stage V | 10,000 AFY | Complete |
| **Recycled Water Conveyance** | **Amount Conveyed** | |
| North Los Angeles/Kern County Regional Recycled Water Project – Division Street Corridor | 786 AFY[a] | Complete |
| North Los Angeles/Kern County Regional Recycled Water Project – Phase 1b | 2,161 AFY[a] | Complete |
| North Los Angeles/Kern County Regional Recycled Water Project – Phase 2 | 2,076 AFY[a] | Complete |
| Antelope Valley Recycled Water Master Plan | Not quantified | Implementation |
| Division Street and Avenue H-8 Recycled Water Tank | 3 AF | Implementation |
| Palmdale Recycled Water Authority – Phase 2 Distribution System | 500 AFY | Implementation |
| Avenue K Transmission Main, Phases I-IV | Not quantified | Conceptual |
| Avenue M and 62th Street West Tanks | 37 AFY | Conceptual |
| Tertiary Treated Water Conveyance and Incidental Groundwater Recharge of Amargosa Creek Avenue M to Avenue H | 100 to 1,000 AFY | Conceptual |
| KC & LAC Interconnection Pipeline | Not quantified | No Longer Pursued |
| North Los Angeles/Kern County Regional Recycled Water Project – Phase 3 | up to approx. 1,300 AFY[a] | No Longer Pursued |
| North Los Angeles/Kern County Regional Recycled Water Project – Phase 4 | up to approx. 7,000 AFY[a] | No Longer Pursued |
| Place Valves and Turnouts on Reclaimed Water Pipeline | Not quantified | No Longer Pursued |
| RCSD Wastewater Pipeline | Not quantified | No Longer Pursued |
| Tropico Park Pipeline | Not quantified | No Longer Pursued |
| **Recycled Water Conversions** | **Amount Reused** | |
| McAdam Park Recycled Water Conversion | 80 AFY | Complete |
| Division Street Corridor Recycled Water Conversions (various) | 2 AFY | Complete |
| Whit Carter Park Recycled Water Conversion | 50 AFY | Implementation |
| Pierre Bain Park Recycled Water Conversion | 75 AFY | Implementation |
| Lancaster National Soccer Center Recycled Water Conversion | 500 AFY | Implementation |
| Lancaster Cemetery Recycled Water Conversion | 40 AFY | Conceptual |
| **Recycled Water Recharge** | **Amount Recharged** | |
| Palmdale Regional Groundwater Recharge Project | 6,500 AFY[b] / AF storage not quantified | Implementation |
| Wastewater Treatment Plant Rehabilitation and Groundwater Protection | 1,500 AFY | Implementation |
| Lower Amargosa Creek Recharge Project | 1,000 AFY / AF storage not quantified | Conceptual |
| Tertiary Treated Water Conveyance and Incidental Groundwater Recharge of Amargosa Creek Avenue M to Avenue H | 1 to 100 AFY / AF storage not quantified | Conceptual |
| **Imported Water Conveyance Infrastructure** | **Amount Conveyed** | |

| Project | Supply Created | Status |
|---|---|---|
| South Antelope Valley Intertie Project | Not quantified | Implementation |
| South North Intertie Pipeline (SNIP) Phase II | 33,600 AFY | Implementation |
| AVEK Strategic Plan | Not quantified | Implementation |
| SWP Turnout Upgrade | Not quantified | Conceptual |
| Gaskell Road Pipeline | 100 – 1,000 AF | No Longer Pursued |
| **Imported Water Recharge** | **Amount Recharged** | |
| Willow Springs Water Bank | 43,500 AFY / 500,000 AF of storage[c] | Partially Complete[d] |
| Aquifer Storage and Recovery Project: Additional Storage Capacity (Westside Water Bank) | Up to 150,000 AF of storage | Complete |
| Aquifer Storage and Recovery Project: Injection Well Development | 12,000 AFY / AF storage not quantified | Complete |
| Eastside Banking & Blending Project | 5,700 AFY / AF storage not quantified | Complete |
| Water Supply Stabilization Project – Westside Project (Westside Water Bank) | Up to 120,000 AF of storage; currently 36,000 of withdrawal capacity | Complete |
| Palmdale Regional Groundwater Recharge Project | 38,000 AFY[c] / AF storage not quantified | Implementation |
| Upper Amargosa Creek Recharge and Channelization Project | 15,000-54,000 AFY[e] / AF storage not quantified | Implementation |
| Water Supply Stabilization Project (WSSP) – Westside Expansion | 6,000 AFY / 500,000 AF storage | Implementation |
| Expansion of the Eastside Water Bank | Not quantified | Conceptual |
| Hunt Canyon Groundwater Recharge and Flood Control Basin | 3,000 AF | Conceptual |
| Big Rock Creek Recharge and Recovery Project | Not quantified | Conceptual |
| Purchasing Spreading Basin Land | Not quantified | No Longer Pursued |
| **Stormwater Capture** | **Amount of Capture** | |
| Littlerock Dam Sediment Removal | 500 AFY | Implementation |
| Stormwater Harvesting | 25 AFY | Conceptual |
| **Stormwater Recharge** | **Amount Recharged** | |
| Upper Amargosa Creek Recharge and Channelization Project | 400[c] AFY / AF storage not quantified | Implementation |
| 45th Street East Groundwater Recharge and Flood Control Basin | 2,000 AFY / AF storage not quantified | Conceptual |
| Amargosa Creek Pathways Project | 100 AFY | Conceptual |
| Avenue Q and 20th Street East Groundwater and Flood Control Basin (Q-West Basin) | 1,600 AFY / AF storage not quantified | Conceptual |
| Avenue R and Division Street Groundwater Recharge and Flood Control Basin | Not quantified | Conceptual |
| Barrel Springs Groundwater Recharge and Flood Control Basin | Not quantified | Conceptual |
| Big Rock Creek In-River Spreading Grounds | 1,000 AFY / 5,500 AF storage | Conceptual |
| Littlerock Creek In-River Spreading Grounds | 1,000 AFY / 7,600 AF storage | Conceptual |
| Multi-use/Wildlife Habitat Restoration Project | Not quantified | Conceptual |

| Project | Supply Created | Status |
|---|---|---|
| **Groundwater** | **Amount Pumped** | |
| Partial Well Abandonment of Groundwater Wells for Arsenic Mitigation | Not quantified | Complete |
| BCSD Arsenic Management Feasibility Study and Well Design | Not quantified | Complete |
| QHWD Partial Well Abandonment | Not quantified | Conceptual |
| Fremont Valley Basin Potable Groundwater Well Treatment Project | 1,500 AFY | Conceptual |
| RCSD Arsenic Consolidation Project | Not quantified | No Longer Pursued |
| Deep Wells to Recapture Banked Water | Not quantified | No Longer Pursued |
| **Conservation** | **Amount Conserved** | |
| Antelope Valley Regional Conservation Project | 12 AFY | Implementation |
| Antelope-Fremont Valleys Stealth Watershed Rapid Response Program | Not quantified | Conceptual |
| Implement ET Controller Program | Not quantified | Conceptual |
| Precision Irrigation Control System | 150 AFY | Conceptual |
| Water Conservation School Education Program | Not quantified | Conceptual |
| ET Based Controller Program | 240 AFY | No Longer Pursued |
| Ultra-Low Flush Toilet Change-out Program | 100 to 1,000 AFY | No Longer Pursued |
| Waste Water Ordinance | Not quantified | No Longer Pursued |

Notes:
(a) Source: *Final Facilities Planning Report*, *Antelope Valley Recycled Water Project*, August 2006.
(b) Assumes that the Palmdale Regional Groundwater Recharge Project will use approximately 6,500 AFY of recycled water and 38,000 AFY of imported water for recharge.
(c) Not all of the future capacity in the Willow Springs Water Bank will be allocated to entities in the Region.
(d) Expansion of the Willow Springs Water Bank is currently ongoing.
(e) The Upper Amargosa Creek Flood Control, Recharge, and Habitat Restoration Project will use approximately 400 AFY of stormwater and 14,600-53,600 AFY of imported water for recharge.

As shown in Table 6-1, the water supply projects submitted by the stakeholders show a range of quantified supply benefits, from 1 AFY to 100,000 AFY. Included in these projects are new recycled water facilities, imported water recharge, stormwater capture and recharge, and conservation. It should be noted that most projects will not alone provide a supply benefit. As stated above, recycled water projects will require projects to increase recycled water supply coming from water reclamation plants, pipes and pump stations to convey the recycled water to users and groundwater recharge facilities, and conversions to enable customers to use the recycled water.

The recycled water projects shown in Table 6-2 are classified as recycled water production, recycled water conveyance, recycled water conversion, and recycled water recharge. As discussed in Section 3, approximately 21,000 AFY of recycled water is currently produced at water reclamation facilities are currently available for non-potable reuse. Currently, approximately 350 AFY of this recycled water supply is used.

A number of implementation projects were identified that can utilize this water, including approximately 500 AFY of conveyance facilities, 625 AFY of conversion for non-potable reuse, and 8,000 AFY of groundwater recharge. It should be noted that additional conveyance, conversion, and recharge facilities would be necessary to reuse all of the available recycled water.

It is expected that by 2040 conceptual recycled water conveyance projects would provide up to an additional 503 AFY of recycled water conveyance. Conceptual recycled water recharge projects were identified for up to an additional 1,100 AFY.

In total, approximately 21,000 AFY of recycled water will be available in 2040 and projects (implementation and conceptual) have been identified that could use up to approximately 14,300 AFY as shown in Section 3 (Table 3-15). Many of these projects still need further development before they can be implemented. It is likely that as groundwater recharge regulations evolve, much of the available recycled water will be reused in future groundwater recharge projects. Ultimately, recycled water will be limited by future population growth which impacts wastewater flows and, in turn, recycled water production. It should also be noted that projects that could recharge with recycled water will likely require blending with imported water or stormwater as diluent flow.

Imported water projects that increase available supplies can include both water transfers and imported water banking projects. There were no projects proposed to acquire additional imported water through transfers; however, there are existing banking projects that have the capacity to bank up to 120,000 AF of imported water (Westside Water Bank) and implementation projects that could bank up to an additional 500,000 AF (Willow Springs Water Bank). Other water banking projects are also proposed, which could increase the total storage capacity in the Antelope Valley groundwater basin. Annual recharge and withdrawal capacities vary as shown in Table 6-2. In order to obtain additional water for banking, imported water purveyors in the area would need to acquire water transfers or capture excess imported water during wet years.

Stormwater supply projects proposed include projects to capture additional stormwater and stormwater recharge projects. Stormwater capture projects include the Littlerock Dam Sediment Removal Project which is estimated to increase stormwater capture by 500 AFY, and Leona Valley's Stormwater Harvesting Project which would capture an additional 25 AFY for treatment and direct use. Stormwater recharge projects include proposed spreading grounds on Amargosa Creek, Littlerock Creek, Big Rock Creek, and at numerous flood control basins in urban areas. Of these recharge projects, only the Upper Amargosa Creek Flood Control, Recharge, and Habitat Restoration Project has implementation project status. This project is estimated to recharge 400 AFY of stormwater. An additional 5,700 AFY of conceptual stormwater recharge projects were also proposed. Some stormwater recharge projects also estimated the total acre-feet of water that would be stored in groundwater aquifers; potentially up to 13,000 AF of stormwater could be stored. It is assumed that projects that would recharge Littlerock Creek water would be operated in conjunction with the Littlerock Creek Dam Sediment Removal Project. In total, stormwater recharge projects with approximately 6,000 AFY of capacity were identified that could store up to approximately 13,000 AF.

Finally, several conservation projects that would reduce water demand were proposed, including programs to install ET based irrigation controllers, develop conservation ordinances, and implement conservation education programs. In total, the proposed conservation projects are estimated to reduce demand by up to 1,510 AFY.

The implementation and conceptual projects described in this IRWM Plan can help to achieve the Supply Planning Targets as follows:

- *Average Year: Provide up to an additional 24,400 AFY of new supply for average years with increased recycled water use (16,000 AFY), stormwater capture (6,625 AFY), and conservation (1,750 AFY). Some of these new supplies can also serve as sources of water for banking.*
- *Single Dry Year: Provide up to an additional 24,400 AFY of new supply for a single dry year and approximately 1,000,000 AF of storage capacity (potentially more) with recharge and recovery capability of up to 250,000 AFY; use of water banked in storage would require the Region to have obtained and recharged supplies prior to a single dry year event, potentially including transfers*

- *Multi-Dry Year Period: Provide up to an additional 24,000 AFY of new supply in multi-dry year periods and approximately 1,000,000 AF of storage capacity (potentially more) with recharge and recovery capability of up to 250,000 AFY; use of water banked in storage would require the Region to have obtained and recharged supplies prior to a multi-dry year event, potentially including transfers*

*Water Supply Objective 2*. Establish a contingency plan to meet water supply needs of the Antelope Valley Region during a plausible disruption of SWP water deliveries.

- *Target:* Demonstrate ability to meet regional water demands without receiving SWP water for 6 months over the summer by 2025.

This scenario is, in some sense, a variation on the dry year scenario if it is assumed that it represents a "very dry 6-month period" during summer months. In the event of a temporary loss of SWP for 6 months over the summer, the Antelope Valley Region would be short approximately 65,000 AFY in an average water year. This estimate assumes that 33 percent (1/3) of demands occur during winter months (October through March) and 66 percent (2/3) occur in summer months (April through September); and it is based on the direct deliveries for AVEK discussed in Section 3.1.1.2.

This Planning Target may be measured by using UWMPs and other capacity-related planning documents to show that sufficient pumping capacity exists in the Region to provide 65,000 AFY of water over a six-month period during the summer. This represents a "worst case scenario" since under dry year and multi-dry year scenarios, smaller allotments of imported water would be available to begin with. So 66 percent reductions in these smaller amounts would have less impact.

Water Supply Objective 2 was more difficult to evaluate in terms of whether the proposed projects adequately met this objective without a developed contingency plan. In order to meet this objective, the Antelope Valley Region would be required to rely on groundwater, recycled water, and demand management measures to meet supply needs. Given that many of the projects proposed were recharge programs, some of which have quantifiable benefits of up to 120,000 AFY of recharge and recovery capacity and/or 500,000 AF of storage capacity (potentially more) as mentioned above, it is likely that this IRWM Plan will contribute towards meeting this objective.

Additionally, each water purveyor in the Antelope Valley Region has already developed Contingency Plans to address emergency situations as discussed in their Urban Water Management Plans. These are not included in the Plan as implementation projects. Emergency demand management measures listed in water districts' urban water management plans include:

- Ordinances prohibiting water waste (e.g. allowing water to run off of property from landscape areas)
- Ordinances controlling landscape irrigation
- Ordinances restricting outdoor water uses (e.g. washing of sidewalks, motor vehicles, decorative fountains)
- Prohibitions on new connections of the incorporation of new areas
- Serving of drinking water in restaurants only when requested
- Rationing of water supplies
- Limiting use of fire hydrants to only firefighting and related activities
- Water shortage pricing

These measures, in conjunction with the proposed recharge programs, would further help the Region to meet the objective to accommodate a six-month stoppage of SWP water over the summer period.

*Water Supply Objective 3*. Stabilize groundwater levels.

- *Target:* Manage groundwater levels throughout the basin such Production Rights defined in the adjudication Judgment are met by 2023.

As mentioned above, many of the projects proposed by the stakeholders are groundwater recharge projects and water banking programs. These projects and programs will require monitoring to identify which regions of the aquifer are best suited for these activities, and will require continued monitoring to ensure they are operating effectively. Monitoring and data collection is the first step in managing groundwater levels throughout the basin.

As discussed in Section 3, adjudication proceedings established pumping rights and restrictions to account for groundwater recharge. Groundwater recharge, banking, water rights transfers, in-lieu recharge, and conservation projects are all intended to help meet the target to maintain or increase groundwater levels. Actual stabilization of groundwater levels is monitored by the Court through the Antelope Valley Watermaster.

### Future Planning Efforts and Actions to Fill the Identified Water Supply Management Gaps

Because it is difficult at this stage in the IRWM Plan process to quantify the potential benefits of all the projects, it is difficult to assess whether the water supply projects will adequately meet this IRWM Plan objective. However, given the projected supply deficits, the following future planning efforts and actions are additional options that could help to meet this objective in addition to the proposed projects described in Section 7.

**Aggressive Conservation.** Implementing an aggressive water conservation program (i.e., beyond current and planned measures) could conserve up to 15,400 AFY in the Antelope Valley Region, assuming an additional 10 percent per capita reduction in urban water demand by 2025. A determination would need to be made as to whether the amount of conservation that is required under this alternative would be achievable or insufficient.

As discussed in Section 5, all water agencies in the Antelope Valley Region currently utilize water conservation methods as a means to reduce demand during drought conditions. However, only LACWD 40 is a member of the California Urban Water Conservation Council (CUWCC) and a signatory of the MOU Regarding Urban Water Conservation in California. AVEK, PWD, QHWD, and RCSD are not signatories to the CUWCC MOU and are not members of CUWCC; however, they have each implemented their own conservation methods.

An aggressive water conservation program would also include agricultural water conservation. On-farm water use can be reduced substantially without decreasing productivity through improved irrigation technologies and efficient water management practices.

**Develop Further Conjunctive Use Management.** The amount of planned and conceptual conjunctive use capacity is considerable for the Region. The number of water banking and ASR projects proposed by the Stakeholders are an indication of how important conjunctive use operations will be in order to meet the water supply needs in the Antelope Valley Region. Below is a discussion of additional conjunctive management project options that may expand water banking and ASR in the Region even further. Successful conjunctive use programs include both new supplies of water as well as storage capacity to accommodate seasonal and wet/dry year variations.

The first option is to increase the amount of imported SWP water into the Antelope Valley Region for direct use or water banking. The main issues associated with increasing use of imported SWP for conjunctive uses include cost, availability, and quality of SWP water (generally high in TDS compared to local stormwater and groundwater).

The capture and recharge of surface water is another conjunctive use method available to the Antelope Valley Region. Most of the runoff into the Antelope Valley Region originates in the surrounding mountains. Rainfall records indicate that runoff sometimes may be available that could be retained and used for artificial groundwater recharge (USGS 1995). Surface water recharge could be increased by limiting development in key recharge areas of the Antelope Valley Region as well as by establishing effective methods to capture surface water. Surface water capture and recharge would need to be evaluated for feasibility prior to implementation to identify recharge areas, as discussed above.

Lastly, conjunctive uses could be expanded to the treatment of poor quality groundwater which could be extracted, treated, and then re-injected into the aquifer. The extraction would be accomplished through the increased use of existing wells and by the installation of additional wells, pumps, and wellhead treatment facilities. Existing or new distribution facilities such as pipelines and pumping stations would be used to transport this water to existing and planned treated water distribution facilities. Pumps and treatment facilities would use electrical power. A detailed geohydrologic investigation would be necessary prior to drilling on a site-by-site basis. Field studies and groundwater modeling activities would be needed to hydraulically evaluate where in the aquifer the additional extraction should come from and if the basin could handle increased pumping without negatively affecting groundwater levels. The pending adjudication would determine the feasibility of this alternative, and to what extent it could be implemented in the Antelope Valley Region.

**Participate in Water Banks Outside of the Antelope Valley Region.** Another potential water supply option is to participate in water banking programs outside of the Antelope Valley Region to bring water into the Antelope Valley Region. Such additional banks could include the Wheeler Ridge Maricopa Water Storage District, the Arvin-Edison Water Storage District, the Chino Basin Groundwater Basin Storage and Recovery Program, the Semitropic Groundwater Storage Bank, the West Kern Water District Groundwater Banking Project, Mojave Water Agency Program, Calleguas Municipal Water District (CMWD) and Metropolitan Water District of Southern California (MWD), Las Posas Aquifer Storage and Recovery, and the Rosedale-Rio Bravo Water Storage District. It should be noted that while water banks operating outside of Antelope Valley Region are possibilities for the Antelope Valley Region, the feasibility of utilizing each still needs to be determined. Benefits to the Antelope Valley Region from utilization of these banks would be to increase water supply reliability for the Antelope Valley Region by increasing the number and mix of sites potentially available in which to bank water for later withdrawal and use. The Region would still need to identify and procure additional water supplies to store in an outside water bank.

**Use Alternative Sources of Water.** Groundwater and imported SWP water make up the majority of the water supplies in the Antelope Valley Region, with groundwater historically providing between 50 and 90 percent of overall supply. The adjudication and variability of SWP in light of global climate change conditions calls into question the reliability of these sources. Another solution is to use alternative sources of water to meet demands. These other sources could include water from the Central Valley of California (Central Valley Project [CVP] water) transfers from other water rights holders in the Sacramento Valley, water from other water supply systems (Los Angeles Department of Water and Power [LADWP]), recycled water, Article 21 water, treated stormwater captured and recharged into the ground, and desalinated water. In addition, alternative imported water sources from SWP contractors other than AVEK could be considered. There are a number of issues involved with the use of these other sources. The use of water from the CVP water would be transported to AVEK via SWP facilities, and as non-SWP water, transmission by these facilities would have low priority. Therefore, the water supply could be less reliable than that of water that AVEK currently supplies. Additionally, the permanent conveyance of this water through the Bay-Delta could result in economic and social impacts associated with transferring water from agricultural use to urban use. Water transfers from CVP contractors also would not likely be feasible because their water already has been allocated for other uses, including environmental restoration projects, and is not available for long-term, reliable sale or exchange.

Various SWP contractors (or their member agencies) hold contractual SWP Table A Amounts in excess of their demands. Due to the high annual fixed costs of SWP Table A Amounts, these agencies may wish to sell this excess to another contractor. Such Table A Amounts would be subject to the SWP annual allocation and SWP delivery reliability constraints. Potential sellers include the County of Butte and Kern County Water Agency (from its member agencies). Article 21 water refers to the SWP contract provision defining this supply as water that may be made available by DWR when excess flows are available in the Delta (i.e., when Delta outflow requirements have been met, SWP storage south of the Delta is full, and conveyance capacity is available beyond that being used for SWP operations and delivery of allocated and scheduled Table A supplies). Article 21 water is made available on an unscheduled and interruptible basis and is typically available only in average to wet years, generally only for a limited time in the late winter. Due to the short duration of its availability and capacity constraints at Edmonston Pumping Plant, Article 21 water is generally delivered most readily to agricultural contractors and to San Joaquin Valley banking programs. Therefore, Article 21 water is not considered a long-term reliable supply for the Antelope Valley Region.

The SWP Contractors Authority (Authority) Dry-year Water Purchase Program allows for the purchase of water from many agents within the California water system on a one-time or short-term basis. Participants could increase reliability during drought years by participating in this program to supplement supplies. This program has historically operated only in years when the SWP allocation is below 50 percent, or when a potentially dry hydrologic season is combined with expected low SWP carryover storage; it thus provides a contingency supplemental water supply. Typical water costs include an option payment (to hold water); the call price (actual purchase price); and loss of water due to movement through the Sacramento/San Joaquin Delta, in addition to SWP transmission costs. Turn-back Water Pools are a means by which SWP contractors with excess Table A Amounts in a given hydrologic year may sell that excess to other contractors. This is included in a provision in the SWP water supply contracts. This provision is available in all year types, but is most in demand during dry periods when Table A allocations are low and almost all contractors are seeking additional supplies. Of course, in those year types, less water is made available to the Turn-back Water Pools. The program is administered by DWR and requires selling and buying contractors to adhere to a specific schedule by which options to water must be exercised. The total amount of water placed into the pools by the selling contractors is allocated to the participating buying contractors based on their contractual Table A Amounts. The water supply contract provides for Turn-back Water Pools in a given water year. Pool "A," which must be purchased by March 1, is priced at 50 percent of the current SWP Delta water rate and the later Pool "B," which must be purchased by April 1, is priced at 25 percent of the current Delta water rate. All of the above mentioned supply alternatives have issues related to capacity and delivery priority in the California Aqueduct and other SWP facilities. SWP contractors, via their water supply contracts with DWR, are allocated specified shares of "reach repayment" capacity in various reaches of the SWP system, starting at Banks Pumping Plant in the Delta and proceeding through the main stem of the Aqueduct and the Aqueduct branches to each contractor's delivery turnout(s). This share of capacity pertains to SWP supplies only, and provides each contractor with delivery priority for its SWP supplies. The water supply contracts also provide for the delivery of non-SWP supplies through the SWP system, provided that other contractors are not coincidentally utilizing all available capacity; these non-SWP supplies are delivered at a lower priority than SWP supplies. Reach repayment capacity is often less than the actual constructed physical capacity of SWP facilities.

It is generally accepted among the SWP contractors that, based on future demand forecasts for all contractors, wet years (which tend to lower service area demands), will result in ample capacity in the southerly reaches of the SWP system, even though Table A allocations are high (i.e., not all water will be needed in the contactors' service areas, and much of it will be banked in other locations or sold into the SWP Turn-back Water Pools). During times when dry years occur in the Antelope Valley (which tend to cause higher service area demands), SWP capacity constraints may occur as southern contractors take water from the various banking programs in the San Joaquin Valley or from various dry year supply programs and attempt to deliver them within the same window of time (i.e., peak demand periods), in addition to Table A allocations. It is also generally accepted that all contractors in a given repayment reach will work cooperatively with DWR and each other to attempt delivery of all requested supplies, whether SWP or non-SWP. As additional contractors obtain additional supplies through time, this cooperative arrangement will be tested.

Utilization of desalinated water is also an alternate source of water that could be made available in the Antelope Valley Region. It is not likely that a desalination plant would be constructed in the Antelope Valley Region due to the distance from the ocean and the associated construction and operation costs. However, it is plausible to obtain desalinated water by exchange. For example, in this situation, AVEK could contribute a portion of the funds needed by another agency to develop a seawater desalination facility along the southern California coast, and water produced by this facility would be exchanged with AVEK for SWP water. A likely partner in such an arrangement could be MWD. If both parties agreed, AVEK would enter into a contract with MWD indicating that a portion of MWD's annual SWP Table A Amount would be delivered to AVEK in exchange for AVEK's contribution to a desalination facility to be constructed by MWD. AVEK would treat and distribute SWP water in existing AVEK facilities, and MWD would use water from the desalination facility in lieu of the SWP water exchanged with AVEK. All of these options present challenges in terms of conveyance, water quality, and cost.

