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 for evaluation is the establishment of an evapotranspiration (ET) based-controller program. Because this program was submitted as a concept project, with the number of potential users and other technical details not yet quantified, the amount of savings 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

[1] A SMART objective is one that is Specific, Measurable, Attainable, Relevant, and Time-Based.

amount of conservation, which would reduce the demand for irrigation water by some percentage, and would therefore help to meet the water supply planning target of reducing the mismatch of expected supply and demand and contribute to the objective of providing a reliable water supply to meet demands between now and 2035.

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, groundwater adjudication proceedings determined that a total sustainable yield for the groundwater basin would be used to determine pumping rights.[2] 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 2007 IRWM Plan which had the result of decreasing its 2035 supply mismatch. In fact, in average years, the data presented in Section 3 indicate a potential surplus. Water banking projects such as the Antelope Valley Water Bank and the WSSP-2 have also been implemented with the intention to store up to approximately 600,000 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 2010 and 2035. 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.

[2] The number for TSY used in this 2013 IRWMP Update is selected strictly for long-term planning purposes and is not intended to answer the questions being addressed within the adjudication process.

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 2. Conveyance pipelines (backbone and smaller laterals) AND 3a. Site conversions (industrial, environmental, irrigation customers) OR 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 2a. Water banking facility, including recharge and recovery capability OR 2b. Distribution facilities to make use of increased volume of imported water
Stormwater	1. Facilities to capture and route storm water AND 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 2035; and adapt to climate change.

- *Target:* Maintain adequate supply and demand in average years.
- *Target:* Provide adequate reserves (61,200 AFY) to supplement average condition supply to meet demands during single-dry year conditions, starting 2009.
- *Target:* Provide adequate reserves (164,800 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
Division Street and Avenue H-8 Recycled Water Tank	3 AF	Implementation
Palmdale Recycled Water Authority – Phase 2 Distribution System	1,000 AFY	Implementation
Avenue K Transmission Main, Phases I-IV	Not quantified	Conceptual
Avenue M and 62th Street West Tanks	Not quantified	Conceptual
KC & LAC Interconnection Pipeline	Not quantified	Conceptual
North Los Angeles/Kern County Regional Recycled Water Project – Phase 3	up to approx. 1,300 AFY[a]	Conceptual
North Los Angeles/Kern County Regional Recycled Water Project – Phase 4	up to approx.. 7,000 AFY[a]	Conceptual
Place Valves and Turnouts on Reclaimed Water Pipeline	Not quantified	Conceptual
RCSD Wastewater Pipeline	Not quantified	Conceptual
Tertiary Treated Water Conveyance and Incidental Groundwater Recharge of Amargosa Creek Avenue M to Avenue H	100 to 1,000 AFY	Conceptual
Tropico Park Pipeline	Not quantified	Conceptual
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	Not quantified	Conceptual
Recycled Water Recharge	**Amount Recharged**	
Littlerock Creek Groundwater Recharge and Recovery Project	5,000 AFY[b] / AF storage not quantified	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**	
South Antelope Valley Intertie Project	Not quantified	Implementation
AVEK Strategic Plan	Not quantified	Implementation

Project	Supply Created	Status
Imported Water Recharge	**Amount Recharged**	
Antelope Valley Water Bank - Phase 1	25,000 AFY / 450,000 AF[c]	Partially Complete[d]
Antelope Valley Water Bank - Phase 2	100,000 AFY / 450,000 AF[c]	Implementation
Aquifer Storage and Recovery Project: Additional Storage Capacity (WSSP-2)	Up to 150,000 AF of storage	Complete
Aquifer Storage and Recovery Project: Injection Well Development	12,000 AFY / AF storage not quantified	Complete
Water Supply Stabilization Project – Westside Project (WSSP-2)	Up to 150,000 AF of storage; currently 20 mgd (23,000 AFY) of withdrawal capacity	Complete
Eastside Banking & Blending Project	10,000 AFY / AF storage not quantified	Implementation
Littlerock Creek Groundwater Recharge and Recovery Project	38,000 AFY[c] / AF storage not quantified	Implementation
Upper Amargosa Creek Flood Control, Recharge, and Habitat Restoration Project	24,300 AFY[e] / AF storage not quantified	Implementation
Water Supply Stabilization Project (WSSP) – Westside Expansion	6,000 AFY / 450,000 AF storage	Implementation
Hunt Canyon Groundwater Recharge and Flood Control Basin	Not quantified	Conceptual
Purchasing Spreading Basin Land	Not quantified	Conceptual
Stormwater Capture	**Amount of Capture**	
Littlerock Dam Sediment Removal	560 AFY	Implementation
Stormwater Harvesting	25 AFY	Conceptual
Stormwater Recharge	**Amount Recharged**	
Upper Amargosa Creek Flood Control, Recharge, and Habitat Restoration 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	Not quantified	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

Project	Supply Created	Status
Littlerock Creek In-River Spreading Grounds	1,000 AFY / 7,600 AF storage	Conceptual
Multi-use/Wildlife Habitat Restoration Project	Not quantified	Conceptual
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	Implementation
RCSD Arsenic Consolidation Project	Not quantified	Implementation
Deep Wells to Recapture Banked Water	Not quantified	Conceptual
QHWD Partial Well Abandonment	Not quantified	Conceptual
Conservation	**Amount Conserved**	
Antelope Valley Regional Conservation Project	Not quantified	Implementation
ET Based Controller Program	240 AFY	Conceptual
Implement ET Controller Program	Not quantified	Conceptual
Precision Irrigation Control System	150 AFY	Conceptual
Ultra-Low Flush Toilet Change-out Program	100 to 1,000 AFY	Conceptual
Waste Water Ordinance	Not quantified	Conceptual
Water Conservation School Education Program	Not quantified	Conceptual