**Make Further Use of Recycled.** Many of the Stakeholder-identified projects involve the use of recycled water. Increasing this amount beyond what is already planned could help to further reduce the gap between future supply and demand. Since the use of recycled water in the Region is currently limited to landscaping and other non-potable uses, it would be important to identify uses for the water beyond those for which its uses are currently dedicated or planned. Another important use for recycled water is groundwater recharge. Particular concern should be paid to salinity concentrations in recycled water. Numerous factors contribute to salinity in recycled water, including imported potable water sources and salts entering with each cycle of urban use for residential, commercial, or industrial purposes. Management of the salt imbalance is important because as salinity increases, irrigation water use must also increase to flush out salts that accumulate in the root zone. Furthermore, industrial users incur extra costs for cooling towers, boilers, and manufacturing processes to deal with the higher salinity water. In addition, groundwater recharge can also be affected when source water quality does not satisfy regulatory requirements (i.e., Basin Plan Objectives). To make full use of recycled water and to realize a water supply benefit, water reclamation plants would need to be expanded to treat increased sewer flows as population increases, additional conveyance pipelines would need to be constructed, and additional end uses (irrigation, industrial, and recharge) would need to be developed.

## 6.2 Water Quality Management

The issues and needs for water quality management in the Antelope Valley Region generally involve providing drinking water that meets current and future standards, protecting existing and future water sources from potential contamination, and making beneficial use of treated wastewaters for recycled water applications.

### Progress to Date and Revisions to Regional Objectives

The Region has implemented several projects since 2007 to improve the water quality of the Valley's groundwater and surface water, as well as increase the beneficial use of recycled water. For example, treatment upgrades and effluent management at the Lancaster WRP and Palmdale WRP have been implemented to support efforts to maximize the beneficial use of recycled water. Additionally, construction of additional portions of the recycled water backbone expanded the availability of recycled water. LACWD 40's aquifer storage and recovery project helped to improve the quality of the Region's aquifers by increasing available groundwater and reducing constituent concentrations.

### Assessment of IRWM Projects' Potential to Meet Water Quality Management Objectives

As detailed in Section 3, the Region has a number of water quality concerns regarding the quality of groundwater, local surface water and stormwater runoff, recycled water, and imported water. Section 4 presented objectives and planning targets identified by the Stakeholder group in order to address these concerns. The projects, shown in Table 6-3, will help the Region to address these concerns.

The objectives and planning targets identified for water quality management are:

*Water Quality Objective 1*. Provide drinking water that meets regulatory requirements and customer expectations.

- *Target:* Continue to meet Federal and State water quality standards as well as customer standards for taste and aesthetics throughout the planning period.

**Table 6-3: Projects with Water Quality Management Benefits**

| Project | Status |
|---|---|
| Aquifer Storage and Recovery Project: Additional Storage Capacity | Complete |
| Aquifer Storage and Recovery Project: Injection Well Development | Complete |
| BCSD Arsenic Management Feasibility Study and Well Design | Complete |
| BCSD Arsenic Removal Treatment Plant (Construction) | Complete |
| Eastside Banking & Blending Project | Complete |
| Lancaster WRP Effluent Management Sites | Complete |
| Lancaster WRP Stage V | Complete |
| North Los Angeles/Kern County Regional Recycled Water Project – Division Street Corridor | Complete |
| North Los Angeles/Kern County Regional Recycled Water Project – Phase 1b | Complete |
| North Los Angeles/Kern County Regional Recycled Water Project – Phase 2 | Complete |
| Palmdale WRP Effluent Management Sites | Complete |
| Palmdale WRP Stage V | Complete |
| Partial Well Abandonment of Groundwater Wells for Arsenic Mitigation | Complete |
| Water Supply Stabilization Project – Westside Project (Westside Water Bank) | Complete |
| Willow Springs Water Bank | Partially Complete |
| Antelope Valley Recycled Water Master Plan | Implementation |
| AVEK Strategic Plan | Implementation |
| Division Street and Avenue H-8 Recycled Water Tank | Implementation |
| Lancaster National Soccer Center Recycled Water Conversion | Implementation |
| Littlerock Dam Sediment Removal | Implementation |
| Palmdale Regional Groundwater Recharge Project | Implementation |

| Project | Status |
|---|---|
| Pierre Bain Park Recycled Water Conversion | Implementation |
| Recycled Water Pipeline at Power Plant Project | Implementation |
| South Antelope Valley Intertie Project | Implementation |
| South North Intertie Pipeline (SNIP) Phase II | Implementation |
| Upper Amargosa Creek Recharge and Channelization | Implementation |
| Wastewater Treatment Plant Rehabilitation and Groundwater Protection | Implementation |
| Water Supply Stabilization Project (WSSP) – Westside Expansion | Implementation |
| Whit Carter Park Recycled Water Conversion | Implementation |
| 42nd Street East, Sewer Installation | Conceptual |
| 45th Street East Groundwater Recharge and Flood Control Basin | Conceptual |
| Antelope Valley Watershed Surface Flow Study | Conceptual |
| Arsenic Contamination Project | Conceptual |
| Avenue Q and 20th Street East Groundwater and Flood Control Basin (Q-West Basin) | Conceptual |
| Avenue R and Division Street Groundwater Recharge and Flood Control Basin | Conceptual |
| Barrel Springs Groundwater Recharge and Flood Control Basin | Conceptual |
| Big Rock Creek Recharge and Recovery Project | Conceptual |
| Ecosystem and Riparian Habitat Restoration of Amargosa Creek Ave J to Ave H | Conceptual |
| Expansion of the Eastside Water Bank | Conceptual |
| Hunt Canyon Groundwater Recharge and Flood Control Basin | Conceptual |
| Lancaster Cemetery Recycled Water Conversion | Conceptual |
| Lower Amargosa Creek Recharge Project | Conceptual |
| Multi-use/Wildlife Habitat Restoration Project | Conceptual |
| New PWD Treatment Plant | Conceptual |
| QHWD Partial Well Abandonment | Conceptual |
| Stormwater Harvesting | Conceptual |
| Tertiary Treated Recycled Water Conveyance and Incidental Groundwater Recharge of Amargosa Creek Avenue M to Avenue H | Conceptual |
| KC & LAC Interconnection Pipeline | No Longer Pursued |
| North Los Angeles/Kern County Regional Recycled Water Project – Phase 3 | No Longer Pursued |
| North Los Angeles/Kern County Regional Recycled Water Project – Phase 4 | No Longer Pursued |
| Place Valves and Turnouts on Reclaimed Water Pipeline | No Longer Pursued |
| RCSD Arsenic Consolidation Project | No Longer Pursued |
| RCSD Tropico Park Pipeline | No Longer Pursued |
| RCSD Wastewater Pipeline | No Longer Pursued |

Projects that would help to meet this first water quality objective include many of the projects shown in Table 6-3. Projects that recharge the Region's aquifers, such as the Palmdale Regional Groundwater Recharge Project and Eastside Banking and Blending Project, will provide soil aquifer treatment and some degree of blending with other groundwater sources. This can support improvements to the quality of drinking water. Other projects may directly treat surface water and imported water to meet drinking water standards, such as the New PWD Treatment Plant.

*Water Quality Objective 2*. Protect and maintain aquifers.

- *Target:* Prevent unacceptable degradation of aquifer according to the Basin Plan throughout the planning period.
- *Target:* Map contaminated sites and monitor contaminant movement by 2017.

- *Target:* Identify contaminated portions of aquifer and prevent migration of contaminants by 2017.

As with the 2nd water supply objective mentioned above, many of the projects proposed by the stakeholders are groundwater recharge projects and water banking programs. These projects and programs will require monitoring to identify which regions of the aquifer are best suited, and they will require continued monitoring to ensure they are operating effectively. Monitoring and data collection are the first steps in protecting the aquifer from contamination. Additional projects submitted that will help to meet these objectives include RCSD's Wastewater Treatment Plant Rehabilitation and Groundwater Protection Project and QHWD Partial Well Abandonment. Another project that will support water quality objectives is the City of Palmdale 42nd Street East Sewer Installation Project which will reduce groundwater pollution by eliminating septic tanks currently in use by homes in the vicinity of 42nd Street East.

*Water Quality Objective 3*. Protect natural streams and recharge areas from contamination.

- *Target:* Prevent unacceptable degradation of natural streams and recharge areas according to the Basin Plan throughout the planning period.

Projects proposed by the stakeholders to address this objective include groundwater recharge projects, retention and detention basin projects, and flood control projects. These projects and programs will require monitoring to identify which locations best suited and will require continued monitoring to ensure they are operating effectively. Monitoring and data collection are the first steps in protecting the natural streams and recharge areas from contamination. Examples of these projects include the City of Lancaster's Ecosystem and Riparian Habitat Restoration of Amargosa Creek Ave J to Ave H Project and the Lower Amargosa Creek Recharge Project, both of which will restore riparian habitat along Amargosa Creek (a natural stream and known recharge area).

*Water Quality Objective 4*. Maximize beneficial use of recycled water.

- *Target:* Increase infrastructure and establish policies to use 33% of recycled water to help meet expected demand by 2015, 66 percent by 2025, and 100 percent by 2035.

Currently, the Region uses a small amount (350 AFY) of the available 21,000 AFY of recycled water to meet non-potable customer demands. These numbers do not include recycled water currently used for environmental maintenance. A number of the proposed projects in the IRWM Plan involve enhancements to treatment facilities. Additionally, a number of the stakeholder-identified projects specify the use of recycled water for irrigation, effluent management, and recharge projects; many of which benefit not only water quality objectives, but also water supply and land use management objectives. There are a number of opportunities for integration between water quality projects, including proposed recharge basins that use effluent from the Palmdale or Lancaster WRPs as a source of recharge water.

### Future Planning Efforts and Actions to Fill the Identified Water Quality Management Gaps

Future efforts are needed to protect the groundwater aquifer from contamination, which includes identifying and mapping the contaminated portions of the aquifer and identifying potential future sources of contamination. The following future planning efforts and actions are suggested to better meet the objectives identified for this strategy.

**Identify Contaminated Portions of the Aquifer.** The planning target, which is provided in order to gauge success on meeting the water quality management objectives, is to identify and prevent migration of contaminated portions of the aquifer. The 2014 SNMP for the Antelope Valley identified and analyzed various constituents found in the Region's aquifer. Additional monitoring and evaluation efforts may be necessary to further study those contaminants that jeopardize the Region's water quality objectives. Refer to the SNMP for information about the Region's groundwater quality.

**Map Contaminated Portions of Aquifer.** The planning target is to map the contaminated portions of the aquifer and monitor contaminant movement. The SNMP mapped the concentrations for select constituents. Additional monitoring, evaluation and mapping efforts may be necessary to better understand the Region's groundwater issues. Refer to the SNMP for available contaminant concentration maps.

**Amend Existing Well Abandonment Ordinance.** Abandoned wells in the Antelope Valley Region present water quality problems in that they act as conduits for surface and subsurface pollutants. The Los Angeles County Code of Ordinances Section 11.38.330 and the Kern County Code of Ordinances Section 14.08.360 specify regulations for the destruction of water wells. Amending these existing well abandonment ordinances would provide the policing authority to enforce the timely destruction of abandoned wells. The ordinances could provide the authority to require well destruction or rehabilitation as a condition upon sale of property, change of ownership or change of use. The ordinances could also require that new well applications be processed only after the applicant has demonstrated that all existing wells on all property they own are not in violation of the well ordinance.

**Develop and Implement a Regional Groundwater Wellhead Protection Program.** A Wellhead Protection Program (WPP) is a pollution prevention and management program used to protect underground sources of drinking water. A national WPP was established in 1986 by the Federal Safe Drinking Water Act. Some of the elements of these types of programs include the identification of recharge areas, zones of influence, groundwater flow directions, and potential contamination sources. This information is then compiled into a management plan, based on the assessment of alternatives for addressing potential sources of contamination, describing the local ordinances, zoning requirements, monitoring program and other local initiatives. The development of a regional WPP could additionally promote smart land use practices, including prohibiting new industrial, commercial and residential development in areas of sensitive groundwater recharge.

**Develop Management Program for Nitrate and TDS.** TDS and nitrate are of particular concern with regard to water quality in the Antelope Valley Region. TDS is concentrated in the groundwater when SWP water is imported and used for irrigation purposes, especially since the Antelope Valley Region is a closed basin. Nitrates are also present from historical irrigation practices and effluent management. Suggested management measures for these constituents include:

- TDS management measures:
    - Reducing the amount of salts imported into the sub-basins – imported water treatment/processes
    - Reducing the amount of salts added to groundwater via source water - wastewater treatment, modified processes such as increased retention time, or blending prior to use for irrigation or basin recharge
    - Reducing the amount of salts added to water via anthropogenic sources – BMPs, public outreach, land management guidelines
    - Natural treatment such as wetland systems
    - Transporting and exporting salts to a landfill
    - Disposing of salts via brine sales or deep well injection
    - Water softener ban

- Nitrate management measures:
    - Developing BMPs such as limiting excess fertilizing (set realistic goals for maximum crop yield) and eliminating over-irrigation to curtail the leaching transport process
    - Developing nutrient management programs and crop-specific nutrient application rates to improve crop fertilizer efficiency (decrease the total residual mass of nitrogen in the soil by using nitrification inhibitors or delayed-release forms of nitrogen)
    - Evaluating activities such as animal operations, food operations, and septic system discharges

Development of a management program and projects for these pollutants of concern, as well as for other emerging contaminants as they are identified, would contribute to meeting the objective of protecting the aquifer from contamination. Additionally, the SNMP for the Antelope Valley found that, based on the Antelope Valley Groundwater Basin's baseline water quality and project source water quality, managing salt and nutrient loadings on a sustainable basis is feasible with a minimal number of implementation measures.

**Expand the Water Quality Monitoring Program.** Monitoring activities in the Antelope Valley Region include groundwater levels, groundwater quality, land surface subsidence, aquifer compaction, and stream flow. According to the Antelope Valley Watermaster 2017 Annual Report (2018), the USGS actively monitors 185 wells for groundwater levels within and adjacent to the Antelope Valley Adjudication Area. USGS also samples a subset of Antelope Valley CASGEM wells for groundwater quality on a rotating basis. Typically, about 10 wells are selected for chemical analyses, with the remaining wells sampled for specific conductance and temperature. In addition to the USGS analyses, public water suppliers are required to sample groundwater quality in public supply wells and summarize data in Consumer Confidence Reports annually. . Expansion of the existing water quality monitoring efforts would allow for more current data collection to better assess the state of the Antelope Valley Region's water quality and other groundwater parameters. These groundwater quality monitoring programs need to be continued in order to capture the effects of changes in management practices. As Phillips states in his 1993 USGS report, "the need for an ongoing monitoring program transcends the importance of the selection of management alternatives." Further, in order for a water quality monitoring program to be successful in the Antelope Valley Region, the information collected needs to be shared regionally (i.e., by establishing a clearinghouse) in order to integrate and synthesize the data.

The SNMP includes a monitoring component to ensure the groundwater quality is consistent with applicable SNMP water quality objectives. The SNMP developed a groundwater quality monitoring plan using wells from the SWRCB Groundwater Ambient Monitoring and Assessment (GAMA) program. The plan includes 23 wells owned and operated by water utilities or the U.S. Air Force in central and southeast portions of the Basin. The program supplements ongoing groundwater monitoring programs by monitoring constituents associated with management goals in the Basin including TDS, nitrate, chloride, arsenic, total chromium, fluoride, and boron. Refer to the SNMP for monitoring and reporting details.

## 6.3 Flood Management

### Progress to Date and Revisions to Regional Objectives

Flood management issues in the Antelope Valley Region generally relate to management of stormwater flows of variable water quality and the management of nuisance water that ponds after a storm event and eventually evaporates. As part of the 2014 IRWM Plan Update, the Region evaluated its flood management needs in order to update its objectives. The Region recognized that stormwater flow has beneficial uses that may be impacted by upstream flood control, and therefore added a second objective to protect, restore and improve the stewardship of aquatic, riparian and watershed resources in the Region.

Though an integrated flood management summary document was developed in conjunction with the 2013 IRWM Plan Update (see Appendix F), the target set to coordinate a regional flood management plan and policy mechanism by 2017 was not met. For this IRWM Plan Update, the Region revised the target to specifically call for the coordination of a regional Stormwater Resource Plan and extend out the goal year to 2025.

#### Assessment of IRWM Projects' Potential to Meet Water Quality Management Objectives

The objectives and planning targets identified for flood management include:

> *Flood Management Objective 1:* Reduce negative impacts of stormwater, urban runoff, and nuisance water, and adapt to climate change impacts in the future.
>
> *Flood Management Objective 2:* Optimize the balance between protecting existing beneficial uses of stormwater and capturing stormwater for new uses.

- *Target:* Coordinate a regional Stormwater Resource Plan and policy mechanism by the year 2025 and incorporate adaptive management strategies for climate change.

Current integrated flood management practices include the identification of infrastructure improvement projects necessary to reduce localized flooding, mitigate poor water quality and/or to enhance localized recharge. Projects proposed as part of this IRWM Plan that will have flood benefits are shown in Table 6-4.

#### Future Planning Efforts and Actions to Fill the Identified Flood Management Gaps

The small scale view typically taken in flood management has a tendency to move projects forward prematurely or to ignore other benefits a project may provide if operated or designed with multi-benefits in mind. Examples of the two tendencies include:

- Example 1: Concurrent water supply retention and flood control projects that could each meet the same objectives if combined and designed in an integrated fashion.
- Example 2: Concurrent groundwater recharge and flood control projects that could each meet the same objectives if combined and designed in an integrated fashion.

**Table 6-4: Projects with Flood Management Benefits**

| Project | Status |
|---|---|
| Quartz Hill Storm Drain | Complete |
| Water Supply Stabilization Project – Westside Project (Westside Water Bank) | Complete |
| Littlerock Dam Sediment Removal | Implementation |
| Upper Amargosa Creek Recharge and Channelization Project | Implementation |
| 45th Street East Groundwater Recharge and Flood Control Basin | Conceptual |
| Amargosa Creek Pathways Project | Conceptual |
| Antelope Valley Watershed Surface Flow Study | Conceptual |
| Avenue Q and 20th Street East Groundwater and Flood Control Basin (Q-West Basin) | Conceptual |
| Avenue R and Division Street East Groundwater and Flood Control Basin | Conceptual |
| Barrel Springs Groundwater Recharge and Flood Control Basin | Conceptual |
| Big Rock Creek In-River Spreading Grounds | Conceptual |
| Big Rock Creek Recharge and Recovery Project | Conceptual |
| Build a bridge at the existing dip crossing of Mt. Emma Road at Littlerock Creek | Conceptual |
| Flooding Issues Avenue P-8 between 160th and 170th Street East | Conceptual |
| Flooding Issues Avenue W. near 133rd Street East | Conceptual |
| Hunt Canyon Groundwater Recharge and Flood Control Basin | Conceptual |
| Implement ET Controller Program | Conceptual |
| Littlerock Creek In-River Spreading Grounds | Conceptual |
| Precision Irrigation Control System | Conceptual |
| Stormwater Harvesting | Conceptual |
| ET Based Controller Program | No Longer Pursued |

These examples illustrate just a few of the concepts that provide support for regional planning. Regional planning begins with stakeholders getting together and formulating a plan to develop a regional plan from flood control, water quality and water supply perspectives, mixing all the components together to optimize the benefits of the program. Typical components of a Storm Water Resource Plan include:

**Beneficial Use Identification.** In-stream and downstream beneficial uses need to be identified so that the uses can be protected during the Flood Mitigation component. In-stream and downstream beneficial uses would include:

- Diversions for agriculture and stock watering.
- Diversions to percolation ponds.
- Flood flows to maintain the "biological crust: and resurfacing of Rosamond Dry Lake at EAFB.
- Flood flows overbank for riparian habitat.
- Dust control.

**Existing Flood Hazard Mapping.** Existing flood hazards need to be well understood and mapped to inform policy and zoning guidelines and identify locations of potential flood mitigation projects. The flood hazards would be developed through hydrologic and hydraulic modeling to create base maps that show flood extents and hazard ratings based on depth and velocity predictions. Potential stakeholders that may contribute financing to the effort would be FEMA and/or the U.S. Army Corps of Engineers (USACE).

**Development Policy.** Standard policy for the Region would need to be enacted for new development projects. The policy would be based on the Existing Flood Hazard Mapping component and would specify criteria for eliminating increased peak flow and volume due to new impervious surfaces and present guidelines for techniques such as Low Impact Development (LID), source control and BMP designed to improve water quality and decrease runoff volume and peak flow. The policy would also address building within the floodplain by setting finished floor elevation criteria with respect to flood event water surface and upstream and downstream impact criteria associated with floodplain encroachment.

**Flood Mitigation.** Areas prone to flooding that were built prior to the Development Policy component would need to be protected through flood mitigation. Flood mitigation techniques include capacity, detention and diversion techniques such as levees, flood walls, detention basins and upsized infrastructure to increase conveyance capacity. The mitigation options would be tested using the existing hydrologic and hydraulic models developed for the Existing Flood Hazard Mapping component. The design and operation of the infrastructure improvements would be conducted to insure beneficial uses and to optimize the other integrated components of water quality improvements and increases in water supply through groundwater recharge.

## 6.4 Environmental Resource Management

### Progress to Date and Revisions to Regional Objectives

Since the 2007 IRWM Plan was completed, the entities in the Region have worked to preserve open space and natural habitat. For example, the Antelope Valley Conservancy preserved 40 acres of wetlands in 2011 near the community of Pearblossom, in addition to ensuring hundreds of miles of recreational trail preservation. PWD's Littlerock Sediment Removal Project and the Antelope Valley Resource Conservation District's Antelope Valley Regional Conservation Project are also expected to add open space and preserve natural habitat in the near future. Despite this, as of the 2019 IRWM Plan Updates, the Region was unable to meet its target of preserving an additional 2,000 acres of open space and natural habitat. The Region updated the target goal date from 2017 to 2025.

### Assessment of IRWM Projects' Potential to Meet Environmental Resource Management Objectives

The main issues of concern regarding environmental resource management in the Antelope Valley Region are protection and preservation of open space and protection of endangered species. The following objectives and planning targets were identified to address these concerns:

*Environmental Resource Objective 1.* Preserve open space and natural habitats that protect and enhance water resources and species in the Antelope Valley Region.

- *Target:* Contribute to the preservation of an additional 2,000 acres of open space and natural habitat to integrate and maximize surface and groundwater management by 2025.

A number of proposed projects, shown in Table 6-5, will help the Region to meet its environmental resource management objective. A number of the projects include components to restore habitat. In addition, projects that will recharge the aquifer using spreading grounds will have the secondary benefit of preserving open space. In total, the projects propose to conserve over 2,000 acres of open space and habitat, which exceeds the Region's target.

### Future Planning Efforts and Actions to Fill the Identified Environmental Resource Management Gaps

To better meet the objectives identified for this strategy, the following future planning efforts and actions are suggested.

**Develop a Habitat Conservation Plan for the Antelope Valley Region.** HCPs are developed to outline what steps must be taken to minimize and mitigate the impact of a permitted "take" on a threatened or endangered species. Many HCPs designate open space or habitat as mitigations of "take." Therefore, an HCP is a tool that could be used in the Antelope Valley Region for preserving and protecting open space and habitat.

**Table 6-5: Projects with Environmental Resource Management Benefits**

| Project | Open Space and Habitat Conserved | Status |
|---|---|---|
| Antelope Valley Regional Conservation Project | 5 acres | Implementation |
| Littlerock Dam Sediment Removal | Not quantified | Implementation |
| Upper Amargosa Creek Recharge and Channelization Project | 15 acres | Implementation |
| 45th Street East Groundwater Recharge and Flood Control Basin | 208 acres | Conceptual |
| Amargosa Creek Pathways Project | Not quantified | Conceptual |
| Antelope Valley Watershed Surface Flow Study | Not quantified | Conceptual |
| Avenue Q and 20th Street East Groundwater and Flood Control Basin (Q-West Basin) | 161 acres | Conceptual |
| Avenue R and Division Street Groundwater Recharge and Flood Control Basin | 93 acres | Conceptual |
| Barrel Springs Groundwater Recharge and Flood Control Basin | 40 acres | Conceptual |
| Ecosystem and Riparian Habitat Restoration of Amargosa Creek Ave J to Ave H | 100 acres | Conceptual |
| Hunt Canyon Groundwater Recharge and Flood Control Basin | 300 acres | Conceptual |
| Multi-use/Wildlife Habitat Restoration Project | Not quantified | Conceptual |
| Antelope-Fremont Watershed Assessment Plan | 2,000 acres | No Longer Pursued |
| Tropico Park Pipeline Project | Not quantified | No Longer Pursued |

**Promote Land Conservation Projects that Enhance Flood Control, Aquifer Recharge, and Watershed and Open Space Preservation.** Though a number of agencies are pursuing groundwater recharge projects, additional promotion of conservation projects could be accomplished through the adoption of a MOU with municipalities in the Antelope Valley Region to elicit and promote compliance with plans approved for the Antelope Valley Region including the area General Plans and the Mojave HCP.

## 6.5 Land Use Planning/Management

### Progress to Date and Revisions to Regional Objectives

Since the 2007 IRWM Plan was developed, the Region has had little growth due to the economic downturn, limiting the Region's ability to meet its land use objectives and targets. The Region has maintained the same objectives and targets, extending out the target date for preserving farmland in rotation through 2040, providing additional acres of recreational space by 2040, and developing a regional land use management plan to 2025.

### Assessment of IRWM Projects' Potential to Meet Environmental Resource Management Objectives

The main issues of concern regarding land use management in the Antelope Valley Region relate to the preservation of agricultural land, which includes a recognition of the historical relationship to the land and a support of a right to farm as well as the private property rights of all owners to economic benefits from their property, and the ability to provide recreational opportunities for a growing population. The following objectives and planning targets were identified to address these concerns:

*Land Use Management Objective 1.* Maintain agricultural land use within the Antelope Valley Region.

- *Target:* Preserve 100,000 acres of farmland in rotation through 2040.

*Land Use Management Objective 2.* Meet growing demand for recreational space.

- *Target:* Contribute to local and regional General Planning documents to provide 5,000 acres of recreational space by 2040.

*Land Use Management Objective 3.* Improve integrated land use planning to support water management.

- *Target:* Coordinate a regional land use management plan by the year 2025 and incorporate adaptive management strategies for climate change.

Several projects were submitted for inclusion in the AV IRWM Plan that provide direct benefits associated with land use management. Projects such as the Multi-use/Wildlife Habitat Restoration Project will directly create recreational area. Projects that recharge groundwater and expand recycled water availability will help to preserve agricultural lands by continuing to provide a reliable water source. These types of projects indirectly benefit land use management, but do not directly meet the objectives identified for the Antelope Valley Region. Employing land use planning as a strategy provides a way to better manage and protect local water supplies. Programs can be developed to assist in water conservation, protect and improve water quality, address stormwater capture and flooding, protect and enhance environmental habitat areas and recreational opportunities. Thus, implementing land use planning strategies can assist in achieving not only the land use management objectives but also the overall AV IRWM Plan objectives. The projects shown in Table 6-6 will help the Region to meet its land use planning/management objectives.

**Table 6-6: Projects with Land Use Planning/Management Benefits**

| Project | Status |
|---|---|
| Eastside Banking & Blending Project | Complete |
| North Los Angeles/Kern County Regional Recycled Water Project - Division Street Corridor | Complete |
| North Los Angeles/Kern County Regional Recycled Water Project - Phase 1b | Complete |
| North Los Angeles/Kern County Regional Recycled Water Project - Phase 2 | Complete |
| Water Supply Stabilization Project – Westside Project (Westside Water Bank) | Complete |
| Willow Springs Water Bank | Partially Complete |
| Amargosa Creek Pathways Project | Implementation |
| Antelope Valley Regional Conservation Project | Implementation |
| AVEK Strategic Plan | Implementation |
| South Antelope Valley Intertie Project | Implementation |
| South North Intertie Pipeline (SNIP) Phase II | Implementation |
| Water Supply Stabilization Project (WSSP) – Westside Expansion | Implementation |
| Lancaster National Soccer Center Recycled Water Conversion | Implementation |
| Littlerock Dam Sediment Removal | Implementation |
| Palmdale Recycled Water Authority – Phase 2 Distribution System | Implementation |
| Palmdale Regional Groundwater Recharge Project | Implementation |
| Pierre Bain Park Recycled Water Conversion | Implementation |
| Recycled Water Pipeline at Power Plant Project | Implementation |
| Whit Carter Park Recycled Water Conversion | Implementation |
| Upper Amargosa Creek Recharge and Channelization Project | Implementation |
| Antelope Valley Watershed Surface Flow Study | Implementation |
| Big Rock Creek In-River Spreading Grounds | Conceptual |
| Ecosystem and Riparian Habitat Restoration of Amargosa Creek Ave J to Ave H | Conceptual |
| Expansion of the Eastside Water Bank | Conceptual |
| Multi-use/Wildlife Habitat Restoration Project | Conceptual |
| North Los Angeles/Kern County Regional Recycled Water Project - Phase 3 | No Longer Pursued |
| North Los Angeles/Kern County Regional Recycled Water Project - Phase 4 | No Longer Pursued |
| Tropico Park Pipeline Project | No Longer Pursued |

### Future Planning Efforts and Actions to Fill the Identified Land Use Management Gaps

Below are additional future planning efforts and actions that have been identified in order to better meet the land use management objectives.

**Preserve Farmland.** The planning target, which is provided in order to gauge success in meeting the land use management objectives, is to preserve 100,000 acres of farmland in rotation through 2040. The 2013 IRWM Plan update estimated approximately 19,000 acres of farmland actively farmed in the Antelope Valley Region. However, recent agricultural data suggests that active farmland decreased to approximately 16,000 acres in 2016. While some of the proposed projects include farmland as a component that would contribute to this target, it is still being suggested as a future planning effort for the Antelope Valley Region because the planning target was not entirely met.

**Build Public Parks and Recreational Amenities.** The planning target, which is provided in order to gauge success in meeting the land use management objectives, is to increase public parks and recreational amenities by providing 5,000 acres of recreational space by 2040. As this planning target was not met by the projects proposed in this IRWM Plan, it is being suggested as a future planning effort for the Antelope Valley Region. As part of this planning effort, an Antelope Valley Region-wide inventory of existing water-related recreational opportunities could be developed that would aid in providing a needs assessment for future opportunities. Implementation of LID techniques where feasible are recommended.

**Create a Watershed Management Plan.** There is currently no watershed management plan for the Antelope Valley Region. Watershed management plans are similar to this IRWM Plan in that they bring together a wide range of stakeholders, including city and county staff, resource managers and policy officials, and community organizations to protect and restore the aesthetic and function of the watershed where needed. Watershed management plans focus on the 'function' of a watershed, and thereby assess the health and value of watershed components.

**Create Incentives for Landowners to Protect/Restore/Preserve Open Space.** Land use agencies have the ability to create incentives and/or eliminate disincentives for landowners to protect and restore open spaces and habitat on their property. Technical assistance and financial incentives have proven effective in protecting and restoring privately held natural areas, which in turn helps to meet regional water quality, flood management and environmental management objectives. Implementation of LID techniques where feasible are recommended.

**Coordinate a Regional Land Use Management Plan.** Traditionally, cities and counties have the responsibility for land use planning, much of which is continued in the local and regional General Plans. These planning documents to some extent address water and environmental resources in the context of land use planning. However, through the coordination of a regional land use plan, these efforts can be combined to better manage and protect local water supplies, improve water quality, reduce flooding, restore habitats and ecosystems, and provide recreational, educational, and access opportunities to the public for a potentially greater regional benefit.

## 6.6 Climate Change Mitigation

### Progress to Date and Revisions to Regional Objective

The Region did not include a climate change mitigation objective as part of its 2007 IRWM Plan. As part of the 2013 Plan Update, the Region considered climate change throughout the various Plan sections, including the addition of a climate change mitigation target in Section 4.

### Assessment of IRWM Projects' Potential to Meet Environmental Resource Management Objectives

The objective and planning target identified for climate change mitigation include:

*Objective 1:* Mitigate against Climate Change

- Target 1: Implement "no regret" mitigation strategies, when possible, that decrease GHGs or are GHG neutral

The projects shown in Table 6-7 will help the Region to decrease GHG emissions caused by water resources management projects or will help the Region to become GHG neutral. Some projects will directly reduce GHG emissions, such as the Solar Power System at K-8 Division which will reduce GHG emissions caused by power generation. Projects that restore habitat will produce carbon sequestration benefits through the introduction of plants to the area. Projects that offset imported water supply will indirectly reduce GHG emissions by reducing the amount of energy required to move water south from the Delta.

**Table 6-7: Projects with Climate Change Mitigation Benefits**

| Project | Status |
|---|---|
| Aquifer Storage and Recovery Project: Injection Well Development | Complete |
| BCSD Arsenic Management Feasibility Study and Well Design | Complete |
| BCSD Arsenic Removal Treatment Plant | Complete |
| Eastside Banking & Blending Project | Complete |
| Lancaster WRP Stage V | Complete |
| North Los Angeles/Kern County Regional Recycled Water Project - Division Street Corridor | Complete |
| North Los Angeles/Kern County Regional Recycled Water Project - Phase 1b | Complete |
| North Los Angeles/Kern County Regional Recycled Water Project - Phase 2 | Complete |
| Palmdale WRP Stage V | Complete |
| Partial Well Abandonment of Groundwater Wells for Arsenic Mitigation | Complete |
| Solar Power System at K-8 Division | Complete |
| Water Supply Stabilization Project – Westside Project (Westside Water Bank) | Complete |
| Willow Springs Water Bank | Partially Complete |
| Antelope Valley Recycled Water Master Plan | Implementation |
| Antelope Valley Regional Conservation Project | Implementation |
| AVEK Strategic Plan | Implementation |
| Division Street and Avenue H-8 Recycled Water Tank | Implementation |
| Lancaster National Soccer Center Recycled Water Conversion | Implementation |
| Littlerock Dam Sediment Removal | Implementation |
| Palmdale Recycled Water Authority – Phase 2 Distribution System | Implementation |
| Palmdale Regional Groundwater Recharge Project | Implementation |
| Pierre Bain Park Recycled Water Conversion | Implementation |
| Recycled Water Pipeline at Power Plant Project | Implementation |
| South North Intertie Pipeline (SNIP) Phase II | Implementation |
| Upper Amargosa Creek Recharge and Channelization Project | Implementation |
| Wastewater Treatment Plant Rehabilitation and Groundwater Project | Implementation |
| Water Supply Stabilization Project (WSSP) – Westside Expansion | Implementation |
| Whit Carter Park Recycled Water Conversion | Implementation |
| 45th Street East Groundwater Recharge and Flood Control Basin | Conceptual |
| Amargosa Creek Pathways Project | Conceptual |
| Avenue Q and 20th Street East Groundwater and Flood Control Basin (Q-West Basin) | Conceptual |
| Avenue R and Division Street Groundwater Recharge and Flood Control Basin | Conceptual |
| Barrel Springs Groundwater Recharge and Flood Control Basin | Conceptual |
| Big Rock Creek In-River Spreading Grounds | Conceptual |
| Big Rock Creek Recharge and Recovery Project | Conceptual |
| Ecosystem and Riparian Habitat Restoration of Amargosa Creek Ave J to Ave H | Conceptual |
| Expansion of the Eastside Water Bank | Conceptual |
| Fremont Valley Basin Potable Groundwater Well Treatment Project | Conceptual |
| Hunt Canyon Groundwater Recharge and Flood Control Basin | Conceptual |
| Implement ET Controller Program | Conceptual |
| Lancaster Cemetery Recycled Water Conversion | Conceptual |
| Littlerock Creek In-River Spreading Grounds | Conceptual |
| Lower Amargosa Creek Recharge Project | Conceptual |

| Project | Status |
|---|---|
| Multi-use/Wildlife Habitat Restoration Project | Conceptual |
| Precision Irrigation Control System | Conceptual |
| QHWD Partial Well Abandonment | Conceptual |
| Stormwater Harvesting | Conceptual |
| Tank 3 Hydro Turbine Generation Feasibility Study | Conceptual |
| Tertiary Treated Water Conveyance and Incidental Groundwater Recharge of Amargosa Creek Avenue M to Avenue H | Conceptual |
| Water Conservation School Education Program | Conceptual |
| ET Based Controller Program | No Longer Pursued |
| KC & LAC Interconnection Pipeline | No Longer Pursued |
| North Los Angeles/Kern County Regional Recycled Water Project - Phase 3 | No Longer Pursued |
| North Los Angeles/Kern County Regional Recycled Water Project - Phase 4 | No Longer Pursued |
| Place Values and Turnouts on Reclaimed Water Pipeline | No Longer Pursued |
| Purchasing Spreading Basin Land | No Longer Pursued |
| RCSD Arsenic Consolidation Project | No Longer Pursued |
| RCSD Wastewater Pipeline | No Longer Pursued |
| Tropico Park Pipeline Project | No Longer Pursued |
| Ultra-Low Flush Toilet Change-out Program | No Longer Pursued |
| Waste Water Ordinance | No Longer Pursued |

### Future Planning Efforts and Actions to Fill the Identified Land Use Management Gaps

Below are additional future planning efforts and actions that have been identified in order to better meet the climate change mitigation objective.

**Create or Update Climate Action Plans.** Climate Action Plans are used by municipalities to define how municipal operations can reduce energy and greenhouse gas emissions. The Region's municipalities may consider creating a climate action plan or continuing to update their Climate Action Plans, particularly focusing on how water operations impact the climate.

**Implement Additional Projects to reduce GHG emissions.** The projects proposed will help the Region to reduce its GHG emissions. It may be possible to further reduce GHG emissions or become GHG neutral through the implementation of strategies that are not considered no-regret strategies.

# Section 7 | Project Evaluation and Prioritization

***This section presents the process used by the Region to submit, review, and prioritize projects. In general, the Region seeks to include projects in the IRWM Plan that support the Regional Objectives and Planning Targets described in Section 4. Section 7.1 provides a discussion of the Project Submittal Process, including the types of projects encouraged, how projects can be submitted, and the information required. Section 7.2 discusses the Project Review Process for the acceptance of projects into the IRWM Plan, and Section 7.3 discusses how the project list will be communicated to the public. Section 7.4 discusses the criteria and methodology used to prioritize the project list.***

## 7.1 IRWM Project Submittal Process

The Antelope Valley IRWM Region allows proponents to submit projects and project updates for consideration on an ongoing basis, and it has a process in place to review submittals on a semi-regular basis utilizing the A-Team and Stakeholder Group. In addition, the Region periodically conducts open "calls for projects". These calls for projects are intended to encourage updates to existing projects and to solicit information about new projects that could be accepted into the IRWM Plan. They primarily occur prior to IRWM Plan Updates and/or grant funding opportunities. Whenever new or revised projects are being considered for acceptance into the IRWM Plan, notices are posted on the Region's website (www.avwaterplan.org), and email notifications are sent to the Region's stakeholders.

Generally speaking, projects that have already been accepted into the IRWMP are considered "grandfathered" in and may be updated by project proponents as appropriate. Revisions to these existing projects will be reviewed by the A-Team as needed, and questions may be presented to the Stakeholder Group for discussion if needed.

The Stakeholders are presented with the projects proposed for inclusion in the Plan

New projects must go through the submittal process. New projects selected for inclusion in the 2019 IRWM Plan Update were submitted in three ways: (1) by email using an electronic or scanned form, (2) on the www.avwaterplan.org website using an electronic form, and (3) with in-person meetings between project proponents and consultants during the Plan Updates. After submittal, the website information was updated with the assistance of LACDPW. The master list of IRWM projects (i.e., accepted into the IRWMP) is maintained on the www.avwaterplan.org website. Before projects are considered to be accepted into the IRWM Plan, they must go through the review process described below. A database of submitted projects that have not yet been accepted into the IRWM Plan is maintained separately from the master projects list on the website. Once projects go through the review process, they may be included in the master projects list. During the 2019 IRWM Plan Update process, all project proponents were encouraged to submit new projects and updates by logging in to the website and entering project information directly.

### What types of projects are encouraged?

Projects eligible for inclusion in the plan include implementation projects, plans and studies, and conceptual projects. Projects at all levels of development are encouraged so that a thorough inventory of ideas can be made available on the website.

IRWM Plan projects that support the following Antelope Valley Regional Objectives are encouraged:

- Provide reliable water supply to meet Antelope Valley's expected demand between now and 2040; and adapt to climate change
- Establish a contingency plan to meet water supply needs of the Antelope Valley Region during a plausible disruption of SWP deliveries
- Stabilize groundwater levels
- Provide drinking water that meets regulatory requirements and customer expectations
- Protect and maintain aquifers
- Protect natural streams and recharge areas from contamination
- Maximize beneficial use of recycled water
- Reduce negative impacts of stormwater, urban runoff, and nuisance water, and adapt to climate change impacts in the future
- Optimize the balance between protecting existing beneficial uses of stormwater and capturing stormwater for new uses
- Preserve open space and natural habitats that protect and enhance water resources and species in the Antelope Valley Region
- Maintain agricultural land use within the Antelope Valley Region
- Meet growing demand for recreational space
- Improve integrated land use planning to support water management

- Mitigate against climate change

The 2016 update to the IRWM Program Guidelines requires that stormwater and dry weather runoff capture projects must be included in a Stormwater Resource Plan (SWRP) and comply with the provisions to receive grant funding. The SWRP must be incorporated into the IRWM Plan to be eligible for funding. The SWRP has not yet been developed for the watersheds in the Region.

### How can projects be submitted and/or updated?

The projects selected for inclusion in the 2019 IRWM Plan Update were submitted in one of three ways: (1) via email using an electronic or scanned form, (2) via online form through www.avwaterplan.org, or (3) via in-person or phone call interviews. Project proponents were then contacted by the Region to collect additional information on the projects. In the future, all regional stakeholders will be encouraged to submit projects using the web interface project form as follows:

1. Register for an account at www.avwaterplan.org in the "Projects" section of the website or, if the applicant does not have internet access, contact the Los Angeles County Department of Public Works at (626) 300-3353 for a hard copy of the project submittal form.
2. Collect the required project information (described below).
3. Upload the required project information to the website; or, if a hard copy form was requested, submit the form to Los Angeles County Department of Public Works by emailing a scanned copy of the form to eballesteros@dpw.lacounty.gov, or sending the form to the County of Los Angeles Department of Public Works, Waterworks Districts, 1000 South Fremont Avenue, Building A9-E, 4th Floor, Alhambra, CA 91803.

Once a project has been submitted, it will be retained in a list of "submitted projects" for subsequent review by the Region's A-Team and Stakeholder Group for potential acceptance into the IRWM Plan.

### What information is required?

Projects at all levels of development are eligible for submittal to the IRWM Plan. For grant funding opportunities, well-developed projects are preferred because they are more competitive in terms of satisfying the typical scoring criteria. Projects eligible for inclusion in the plan include implementation projects, plans and studies, and conceptual projects.

Implementation Projects

For implementation projects, the basic project information is required:

- Project title
- Project proponent
- Project partners
- Project contact information
- Proponent's IRWM Plan adoption status
- Project description (2-3 paragraphs)
- Project location (using GeoTracker)
- Project integration information

The following narrative and technical information is also required:

- **How the project will contribute to IRWM Plan objectives**: The project must help the Region to achieve its IRWM Plan objectives, as discussed in Section 4. To demonstrate this, the project sponsor must indicate which objectives the project will support.
- **How the project is related to resource management strategies**: The IRWM Plan identifies the RMS selected for use in the Plan with the goal of diversifying the Region's water management portfolio, as indicated in Section 5. The project sponsor must indicate which of these RMS that the project aligns with.
- **Technical feasibility of the project:** Technical feasibility is related to the knowledge of the project location; knowledge of the water system at the project location; or with the material, methods, or processes proposed to be employed in the project. The project sponsor must cite supporting documents to demonstrate that there is enough known about existing conditions where the project will be located and that there is sufficient technical data to indicate that the project will result in a successful outcome.
- **Specific benefits to critical DAC water issues:** Identification and consideration of water-related needs of DACs in the area must be addressed by the Region in the IRWM Plan. Therefore, it is required that the project sponsor indicate if and how the project will address such needs.
- **Specific benefits to critical water issues for Native American tribal communities:** Identification and consideration of water-related needs of Native American tribal communities in the area must be addressed by the Region in the IRWM Plan. Therefore, it is required that the project sponsor indicate if and how the project will address such needs.
- **Environmental justice considerations[1]:** As IRWM plans contain multiple projects that will affect stakeholders in the Region, environmental justice concerns must be considered. The Region is required to ensure that project sponsors are aware of the impacts of the project on stakeholders, and therefore the project sponsor is required to indicate whether there are known environmental justice concerns or whether these concerns are unknown.
- **Project costs and financing:** The project's estimated costs and how it will be financed must be indicated by the project sponsor. If a cost estimate has been prepared for the project, a link to that estimate must be provided.

- **Economic feasibility:** The economic feasibility of the project must be discussed by the project sponsor. This can take the form of either a cost-effectiveness or benefit-cost analysis, and should include the types of benefits and the types of costs including capital costs, O&M costs, and potential adverse effects to others from the project.
- **Project status:** The status of the project, also referred to as the project's readiness to proceed, should be indicated by specifying whether the project is conceptual (minimal

[1] Environmental justice is the "fair treatment of people of all races, cultures, and incomes with respect to the development, adoption, implementation, and enforcement of environmental laws, regulations, and policies" (California Government Code §65040.12(e)).

planning has been completed), in the design phase (design drawings are being prepared, or more detailed planning is underway), or ready for construction. The project sponsor must also indicate whether CEQA is complete. As the planning horizon for the 2019 IRWM Plan Update is 21 years (to 2040), projects at all levels of development will be considered for inclusion in the IRWM Plan.

- **Contribution of the project in adapting to or mitigating against the effects of climate change:** The Region is dedicated to adapting to and mitigating against future climate change impacts. Project sponsors should indicate whether the project may help the Region to adapt to the predicted impacts of climate change (see Section 2), or will mitigate against climate change by reducing GHG emissions or providing greater energy efficiency as compared to project alternatives.

Once the project is submitted, it will be considered for inclusion in the IRWM Plan by the A-Team and Stakeholder Group. A copy of the Project Submittal Form is included in Appendix J.

Plans and Studies

The above discussion applies to implementation projects. Plans and studies may also be submitted as projects, but the level of detail discussed above may not be applicable.

For plans and studies, the basic project information is required:

- Project title
- Project proponent
- Project partners
- Project contact information
- Proponent's IRWM Plan adoption status
- Project description (2-3 paragraphs)
- Project location (if applicable, using GeoTracker)
- Project integration information

The following narrative and technical information is also required (see above for descriptions of these items):

- How the project will contribute to IRWM Plan objectives
- How the project is related to RMS
- Specific benefits to critical DAC water issues
- Specific benefits to critical water issues for Native American tribal communities
- Project costs and financing
- Contribution of the project in adapting to or mitigating against the effects of climate change

Conceptual Projects

Projects that do not meet the basic review criteria for implementation projects may still be admitted as "conceptual" projects. These are projects that the A-Team and Stakeholder Group determine could contribute to meeting the Region's IRWM objectives, but may not yet be developed enough to include in the IRWM Plan as an implementation project. For the purposes of this Plan, the Stakeholder Group has determined that if a preliminary economic analysis has not been conducted the project will be considered conceptual. For conceptual projects, the following basic information is required:

- Project title
- Project proponent
- Project partners
- Project contact information
- Proponent's IRWM Plan adoption status
- Project description (1 paragraph) – should indicate how the project could provide the Region with at least one benefit, address at least one regional IRWMP objective, and utilize at least one of the RMS
- Project location (using GeoTracker, if appropriate)
- Project integration information

Conceptual projects will be revisited should additional information be provided.

## 7.2 IRWM Project Review for Inclusion in the Plan

As with project submittal, project review is intended to be an ongoing process. The A-Team is responsible for reviewing new projects and project updates and for making recommendations to the Stakeholder Group about acceptance into the IRWM Plan. This is done on an ongoing basis as projects are submitted.

Projects are reviewed by the A-Team using the process shown in Figure 7-1 and based on the required criteria listed below in Table 7-1. Those projects that meet the minimum requirements may be recommended for inclusion in the Plan as conceptual projects. If a preliminary economic analysis has been conducted, the A-Team may recommend a project to be accepted as an implementation project. The list of projects recommended by the A-Team for acceptance in the Plan is then approved by the Stakeholder Group at regular stakeholder meetings.

**Figure 7-1: IRWM Project Review Process**

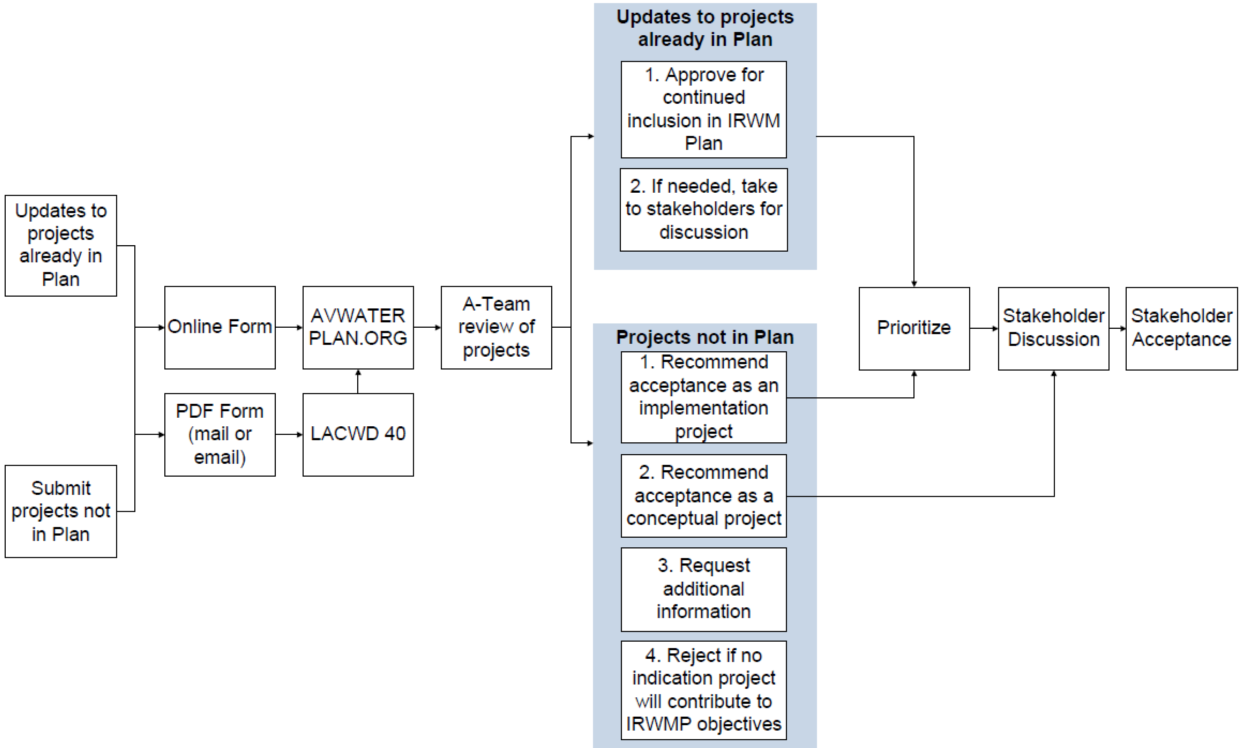

**Table 7-1: Project Review Factors for Acceptance into the IRWM Plan**

| Review Factor[2] | Criteria and Comments |
|---|---|
| **General Information** | Has general information been provided? This includes project title, proponent, partners, contact information, and proponent's IRWM Plan adoption status. |
| **Project Description** | Has a complete project description been provided? This includes a project description, project integration information, and project document sources. |
| **Project Location** | Has the project location been provided? |
| **Project Benefits** | Is a minimum of one quantifiable benefit identified? |
| **IRWMP Objectives[3]** | Will at least one Antelope Valley IRWMP objective be addressed? |
| **Resource Management Strategies[4]** | Will at least one Resource Management Strategy be addressed? |
| **Technically Feasible** | Is at least one study/report/document identified that justifies technical feasibility? |
| **DAC Benefits** | If the project will benefit a DAC, has the proponent described how the project addresses the needs of the DAC? |
| **Native American Tribal Community Benefits** | If the project will benefit a Native American tribal community, has the proponent described how the project addresses the needs of the Native American tribal community? |
| **Environmental Justice Considerations** | If the project has environmental justice issues, have they been described? |
| **Project Costs and Financing** | Have the project capital cost, operations and maintenance costs, and funding/financing sources been provided? If a cost estimate has been completed, has it been provided? |
| **Economic Feasibility** | If a cost-effectiveness or benefit-cost analysis has been performed, has it been provided? |
| **Readiness to Proceed** | Is the project status identified (i.e., conceptual, design, ready for construction, CEQA Compliance)? |
| **Benefits to Multiple Stakeholders** | Will the project benefit more than one stakeholder or are there multiple project benefits? |
| **Climate Change Adaptation/GHG Mitigation** | Has the proponent indicated how the project will help the Region adapt to climate change and/or aid the Region in reducing GHG emissions? |

[2] Shaded review factors indicate those criteria that are required to be accepted into the plan as a conceptual project.
[3] See *2019 Antelope Valley IRWMP, Section 4 Objectives* for more information.
[4] See *California Water Plan Update 2018*, https://water.ca.gov/Programs/California-Water-Plan/Water-Resource-Management-Strategies

## 7.3 Procedures for Communicating the Project List of Selected Projects

The project list in the original 2007 IRWM Plan was included in that document as an appendix. However, the updated project list is meant to be a "living document" and will therefore be maintained on the www.avwaterplan.org website as both a database of "submitted" projects and a listing of "accepted" projects. The Region's A-Team will evaluate submitted projects based on the previously discussed information. After review of a given project, the A-Team may take one of three actions: (1) recommend the project to the Stakeholder Group for acceptance into the IRWM Plan, (2) hold the project and request additional information, or (3) maintain the project within the database as a "submitted" project.