Notes:
(a) Source: *Final Facilities Planning Report, Antelope Valley Recycled Water Project,* August 2006.
(b) Assumes that the Littlerock Creek Groundwater Recharge and Recovery Project will use approximately 5,000 AFY of recycled water and 38,000 AFY of imported water for recharge.
(c) Not all of the future capacity in the Antelope Valley Water Bank will be allocated to entities in the Region.
(d) It is assumed that the Antelope Valley Water Bank - Phase 1 is complete but not yet operational.
(e) The Upper Amargosa Creek Flood Control, Recharge, and Habitat Restoration Project will use approximately 400 AFY of stormwater and 24,300 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 20,000 AFY of recycled water is currently produced at water reclamation facilities are currently available for non-potable reuse. Currently, approximately 82 AFY of this recycled water supply is used.

A number of implementation projects were identified that can utilize this water, including approximately 1,000 AFY of conveyance facilities, 625 AFY of conversion for non-potable reuse, and 5,000 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 2035, an additional 11,000 AFY of recycled water production will be available for reuse, for a total of 31,000 AFY. Conceptual recycled water conveyance projects were identified that would provide up to an additional 9,300 AFY of recycled water conveyance. Conceptual recycled water recharge projects were identified for up to an additional 1,100 AFY.

In total, approximately 31,000 AFY of recycled water will be available in 2035 and projects (implementation and conceptual) have been identified that could use up to approximately 22,000 AFY as shown in Section 3 (Table 3-12). 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 150,000 AF of imported water (WSSP-2) and implementation projects that could bank up to an additional 450,000 AF (Antelope Valley 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 560 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 5,600 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, install ultra-low flush toilets, develop conservation ordinances, and implement conservation education programs. In total, the proposed conservation projects are estimated to reduce demand by up to 1,390 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 30,000 AFY of new supply for average years with increased recycled water use (22,000 AFY), stormwater capture (6,585 AFY), and conservation (1,390 AFY). Some of these new supplies can also serve as sources of water for banking.*
- *Single Dry Year: Provide up to an additional 30,000 AFY of new supply for a single dry year and approximately 600,000 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 30,000 AFY of new supply in multi-dry year periods and approximately 600,000 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*

As mentioned in Section 3, the total sustainable yield of the Region's groundwater basin could potentially be adjusted through the course of ongoing adjudication proceedings. If future total sustainable yield is determined by the court to be lower than 110,000 AFY,[3] the supply-demand mismatch will be greater for single- and multi-dry year periods, increasing the need to implement supply related projects. If the final total sustainable yield is determined to be higher than 110,000 AFY, the Region's supply-demand mismatch will decrease, and the Region will be in a better position to meet single and multiple dry year demands.

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 June 2017.

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 3.1.2.

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.[4]

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 250,000 AFY of recharge and recovery capacity and/or 600,000 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

---

[3] The number for TSY used in this 2013 IRWMP Update is selected strictly for long-term planning purposes and is not intended to answer the questions being addressed within the adjudication process.

[4] An average water year for the Region has approximately 95,500 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.

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 that a 10-year moving average of change in observed groundwater levels is greater than or equal to 0, starting January 2010.

This planning target will be heavily influenced by the outcome of the adjudication process that has a similar objective to stabilize groundwater levels in the Region. 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 are the first step in managing groundwater levels throughout the basin.

As discussed in Section 3, adjudication proceedings are ongoing, and have yet to establish 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 expected to be monitored by the Court through a watermaster or other court appointed agent. As such, this target will be re-assessed in subsequent revisions of this IRWM Plan.

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 20,000 AFY in the Antelope Valley Region, assuming an additional 10 percent per capita reduction in urban water demand by 2020. 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 Wheeler Ridge Maricopa Water Storage District White-Wolf Ridge, the Chino Basin Groundwater Basin Storage and

Recovery Program, the Semitropic Water Banking and Exchange Program, Calleguas Municipal Water District (CMWD) and Metropolitan Water District of Southern California (MWD), Los Posas ASR, 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.

Create Regional Database for Groundwater Pumping. The analysis in Section 3 helped to identify a number of issues regarding the availability of accurate water resource data for the Antelope Valley Region. M&I and major agricultural pumpers generally measure their groundwater extractions and submit this information to DWR. The pumpers that do not measure groundwater extractions are anticipated to be agricultural and small domestic water users. The existing databases do not have broad agreement for pumping within the same areas and it is thought that pumping is generally underreported (USGS 1995). Furthermore, there is a significant lack of groundwater pumping data available for the Kern County portion of the Antelope Valley Region and for the smaller mutual water companies in the Antelope Valley Region. By creating a regional database for groundwater pumping and a methodology for its management, this data can be regularly obtained and made available for research studies such as this IRWM Plan and contribute to meeting the objective of stabilizing groundwater at current conditions. It is recommended that these data be regularly collected and compiled. For pumpers that do not monitor groundwater extractions, indirect methods, such as estimates based on power or consumptive use, can be utilized for groundwater management purposes.

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 pending 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. Turnback 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 Turnback 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 Turnback 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 Turnback 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 will expand the availability of recycled water for future use. LACWD 40's aquifer storage and recovery project, if continued, will help to improve the quality of the Region's aquifers by increasing available groundwater and reducing constituent concentrations.