As the AV IRWM Plan is updated, the opportunity exists to reevaluate the projects included in this IRWM Plan as their project scopes are refined, and a continual assessment of whether this IRWM Plan is meeting the issues and needs of the Antelope Valley Region will be conducted. Additionally, this IRWM Plan provides a mechanism for identifying new projects designed in accordance with the regional objectives, priorities, and management strategies.

## 7.4 IRWM Project Prioritization

The projects included in the IRWM Plan are projects that will implement the Plan and help to achieve the Plan objectives. The intent of the project prioritization process is to identify those projects and management actions the Region's stakeholders would like to pursue first to address the Region's issues and needs. Projects should embody the priorities of the planning effort and are intended to represent a prudent investment for sources of grant funding. For the purposes of this plan, only implementation projects were prioritized. The general process and criteria used to determine the priority level of implementation projects are described below. These criteria could be superseded by specific grant criteria as grant opportunities become available.

### 7.4.1 Project Prioritization Criteria

Each project is assessed using the project review criteria described below. The methodology for applying the criteria is also described. Studies and reports are considered "implementation" projects since for some grant programs certain studies/reports are eligible for implementation funding. If a project or plan is not far enough along to have a preliminary economic analysis available, then it is considered conceptual and not scored with the implementation projects. Projects that promote the beneficial use of stormwater and alleviate flooding were integrated into this 2019 IRWM Plan Update but were not evaluated with the implementation projects since the Region has not yet developed an SWRP for the Region. Table 7-2 summarizes the criteria and scoring used to categorize and prioritize the implementation projects.

Project Benefits: Each project is evaluated on the number of quantifiable water-related benefits it could produce that would help the Region meet its objectives. There is no limit to the number of quantifiable benefits as long as adequate justification is provided. Each benefit is assessed as having "good", "fair", or "poor" justification. Projects that could contribute more benefits and/or that have more substantial technical justification are favored over projects that have less. Recharge projects with spreading basins are assumed to have water quality benefits because of soil aquifer treatment. This benefit is not assumed for projects that inject water into the basin (ASR). Projects that increase local supply are assumed to also offset water supply from the Sacramento-San Joaquin Delta and thereby also reduce energy consumption/greenhouse gas emissions by decreasing water conveyance energy requirements.

IRWM Plan Objectives: Each project is evaluated on the number of IRWM Plan Objectives it would help the Region meet. Projects with more IRWM Objectives are preferred over projects with fewer.

Recharge projects are assumed to support the objective of "protect and maintain aquifers" when they recharge groundwater with water from high quality sources, such as imported water. Projects that offset water supply from the Sacramento-San Joaquin Delta are also assumed to mitigate climate change impacts since they reduce the energy consumption and greenhouse gas emissions associated with pumping and transporting imported water. Projects that increase the transport or storage of recycled water to recreational areas are assumed to support the objective of "meet the growing demand for recreational space". These types of projects would help recreational areas remain operational during droughts when potable supplies may be rationed.

Resource Management Strategies: Each project is evaluated on the number of RMS it would help to implement. These RMS are listed in the 2016 update of the DWR's California Water Plan.[5] Projects that support more RMS are favored over those that support fewer.

DAC Benefits: Projects that provide water supply, quality, and/or flood management benefits to DACs are favored over projects that do not. Projects that produce region-wide benefits were assumed to also benefit DACs if it can be demonstrated that DAC areas lie within the regional influence.

Native American Tribal Community Benefits: Projects that provide benefits to Native American tribal communities are favored over projects that do not. No Native American Tribal Communities have been identified in the watershed at this time.

Environmental Justice Considerations: Projects that address environmental justice issues are favored over projects that do not.

[5] An update to the 2016 California Water Plan was completed in 2018. However, the 2018 California Water Plan did not provide further updates to the RMS listed in the 2016 California Water Plan.

**Table 7-2: Prioritization Method and Scoring**

| Criterion | Conceptual | Implementation | Prioritization Scoring |
|---|---|---|---|
| General Information | Project description, location, and general info | Project description, location, and general info | --- |
| Prelim. Economic Analysis | NO | YES | --- |
| Project Benefits | At least one | At least one | Per Benefit:<br>3 pts = good justification<br>2 pts = fair justification<br>1 pts = poor justification |
| IRWMP Objectives | At least one | At least one | 1 pt. per Objective |
| Resource Mgmt. Strategies | At least one | At least one | 1 pt. per RMS |
| DAC/Tribal/Env. Justice | Sufficient information | Sufficient information | For each:<br>Yes = 3 pts<br>No = 0 pts |
| Project Costs | Sufficient information for level of design | Sufficient information for level of design | --- |
| Technically Feasible | At least one supporting document | At least one supporting document | --- |
| Readiness to Proceed | Status clearly defined | Status clearly defined | --- |
| Climate Change | Sufficient information | Sufficient information | --- |

Other criteria not directly addressed in the project prioritization include a project's technical feasibility, project costs and financing, benefits to multiple stakeholders and climate change adaptation and greenhouse gas mitigation. These additional criteria include considerations to the project's ability to adapt to climate change vulnerabilities, changes in runoff and recharge, and the effects of sea level rise on imported water supply, as well as the project's contribution to reducing GHG emissions as compared to project alternatives and reducing the Region's overall energy consumption. These criteria are already captured in the other prioritization criteria. Additionally, a project's economic feasibility is incorporated into the judgment of whether it is considered an implementation or conceptual project through the requirement of a preliminary economic analysis.

### 7.4.2 Prioritized Projects

The Antelope Valley IRWMP project list should be considered a "living document" to be continually modified and updated on the IRWMP website. The projects listed below are only a snapshot of the projects as of the development of this IRWMP and should only be considered as such. For more updated project information, please consult the website at www.avwaterplan.org.

The projects shown in Table 7-3 are classified as studies or plans and implementation projects and are scored according to the prioritization method. Those projects that received higher scores are shown at the top of the table. Projects that were accepted into the Plan as conceptual projects were not scored but are listed in Table 7-4. Table 7-3 and Table 7-4 both contain stormwater-related projects that may require development of an SWRP in order to receive grant funds for project implementation. Projects that have been completed or are no longer pursued have been excluded from these lists. For a more detailed table of the projects accepted into the Plan, including completed projects and detailed scoring of the implementation projects, please see Appendix K.

**Table 7-3: Prioritized Implementation Projects Accepted into the Antelope Valley IRWM Plan**

| Sponsor | Project Name | | Benefits Score | Objectives Score | RMS Score | DAC | Total Score |
|---|---|---|---|---|---|---|---|
| **Willow Springs Water Bank** | Willow Springs Water Bank | Implementation | 17 | 7 | 4 | 3 | **35** |
| **City of Palmdale** | Upper Amargosa Creek Flood Control, Recharge, and Habitat Restoration Project | Implementation | 13 | 11 | 8 | 3 | **35** |
| **Palmdale Water District** | Littlerock Dam Sediment Removal | Implementation | 14 | 8 | 4 | 3 | **29** |
| **Palmdale Water District** | Palmdale Regional Groundwater Recharge Project | Implementation | 10 | 8 | 8 | 3 | **29** |
| **Antelope Valley Resource Conservation District** | Antelope Valley Regional Conservation Project | Implementation | 10 | 5 | 9 | 3 | **27** |
| **Palmdale Recycled Water Authority** | Phase 2 Distribution System | Implementation | 12 | 6 | 5 | 3 | **26** |
| **AVEK** | Water Supply Stabilization Project (WSSP) – Westside Expansion | Implementation | 8 | 8 | 4 | 3 | **23** |
| **Rosamond CSD** | Wastewater Treatment Plant Rehabilitation and Groundwater Protection | Implementation | 6 | 7 | 6 | 3 | **22** |
| **AVEK** | AVEK Strategic Plan | Study/Report | 6 | 6 | 7 | 3 | **22** |
| **AVEK** | South Antelope Valley Intertie Project | Implementation | 5 | 6 | 7 | 3 | **21** |
| **AVEK** | South North Intertie Pipeline (SNIP) Phase 2 | Implementation | 6 | 6 | 6 | 3 | **21** |
| **City of Lancaster** | Antelope Valley Recycled Water Master Plan | Study/Report | 9 | 4 | 5 | 3 | **21** |
| **City of Lancaster** | Whit Carter Park Recycled Water Conversion | Implementation | 9 | 5 | 3 | 3 | **20** |
| **City of Lancaster** | Division Street and Avenue H-8 Recycled Water Tank | Implementation | 9 | 5 | 3 | 3 | **20** |
| **City of Lancaster** | Lancaster National Soccer Center Recycled Water Conversion | Implementation | 9 | 5 | 3 | 3 | **20** |
| **City of Lancaster** | Pierre Bain Park Recycled Water Conversion | Implementation | 9 | 5 | 3 | 3 | **20** |
| **City of Palmdale** | Palmdale Power Plant Project | Implementation | 3 | 3 | 3 | 3 | **12** |

**Table 7-4: Conceptual Projects Accepted into the Antelope Valley IRWM Plan**

| Sponsor | Conceptual Projects |
|---|---|
| Antelope Valley Duck Hunting | • Multi-use/Wildlife Habitat Restoration Project |
| Antelope Valley Resource Conservation District | • Antelope-Fremont Valleys Stealth Watershed Rapid Response Program |
| AVEK | • Big Rock Creek Recharge and Recovery Project<br>• Expansion of the Eastside Water Bank |
| City of Lancaster | • Amargosa Creek Pathways Project<br>• Ecosystem and Riparian Habitat Restoration of Amargosa Creek Ave J to Ave H<br>• Lancaster Cemetery Recycled Water Conversion<br>• Tertiary Treated Water Conveyance and Incidental Groundwater Recharge of Amargosa Creek Avenue M to Avenue H |
| City of Palmdale | • 42nd Street East, Sewer Installation<br>• 45th Street East Groundwater Recharge and Flood Control Basin<br>• Avenue R and Division Street Groundwater Recharge and Flood Control Basin<br>• Avenue Q and 20th Street East Groundwater and Flood Control Basin (Q-West Basin)<br>• Barrel Springs Groundwater Recharge and Flood Control Basin<br>• Hunt Canyon Groundwater Recharge and Flood Control Basin<br>• Lower Amargosa Creek Recharge Project |
| EAFB | • Antelope Valley Watershed Surface Flow Study |
| LACDPW | • Big Rock Creek In-River Spreading Grounds<br>• Little Rock Creek In-River Spreading Grounds |
| LACWD 40 | • Avenue K Transmission Main, Phases I-IV<br>• Avenue M and 62th Street West Tanks<br>• Implement ET Controller Program<br>• Water Conservation School Education Program |
| Leona Valley Town Council | • Precision Irrigation Control System<br>• Stormwater Harvesting |
| Little Rock Creek Irrigation District | • SWP Turnout Upgrade |
| North Edwards WD | • Arsenic Contamination Project |
| Palmdale Water District | • New PWD Treatment Plant |
| QHWD | • QHWD Partial Well Abandonment |
| Road Maintenance Division (LACDPW) | • Build a bridge at the existing dip crossing of Mt. Emma Road @ Littlerock Creek<br>• Flooding issues Avenue P-8, between 160th and 170th Street East<br>• Flooding issues Avenue W, near 133rd Street East |

| | |
|---|---|
| Rosamond CSD | • Fremont Valley Basin Potable Groundwater Well Treatment Project<br>• Tank 3 Hydro Turbine Generation Feasibility Study |

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# Section 8 | Implementation

***This section develops a comprehensive implementation plan for the IRWM Plan. The objectives of this section are to describe how the governance structure of the Region operates now and in the future, develop a financial plan for implementation of the Plan and projects selected as implementation projects, describe how the Region will manage and report data, describe the technical information used in developing this plan and data gaps found, identify a means for monitoring progress in meeting Plan objectives, and describe how the Plan will be updated and maintained throughout the planning horizon.***

## 8.1 Framework Introduction

This subsection discusses the agencies and stakeholders that develop plans or participate in the development of plans in the Antelope Valley Region, and it identifies the different scales at which planning occurs. How local agencies and stakeholders choose to link regional water issues and challenges with the IRWM Plan priorities, strategies, and objectives noted in Section 4; combine water management strategies; or determine which specific activities should occur for any specific water management strategy may vary based on the scale of planning. It is within this framework that the stakeholders intend to move toward the shared resource management objectives, following a course of greater integration and coordination of water projects and programs in the Region.

### 8.1.1 Existing Plans and Programs

A substantial number of federal, state and local/regional agencies and jurisdictions are responsible for, or participate in, the development and implementation of plans and programs that satisfy the resource management strategies developed earlier in this report.

Land use decisions have the potential to affect the resource management strategies utilized in the AV IRWM Plan, as land use can affect population growth, water demand, and surface water quality. The implementation of stormwater capture projects may require acquisition of land which could displace existing uses and may warrant consideration of modifications to land use policies and practices. In addition, the passage and implementation of water conservation or floodplain management ordinances can further address IRWM Plan objectives. In developed areas, the land use decision makers are primarily the cities and the counties. In open space areas, the Forest Service, National Park Service, and California State Parks have regulatory responsibility for the conservation and preservation of those spaces. Additionally, many 'open spaces' in the Antelope Valley Region are undeveloped rural lands under Los Angeles and Kern County jurisdiction. All of these agencies and jurisdictions have been involved in the AV IRWM Plan as part of the stakeholder process or are active members of the Antelope Valley RWMG (e.g., cities and counties).

The stakeholder process allows for interactive feedback to occur between local land use and water resources planning, and regional IRWM Plan planning. Local planning is conducted by cities, counties, and local agencies and districts. Most of the cities and counties in the Antelope Valley Region have participated either directly, or through the participation of a regional representative. Through the stakeholder workshops, the cities, counties and municipal agencies have advocated for their respective local planning needs and issues, which have been incorporated into the IRWM Plan through stakeholder feedback and project solicitation. Subsequently, the outcomes from the AV IRWM Plan process have been disseminated by the representatives back to their local decision makers, allowing the IRWM Plan priorities, objectives and planning targets to be considered in local planning efforts where appropriate. For example, the AV IRWM Plan was used to inform the Los Angeles County General Plan update in 2015 in areas related to water resource management.

Stakeholder meetings facilitate information sharing and collaboration with regional land use planning to manage multiple water demands throughout the State, adapt to water management systems to climate change, and offset climate change impacts to the water supply. Given this interactive opportunity and plan review processes, numerous plans and studies related to water resources and land use management in the Antelope Valley Region have contributed to the development of the IRWM Plan. Thus, the AV IRWM Plan has been developed from and is consistent with local planning efforts in the Antelope Valley Region shown in Table 8-1.

## 8.2 Governance Structure

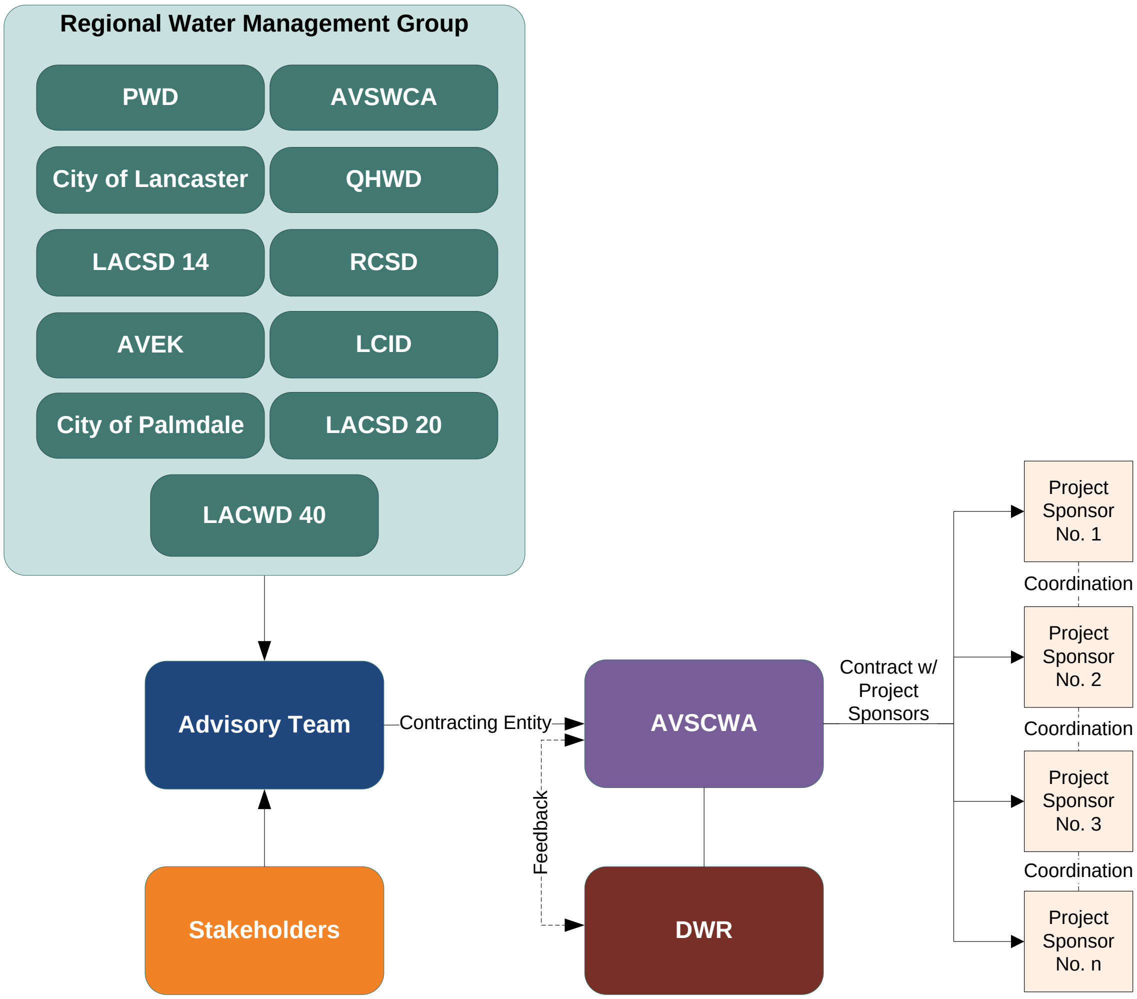
Governance structure means "decision-making" structure or management structure. As described in Section 1, the RWMG uses a governance structure established through an MOU that prescribed the roles and responsibilities for the RWMG. The MOU identifies how the RWMG will incorporate new members. When approved by all parties, new members may join the RWMG by adopting the IRWMP and executing the MOU. The MOU also states that, when appropriate, new members may pay a reasonable financial contribution as the existing RWMG members shall determine. Any action of the RWMG requiring funding from the members, including updates to the IRWMP, public noticing, and preparation of grant applications, will require a separate agreement approved by the governing boards of each respective member.

As shown in Figure 8-1, the RWMG is the governing body, and invites stakeholder involvement beyond the MOU signatories through regularly scheduled stakeholder meetings and participation in the Advisory Team and subcommittees. The RWMG has engaged a balance of interested persons or entities representing sectors or interests by conducting all business in consultation with the larger Stakeholder Group in meetings which are open to the public. The Stakeholder Group includes all participants within the IRWMP process including agencies that comprise the RWMG as well as an extensive mix of other cities and regulatory, environmental, industrial, agricultural, and land-use planning agencies that represent all areas of the Antelope Valley Region. Any interested person may participate in Stakeholder meetings and provide input. The Stakeholder Group meets at least once per quarter (i.e., 4 times per year) to review progress on IRWMP implementation and to consider updates to the IRWMP (such as newly proposed projects or management actions that address the Regional Plan objectives).

**Table 8-1: IRWM Plan Relationship to Local Planning Documents**

| Planning Document | Jurisdiction | Relationship to IRWM Plan | Updates |
|---|---|---|---|
| General Plans | Land use and zoning | Include land use and zoning information, significant ecological areas and growth projections for Antelope Valley cities and counties. | As needed |
| Lahontan Regional Water Quality Control Board Basin Plan | Water quality | Includes water quality information on local surface waters such as 303(d) listings, beneficial uses, non-point source pollution, and total maximum daily loads. | As needed |
| Urban Water Management Plans | Water supply | Provides current and 25-year projected water supply and demand, drinking water supply/quality issues, population and facilities | Every 5 years |
| State Water Project Delivery Capability Report | Water supply | Contains information on projected reliability of imported water from the Delta. | Every 5 years |
| Antelope Valley Watermaster Annual Reports | Water supply | Includes information on ongoing monitoring per the Antelope Valley Groundwater Basin adjudication Judgment, including historical and current pumping patterns, conditions of overdraft, and total sustainable yield. | Every 5 years |
| Recycled Water Facilities Plans (Lancaster, Palmdale, Palmdale Water District, LA County Waterworks District 40) | Water supply | Includes information on current and projected available recycled water supply and plans for future recycled water system expansion. | As needed |
| 2016 Resource Management Strategies Update and 2018 California Water Plan Update | Water resources planning | Includes statewide discussion of water resources in California, including resource management strategies, strategic planning, and regional discussions. | Every five years |
| Species Recovery Plans | Habitat | Contains information on the locations of habitats of local endangered species. | As needed |
| Water Reclamation Plant Facilities Plans | Wastewater planning | Includes information on current and projected available recycled water supply and plans for future water reclamation plant expansion. | As needed |

**Figure 8-1: Antelope Valley IRWM Governance Structure**




The RWMG has agreed to evaluate the effectiveness of the Region's governance structure periodically, and to explore additional options for governance structures for integrated regional water management in the Antelope Valley if needed. The following discussion provides additional detail on how the Region's governance structure performs various activities.

## 8.2.1 Public Involvement Process

The Region encourages public involvement in both the IRWM Plan development process and implementation process. The regional planning and public involvement process, described in Section 1, provided useful, broadly accepted information that supported development of the IRWM Plan Update. The public is encouraged to participate in the implementation of the updated IRWM Plan. To ensure continued participation, the Region will continue to hold regular stakeholder meetings open to the public. These meetings will allow the Region to accept project proposals on an ongoing basis, to continue to reach out to DACs, and to provide technical assistance when needed. DACs will be continually represented in the Stakeholder group so that the AV IRWM Plan will address the diverse issues and needs of the Antelope Valley Region.

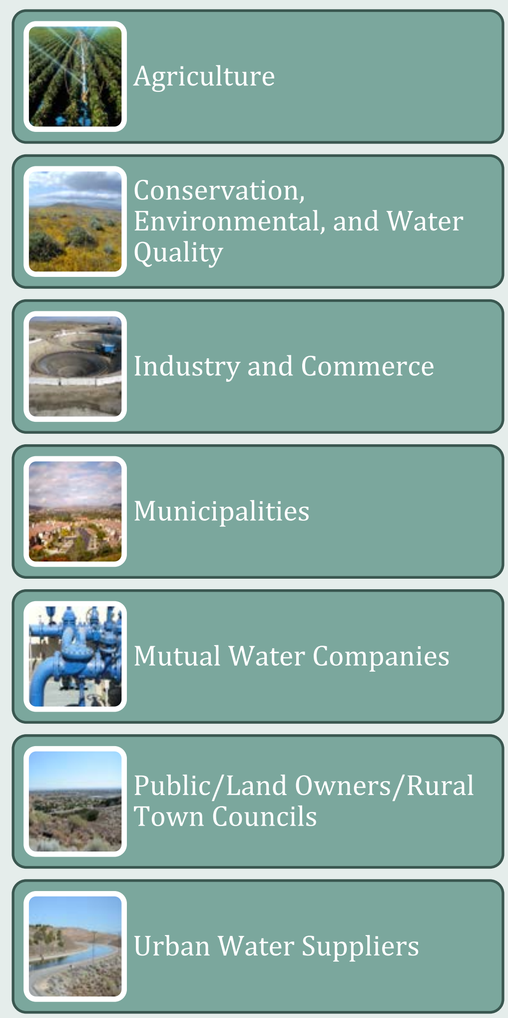
### 8.2.2 Effective Decision Making

The RWMG has operated since its inception using a systematic approach called "facilitated broad agreement." Whenever a decision needs to be made, the discussion between the RWMG members and the Stakeholder Group is facilitated until all members come to a consensus on an acceptable course of action.

### 8.2.3 Balanced Access and Opportunity for Participation

The Region's planning efforts involve a diverse group of people with differing expertise, perspectives and authority of various aspects of water management to ensure balanced access and opportunity for participation. The RWMG itself is composed of various entities that represent water suppliers, wastewater service providers, land-use managers, flood managers, parks and recreation service providers, and environmental services. The Region's stakeholders represent a diverse group of entities that actively participate in regular stakeholder meetings and other IRWM program related activities, as described in Section 1.2.2.

Figure 8-2: Advisory Team Interest Representation




Meeting materials for the Plan Update were developed by a consultant team in cooperation with RWMG members and other stakeholders, and made available for review and comment by the stakeholders. For the 2013 IRWM Plan Update, the Region formed various subcommittees that stakeholders participated in to provide further input, including the advisory team (A-Team), a public outreach subcommittee, a DAC subcommittee, a flood management subcommittee, an SNMP subcommittee, and a climate change subcommittee. While all subcommittees provided invaluable support during the 2013 IRWM Plan update, only the A-Team resumed for the 2019 IRWM Plan Update. These subcommittees are described below.

#### 8.2.3.1 Advisory Team

The MOU created an A-Team to provide focused initiative and effort to implement the IRWM Plan. The A-Team is not a decision-making body but is responsible for tasks such as:

- Organizing stakeholder meetings
- Maintaining the AVIRWM Plan website
- Identifying grant opportunities for which the RWMG or its members may apply
- Developing a list of short-term implementation objectives for consideration and approval by the RWMG and stakeholders[1]

[1] This task was completed when the first IRWMP was developed in 2007.

- Maintaining a list of long-term implementation objectives for the RWMG to address and update at stakeholder meetings
- Recommending an annual scope and budget for the RWMG
- Distributing information to stakeholders

The A-Team includes seven members selected by the Stakeholder Group to serve a three year term, and represent the categories of water-related interests shown in Figure 8-2.

The current list of A-Team seats and active members is maintained on the www.avwaterplan.org website.

#### 8.2.3.2 Public Outreach Subcommittee

The Public Outreach Subcommittee was formed in order to provide public outreach for the Region's IRWM Program. For the 2013 IRWM Plan update, this subcommittee was responsible for:

- Assisting with community events
- Assisting with outreach presentations
- Assisting with public notices
- Collaborating with DAC outreach

This subcommittee provided recommendations to the stakeholder group and RWMG for inclusion of the above items in the 2013 IRWM Plan Update and reporting on public outreach activities as needed at stakeholder meetings. There is no limit to the term of service for serving on this subcommittee. These responsibilities have largely been assumed by the A-Team for the 2019 IRWM Plan update.

#### 8.2.3.3 DAC Subcommittee

The DAC Subcommittee was formed in order to encourage participation by DACs in the IRWM Program and to solicit feedback in DAC-related issues. For the 2013 IRWM Plan update, this subcommittee was responsible for:

- Helping coordinate DAC meetings
- Assisting with outreach discussions
- Reviewing technical memorandums related to DAC water supply and water quality needs
- Collaborating with the Public Outreach subcommittee

All stakeholders were invited to participate in this subcommittee through the duration of the 2013 IRWM Plan update process. This subcommittee provided recommendations to the stakeholder group and RWMG for inclusion of these items in the 2013 IRWM Plan Update and reporting on DAC outreach activities. These responsibilities were transferred to the A-Team for the 2019 IRWM Plan update.

#### 8.2.3.4 Flood Subcommittee

The Flood Subcommittee was formed in 2013 to incorporate integrated flood management concepts into this Plan Update. This subcommittee was responsible for:

- Participating in flood/stormwater discussions related to existing flood plans, flood needs, project priorities, multiple-benefits, stormwater quality, NFIP, and FloodSAFE
- Reviewing technical memorandums related to existing flood plans, flood needs, project priorities, multiple-benefits, stormwater quality, NFIP, and FloodSAFE

All stakeholders were invited to participate in this subcommittee through the duration of the 2013 IRWM Plan update process. This subcommittee provided recommendations to the stakeholder group and RWMG for inclusion of these items in the 2013 IRWM Plan Update. This subcommittee was not reconvened for the 2019 IRWM Plan update as all flood related information is still accurate.

#### 8.2.3.5 Climate Change Subcommittee

The Climate Change Subcommittee was formed in 2013 to incorporate climate change projections and impacts into this Plan Update. This group was responsible for:

- Reviewing and vetting projected effects and impacts of climate change
- Determining and prioritizing the Region's climate change vulnerabilities
- Assessing strategies for responding to climate change
- Developing climate change related objectives and targets

All stakeholders were invited to volunteer to participate in this subcommittee through the duration of the 2013 IRWM Plan update process. This subcommittee provided recommendations to the stakeholder group and RWMG for inclusion of these items in the 2013 IRWM Plan Update. This subcommittee was not reconvened for the 2019 IRWM Plan update as all information related to climate change remains accurate.

### 8.2.4 Communication

The Region's IRWM program fosters communication with various functional groups both within the Region and outside the Region. Communication among the Region's stakeholders (including RWMG representatives, governmental agencies, project proponents, general stakeholders, and neighboring RWMGs) regarding the IRWM program typically occurs through email notifications, announcements posted to the Region's website (www.avwaterplan.org), public presentations, stakeholder workshops, subcommittee workshops and A-Team meetings. In addition, several one-on–one meetings were conducted in support of this IRWM Plan update to encourage participation by DACs (see Section 1 for additional information regarding DAC outreach), develop projects, and evaluate regional needs and issues (e.g., groundwater adjudication).

### 8.2.5 Long-term Implementation of the IRWM Plan

The Antelope Valley IRWM Program is committed to ensuring long-term implementation of the IRWM Plan to ensure sustainability of the Region's water supply, water quality and natural resources. All interested stakeholders will continue to be invited to participate in IRWM program meetings and planning efforts. The Region's MOU reflects the commitment to ensure long-term implementation of the IRWM Plan given that the MOU signed by each RWMG member does not expire for 20 years after the date of execution (i.e., January 2027).

It is expected by the stakeholder group that each member of the RWMG will adopt the 2019 IRWM Plan Update in early 2020. Project proponents who plan to submit grant funding applications are also encouraged to adopt the 2019 IRWM Plan Update prior to the grant awards. Other members of the stakeholder group may also adopt the Plan.

### 8.2.6 Coordination with Neighboring IRWM Efforts, State Agencies, and Federal Agencies

The Region's governance structure allows for coordination with neighboring IRWM Regions, State Agencies, and Federal Agencies. Representatives from neighboring IRWM regions, state agencies, and federal agencies are included in the Region's email list to receive meeting notifications and updates on IRWM program activities. When necessary, the Region coordinates directly with neighboring IRWM efforts and state and federal agencies by electing an appropriate RWMG or A-Team member to represent the Region. In the past, the Antelope Valley Region has coordinated with the Mojave

IRWM, Kern IRWM, and Fremont Basin IRWM Regions on regional boundary overlaps and city and agency overlaps for the Region Acceptance Process. The Antelope Valley Region has also coordinated with the Mojave, Inyo-Mono, Tahoe-Sierra, and Fremont Basin Regions on potential fund-sharing ideas within DWR's Lahontan funding area.

Additionally, the Region coordinates with state and federal agencies on grant and planning efforts by electing appropriate representatives. For example, the RWMG selected the AVSWCA to interface with DWR for the Proposition 84 and Proposition 1 grant efforts. Grant administration includes the ability to receive and administer funds to the awarded sponsored projects, to prepare the necessary progress reports and invoicing reports, to make investigations, and to execute, and file such documents and agreements with DWR as required.

### 8.2.7 Changes and Updates to the IRWM Plan

The AV IRWM Plan is a dynamic planning document. Given that the Region will continue the IRWM Program into the future, it will be possible to perform interim and formal changes to the IRWM Plan in response to changing conditions, and/or update or amend the IRWM Plan as needed. Should a change in the Region's water resources occur, stakeholders will have the opportunity to provide feedback at stakeholder meetings where the A-Team will determine necessary action items.

The AV IRWM Plan at a minimum will be updated every five years[2] as further study and planning is conducted, projects continue to be developed and objectives and priorities are adjusted. There will be an ongoing process for keeping the proposed project list up-to-date through regular quarterly updates with additional meetings. Revisions to the project list will be made as needed before major grant applications, as conditions change, as funding is identified, as projects are implemented, and as objectives are revised. The process for revising the project list is detailed in Section 7.

### 8.2.8 Future Governance Structure

Though no changes were made to the existing governance structure since 2007, in the future, the Region may consider formation of a JPA to replace the MOU. A JPA is formed when it is to the advantage of two or more public entities (e.g., utility or transport districts) with common powers to consolidate their forces to acquire or construct a joint-use facility. Their bonding authority and taxing ability is the same as their powers as separate units. A JPA is distinct from the member authorities, as they have separate operating boards of directors, yet these boards can be given any of the powers inherent in all of the participating agencies. In setting up a JPA, the constituent authorities must establish which of their powers the new authority will be allowed to exercise. A term and the membership and standing orders of the board of the authority must also be laid down. The joint authority can employ staff and establish policies independently of the constituent authorities. A prominent JPA in the Antelope Valley Region is the AVSWCA, formed in May 1999 by the three local SWP contractors of the Antelope Valley.

## 8.3 Funding and Financing of the IRWM Plan

Funding and financing needs for implementation of the IRWM Plan falls into the three categories of IRWM program, projects, and planning, as shown in Figure 8-3. IRWM Program activities meet the most basic requirements necessary for the Region to exist and implement the Plan according to DWR standards. These activities include outreach/communication activities discussed in Section 1 and 8.2 (e.g., website maintenance, email list and notifications management, participation in the public outreach subcommittee), data management activities discussed in Section 8.4, governance activities

[2] The 2007 IRWMP originally said that updates would be completed every two years. This was adjusted to every five years in the 2013 IRWMP Update to coordinate with UWMP updates and SNMP updates.

discussed in Section 8.2 (e.g., A-Team and stakeholder meeting preparation and attendance, program administration), and regular plan updates every 5 years.

**Figure 8-3: Antelope Valley IRWM Financing Needs**

| IRWM Program | Projects | Additional Planning |
|---|---|---|
| • Outreach/communication<br>• Plan performance<br>• Data management<br>• Governance<br>• Plan updates (every 5 years) | • Project review<br>• Project prioritization<br>• Grant application preparation<br>• Grant management<br>• Project implementation<br>• Project O&M | • Regional planning needs<br>• More frequent Plan updates |

Activities related to the Region's projects include project review and prioritization (discussed in Section 7), grant application preparation and management (which the Region intends to continue), project implementation, and project operations and maintenance (O&M). Additional planning activities in the Region beyond IRWM and project activities allow the Region to further enhance regional planning and coordination activities. Since these additional planning activities are not required, the resources dedicated to them would be discretionary and only provided after the IRWM and project related activities are funded. Additional planning activities may include implementation of plans and studies in response to regional needs such as preparing a Region-wide watershed management plan or a groundwater master plan and more frequent Plan updates.

## 8.3.1 Funding/Financing Options

To meet the resource needs identified above, the Region will need to secure funding as both in-kind services and monetary resources. Potential funding sources and methods include:

- Sources
    - Ratepayers
    - Operating Funds
    - Water Enterprise Funds
    - Assessments/Fees/Taxes
    - Loans/Grants
    - Bonds
- Methods
    - In-Kind Time
    - Annual Dues
    - As-Needed Assessments
    - Grants/Loans

Given that local revenue sources will not be sufficient to fully fund all aspects of the IRWM Program's financing needs over the 20-year planning horizon, the Region intends to fund its activities using a combination of local, state and federal funds. The following is a program-level description of the sources of funding which will be utilized for the development and ongoing funding of the IRWM Plan; and it includes potential funding sources for projects that implement the IRWM Plan, including project O&M costs.

#### Local Financing

Local in-kind services provided by representatives of the Region's RWMG, A-Team and Stakeholder Group are the most important resource used by the Region. All of the Region's governance, outreach, communication, data management, plan review, plan performance and project development work is contributed as in-kind services. The capability of these entities to continue to dedicate staff resources for implementation of the IRWM Plan is critical to the Region's success.

In addition to in-kind services, members of the RWMG will continue to contribute funds to the Region as defined in the MOU, and provide local funds to finance projects included in the IRWM Plan. While existing funding mechanisms are in place for development of water supply and wastewater facilities and operation and maintenance of these facilities, the funds may not be sufficient to achieve the planning targets described in Section 4 of this IRWM Plan Update. It will be necessary for local agencies to implement additional local funding measures and/or pursue state and federal opportunities to fully fund implementation of the Plan.

O&M costs for specific implementation projects in this IRWM Plan will be funded by the project proponents/agencies from ratepayers, operating funds, water enterprise funds, assessments, fees, and taxes. The certainty of O&M funding is dependent on the particular project and project proponent. Additional detail on O&M costs may be found in Appendix K.

#### State Financing

The Region has pursued funding to implement projects in its IRWM Plan in the past, including grant opportunities through Propositions 50, 84 and 1E. The Region will continue to evaluate and apply for state funding opportunities such as the Proposition 1, Round 1 grant program for IRWM Plan project implementation and state revolving fund (SRF) loans. The Region will also participate in opportunities to provide leadership on statewide funding measures such as statewide discussions regarding the future of the IRWM Program and discussions on the language of future funding measures.

#### Federal Financing

Local agencies may seek federal funding opportunities to fund projects as they become available.

### 8.3.2 Funding/Financing Plan

Table 8-2 shows the Region's funding and financing plan to achieve the IRWM Program O&M and Project activities discussed above. Note that additional planning needs are not included here as they have not been determined at this time.

### Table 8-2: IRWM Plan Financing Plan

| Activity | Approximate Total Cost | Sources and % of Total Cost | Funding Certainty/Longevity | Assumptions |
|---|---|---|---|---|
| **IRWM Program** | | | | |
| **Outreach/ communication** | 48 hours/year<br>$5,000/year | *In-kind*<br>100% RWMG agencies and/or A-Team members<br>*Funds*<br>100% RWMG agencies | Contingent on on-going agency staff allocations<br>MOU program fund sharing in place for 20 years from date of execution | • 4 hours/month for regular communication to stakeholder group = 48 hours/year<br>• $5,000 per year to maintain program website |
| **Plan performance** | 24 hours/year | *In-kind*<br>100% RWMG agencies and/or A-Team members | Contingent on on-going agency staff allocations<br>MOU program fund sharing in place for 20 years from date of execution | • 24 hours/year (completed on annual basis by A-Team or subcommittee) |
| **Data management** | 120 hours/year | *In-kind*<br>100% RWMG agencies and A-Team members | Contingent on on-going agency staff allocations<br>MOU program fund sharing in place for 20 years from date of execution | • 10 hours/month = 120 hours/year |
| **Governance** | 760<br>hours/year | *In-kind*<br>100% RWMG agencies and A-Team members | Contingent on on-going agency staff allocations<br>MOU program fund sharing in place for 20 years from date of execution | • Stakeholder meeting attendance: 6 meetings/year * 4 hours * 25 attendees = 600 hours<br>• Program administration: 8 hours/month = 96 hours/year<br>• A-Team meeting attendance: 4 meetings/year * 2 hours * 8 attendees = 64 hours/year |
| **Plan update: stakeholder review and consultant assistance** | 128 hours/update<br>$500,000/ update | *In-kind*<br>100% RWMG agencies and A-Team members<br>*Funds*<br>50% RWMG agencies<br>50% State grant funds | Contingent on on-going agency staff allocations<br>MOU program fund sharing in place for 20 years from date of execution<br>Contingent on success in obtaining future grant funds for IRWM planning | • Stakeholder review of plan update: 4 reviewers/section * 8 sections * 4 hours/section = 128 hours/update<br>• Consultant assistance with plan update: $160,000/update |

| Activity | Approximate Total Cost | Sources and % of Total Cost | Funding Certainty/Longevity | Assumptions |
|---|---|---|---|---|
| **Projects** | | | | |
| **New projects: Initial review and prioritization, and stakeholder approval of new projects** | 12 hours/year | *In-kind*<br>100% RWMG agencies and A-Team members | Contingent on on-going agency staff allocations<br>MOU program fund sharing in place for 20 years from date of execution | • Initial review and prioritization of new projects: 7 person* 2 hours/year = 14 hours/year<br>• A-Team and stakeholder approval of new projects: 0 hours (approval will occur at regular stakeholder and A-Team meetings) |
| **Grant application preparation** | 40 hours/project application<br>$20,000/ project application | *In-kind*<br>90% Project proponents<br>10% Program manager<br>*Funds*<br>100% project proponents or RWMG | Contingent on on-going agency staff allocations<br>MOU program fund sharing in place for 20 years from date of execution | • Project proponents: 40 hours/project application<br>• Consultant assistance: $20,000/project application |
| **Grant management** | 620 hours/year | *In-kind*<br>25% Project proponents<br>75% Program manager | Contingent on continued success in grant programs. | Program manager: 40 hours/month = 480 hours/year<br>Project proponent reporting: 12 hours/month = 144 hours/year |
| **Project implementation** | Between $70 million and $80 million capital costs<br>Between $1 million/year and $2 million/year O&M costs | *In-kind*<br>100% Project proponents<br>*Funds*<br>25% Project proponents<br>75% State grant assistance | Contingent on on-going agency staff allocations and agency funds.<br>Contingent on continued success in grant programs. | Total capital and O&M costs for implementation projects that have provided cost estimates |

## 8.4 Data Management

This section discusses the importance of collecting, managing, disseminating and utilizing data to create a sustainable integrated plan. A comprehensive data management approach will help to quickly identify data gaps, detect and avoid duplication, support regional data collection, and integrate with other regional and statewide programs.

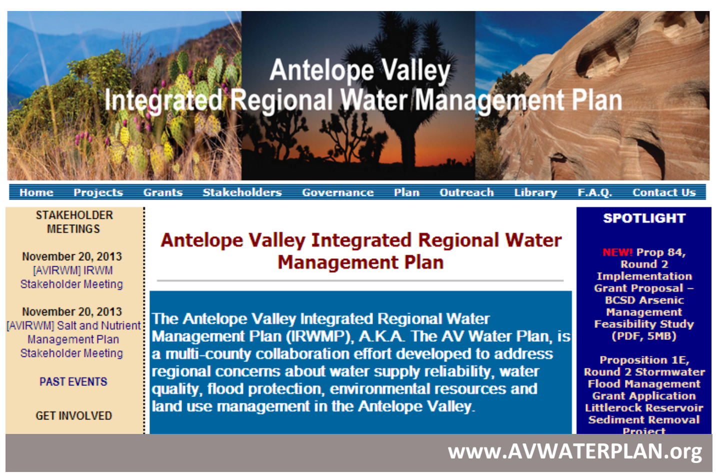
A wide variety of information is necessary to effectively manage water. The kinds of data needed include information regarding water quality, quantity, population demographics, climate and rainfall patterns, treatment plant effluent, habitat locations and needs, water costs, and more. Data is vitally important to agencies trying to maximize operating efficiency and design projects with limited budgets. The types of data available, current relevance and trends, and knowledgeable people that can interpret the data are all important. Equally important is the opportunity for Federal and State agencies to view local data for their own monitoring needs and to better understand local conditions.

The collection, management, dissemination and utilization of data (e.g., information gathered from studies, sampling events, or projects) are essential elements to creating a sustainable integrated plan. Information needs to be available to regional leaders, stakeholders, and the public to facilitate effective planning and decision-making.

As part of this IRWM Plan, the data management strategies described below will be applied to coordinate data collection between implementation projects, leverage existing data available from ongoing statewide and regional programs, provide timely data to stakeholders and the public, and consolidate information to be used in other state programs. These strategies are explained in more detail below.

### 8.4.1 Management and Data Reporting

Dissemination of data to stakeholders, agencies, and the general public is integrated into the AV IRWM Plan process to ensure overall success. A requirement of the Proposition 1 Guidelines is the routine reporting on project performance. The routine collection of this data naturally lends itself to the routine collection and reporting that is required as part of the AV IRWM Plan process. The AVSWCA, as the grant contracting entity, will compile the reporting of this IRWM Plan and work individually with the project proponents to receive updates on individual project progress. The AVSWCA will also ensure that all submitted monitoring data has undergone a robust quality assurance and quality control (QA/QC) process by requiring the agencies and organizations to provide a certification that states an appropriate level of QA/QC has been performed. A standardized reporting format will be created which the AVSWCA could use to compile this data, which will then be uploaded to the project website described in more detail below. Data collected or produced as part of the AV IRWM Plan will then be presented and disseminated during bi-monthly stakeholder meetings.




A public website has been created to store data and information about the AV IRWM Plan process so that the public can find information about public meeting dates, agendas, and notes. The website provides information on the AV IRWM Plan process and posts annual reports and relevant documents. Data collected during the AV IRWM Plan process is available on the website as well. The website also provides links to other existing monitoring programs to promote data sharing between these programs and the AV IRWM Plan. This provides a means to identify data gaps (e.g., information needed to provide a more complete assessment of the status of a specific issue or program) and to ensure that monitoring efforts are not duplicated between programs.

The AV IRWM Plan website, www.avwaterplan.org, provides a mechanism for stakeholders to upload project information regarding water supply, water quality, and other benefits of projects which will be collected in a database to manage, store, and disseminate information to the public. A data collection template will be available on the website in the future so that data collected during the AV

IRWM Plan can be stored and managed in a consistent format. This template will be compatible with those used in state databases, discussed further in subsection 8.4.4. The Region expects that project proponents will ensure the quality of their data prior to upload to the IRWM Plan website.

### 8.4.2 Regional Data Needs

This subsection identifies regional data needs including information required to evaluate the effectiveness of projects that produce non-traditional data.

As part of this IRWM Plan Update, data sets and reports were reviewed for their applicability to the Antelope Valley IRWM Region. This knowledge has provided the information necessary to identify data gaps which represent information crucial to a greater understanding of the Antelope Valley IRWM Region and help develop context for future projects (as discussed in Section 8.5 below). Data gaps identified through this IRWM Plan Update include:

- Water demands for users served by small, mutual water companies or private well owners
- Actual agricultural pumping
- Outdoor verses indoor water use
- Consumptive use losses in the basin
- Consolidated regional data on flooding issues, including flood hazard mapping
- Flood mitigation needs identification
- Groundwater recharge loss due to septic removal
- Subsurface flow
- Stormwater beneficial use identification
- Water available for recovery from surface water runoff, particularly from Amargosa Creek
- Baseline embedded energy use and GHG emissions emitted by water resources-related activities

It is recommended that additional monitoring and studies be conducted to fill in these data gaps.

In the future, the AV IRWM Region will also collect non-traditional data (i.e., summarizing the effectiveness of water conservation programs throughout the Antelope Valley Region) in a comprehensive way that can be a powerful contribution to statewide water management efforts. Comprehensive data collection and measurement of these efforts will provide leadership and guidance to growing metropolitan areas throughout California.

### 8.4.3 Existing Monitoring Efforts

This subsection will provide the existing surface and groundwater level and quality monitoring efforts in the Antelope Valley Region and will identify opportunities for additional monitoring and/or for partnership.

#### 8.4.3.1 Surface Water

Surface water for the Region comes from the state aqueduct and Littlerock Reservoir. Water from the state aqueduct is monitored by both DWR and by local water purveyors receiving the water. Surface water from Littlerock Reservoir is monitored by PWD. Data on the quantity of surface water in the Region is available through UWMPs and DWR reporting. See Section 8.4.3.2 below for a discussion of drinking water quality monitoring.

#### 8.4.3.2 Drinking Water

Drinking water quality is monitored through the following means:

- Safe Drinking Water Act (SDWA) compliance monitoring and reporting: All public water systems are required to produce water that complies with the SDWA. To this end, specific monitoring information is required and conducted routinely. Results of the monitoring are reported to the California DPH. In addition, monitoring information is required to be published in the annual Consumer Confidence Report (also required by the SDWA).
- Unregulated Contaminant Monitoring Rule Results: The 1996 SDWA Amendments mandate that EPA publish a list of unregulated contaminants that may pose a potential public health risk in drinking water. This list is called the Contaminant Candidate List (CCL). The initial 1998 accounting listed 60 contaminants. USEPA uses this list to prioritize research and data collection efforts for future rulemaking purposes. The 1996 SDWA amendments incorporated a tiered monitoring approach. The rule required all large public water systems and a nationally representative sample of small public water systems serving less than 10,000 people to monitor the contaminants. The information from the monitoring program for the Antelope Valley IRWM Region will be compiled and submitted to the State as well as be available on the website.

#### 8.4.3.3 Groundwater

AVEK and the USGS have coordinated groundwater monitoring efforts in the Antelope Valley Region for several years. Groundwater monitoring is also required in areas on and surrounding the EAFB as well as regional landfills. The Region's SNMP includes a groundwater monitoring component for tracking of groundwater quality with a focus on water supply wells and areas proximate to large water projects. These data will be reported to the CDPH, and compiled through the State's GAMA program. The following is a summary of the ongoing monitoring programs for groundwater levels and groundwater quality in the Region:

- Geotracker-GAMA: The Geotracker- GAMA groundwater information system is California's comprehensive groundwater quality monitoring program that was created by the SWRCB in response to the Groundwater Quality Monitoring Act of 2001. The SWRCB was required to incorporate and display existing water quality data through a publicly accessible interactive online map from various monitoring programs throughout the State. Geotracker-GAMA is based on interagency collaboration with the SWRCB, Regional Water Boards, DWR, Department of Pesticide Regulations, USGS, and Lawrence Livermore National Laboratory. It also relies on cooperation from local water agencies and well owners. Data reporting frequencies under Geotracker-GAMA range from every three years, to annual, to quarterly, depending on the well and constituent. Groundwater quality is typically monitored by public agencies at their wells in addition to the data reported on the Geotracker-GAMA online website.

- USGS: In addition to the Geotracker-GAMA website, USGS maintains water quality data for groundwater basins in the National Water Quality Information System. USGS reports concentration values every three years. USGS also monitors water levels in approximately 185 wells within and adjacent to the Antelope Valley Adjudication Area. The USGS monitoring program was developed, in part, to comply with the California Statewide Groundwater Elevation Monitoring (CASGEM) program for the groundwater basin. The CASGEM program was developed by DWR to track seasonal and long-term trends in groundwater elevations in

California's groundwater basins and establish collaboration between local monitoring parties and DWR. The number of wells in this regional monitoring program varies from year to year based, in part, on access and well status/operation. Water level monitoring occurs in all wells in March, and in a smaller subset of wells monitored in October.

- Antelope Valley Watermaster: Under the adjudication Judgment, the Watermaster Engineer has the responsibility of preparing annual reports for the Court. The reports present relevant data from the monitoring of Safe Yield components in the basin and provide preliminary analyses on current groundwater levels and change in groundwater storage annually. The reports also provide details on water accounting for Parties to the Judgment, including production, imported water use and return flows, transfers, stored water, and other relevant practices that may impact groundwater levels.

### 8.4.4 Integration of Data into Existing State Programs

Data collected as part of this IRWM Plan can be used to support existing state programs such as:

- California Environmental Data Exchange Network (CEDEN)
- Water Data Library (WDL)
- California Statewide Groundwater Elevation Monitoring Program (CASGEM)
- Surface Water Ambient Monitoring Program (SWAMP)
- GAMA
- California Environmental Information Catalog (CEIC)
- Integrated Water Resources Information System
- California Environmental Resources Evaluation System (CERES)
- California FloodSAFE

To facilitate the integration of the Region's data with state databases, the Region's data collection templates discussed under subsection 8.4.1 will be compatible with state databases. The Region assumes that project proponents will ensure the quality of their data and that project proponents will upload their data to the appropriate state databases.

## 8.5 Technical Information

This subsection describes the technical information used in the development of the 2019 IRWM Plan Update which relied on an extensive list of plans, studies, and other documents and information sources. In addition, several technical memoranda were prepared for the 2013 IRWM Plan Update to further study the Region's DAC and flood management related needs and develop an SNMP. These memoranda are included as Appendix D, F, and G, respectively. Table 8-3 provides a summary of the documents and data sources used, the method of analysis, the results derived, and how they were used in the 2019 Plan Update.

**Table 8-3: Technical Information**

| Technical Information | Analysis Method | Results/Derived Information | Use in IRWM Plan | Reference or Source |
|---|---|---|---|---|
| **Population Projections** | Extracted 2017 populations using 2010 census block group data and 2013-2017 American Community Survey data<br>Extracted projected population information using 2019 Department of Finance data for Kern and Los Angeles Counties<br>Extracted projected population information using Southern California Association of Government data for Palmdale and Lancaster | 2015 population estimates<br>Projected population increases between 2015 and 2040 | Used to describe regional characteristics, estimate future demand | US Census Bureau, 2010. 2010 US Census statistics.<br>US Census Bureau, 2019. 2013-2017 5-Year American Community Survey.<br>Southern California Association of Governments, 2012. Adopted 2012 RTP Growth Forecast, by City. |
| **DAC identification** | Extracted income information by census block group and place | Median household income | Used to identify DACs within the Region | US Census Bureau, 2019. 2013-2017 American Community Survey 5-year Estimates.<br>RMC, 2013. Task 2.1.2 DAC Water Supply, Quality, and Flooding Data. Antelope Valley IRWMP 2007 Update. |

| Technical Information | Analysis Method | Results/Derived Information | Use in IRWM Plan | Reference or Source |
|---|---|---|---|---|
| **Water Supply Projections** | Reviewed 2015 Urban Water Management Plans | Water supply by source projected between 2015 and 2035 or 2040 by water district | Used to project water supply availability for the Region, and identify water supply needs and issues | AVEK, 2016. 2015 Urban Water Management Plan.<br>California Water Service, 2016. 2015 Urban Water Management Plan.<br>LACWD 40, 2017. 2015 Urban Water Management Plan.<br>PWD, 2016. 2015 Urban Water Management Plan.<br>QHWD, 2016. 2015 Urban Water Management Plan.<br>RCSD, 2017. 2015 Urban Water Management Plan. |
| **Urban Water Demand Projections** | Review of 2015 urban water management plans<br>Extrapolated using Department of Finance population growth rates for Kern and Los Angeles County | Projected total demand and per capita demand | Used with population projections to project demand for the Region | AVEK, 2016. 2015 Urban Water Management Plan.<br>California Water Service, 2016. 2015 Urban Water Management Plan.<br>LACWD 40, 2017. 2015Urban Water Management Plan.<br>PWD, 2016. 2015 Urban Water Management Plan.<br>QHWD, 2016. 2015 Urban Water Management Plan.<br>RCSD, 2017. 2015 Urban Water Management Plan.<br>DOF, 2019. County Population Projections (2010-2060). |

| Technical Information | Analysis Method | Results/Derived Information | Use in IRWM Plan | Reference or Source |
|---|---|---|---|---|
| **Agricultural Water Demand Projections** | Review of existing records of agricultural land use<br>Estimation of crop evapotranspiration using Palmdale area ETo station<br>Calculation of crop water requirements using ETo, crop types, crop area, historical rainfall | Estimated crop water requirements for the Antelope Valley | Used to describe current water demands, and estimate future supply needs | Hansen, B.R., et al. 2004. "Scheduling Irrigation: When and How much Water to Apply," Water Management Series Publication Number 3396, Department of Land, Air & Water Resources, University of California, Davis<br>Pruitt, W.O., et al. "Reference Evapotranspiration (ETo) for California," UC Bull. 1922.<br>CIMIS, 2012. Evapotranspiration Estimates. Palmdale Station 197 from Jan. 2008 to Dec. 2018.<br>Kern County Agricultural Commissioner, 2019. Crop acreage reports for Kern County Portion of the Antelope Valley for 2016.<br>Los Angeles County Agricultural Commissioner, 2019. Crop acreage reports for Kern County Portion of the Antelope Valley for 2016. |
| **Total Sustainable Yield** | Review of Antelope Valley groundwater basin adjudication documents<br>Discussion with stakeholders | Estimated range of the total sustainable yield of the Antelope Valley Groundwater Basin | Used to estimate groundwater supply availability | Appendix I documents |
| **Groundwater Quality** | Extraction of groundwater quality data by well for select constituents | Wells that exceed drinking water limits for select constituents within the Antelope Valley | Used to describe current groundwater quality, and determine drinking water quality issues and needs | SWRCB, 2017. GeoTracker GAMA. Groundwater Ambient Monitoring & Assessment Program.<br>LACWD 40, 2014. Salt and Nutrient Management Plan for the Antelope Valley. |
| **Regional Flood Needs** | Review of existing records of localized flooding<br>Review of FEMA flood zones | Locations of localized flooding<br>Locations of 100 year flood zone | Used to determine flood infrastructure or management needs | RMC, 2013. Task 2.3.2 Flood Protection Needs. Antelope Valley IRWMP 2007 Update. |

| Technical Information | Analysis Method | Results/Derived Information | Use in IRWM Plan | Reference or Source |
|---|---|---|---|---|
| **DAC water resources needs** | Review of existing records supply availability, groundwater quality, and flooding records for DAC areas in Antelope Valley | Identified water supply, water quality and flood related needs in the DAC areas of Antelope Valley | Used to determine DAC related issues and needs. | RMC, 2013. Task 2.1.2 DAC Water Supply, Quality, and Flooding Data. Antelope Valley IRWMP 2007 Update. |
| **SWP reliability** | Review of DWR's State Water Project Final Delivery Capability Report | Projected state water project deliveries under various hydrologic scenarios | Used to project imported water supplies under average year, singly dry year, multiple dry year scenarios. | DWR, 2018. The State Water Project Final Delivery Capability Report 2017. |

## 8.6 IRWM Plan Performance

This subsection develops measures that will be used to evaluate Plan and project performance, monitoring systems that will be used to gather performance data, and mechanisms to adapt strategy implementation and operations based on performance data collected.

### 8.6.1 Performance Measures

Generally, the success of the AV IRWM Plan will depend on how well the individual plan objectives are accomplished. Achievement of all of these objectives will, in large part, determine the success of local integrated regional water management planning processes. Additionally, the success may be attributed to the AV IRWM Plan when individual projects meet their goals and objectives and help to cumulatively and positively address Regional plan objectives.

This IRWM Plan is a dynamic document, part of an ongoing local effort to achieve integration of local water management. The process, through stakeholder participation and plan revisions, will continue for many years and will be an effective mechanism for addressing the water management issues facing the Antelope Valley Region. On an ongoing basis, plan objectives and statewide priorities will be reviewed for relevance and modified as needed to ensure the overall IRWM Plan reflects changing needs and continues to be effective. Additionally, the projects identified for future implementation will be reviewed and evaluated periodically to ensure that current plan objectives will be met and that the proposed projects offer the greatest benefit possible. Periodically, a new set of projects will be developed to address plan objectives and State and regional priorities.

Performance measures for each of the planning targets discussed in Section 4 are addressed below. These measures are based on the AV IRWM Plan objectives and were developed to allow progress of the overall IRWM Plan to be measured. This section describes the monitoring methods and programs that will be used to collect data and the mechanisms by which this data will drive future improvements to projects and the AV IRWM Plan.

It is recognized that more detail is needed for a number of these performance measures in order for them to sufficiently be measured and implemented. Therefore, the Stakeholder group agrees to continue to refine these performance measures. The A-Team, in conjunction with a potential committee made up of stakeholder group members, will be taking primary responsibility for organizing the tracking and evaluation of IRWM Plan performance, though tracking of individual output indicators may be completed by different entities.

#### Water Supply Management Targets

**Maintain adequate supply and demand in average years.** Implementation of a project with a quantifiable benefit, either supply enhancement, or demand reduction with a known timeline for implementation or realization of the benefit will allow for measurement of this planning target. For example, on the demand management side, the performance of this planning target could be measured through the number of water conservation devices installed. Each agency participating in a water conservation program would maintain records of water conservation devices provided to customers for installation, such as ultra-low flush toilets (ULFT), high-efficiency clothes washers (HECW), rotary sprinkler nozzles (RSN), and weather-based irrigation controllers (WBIC). The number of water conservation devices provided on an annual basis would be recorded and the estimated water savings per unit determined through use of existing documentation and accepted methodologies, such as CUWCC worksheets, and would be submitted on a monthly or quarterly basis for inclusion in a central data management program as described in Section 8.4. The volume of recycled water produced will be monitored by the treatment plants and Wastewater Operations Reports maintained by the governing agency. Recycled water served to customers will be measured and reported in water purveyor annual reports and in UWMPs every five years. This target will also be met by additional potable water produced and stored. Potable water served to customers will also be measured and reported in these ways. Annual precipitation data for groundwater and surface water conditions, total volumes of recycled water produced, potable water produced, and potable or recycled water stored will be recorded on a monthly or quarterly basis by the individual agencies managing the projects and included in the central data management program, as described in Section 8.4.

**Provide adequate reserves (77,200 AFY) to supplement average condition supply to meet demands during single-dry year conditions, starting 2009.** The performance of this planning target can be measured through monitoring the amount of water in reserve each year along with the volumes of groundwater banked and withdrawn quarterly. The cumulative total amount of water banked may also be recorded quarterly. As water is put into storage, the total mismatch and reduction in demand for meeting this single-dry year target volume would be recorded and included in the central data management program.

**Provide adequate reserves (198,800 AF/4-year period) to supplement average condition supply to meet demands during multi-dry year conditions, starting 2009.** The performance of this planning target would similarly be measured through monitoring the amount of water in reserve each year and by recording the volumes of groundwater banked and withdrawn quarterly, with the cumulative total amount of water banked also recorded quarterly. As water is put into storage, the total mismatch and reduction in demand for meeting multi-dry year conditions would be recorded and included in the central data management program.

**Adapt to additional 7-10% reduction in imported deliveries by 2050, and additional 21-25% reduction in imported water deliveries by 2100.** The performance of this planning target would be monitoring in the same way as the target above to reduce mismatch of expected supply and demand in dry and multi-dry years by providing new water supply and reducing demand, starting 2009.

**Demonstrate ability to meet regional water demands over an average year without receiving SWP water for 6 months over the summer, by 2025.** The ability to provide a diversity of water supply sources to meet peak demands over the summer without receiving SWP water can be measured by first refining the estimate of how much imported water is used during that time period and then comparing that number to how much water is available as an emergency supply or demand-reduction source. The total volume of water required during the 6-month peak summer period would be measured through monitoring SWP deliveries from AVEK, LCID, and PWD under current average conditions. Once the demand is determined, the current reserve supply can be quantified by measuring the total water supply available as emergency supply sources, such as banked water reserves, emergency transfer contracts, short-term paid non-use contracts, the maximum demand reduction that can be achieved through an aggressive water conservation program, and the overall storage capacity of recharge and extraction facilities. Annual total volumes would be recorded and included in a central data management program and the demand may be compared against the supply reserves to show whether there is sufficient supply (or potential to reduce demand) to accommodate the loss of SWP supply.

**Manage groundwater levels throughout the basin such that Production Rights defined in the adjudication Judgment are met by 2023.** Per the Antelope Valley adjudication Judgment, the Watermaster is responsible for monitoring groundwater levels in the Basin. The Production Rights defined in the adjudication Judgment aim to stabilize long-term groundwater levels in the region by showing groundwater recharge and extractions are within the Native Safe Yield of the Basin. Progress can be measured through monitoring groundwater extractions, recharge. and return flows as reported in the Antelope Valley Watermaster Annual Reports. Groundwater levels should be monitored, at a minimum, on a quarterly basis to account for seasonal variations. In order to sufficiently measure the performance of this planning target. Watermaster Annual Reports have incorporate a number of details about measuring, including: the number of groundwater monitoring wells, which wells to be monitored, which subbasins to be monitored, who will collect the data, and how it will be coordinated.

#### Water Quality Management Targets

**Continue to meet Federal and State water quality standards as well as customer standards for taste and aesthetics throughout the planning period.** To measure the performance of this planning target, water quality will be tested in accordance with EPA and Consumer Confidence Reporting (CCR) Protocols and the data compared to adopted water quality standards such as California Drinking Water Standards established by the CDPH. If the measurements indicate that compliance is not being achieved, additional water quality monitoring of taste and odor causing compounds, such as geosmin (a compound found in soils that is responsible for the earthy, musty odor and taste in water) and algae could be undertaken. To monitor overall customer satisfaction and perceived taste and aesthetics, consumer input would be solicited at community fairs and in semi-annual mail-in surveys. The data acquired through these monitoring efforts will be recorded by the local water districts and agencies responsible for providing drinking water and included in the central data management program.

**Prevent unacceptable degradation of aquifer according to the Basin Plan throughout the planning period.** To preserve the acceptable quality of groundwater, with close attention paid to potential contaminants such as arsenic, nitrate, salinity and other problem pollutants, monitoring of groundwater quality would be undertaken, using GAMA Program methodology, as appropriate. The quality of groundwater in recharge zones will also be monitored to ensure that the non-impacting activities that help meet Basin Plan requirements are sited appropriately. These monitoring efforts would align with SNMP monitoring efforts. The difference between the baseline groundwater quality measured and the Basin Plan goals will be an indicator of plan performance. In order to sufficiently measure the performance of this planning target, a number of details about measuring need to be identified including, but not limited to: identification of sampling sites, establishing groundwater monitoring wells, the number of wells to be monitored, the frequency of monitoring, who will collect the data, and how it will be handled. The data acquired through the groundwater monitoring, as well as monitoring of areas where impacting activities are located near recharge zones, will be included in the central data management program.

**Map contaminated and degraded sites and monitor contaminant movement, by 2017.** This planning target aligns with existing SNMP monitoring efforts in the Region. The 2014 SNMP already mapped the concentrations for select constituents. Additional monitoring, evaluation and mapping efforts may be necessary to better understand the Region's groundwater issues. Advancing this planning target beyond 2017 requires updating maps and continuing monitoring of contaminated sites. To measure program performance, general groundwater quality monitoring of the Region would be conducted to continue identifying locations of contaminated sites and to support the establishment of a monitoring program in the problem area to document the change in contaminant plume over time and rate of migration. Sites can be identified by reviewing historical land use to search for potential high risk uses including industrial, agricultural or military, as well as through databases listing known pollutant leaks, spills or contamination issues. Additional details needed for measuring performance include determination of water quality constituents of concern, the number of groundwater monitoring wells needed per site, the frequency of monitoring, who will map and collect the data, and how it will be recorded in the central data management program.

**Identify contaminated portions of aquifer and prevent migration of contaminants, by 2017.** This planning target aligns with existing SNMP monitoring efforts in the Region. The 2014 SNMP for the Antelope Valley has already identified and analyzed various constituents found in the Region's aquifer. To prevent migration of existing contaminants to currently uncontaminated portions of the aquifer, groundwater quality monitoring will be used to collect data to determine the potential sources of contaminants and the drivers influencing migration, such as seasonal variation. The data would be input into a database for continual monitoring and modeling, if required, to help evaluate management alternatives to prevent further migration. To measure the performance of this planning target, a number of details to be further defined include the identification of a groundwater modeling expert, determination of the number of groundwater monitoring wells needed, and identification of who will collect and incorporate the data into the central data management program.

**Prevent unacceptable degradation of natural streams and recharge areas according to the Basin Plan throughout the planning period.** This planning target is being completed through ongoing SNMP monitoring efforts. To preserve the ecosystem health of current stream systems and groundwater recharge areas, the sources of flow that could carry contaminants would be measured through surface water monitoring efforts. Potential contamination sources and mechanisms and areas that need protection and additional monitoring would be identified using standard methods and procedures for water quality testing, such as GAMA Program methodologies, as appropriate. Additional information to be developed in support of this planning target include establishing groundwater monitoring wells, determining the number of wells to be monitored and how frequently, as well as identifying who would collect and disseminate the data for the central data management program.

**Increase infrastructure and establish policies to use 33 percent of recycled water to help meet expected demand by 2015, 66 percent by 2025, and 100 percent by 2035.** To increase the use of recycled water, and thereby reduce the demand on imported water or groundwater resources, the annual volume of recycled water produced and the annual volume of recycled water banked or delivered would be measured using flow meters. The recycled water infrastructure is already planned for expansion, as shown by the Los Angeles/Kern County Regional Recycled Water Project and the LACSD's tertiary treatment facility upgrades. Additional urban and agricultural recycled water users should also be identified through ongoing planning efforts. The data acquired through these monitoring efforts would then be included in the central data management program.

#### Flood Management Targets

**Coordinate a regional Storm Water Resource Plan and policy mechanism by the year 2025 and incorporate adaptive management strategies for climate change.** Development of a Storm Water Resources Plan and policy mechanism would require identification of data gaps related to flood management; preparation of detailed flood use maps for the Region; identification of policies to protect aquifers, natural streams and recharge areas from contamination in the area; and identification of flood management opportunities. The progress of this planning target would be measured by monitoring the progress of development of the plan on a section by section basis. The signing of an MOU (or other suitable governance structure) and the commitment of funds for the regional flood management plan would also be indicators of program performance. Progress would be included in the central data management program to ensure close coordination of efforts.

### Environmental Resource Management Targets

**Contribute to the preservation of an additional 2,000 acres of open space and natural habitat to integrate and maximize surface water and groundwater management by 2025.** This planning target will be measured by recording the existing acres of open space and natural habitat and comparing those totals to the newly developed acres of open space and natural habitats created, restored or enhanced annually. The change between baseline acreage and new, measured open space and natural habitat created or preserved through community-based projects would be reported and included in the central data management program. A stakeholder process would further help to identify projects, create awareness for, or provide financial contributions towards the development of open space, and this information could be compiled and mapped for future project concepts or integration with other IRWM Plan projects.

### Land Use Planning/Management Targets

**Preserve 100,000 acres of farmland in rotation through 2040.** To measure the economic health of the Agricultural community in the Region, and the land remaining in agricultural use, the existing acreage of agricultural land in rotation will be compared to the future, measured agricultural land in rotation. Landowners working would work with local water agencies in coordinated water banking rotation projects, and the resulting number of acres of farmland and the number of water resource projects that integrate agricultural land with irrigation practices would be indicators of progress. This data would be included in the central data management program.

**Contribute to local and regional General Planning documents to provide 5,000 acres of recreational space by 2040.** Providing low impact recreational opportunities for residents and visitors into the future will require the measurement of existing acreage of recreational space to compare against future acreage. A stakeholder process would contribute to the identification of community-based projects that could be developed to increase recreational space, and coordination with General Plan updates and policy directives would further build consensus. The annual acreages would then be included in the central data management program.

**Coordinate a regional land use management plan by the year 2025 and incorporate adaptive management for climate change.** Development of a Regional Land Use Management Plan would require identification of data gaps, preparation of detailed land use maps for the Region, identification of policies to protect and enhance land uses in the area, and identification of land use management opportunities. The progress of this planning target would be measured by monitoring the progress of development of the plan on a section by section basis. The signing of an MOU (or other suitable governance structure) and the commitment of funds for the regional plan would also be indicators of performance. Quarterly progress reports on the development of the plan would be included in the central data management program to ensure close coordination of efforts.

### Climate Change Mitigation Target

**Implement "no regret" mitigation strategies, when possible, that decrease GHG's or are GHG neutral.** To measure GHG reductions in the Region, the existing GHG emissions created through water resources management will be compared to the future GHG emissions created. Water purveyors would estimate the GHG emissions reductions created through the implementation of mitigation strategies, or the reduction of embedded energy used to imported water and associated GHG emissions. This data would be included in the central data management program. GHG emission reductions will also be monitored by tracking of the number of projects that help mitigate climate change and meet key elements of the Scoping Plan.

Table 8-4 summarizes project monitoring and program performance measures.

**Table 8-4: Project Monitoring and Program Performance Measures**

| Desired Outcome | Output Indicators *(measures to effectively track output)* | Outcome Indicator *(measures to evaluate change that is a direct result of the work)* | Measurement Tools and Methods<br>*What needs to be measured:* | <br>*How it should be measured:* | *Measurement/ Reporting Frequency* | *Who should measure* | Measurement to be Reported and Overall Reporting Guidelines |
|---|---|---|---|---|---|---|---|
| **Maintain adequate supply and demand in average years.** | | | | | | | |
| Supply and demand balance in average years (no mismatch) over the planning horizon | Update estimated supply and demand each year (for that year and future years) using similar approach to that used in the IRWM Plan including any updated information such as new population estimates, per capita use, etc. | Create an "accounting table" that starts with the estimated mismatch from the IRWM Plan and report expected changes to the mismatch that would result from management actions (e.g., a groundwater banking project, a low flow toilet rebate program, etc.).<br><br>This would allow quarterly reporting of expected adjustments to the mismatch based on project actions being implemented. In addition to accounting for the expected changes to the mismatch, require projects that are estimating increases in supply, or reductions in demand to track tangible metrics that demonstrate the progress they are making over time. | Precipitation measurement to determine if it is an average, single dry or multiple dry year<br><br>ETo from CIMIS weather stations in Palmdale and Victorville. | Rain gauges in mountains and stream/run-off gauges for groundwater conditions and recharge estimates (still need to determine how many, where to place these, who will operate, and how to report the data.)<br><br>Littlerock precipitation data for surface water conditions<br><br>Northern California conditions for imported water conditions | Daily/Annually | Western Regional Climate Center, EAFB | Measurement to be reported: Total reduction in mismatch<br><br>Reporting: Report quarterly with updates to regional board and compare against objectives |
| | | | Imported water delivered to AVEK, PWD, LCID, how much they deliver, and how much water is banked | Annual Water Production Reports | Monthly/ Quarterly | AVSWCA | |
| | | | Inflows to and deliveries from Littlerock Reservoir (including water levels in reservoir, delivered water, spill over, and amount evaporated) | PWD | Monthly/ Quarterly | PWD | |
| | | | Amount of recycled water produced, delivered (by water use category), and banked (including quantity, timing, and location) | Wastewater Operations Reports flow meters at reuse sites | Monthly/ Quarterly | LACSD | |
| | | | Population Projections | Census statistics<br><br>SCAG population projections<br><br>Department of Finance projected growth rates | Annually | Counties and cities | |
| | | | M&I Demand | Recalculate the regional average per capita demand. Then use this number and the projected population estimates to calculate total demand. | Annually | Water purveyors | |
| | | | Agricultural Demand | Obtain annual agricultural acreage by crop type from LA and Kern County Agricultural Commissioners and calculate demand using the crop use requirements in the Plan.<br><br>Update crop estimates with release of new data<br><br>(Use actual demand measurements when available.) | Annually | Los Angeles County Farm Bureau, Kern County Farm Bureau | |

| Desired Outcome | Output Indicators *(measures to effectively track output)* | Outcome Indicator *(measures to evaluate change that is a direct result of the work)* | *What needs to be measured:* | Measurement Tools and Methods *How it should be measured:* | *Measurement/ Reporting Frequency* | *Who should measure* | Measurement to be Reported and Overall Reporting Guidelines |
|---|---|---|---|---|---|---|---|
| | | | Proposed/Actual amount of new water supply | All Projects:<br>Estimated in 5-year intervals from project information<br><br>• Amount of water produced from project (operation records)<br>• Amount delivered from project (billing records)<br>• For projects with banking/ recharge element: monitored daily, reported monthly<br>• Overall Project injection, storage, and pumpback capacity<br>• Actual amount injected<br>• Actual amount pumped from bank<br>• Total amount in storage<br>• Percent remaining in storage to improve groundwater levels<br><br>For Water Deals/Transfers:<br>• Amount agreed/allotted (water right)<br>• Actual amount transferred. | Monthly/ Quarterly | Project Proponents | |
| | | | Planned and actual reduction in demand | Proposed/Actual number of units installed/lines replaced/ rebates planned (est. water savings per unit from existing documentation such as CUWCC worksheets and methods for estimating water savings for various BMPs)<br><br>Also need to consider impacts of demand reduction on wastewater inflows and recycled water availability. Should try to reduce outdoor use as much as possible. | Monthly/ Quarterly | Project Proponents | |
| **Provide adequate reserves (77,200 AFY) to supplement average condition supply to meet demands during single-dry year conditions, starting 2009.** | | | | | | | |
| Establish a mechanism to dedicate supply in groundwater for dry year use.<br><br>Start banking water in average year conditions to meet the expected quantity by 2009 and beyond. | Amount of water in reserve each year. | Amount of water banked and withdrawn quarterly and a cumulative total in bank quarterly. | Amount of water banked | Water put in storage for purpose of reserve | Quarterly | Water bank operators | Measurement to be reported: Total mismatch and reduction in demand<br><br>Reporting: Report every five years minimum |

| Desired Outcome | Output Indicators *(measures to effectively track output)* | Outcome Indicator *(measures to evaluate change that is a direct result of the work)* | *What needs to be measured:* | Measurement Tools and Methods *How it should be measured:* | *Measurement/ Reporting Frequency* | *Who should measure* | Measurement to be Reported and Overall Reporting Guidelines |
|---|---|---|---|---|---|---|---|
| **Provide adequate reserves (198,800 AF/4-year period) to supplement average condition supply to meet demands during multi-dry year conditions, starting 2009.** | | | | | | | |
| Establish a mechanism to dedicate supply in groundwater for dry year use.<br><br>Start banking water in average year conditions to meet the expected quantity by 2009 and beyond. | Amount of water in reserve each year. | Amount of water banked and withdrawn quarterly and a cumulative total in bank quarterly. | Amount of water banked | Water put in storage for purpose of reserve | Quarterly | Water bank operators | Measurement to be reported: Total mismatch and reduction in demand<br><br>Reporting: Report every five years with update of the Plan and compare against objectives |
| **Adapt to additional 7-10% reduction in imported deliveries by 2050, and additional 21-25% reduction in imported water deliveries by 2100.** | | | | | | | |
| Increased local supply development. | Amount of local water supply development each year. | Amount of groundwater, local surface water and recycled water used each year. | Local water supply accessibility. | Use deliveries of groundwater, local surface water, and recycled water from annual reports.<br><br>Estimation of local supplies made accessible by implemented projects. | Annually | AVSWCA in conjunction with water purveyors | Measurement to be reported: Total increase in local water supply delivery and development.<br><br>Reporting: Report every five years with update of the Plan and compare against objectives. |
| **Demonstrate ability to meet regional water demands without receiving SWP water for 6 months over the summer by 2025.** | | | | | | | |
| Provide a diversity of water supply sources to meet peak demands over the summer | Estimated SWP demand during 6-month summer period<br><br>Estimate of maximum savings from emergency conservation program<br><br>Estimate of recycled water demand<br><br>Estimate of banked water amount | Percent change in SWP water deliveries over the 6-month period<br><br>Percent change in groundwater extractions from using banked water<br><br>Quantification of additional water transported to Region (i.e. banked water from outside region, transfers from south of Delta Water Supplies during emergency conditions from trade agreements)<br><br>Quantification of reduction in demand from emergency conservation measures | Amount of SWP received in a 6-month summer period (updated from estimate provided in Section 4.2) | Use deliveries from AVEK, LCID, and PWD during 6-month summer periods. | Annually | AVEK, LCID, PWD | Measurement to be reported: The difference between how much water is needed, compared to how much water is available during the 6-month summer period.<br><br>Reporting: Report every five years with update of the Plan and compare against objectives<br><br>Need to show have sufficient reserves (or potential to reduce demand) to meet the loss of SWP supply. |
| | | | Total water supply available over 6-month summer period without above | Account for available emergency supply sources, such as banked water reserves, emergency transfer contracts, short-term paid non-use contracts, etc. | Annually | Water bank operators | |
| | | | Maximum reduction in demand that can be reasonable achieved | Using Contingency/Water Conservation Plans and Emergency Response Plan assuming highest level of water shortage<br><br>Compare economic tradeoffs of aggressive short-term rationing to the cost of securing other supplies | Annually | Local water purveyors | |
| | | | Overall storage capacity within existing or proposed recharge and extraction facilities. | Master Plans/Infrastructure Reports | Annually | Water bank operators, agencies implementing local groundwater recharge | |

| Desired Outcome | Output Indicators *(measures to effectively track output)* | Outcome Indicator *(measures to evaluate change that is a direct result of the work)* | *What needs to be measured:* | Measurement Tools and Methods *How it should be measured:* | *Measurement/ Reporting Frequency* | *Who should measure* | Measurement to be Reported and Overall Reporting Guidelines |
|---|---|---|---|---|---|---|---|
| **Manage groundwater levels throughout the basin such that Production Rights defined in the Judgment are met by 2023.** | | | | | | | |
| Stabilize long-term groundwater levels in region, meaning groundwater recharge and extractions are in balance. | Observed groundwater levels in a monitoring network that provides representative view of entire groundwater basin<br><br>Coordination with the Lahontan RWQCB for continued compliance with new or changes to existing discharge permits, regulations, etc. | Annual change in groundwater level (+ / -) from previous year averaged over past 10 years | Groundwater levels | Well monitoring (CASGEM Monitoring Plan) | Annual | Antelope Valley Watermaster Engineer | Measurement to be reported: Observed groundwater level improvements; calculate 10-year average<br><br>Reporting: Antelope Valley Watermaster Annual Report |
| **Continue to meet Federal and State water quality standards as well as customer standards for taste and aesthetics throughout the planning period.** | | | | | | | |
| Meet Federal and State water quality standards and achieve high levels of customer satisfaction | Monitoring to ensure compliance<br><br>Coordination with Regional Boards for continued compliance with new or changes to existing discharge permits, regulations, etc. | Compliance with Consumer Confidence Reporting (CCR) and EPA's unregulated contaminant monitoring rule reporting<br><br>Customer Satisfaction | Standard lab methods for water quality testing, EPA Protocols, CCR Reporting Protocols | See EPA and CCR Protocols | See EPA and CCR Protocols | See EPA and CCR Protocols | Measurement to be reported: Comparison of measured water quality data to water quality standards. For taste & aesthetics, overall consumer satisfaction with water quality.<br><br>Reporting: Taste & aesthetics collect annual data, report with updates, could also add to CCR Reporting. |
| | | | Taste & aesthetic | Solicit consumer input at a community fair | Monthly/Annually | Local water districts | |
| | | | Overall customer satisfaction | Include a bi-annual mail-in survey in the monthly water bill | Semi-annually | Local water districts | |
| **Prevent unacceptable degradation of aquifer according to the Basin Plan throughout the planning period.** | | | | | | | |
| Preserve acceptable quality of groundwater paying special attention to potential contaminants such as arsenic, nitrate, salinity and other problem pollutants | Monitoring of groundwater quality<br><br>Coordination with Regional Boards for continued compliance with new or changes to existing discharge permits, regulations, etc.<br><br>Monitor areas where impacting activities are located near recharge zones. | Difference between background or baseline groundwater quality and goals for arsenic, nitrate, salinity and other problem pollutants<br><br>Promote non-impacting activities in recharge zones (not allow impacting activity in recharge zones) | Bacteria, Coliform, Radioactivity, Taste and Odor, Ammonia, Biostimulatory, Substances, Chemical Constituents, Chlorine, Total Residual Color, Dissolved Oxygen, Floating Materials, Oil and Grease, Non-degradation of Aquatic Communities, Pesticides, pH, as required by Basin Plan and additionally measure pollutants of concern such as arsenic, nitrate, TDS | Standard methods and procedures for water quality testing; GAMA Program methodology will be followed, when applicable.<br><br>The Basin Plan requires that all drinking water requirements (MCL and Secondary MCL) are to be met | Monthly or more frequently, can refer to Title 22 for additional monitoring requirements<br><br>Report quarterly | RWQCB | Measurement to be reported: water quality limits<br><br>Reporting: Report with update of the Plan and compare against objectives |

| Desired Outcome | Output Indicators *(measures to effectively track output)* | Outcome Indicator *(measures to evaluate change that is a direct result of the work)* | Measurement Tools and Methods *What needs to be measured:* | *How it should be measured:* | *Measurement/ Reporting Frequency* | *Who should measure* | Measurement to be Reported and Overall Reporting Guidelines |
|---|---|---|---|---|---|---|---|
| **Map contaminated and degraded sites and monitor contaminant movement, by 2017.** | | | | | | | |
| Set up a process for identifying, mapping and monitoring contaminated sites.<br><br>*Note: Groundwater quality monitoring is being completed as part of ongoing SNMP efforts.* | Locations, constituents, and constituent concentrations<br><br>Coordination with Regional Boards for continued compliance with new or changes to existing discharge permits, regulations, etc.<br><br>Records database search for pollutant leaks, spills, contamination, etc.<br><br>Enhance monitoring system to detect identified potential pollutants (i.e. modify sampling plan to include identified potential pollutants or indicators of those pollutants, perform vertically discrete sampling, etc.). | Change in contaminant plume over time and rate of migration of contaminant | Water quality of Region to identify contaminated sites. Do a general sweep, then monitor more often in problem areas. | Database with location of the well, contaminants and detection levels, continually monitor that, monitoring of a few wells near it. Upstream and downstream well.<br><br>May require additional monitoring wells. | Quarterly for common contaminants, if no contamination found for 5-10 years, then go to annually for that well. | Groundwater pumpers in conjunction with RWQCB | Measurement to be reported: Record of contaminated sites<br><br>Reporting: Report every year with update of the Plan and compare against objectives |

| Desired Outcome | Output Indicators *(measures to effectively track output)* | Outcome Indicator *(measures to evaluate change that is a direct result of the work)* | *What needs to be measured:* | Measurement Tools and Methods *How it should be measured:* | *Measurement/ Reporting Frequency* | *Who should measure* | Measurement to be Reported and Overall Reporting Guidelines |
|---|---|---|---|---|---|---|---|
| **Identify contaminated portions of aquifer and prevent migration of contaminants, by 2017.** | | | | | | | |
| Provide information for groundwater management that will prevent migration of existing contaminants to currently uncontaminated portions of the aquifer<br><br>*Note: Groundwater quality monitoring is being completed as part of ongoing SNMP efforts.* | Locations, constituents, and constituent concentrations<br><br>Potential sources of contaminants<br><br>Potential drivers influencing migration (e.g., nearby cone of depression)<br><br>Coordination with Regional Boards for continued compliance with new or changes to existing discharge permits, regulations, etc.<br><br>Install monitoring wells (need several years of data to know if the contamination is due to seasonal variation or not) | Change in contaminant plume over time and rate of migration of contaminant<br><br>Locate production wells geographically and with respect to depth in order to manipulate groundwater movement | Water quality of Region to identify contaminated sites. Do a general sweep, then monitor more often in problem areas.<br><br>Migration of the contaminant | Database with location of the well, contaminants and detection levels, continually monitor, monitoring of nearby wells. | Quarterly | Groundwater pumpers in conjunction with RWQCB | Measurement to be reported: water quality data, contour level data, TBD<br><br>Reporting: Report with update of the Plan and compare against objectives |
| **Prevent unacceptable degradation of natural streams and recharge areas according to the Basin Plan throughout the planning period.** | | | | | | | |
| Preserve ecosystem health of current stream systems<br><br>Preserve opportunity to use existing and promising future groundwater recharge areas<br><br>*Note: Groundwater quality monitoring is being completed as part of ongoing SNMP efforts.* | Identification of potential contamination sources and mechanisms<br><br>Identification of areas that need to be protected and monitored.<br><br>Coordination with Regional Boards for continued compliance with new or changes to existing discharge permits, regulations, etc. | Sources of flow that could carry contaminants<br><br>Contaminants in flows entering areas desired to protect | Bacteria, Coliform,<br>Radioactivity, Taste and Odor, Ammonia, Biostimulatory, Substances,<br>Chemical Constituents,<br>Chlorine, Total Residual<br>Color, Dissolved Oxygen,<br>Floating Materials,<br>Oil and Grease,<br>Non-degradation of Aquatic Communities, Pesticides,<br>pH, as required by Basin Plan and additionally measure pollutants of concern such as arsenic, nitrate, and TDS | Standard methods and procedures for water quality testing; GAMA Program methodology will be followed, when applicable.<br><br>The Basin Plan requires that all drinking water requirements (MCL and Secondary MCL) are to be met. | Monthly or more frequently, can refer to Title 22 for additional monitoring requirements<br><br>Report quarterly | RWQCB, purveyors | Measurement to be reported: water quality limits<br><br>Reporting: Report with update of the Plan and compare against objectives |

| Desired Outcome | Output Indicators *(measures to effectively track output)* | Outcome Indicator *(measures to evaluate change that is a direct result of the work)* | Measurement Tools and Methods *What needs to be measured:* | *How it should be measured:* | *Measurement/ Reporting Frequency* | *Who should measure* | Measurement to be Reported and Overall Reporting Guidelines |
|---|---|---|---|---|---|---|---|
| **Increase infrastructure and establish policies to use 33% of recycled water to help meet expected demand by 2015, 66% by 2025, and 100% by 2035.** | | | | | | | |
| Increased use of recycled water, which would decrease demand on other resources, such as imported water or groundwater. | New users for 7,700 AFY in 2015, 18,000 AFY in 2025, and 31,000 AFY of recycled water under contract by 2035.<br><br>These numbers do not include recycled water used currently for environmental maintenance. | Volume of recycled water available: 23,000 AFY in 2015, 27,000 AFY in 2025, and 31,000 AFY in 2035 that will be used in the M&I, GWR, or agricultural setting where it is not currently used. | Amount of recycled water delivered and banked. | Deliveries would be measured using flow meters.<br><br>Monitoring will be consistent with the permit requirements for the use sites. | Monthly/ Quarterly | LACSD | Measurement to be reported: Total volume of recycled water banked or delivered compared to 33%, 66%, 100%<br><br>Reporting: Report with update of the Plan and compare against objectives |
| **Coordinate a regional Stormwater Resource Plan and policy mechanism by the year 2025 and incorporate adaptive management strategies for climate change.** | | | | | | | |
| Identification of data gaps, preparation of detailed flood use maps for the Antelope Valley Region, identification of policies to protect aquifer, natural streams and recharge areas from contamination in the Valley, and identification of flood management opportunities. | Identification of entities that would be involved in coordination of the regional Stormwater Resource Plan; the establishment of a regional flood management committee; and the identification of the funding mechanism for creating and implementing a plan. | Signing of an MOU (or other suitable governance structure) and commitment of funds for the regional Stormwater Resource Plan. | Monitoring progress of development of the Plan and policy mechanism | Monitoring of localized flooding incidents<br><br>Monitoring of new flood control projects<br><br>Development of an integrated flood management plan | Quarterly | Counties and Cities | Measurement to be reported: Measuring progress of a flood management plan development.<br><br>Reporting: Report with update of the Plan and compare against objectives |
| **Contribute to the preservation of an additional 2,000 acres of open space and natural habitat, to integrate and maximize surface water and groundwater management by 2025.** | | | | | | | |
| Help contribute through identification of, awareness for, financial contribution towards, or similar for creating, restoring, or preserving near-term open space and natural habitat in the Antelope Valley. | Stakeholder-coordinated meetings with implementation partners to develop community projects.<br><br>Increase in restoration plantings or mitigation planting sites. | Community consensus and agreement on project list/alternative, as developed through meetings and coordination<br><br>Work with individual landowners to re-vegetate the areas<br><br>Number of acres preserved & treated for open space and natural habitat; measurement of the health of open space and natural habitat | To measure 'preservation': existing acres of open space and natural habitat to measure additional open space and natural habitat acreage<br><br>Fugitive dust management (measured and mapped); tons of soil per acre (particulate matter pm10, pm2.5)<br><br>Acreage of new plantings | Land use maps; satellite imagery; AV conservancy database; General Plan GIS data<br><br>Measure fugitive dust according to Air Quality Management District (AQMD) standards | Annually<br><br>Soil data measured daily/reported annually | Counties, AVRCD | Measurement to be reported: Comparison between existing (2005) acreage of open space and natural habitat and measured open space and natural habitat.<br><br>Reporting: Report with update of the Plan and compare against objectives |

| Desired Outcome | Output Indicators *(measures to effectively track output)* | Outcome Indicator *(measures to evaluate change that is a direct result of the work)* | *What needs to be measured:* | Measurement Tools and Methods *How it should be measured:* | *Measurement/ Reporting Frequency* | *Who should measure* | Measurement to be Reported and Overall Reporting Guidelines |
|---|---|---|---|---|---|---|---|
| **Preserve 100,000 acres of farmland in rotation through 2040.** | | | | | | | |
| The agricultural community in the Antelope Valley stays economically healthy and land use remains in agriculture. | Landowners working with local water agencies in coordinated water banking rotation projects. | Number of water-resource integrated projects<br><br>The number of acres of farmland in active rotation | Existing acreage in rotation and current land use by type (active farming, fallowing, recharge, etc.)<br><br>Fugitive dust management (measured and mapped); tons of soil per acre (particulate matter pm10, pm2.5) | land use maps; satellite imagery; survey of landowners; General Plan GIS data, County commissioner reports<br><br>Measure fugitive dust according to Air Quality Management District (AQMD) standards | Quarterly/ Annually<br><br>Soil data measured daily/reported annually | Los Angeles County Farm Bureau, Kern County Farm Bureau | Measurement to be reported: Comparison between existing (2005) acreage of agricultural land in rotation and measured agricultural land in rotation.<br><br>Reporting: Report with update of the Plan and compare against objectives |
| **Contribute to local and regional General Planning documents to provide 5,000 acres of recreational space by 2040.** | | | | | | | |
| Provide low impact recreational opportunities for residents and visitors into the future. | Stakeholder-coordinated meetings with implementation partners to develop community projects | Community consensus and agreement on project list/alternatives, as developed through meetings and coordination | Existing acreage of recreational space and future acreage | Land use maps; satellite imagery; General Plan GIS data | Quarterly/ Annually | Counties and cities | Measurement to be reported: Comparison between existing acreage of recreational land and measured recreational land.<br><br>Reporting: Report with update of the Plan and compare against objectives |
| **Coordinate a regional land use management plan by the year 2025 and incorporate adaptive management strategies for climate change.** | | | | | | | |
| Identify data gaps, prepare detailed land use maps for the Antelope Valley Region, identify policies to protect land uses in the Valley, identify land use management opportunities | Identification of entities that would be involved in coordination of the regional land management plan; the establishment of a regional land management committee; and the identification of the funding mechanism for the plan. | Signing of an MOU and commitment of funds for the regional land use management plan.<br><br>A broadly supported regional land use management plan. | Monitoring progress of development of the plan and policy mechanism | Plan development | Quarterly | Counties and cities | Measurement to be reported: Measuring progress of land use management plan development.<br><br>Reporting: Report with update of the Plan and compare against objectives |
| **Implement “no regret” mitigation strategies, when possible, that decrease GHGs or are GHG neutral.** | | | | | | | |
| Decrease or neutralize GHG emissions from water resources management activities. | Records of GHG emissions from water and wastewater treatment and distribution.<br><br>Records of imported water use versus local water supply use.<br><br>Records of projects that meet key elements of the Scoping Plan. | Reported decrease in estimated GHG emissions from water/wastewater distribution systems.<br><br>Decrease in imported water usage.<br><br>Increase in projects that decrease GHG emissions. | Monitoring of GHG emissions from local activities and import of water. | Existing reporting through annual reports, UWMPs, and Air Resources Board reporting. | Annually | AVSWCA and purveyors | Measurement to be reported: Reduction in GHG emissions<br><br>Reporting: Report with update of the Plan and compare against objectives |

### 8.6.2 Project Specific Monitoring Plans

Project-specific monitoring plans will be developed for projects as they are implemented. They will be required to track each project's progress in meeting the Region's objectives and targets as well as in meeting the individual project's expected benefits. Table 8-5 describes the types of information that may be monitored for the implementation projects described in Section 7.

**Table 8-5: Implementation Project Potential Monitoring Activity**

| Sponsor | Project Name | Potential Monitoring Activity |
|---|---|---|
| Willow Springs Water Bank | Willow Springs Water Bank | • Volume of water recharged<br>• Acres of habitat and open space created<br>• Acre-feet of imported water used before and after project implementation, and associated energy use reduction |
| City of Palmdale | Upper Amargosa Creek Flood Control, Recharge, and Habitat Restoration Project | • Volume of water recharged<br>• Volume of imported water used before and after project implementation<br>• Water quality in Amargosa Creek upstream and downstream of project<br>• Acres of habitat and open space created<br>• Acres of improved flood protection |
| Palmdale Water District | Littlerock Dam Sediment Removal | • Volume of water recharged<br>• Acre-feet of imported water used before and after project implementation, and associated energy use reduction<br>• Water quality in Littlerock Creek upstream and downstream of project<br>• Acres of habitat and open space created<br>• Acres of improved flood protection |
| Palmdale Water District | Palmdale Regional Groundwater Recharge Project | • Volume of water recharged<br>• Acre-feet of imported water used before and after project implementation, and associated energy use reduction<br>• Acres of habitat and open space created<br>• Acres of improved flood protection |
| Antelope Valley Resource Conservation District | Antelope Valley Regional Conservation Project | • Acre-feet of imported water used before and after project implementation, and associated energy use reduction<br>• Acres of recreation and open space created<br>• Square feet of turf removed<br>• Number of education lessons and outreach events |
| Palmdale Recycled Water Authority | Phase 2 Distribution System | • Acre-feet of imported water used before and after project implementation, and associated energy use reduction<br>• Volume of new recycled water use |
| Rosamond CSD | Wastewater Treatment Plant Rehabilitation and Groundwater Protection | • Acre-feet of water recharged<br>• Acre-feet of water treated<br>• Groundwater quality before and after project |
| AVEK | AVEK Strategic Plan | • Not applicable – planning document |

| Sponsor | Project Name | Potential Monitoring Activity |
|---|---|---|
| AVEK | South Antelope Valley Intertie Pipeline (SNIP) Phase 2 | • Acre-feet of imported water used before and after project implementation, and associated energy use reduction<br>• THM levels in drinking water before and after project |
| City of Lancaster | Antelope Valley Recycled Water Master Plan | • Not applicable – planning document |
| AVEK | Eastside Banking & Blending Project | • Volume of water recharged<br>• Acre-feet of imported water used before and after project implementation, and associated energy use reduction<br>• THM levels in drinking water before and after project |
| City of Lancaster | Whit Carter Park Recycled Water Conversion | • Acre-feet of imported water used before and after project implementation, and associated energy use reduction<br>• Volume of new recycled water use |
| City of Lancaster | Division Street and Avenue H-8 Recycled Water Tank | • Acre-feet of imported water used before and after project implementation, and associated energy use reduction<br>• Volume of new recycled water use |
| City of Lancaster | Lancaster National Soccer Center Recycled Water Conversion | • Acre-feet of imported water used before and after project implementation, and associated energy use reduction<br>• Volume of new recycled water use |
| City of Lancaster | Pierre Bain Park Recycled Water Conversion | • Acre-feet of imported water used before and after project implementation, and associated energy use reduction<br>• Volume of new recycled water use |
| AVEK | Expansion of the Eastside Water Bank | • Volume of water recharged<br>• Acre-feet of imported water used before and after project implementation, and associated energy use reduction |
| City of Lancaster | Lancaster Cemetery Recycled Water Conversion | • Acre-feet of imported water used before and after project implementation, and associated energy use reduction<br>• Volume of new recycled water use |
| City of Palmdale | Palmdale Power Plant Project | • Acre-feet of imported water used before and after project implementation, and associated energy use reduction<br>• Volume of new recycled water use |

Project proponents will be expected to monitor at the locations and frequency required by regulatory agencies and permitting. As described under Section 8.4.1, the AV IRWM Plan website, www.avwaterplan.org, provides a mechanism for stakeholders to upload project information regarding water supply, water quality, and other benefits, which will be collected in a database to manage, store, and disseminate information to the public. A data collection template will be available on the website in the future so that data collected during the AV IRWM Plan can be stored and managed in a consistent format.

## 8.7 Adaptive Management

The Antelope Valley Region will use an adaptive management process in its analysis of Plan and project performance and will utilize a methodology to update the Plan and modify projects. The Region will perform reviews of Plan performance at the frequency described in the above monitoring plan in addition to IRWM Plan updates that will occur every five years. The IRWM Plan is not static; it will be adjusted as more effects of climate change manifest, new tools are developed, and new information becomes available. The integration of new information will ensure that the IRWM Plan and the adopted objectives are consistent with regional needs.

At the Plan level, the Region will review its progress in meeting the planning targets to determine whether they are being met. If the Region's planning targets are not being met, then a review of the original targets, verification of submitted project data, a request for additional data, and/or consideration of a broader mix of strategies and or projects may be warranted. The Region will perform a more in-depth examination of its targets and objectives during its five-year Plan updates that will incorporate new studies and data relevant to the Region, and the Region will re-evaluate its issues and needs (i.e., the Region's prioritized vulnerabilities to climate change).

At the project level, project proponents will be responsible for tracking project performance and adjusting project operations for maximum benefit. Those projects that are funded through IRWM program grants will be expected to report on project performance to the Region.

If both project and plan level responses do not lead to satisfactory results, then a change in the Region's governance structure may be considered. This could involve identifying and inviting additional stakeholders whose participation would improve success. Changes to the stakeholder process could be explored to bring new ideas. Finally, a change in the decision-making process could be considered.

# Section 9 | References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# Section 10 | Glossary & Acronyms

## 10.1 Glossary of Terms

| Term | Definition |
|---|---|
| **- A -** | |
| **ACRE-FOOT** | The quantity of water required to cover one acre to a depth of one foot; equal to 43,560 cubic feet, or approximately 325,851 gallons. |
| **ADJUDICATION** | A case that has been heard and decided by a judge. In the context of an adjudicated groundwater basin, landowners or other parties have turned to the courts to settle disputes over how much groundwater can be extracted by each party to the decision. |
| **ADOPTED IRWM PLAN** | The version of the IRWM Plan that is adopted by the governing bodies of at least three or more member agencies to the Regional Water Management Group (RWMG), two of which have statutory authority over water supply, as evidenced by resolutions. |
| **AGRONOMIC RATE** | The rate of nutrient application to fulfill a plant's nitrogen requirements while minimizing the amount of nutrients that passes to groundwater. |

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| **ALLUVIUM** | Sediment deposited by flowing water, such as in a riverbed, flood plain or delta. |
| **ALLUVIAL AQUIFER** | Earth, sand, gravel or other rock or mineral materials laid down by flowing water, capable of yielding water to a well. |
| **ANTELOPE VALLEY REGION** | The Antelope Valley Region, as defined for the purposes of this IRWM Plan, follows the Antelope Valley's key hydrologic features, bounded by the San Gabriel Mountains to the south and southwest, and the Tehachapi Mountains to the northwest, forming a well-defined triangular point at the Valley's western edge. The Region covers portions of northern Los Angeles and southeastern Kern Counties, and encompasses the majority of the AVEK service area. |
| **APPLIED WATER DEMAND** | The quantity of water that would be delivered for urban or agricultural applications if no conservation measures were in place. |
| **AQUIFER** | An underground layer of rock, sediment or soil, or a geological formation/unit that is filled or saturated with water in sufficient quantity to supply pumping wells. |
| **ARID** | A term describing a climate or region in which precipitation is so deficient in quantity or occurs so infrequently that intensive agricultural production is not possible without irrigation. |
| **ARTICLE 21 WATER** | Refers to the SWP contract provision defining this supply as water that may be made available by DWR when excess flows are available in the Delta. Article 21 water is made available on an unscheduled and interruptible basis and is typically available only in average to wet years, generally only for a limited time in the late winter. |
| **ARTIFICIAL RECHARGE** | The addition of water to a groundwater reservoir by human activity, such as irrigation or induced infiltration from streams, wells, or recharge/spreading basins. See also GROUNDWATER RECHARGE, RECHARGE BASIN. |
| **- B -** | |
| **BEDROCK AQUIFER** | A consolidated rock deposit or geological formation of sufficient hardness and lack of interconnected pore spaces, but which may contain a sufficient amount of joints or fractures capable of yielding minimal water to a well. |
| **BENEFICIAL USES** | Include fish, wildlife habitat, and education, scientific and recreational activities which are dependent upon adequate water flow thorough rivers, streams and wetlands. The Regional Water Quality Control Board's Basin 4A Plan categorizes beneficial uses per water quality standards. |

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| **BEST MANAGEMENT PRACTICE (BMP)** | An urban water conservation (water use efficiency) measure that the California Urban Water Conservation Coalition agrees to implement among member agencies. The BMP's are intended to reduce long-term urban water demand. |
| **BRACKISH WATER** | Water containing dissolved minerals in amounts that exceed normally acceptable standards for municipal, domestic, and irrigation uses. Considerably less saline than sea water. |
| **- C -** | |
| **CLOSED BASIN** | A topographic water basin with no outlet to the ocean |
| **CONFINED AQUIFER** | A water-bearing subsurface stratum that is bounded above and below by formations of impermeable, or relatively impermeable, soil or rock. |
| **CONJUNCTIVE USE** | The operation of a groundwater basin in coordination with a surface water storage and conveyance system. The purpose is to recharge the basin during years of above average water supply to provide storage that can be withdrawn during drier years when surface water supplies are below normal. |
| **CONSERVATION** | *Urban water conservation or water use efficiency* includes reductions realized from voluntary, more efficient, water use practices promoted through public education and from state-mandated requirements to install water-conserving fixtures in newly constructed and renovated buildings. *Agricultural water conservation or agricultural water use efficiency*, means reducing the amount of water applied in irrigation through measures that increase irrigation efficiency. See NET WATER CONSERVATION. |
| **CRITICAL DRY PERIOD** | A series of water-deficient years, usually an historical period, in which a full reservoir storage system at the beginning is drawn down (without any spill) to minimum storage at the end. |
| **CRITICAL DRY YEAR** | A dry year in which the full commitments for a dependable water supply cannot be met and deficiencies are imposed on water deliveries. |
| **CUBIC FEET PER SECOND (cfs)** | A unit of measurement describing the flow of water. A cubic foot is the amount of water needed to fill a cube that is one foot on all sides, about 7.5 gallons. |
| **- D -** | |
| **DECISION 1641** | An action by the State Water Resources Control Board (SWRCB) to establish water quality objectives for water users in the Delta. The Bay/Delta Water Quality Control Plan was developed as a means to attain these water quality objectives. |

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| **DESALTING/DESALINATION** | A process that converts sea water or brackish water to fresh water or an otherwise more usable condition through removal of dissolved solids. |
| **DISADVANTAGED COMMUNITY** | A community with an annual median household income that is less than 80 percent of the statewide annual median household income (CWC § 79505.5 (a)). |
| **DISTRIBUTION UNIFORMITY (DU)** | The ratio of the average low-quarter depth of irrigation water infiltrated to the average depth of irrigation water infiltrated, for the entire farm field, expressed as a percent. |
| **DRAINAGE BASIN** | The area of land from which water drains into a river; as, for example, the Sacramento River Basin, in which all land area drains into the Sacramento River. Also called, "WATERSHED." |
| **DRY-WEATHER RUNOFF** | Urban runoff that enters the drainage system due to human activities such as car washing and lawn irrigation. Dry-weather runoff can also result from illicit connections to the stormwater or sewer systems. |
| **- E -** | |
| **EFFICIENT WATER MANAGEMENT PRACTICE (EWMP)** | An agricultural water conservation measure that water suppliers could implement. EWMPs are organized into three categories: 1) Irrigation Management Services; 2) Physical and Structural Improvements; and 3) Institutional Adjustments. |
| **EFFLUENT** | Waste water or other liquid, partially or completely treated or in its natural state, flowing from a treatment plant. |
| **EMPIRICAL YIELD** | See SAFE YIELD (GROUNDWATER) |
| **EPHEMERAL** | An ephemeral water body is one that exists for only a short period of time following precipitation or snowmelt. This is not the same as an intermittent or seasonal water body which exists for a longer period of time. |
| **EVAPOTRANSPIRATION (ET or ETo)** | The quantity of water transpired (given off), retained in plant tissues, and evaporated from plant tissues and surrounding soil surfaces. Quantitatively, it is expressed in terms of depth of water per unit area during a specified period of time. |
| **- F -** | |
| **FINAL IRWM PLAN** | The version of the IRWM Plan that is deemed ready for adoption by 50 percent or more of the representatives from the RWMG member agencies. |
| **FIRM YIELD** | The maximum annual supply of a given water development that is expected to be available on demand, with the understanding that lower yields will occur in accordance with a predetermined schedule or probability. |

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| **FOREBAY** | A groundwater basin immediately upstream or upgradient from a larger basin or group of hydrologically connected basins. Also, a reservoir or pond situated at the intake of a pumping plant or power plant to stabilize water levels. |
| **- G -** | |
| **GROUNDWATER** | Water that occurs beneath the land surface and completely fills all pore spaces of the alluvium or rock formation in which it is located. |
| **GROUNDWATER BASIN** | A groundwater reservoir, together with all the overlying land surface and underlying aquifers that contribute water to the reservoir. |
| **GROUNDWATER MINING** | The withdrawal of water from an aquifer greatly in excess of replenishment; if continued, the underground supply will eventually be exhausted or the water table will drop below economically feasible pumping lifts. |
| **GROUNDWATER OVERDRAFT** | The condition of a groundwater basin in which the amount of water withdrawn by pumping exceeds the amount of water that replenishes the basin over a period of years. |
| **GROUNDWATER RECHARGE** | Increases in groundwater quantities or levels by natural conditions or by human activity. See also ARTIFICIAL RECHARGE. |
| **GROUNDWATER STORAGE CAPACITY** | The space contained in a given volume of deposits. Under optimum use conditions, the usable groundwater storage capacity is the volume of water that can, within specified economic limitations, be alternately extracted and replaced in the reservoir. (Directly related to SAFE YIELD). |
| **GROUNDWATER TABLE** | The upper surface of the zone of saturation (all pores of subsoil filled with water), except where the surface is formed by an impermeable body. |
| **- H -** | |
| **HYDRAULIC CONDUCTIVITY** | A property of vascular plants, soil or rock, that describes the ease with which water can move through pore spaces or fractures. It depends on the permeability of the material and on the degree of saturation. |
| **- I -** | |

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| **IMPORTED WATER RETURN FLOWS** | Water brought into the basin from outside of the watershed that provides a net increase in groundwater supply (i.e., does not include consumed or evaporated imported water). |
| **INSTREAM USE** | Use of water that does not require diversion from its natural watercourse. For example, the use of water for navigation, recreation, fish and wildlife, esthetics, and scenic enjoyment. |
| **IRRIGATION EFFICIENCY** | The efficiency of water application. Computed by dividing evapotranspiration of applied water by applied water and converting the result to a percentage. Efficiency can be computed at three levels: farm, district, or basin. |
| **IRRIGATION RETURN FLOW** | Applied water that is not transpired, evaporated, or deep percolated into a groundwater basin, but that returns to a surface water supply. |
| **- J -** | |
| **JUDGEMENT** | Judgement is a decision of a court regarding the rights and liabilities of parties in a legal action or proceeding. In the context of the adjudication, the Judgement guides the long-term management of the basin. |
| **- L -** | |
| **LACUSTRINE** | In geology, the sedimentary environment of a lake. |
| **LAND SUBSIDENCE** | Land subsidence is the lowering of the land-surface elevation from changes that take place underground. Overdrafting of aquifers is the major cause of subsidence in the southwestern United States. |
| **LEACHING** | The flushing of salts from the soil by the downward percolation of applied water. |
| **- M -** | |
| **MAXIMUM CONTAMINANT LEVEL (MCL)** | The maximum level of a drinking water contaminant allowed under the federal Safe Water Drinking Act. MCLs set under National Primary Drinking Water Regulations are legally enforceable standards that apply to public water systems. |
| **M&I** | Municipal and Industrial (water use); generally urban uses for human activities. |
| **MILLIGRAMS PER LITER (MG/L)** | The mass (milligrams) of any substance dissolved in a standard volume (liter) of water. One liter of pure water has a mass of 1000 grams. For dilute solutions where water is the solvent medium, the numerical value of mg/l is very close to the mass ratio expressed in parts per million (ppm). |

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| **MINERALIZATION (OF GROUNDWATER)** | The addition of inorganic substances, usually dissolved from surface or aquifer material, to groundwater. |
| **NATURALLY OCCURRING CONTAMINANTS (IN GROUNDWATER)** | A deleterious substance present in groundwater which is of natural origin, i.e., not caused by human activity. |
| **- N -** | |
| **NATIVE SAFE YIELD** | A safe yield estimate provided in the Judgement based on estimates of natural groundwater recharge from the hydrologic system including subsurface inflows from the surrounding bedrock and infiltration from precipitation and streamflow. It also accounts for return flows from basin pumping. See SAFE YIELD. |
| **NATURAL HABITAT** | See OPEN SPACE. |
| **NET WATER CONSERVATION** | The difference between the amount of applied water conserved and the amount by which this conservation reduces usable return flows. |
| **NET WATER DEMAND** | The applied water demand less water saved through conservation efforts (= net applied water = actual water used). |
| **NON-POINT SOURCE POLLUTION** | A diffuse discharge of pollutants throughout the natural environment. See POINT SOURCE. |
| **- O -** | |
| **OPEN SPACE** | Open space can mean natural open space, passive and active recreation which may or may not be compatible with natural habitats or natural open space preservation. As an example, open space can mean soccer fields, playgrounds, etc. and should not be considered as natural habitat. See also NATURAL HABITAT. |
| **OVERDRAFT** | Withdrawal of groundwater in excess of a basin's perennial yield. See also PROLONGED OVERDRAFT. |
| **- P -** | |
| **PARTS PER MILLION (PPM)** | A ratio of two substances, usually by mass, expressing the number of units of the designated substance present in one million parts of the mixture. For water solutions, parts per million is almost identical to the milligrams per liter. |
| **PER-CAPITA WATER USE** | The amount of water used by or introduced into the system of an urban water supplier divided by the total residential population; normally expressed in gallons per-capita-per-day (gpcd). |

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| **PERCHED GROUNDWATER** | Groundwater supported by a zone of material of low permeability located above an underlying main body of groundwater with which it is not hydrostatically connected. |
| **PERCOLATION** | The downward movement of water through the soil or alluvium to the groundwater table. |
| **PERENNIAL YIELD** | Perennial yield is an estimate of the long-term average annual amount of water that can be withdrawn without inducing a long-term progressive drop in water level. The term “safe yield” is sometimes used in place of perennial yield, although the concepts behind the terms are not identical: the older concept of “safe yield” generally implies a fixed quantity equivalent to a basin’s average annual natural recharge, while the “perennial yield” of a basin or system can vary over time with different operational factors and management goals. |
| **PERMEABILITY** | The capability of soil or other geologic formation to transmit water. |
| **PLAYA** | A dry lakebed, also known as an alkali flat. Playas consist of fine-grained sediments infused with alkali salts and are devoid of vegetation. |
| **PLAYA DEPOSIT** | A thick salt deposit that forms over time through the accumulation of layers of dissolved minerals from rocks. Dissolved salts that form a playa deposit are laid by rainfall that rapidly evaporates once reaching the earth’s surface. |
| **POINT SOURCE** | Any discernable, confined and discrete conveyance site from which waste or polluted water is discharged into a water body, the source of which can be identified. See also NON-POINT SOURCE. |
| **POLLUTION (OF WATER)** | The alteration of the physical, chemical, or biological properties of water by the introduction of any substance into water that adversely affects any beneficial use of water. |
| **POTABLE WATER** | Water suitable for human consumption without undesirable health consequences. Drinkable. Meets Department of Health Services drinking water requirements. |
| **PRODUCTION RIGHT** | The portion of the Native Safe Yield assigned to each groundwater user. Production Rights for specific parties are defined in the adjudication Judgment. |
| **PROLONGED OVERDRAFT** | Net extractions in excess of a basin’s perennial yield, averaged over a period of ten or more years. |
| **PROPOSITION 50** | The “Water Security, Clean Drinking Water, Coastal and Beach Protection Act of 2002”, as set forth in Division 26.5 of the California Water Code (commencing with § 79500). |

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| **- Q -** | |
| **QUATERNARY GEOLOGY** | Younger of the two geologic periods of the Cenozoic era of geologic time lasting from 2 million years ago to the present. Comprising all geologic time from the end of the Tertiary period to today. |
| **- R -** | |
| **RAMPDOWN PERIOD** | In terms of the Antelope Valley Groundwater Basin adjudication, the rampdown period outlined in the Judgement is a mandatory reduction in groundwater production between 2016 and 2022 to meet the Native Safe Yield by 2023. |
| **RAMPDOWN PRODUCTION** | The reasonable and beneficial use of groundwater, excluding Imported Water Return Flows, at a time prior to the Judgment, or the Production Right, whichever is greater. During the seven-year Rampdown Period, production is reduced – or ramped down – from the Pre-Rampdown Production Right to the Production Right for certain parties with Pre-Rampdown Production rights. |
| **REACH REPAYMENT CAPACITY** | SWP contractors, via their water supply contracts with DWR, are allocated specified shares of “reach repayment” capacity in various reaches of the SWP system. This share of capacity pertains to SWP supplies only, and provides each contractor with delivery priority for its SWP supplies. Reach repayment capacity is often less than the actual constructed physical capacity of SWP facilities. |
| **RECHARGE BASIN** | A surface facility, often a large pond, used to increase the infiltration of water into a groundwater basin. |
| **RECYCLED WATER** | Urban wastewater that becomes suitable for a specific beneficial use as a result of treatment. |
| **REGIONAL PRIORITIES** | The short-term and long-term issues and/or objectives that are determined to be most important on the Region’s needs. |

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| **REGIONAL WATER MANAGEMENT GROUP** | A group that, at a minimum, includes three or more local public agencies, at least two of which have statutory authority over water management, which may include but is not limited to water supply, water quality, flood control, or storm water management. The Antelope Valley Regional Water Management Group includes Antelope Valley-East Kern Water Agency, Palmdale Water District, Quartz Hill Water District, Littlerock Creek Irrigation District, City of Palmdale, City of Lancaster, Los Angeles County Sanitation District Nos. 14 & 20, Rosamond Community Services District, and Los Angeles County Waterworks District No. 40, Antelope Valley. |
| **REVERSE OSMOSIS** | Method of removing salts from water by forcing water through a membrane. |
| **RETURN FLOW** | The portion of withdrawn water that is not consumed by evapotranspiration and returns instead to its source or to another body of water. |
| **REUSE** | The additional use of once-used water. |
| **RIPARIAN** | Of, or on the banks of, a stream or other of water. |
| **RIPARIAN VEGETATION** | Vegetation growing on the banks of a stream or other body of water. |
| **RUNOFF** | The surface flow of water from an area; the total volume of surface flow during a specified time. |
| **- S -** | |
| **SAFE YIELD (GROUNDWATER)** | The maximum quantity of water that can be withdrawn from a groundwater basin over a long period of time without developing a condition of overdraft. Sometimes referred to as sustained yield. |
| **SAG POND** | An enclosed depression formed where active or recent fault movement results in impounded drainage. |

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| **SALINITY** | Generally, the concentration of mineral salts dissolved in water. Salinity may be measured by weight (total dissolved solids), electrical conductivity, or osmotic pressure. Where seawater is the major source of salt, salinity is often used to refer to the concentration of chlorides in the water. See also TDS. |
| **SERIOUS OVERDRAFT** | Prolonged overdraft that results, or would result, within ten years, in measurable, unmitigated adverse environmental or economic impacts, either long-term or permanent. Such impacts include but are not limited to seawater intrusion, other substantial quality degradation, land surface subsidence, substantial effects on riparian or other environmentally sensitive habitats, or unreasonable interference with the beneficial use of a basin's resources. |
| **SEAWATER INTRUSION** | Occurs when extractions exceed freshwater replenishment of groundwater basins and causes seawater to travel laterally inland into fresh water aquifers. |
| **SECONDARY TREATMENT** | In sewage treatment, the biological process of reducing suspended, colloidal, and dissolved organic matter in effluent from primary treatment systems. Secondary treatment is usually carried out through the use of trickling filters or by an activated sludge process. |
| **SHEET FLOW** | Shallow-depth, low velocity water flow. |
| **SILT** | A sedimentary material composed of very fine particles intermediate in size between sand and clay. |
| **SILTATION** | The deposition or accumulation of silt. |
| **SPREADING BASIN** | See RECHARGE BASIN. |
| **SPREADING GROUNDS** | See RECHARGE BASIN. |
| **STAKEHOLDER** | An individual, group, coalition, agency or others who are involved in, affected by, or have an interest in the implementation of a specific program or project. |
| **SOLUTE** | A substance dissolved in another substance, usually the component of a solution present in the lesser amount. |
| **SUBSIDENCE** | See LAND SUBSIDENCE. |
| **SUSTIANABLE GROUNDWATER MANAGEMENT ACT (SGMA)** | State legislation passed in 2014 that provides a framework for sustainable groundwater management in a manner that can be maintained during the planning and implementation horizon without causing undesirable results. |

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| **TABLE A AMOUNT** | A reference to the amount of water listed in "Table A" of the contract between the State Water Project (SWP) and the contracting agencies and represents the maximum amount of water an agency may request each year. |
| **TERTIARY GEOLOGY** | Geologic time period between roughly 65 million and 2 million years ago. |
| **TERTIARY TREATMENT** | In sewage, the additional treatment of effluent beyond that of secondary treatment to obtain a very high quality of effluent. |
| **TOTAL DISSOLVED SOLIDS (TDS)** | A quantitative measure of the residual minerals dissolved in water that remain after evaporation of a solution. Usually expressed in milligrams per liter (mg/l) or in parts per million (ppm). See also Salinity. |
| **TOTAL SAFE YIELD** | A safe yield estimate provided in the Judgement based that accounts for the Native Safe Yield and imported water return flows. See SAFE YIELD. |
| **TURBIDITY** | A measure of cloudiness and suspended sediments in water. Water high in turbidity appears murky and contains sediments in suspension. Turbid water may also result in higher concentrations of contaminants and pathogens, that bond to the particles in the water. |
| **TURNBACK POOLS** | A means in which SWP contractors with excess Table A Amount water in a given hydrologic year may sell that excess to other contractors. This is included in a provision in the SWP water supply contracts. The program is administered by DWR. |
| **- W -** | |
| **WASH** | A wash, also called an arroyo, is a usually dry creek bed or gulch that temporarily fills with water after a heavy rain, or seasonally. |

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| **WATER MANAGEMENT STATEGIES** | Specified categories of approaches to meet regional objectives. According to the IRWM Grant Program Guidelines, the water management strategies include, but are not limited to, ecosystem restoration, environmental and habitat protection and improvement, water supply reliability, flood management, groundwater management, recreation and public access, storm water capture and management, water conservation, water quality protection and improvement, water recycling, wetlands enhancement and creation, conjunctive use, desalination, Imported water, land use planning, non-point source pollution control, surface storage, watershed planning, water and wastewater treatment, and water transfers. |
| **WATER MANAGEMENT STRATEY ALTERNATIVE** | A set of projects, project concepts, actions, and/or studies that when implemented together would fill the gaps, minimize the overlaps, maximize benefits for multiple water management strategies, and ultimately achieve the regional planning objectives. |
| **WATER MANAGEMENT STRATEGY AREA** | A group of similar or related water management strategies to make the Antelope Valley IRWM Plan development more efficient and manageable (data collection, management, and dissemination). |
| **WATER MANAGEMENT STRATEGY INTEGRATION** | A process to design water management strategy alternatives to maximize regional benefits by identifying potential synergies, linkages, and gaps between water management strategies and evaluating geographical distribution of project benefits. |
| **WATER MANAGEMENT STRATEGY OBJECTIVE** | A goal for the Region to achieve in order to meet the needs for a water management strategy. A quantifiable objective can be used to allow future measurement of progress towards accomplishment of the objectives (e.g., conserve 10,000 AFY of drinking water by 2030). |
| **WATER QUALITY** | A term used to describe the chemical, physical, and biologic characteristics of water with respect to its suitability for a particular use. |
| **WATER QUALITY CONTAMINATION** | For the purposes of the IRWM Plan, any increase in water constituent levels over the State or Federal standards is considered contamination. |
| **WATER QUALITY DEGRADATION** | Any increase in water constituent levels over naturally occurring levels is considered degradation. |

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| **WATER RECLAMATION** | The treatment of water of impaired quality, including brackish water and seawater, to produce a water of suitable quality for the intended use. |
| **WATER RIGHT** | A legally protected right, granted by law, to take possession of water occurring in a water supply and to divert the water and put it to beneficial uses. |
| **WATERMASTER** | The governing body identified by the Judgement that ensures that the basin or portion of the basin that is adjudicated is managed in accordance with the court's decree. The Watermaster must report periodically to the court. |
| **WATERSHED** | The area or region drained by a reservoir, river, stream, etc.; drainage basin. |
| **WATER TABLE** | The surface of underground, gravity-controlled water. |

## 10.2 Acronym List

| Acronym | Meaning |
|---|---|
| **AB** | Assembly Bill |
| **ACEC** | Areas of Critical Environmental Concern |
| **AF** | acre-foot |
| **AFB** | Air Force Base |
| **AFY** | acre-feet per year |
| **AQMD** | Air Quality Management District |
| **ASR** | Aquifer Storage and Recharge/Recovery |
| **A-Team** | Advisory Team |
| **AV** | Antelope Valley |
| **AVEK** | Antelope Valley-East Kern Water Agency |
| **AVSWCA** | Antelope Valley State Water Contractors Association |
| **AVWCC** | Antelope Valley Water Conservation Coalition |
| **BIA** | Building Industry Association |
| **BLM** | Bureau of Land Management |
| **BMP** | Best Management Practice |
| **BO** | Biological opinion |
| **Cal Water** | California Water Service |
| **CAS** | Conventional Activated Sludge |
| **CASGEM** | California Statewide Groundwater Elev. Monitoring Program |
| **CCD** | Census County Division |
| **CCL** | Contaminant Candidate List |
| **CCR** | California Code of Regulations |
| **CCR** | Consumer Confidence Reporting |
| **CDFG** | California Department of Fish and Game |
| **CDFA** | California Department of Food and Agriculture |
| **CDPH** | California Department of Public Health |
| **CEDEN** | California Environmental Data Exchange Network |
| **CEIC** | California Environmental Information Catalog |
| **CEQA** | California Environmental Quality Act |
| **CERES** | California Environmental Resources Evaluation System |
| **cfs** | cubic feet per second |
| **CIMIS** | California Irrigation Management Information System |
| **CIP** | Capital Improvements Plan |
| **CLWA** | Castaic Lake Water Agency |
| **CMWD** | Calleguas Municipal Water District |
| **CRS** | Community Rating System |
| **CUWCC** | California Urban Water Conservation Council |
| **CVP** | Central Valley Project |
| **CWA** | Clean Water Act |
| **CWC** | California Water Code |

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| **DAC** | Disadvantaged Communities |
| **DPH** | Department of Public Health |
| **DMM** | Demand management measure |
| **DU** | Distribution Uniformity |
| **DWMA** | Desert Wildlife Management Area |
| **DWR** | Department of Water Resources |
| **EAFB** | Edwards Air Force Base |
| **EIR** | Environmental Impact Report |
| **EJ** | Environmental Justice |
| **EJCW** | Environmental Justice Coalition for Water |
| **EPA** | Environmental Protection Agency |
| **ESA** | Federal Endangered Species Act |
| **ETc** | Evapotranspiration (for a particular crop) |
| **ETo** | Evapotranspiration (general or reference) |
| **EWMP** | Efficient Water Management Practice |
| **° F** | degree Fahrenheit |
| **FEIR** | Final Environmental Impact Report |
| **FEMA** | Federal Emergency Management Agency |
| **FIRM** | Flood insurance rate map |
| **FWSMPU** | Final Water System Master Plan Update |
| **gal** | gallon |
| **GAMA** | Groundwater Ambient Monitoring and Assessment |
| **GHG** | Greenhouse gas |
| **GIS** | Geographic Information System |
| **gpcd** | gallons per-capita-per-day |
| **gpd** | gallons per day |
| **gpm** | gallons per minute |
| **GPS** | Global positioning system |
| **GWR-RW** | Groundwater Recharge Using Recycled Water |
| **GWR** | Groundwater recharge |
| **HCP** | Habitat Conservation Plan |
| **HECW** | High-Efficiency Clothes Washer |
| **IFM** | Integrated Flood Management |
| **IRWM Plan (or IRWMP)** | Integrated Regional Water Management Plan |
| **IUWMP** | Integrated Urban Water Management Plan |
| **IWRP** | Integrated Water Resources Plan |
| **JPA** | Joint Powers Authority |
| **LACSD** | Los Angeles County Sanitation District |
| **LACWD 40** | Los Angeles County Waterworks District No. 40 |
| **LACDPW** | Los Angeles County Department of Public Works |
| **LADWP** | Los Angeles Department of Water and Power |
| **LAFCO** | Local Area Formation Commission |
| **Lancaster** | Lancaster, City of |

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| **LAWA** | Los Angeles World Airports |
| **LCID** | Littlerock Creek Irrigation District |
| **LID** | Low Impact Development |
| **LWRP** | Lancaster Water Reclamation Plant |
| **M&I** | municipal & industrial |
| **MAF** | Million acre-feet |
| **MBR** | Membrane bioreactor |
| **MCL** | Maximum Contaminant Level |
| **MG** | million gallon |
| **mgd** | million gallons per day |
| **mg/L** | milligrams per liter |
| **MHI** | median household income |
| **MOA** | Memorandum of Agreement |
| **MOU** | Memorandum of Understanding |
| **MW** | megawatt |
| **MWA** | Mojave Water Agency |
| **MWD** | Metropolitan Water District of Southern California |
| **ND** | Non-detect |
| **NFIP** | National Flood Insurance Program |
| **NLFC** | Newhall Land and Farming Company |
| **NMFS** | National Marine Fisheries Service |
| **NOI** | Notice of Intent |
| **NPDES** | National Pollutant Discharge Elimination System |
| **NRCS** | National Resource Conservation Service |
| **O&M** | operations and maintenance |
| **OEHHA** | Office of Environmental Health Hazard Assessment |
| **OHV** | Off-Highway Vehicle |
| **NRCS** | Natural Resource Conservation Service |
| **PHG** | Public Health Goal |
| **ppb** | parts per billion |
| **ppm** | parts per million |
| **PAC** | Performance Advisory Committee |
| **Palmdale** | Palmdale, City of |
| **PID** | Palmdale Irrigation District |
| **Plant 42** | U.S. Air Force Plant 42 |
| **PM** | Particulate Matter |
| **PWD** | Palmdale Water District |
| **PWRP** | Palmdale Water Reclamation Plant |
| **QHWD** | Quartz Hill Water District |
| **RAP** | Region Acceptance Process |
| **RCSD** | Rosamond Community Services District |
| **Region** | Antelope Valley Region |
| **RMS** | Resource Management Strategy |

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| **RO** | reverse osmosis |
| **ROC** | reactive organic compound |
| **RRBWSD** | Rosedale-Rio Bravo Water Storage District |
| **RSN** | Rotary Sprinkler Nozzle |
| **RWMG** | Regional Water Management Group |
| **RWQCB** | Regional Water Quality Control Board |
| **RWQCB-LR** | Regional Water Quality Control Board – Lahontan Region |
| **SB** | Senate Bill |
| **SCAG** | Southern California Association of Governments |
| **SDWA** | Safe Drinking Water Act |
| **SEA** | Significant Ecological Area |
| **Semitropic** | Semitropic Water Storage District |
| **SGMA** | Sustainable Groundwater Management Act |
| **SMART** | Specific Measurable Attainable Relevant Time-based |
| **SNMP** | Salt and Nutrient Management Plan |
| **SRF** | State Revolving Fund |
| **SWAMP** | Surface Water Ambient Monitoring Program |
| **SWP** | State Water Project |
| **SWRCB** | State Water Resources Control Board |
| **TAC** | Technical Advisory Committee |
| **TDS** | Total Dissolved Solids |
| **THM** | Trihalomethanes |
| **TTHM** | Total Trihalomethanes |
| **TMDL** | Total Maximum Daily Load |
| **TOC** | total organic carbon |
| **TSY** | Total Sustainable Yield |
| **TTP** | Tertiary Treatment Plant |
| **UCCE** | University of California Cooperative Extension |
| **ug/L** | micrograms per liter |
| **ULFT** | Ultra Low Flush Toilet |
| **(uS/cm)** | microsiemens per centimeter |
| **U.S.** | United States |
| **USACE** | U.S. Army Corps of Engineers |
| **USBR** | U.S. Bureau of Reclamation |
| **USFWS** | U.S. Fish and Wildlife Service |
| **USGS** | U.S. Geological Survey |
| **UWMP** | Urban Water Management Plan |
| **WBIC** | Weather-Based Irrigation Controller |
| **WDL** | Water Data Library |
| **WDR** | Waste Discharge Requirements |
| **WPP** | Wellhead Protection Program |
| **WRP** | Water Reclamation Plant |
| **WSA** | Water Supply Assessment |

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| **WSMP** | Water System Master Plan |
| **WTP** | Water Treatment Plant |
| **WWTP** | Wastewater Treatment Plant |