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 2009 California Water Plan, has identified 33 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.

- Crop Idling for Water Transfers: Because there has been no adjudication of groundwater rights in the Region as of the 2013 Update of the Plan, this strategy was not considered feasible for the Region.
- 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.
- Irrigated Land Retirement: Because there has been no adjudication of groundwater rights in the Region as of the 2013 Update of the Plan, this strategy was not considered feasible.
- 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.
- Waterbag Transport/Storage Technology: This technology is unproven and was therefore not considered feasible for the Region.

Table 5-1: 2009 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

Resource Management Strategy	Description	Included in IRWM Plan
Precipitation Enhancement	Precipitation enhancement artificially stimulates clouds to produce more rainfall or snowfall than they would naturally.	No
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
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
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

Resource Management Strategy	Description	Included in IRWM Plan
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
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
Watershed Management	Watershed management utilizes planning, programs, and projects to restore and enhance watershed functions.	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.	No
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.	No
Rainfed Agriculture	Rainfed agriculture is when all crop consumptive water use is provided directly by rainfall on a real time basis.	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

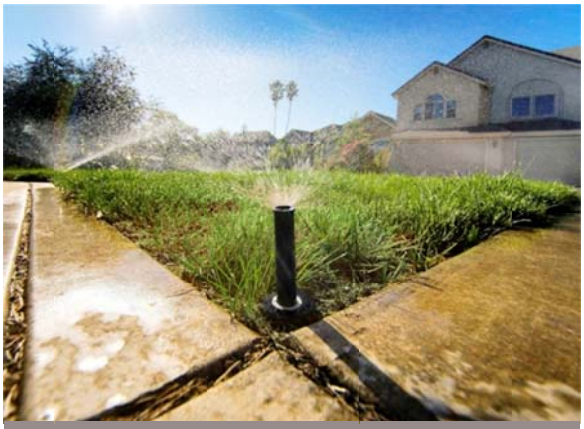
	Antelope Valley Region Objectives														
	Water Supply Management			**Water Quality Management**				**Flood Management**		**Environ. Resource Mgmt.**		**Land Use Planning/ Mgmt**		**Climate Change**
	Provide reliable water supply to meet the Region's expected demand between now and 2035; and adapt 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	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				●										
Groundwater and Aquifer Remediation	●	●		●	●									
Matching Water Quality to Use							●		●			●		
Pollution Prevention				●	●	●		●		●				

	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 2035; 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	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
Salt and Salinity Management				●	●									
Urban Runoff Management	●		●		●	●		●	●				●	
Flood Management														
Flood Risk Management	●	●	●			●		●	●	●			●	
Practice Resources Stewardship														
Agricultural Lands Stewardship	●									●	●		●	●
Economic Incentives	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Ecosystem Restoration					●	●		●	●	●		●	●	●
Forest Management						●				●		●	●	●
Land Use Planning and Management								●	●	●	●	●	●	
Recharge Areas Protection			●		●	●		●		●			●	
Water-dependent Recreation						●				●		●	●	
Watershed Management					●	●		●	●	●	●	●	●	●

5.2 Strategies for Water Supply Management

Objective: Provide reliable water supply to meet the Region's expected demand between now and 2035; 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

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

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 the Region and therefore allows for groundwater supplies to be obtained from areas that are managed

Agricultural water use efficiency measures can reduce the Region's agricultural demand.

- *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
- *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
- *Recharge Areas Protection* – maintains lands that are most suitable for groundwater recharge, thus contributing to the stabilization of groundwater levels

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
- *Economic Incentives* – used to implement water quality improvement projects and therefore help to meet regulatory requirements and customer expectations

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
- *Economic Incentives* – used to implement water quality improvement projects that protect and maintain 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
- *Watershed Management* – protects ecosystem functions provided by natural systems including the natural filtration of runoff before it enters 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
- *Economic Incentives* – used to implement water quality improvement projects that reduce contaminant loading to natural streams and recharge areas
- *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

Installation of bioswales reduces the amount of contaminants reaching local creeks.

- *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
- *Water-dependent Recreation* – protects water quality in streams for recreational purposes
- *Watershed Management* – maintains and enhances ecosystem functions, including those provided by natural streams and recharge 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

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
- *Economic Incentives* – used to implement stormwater management projects that improve stormwater and urban runoff water quality
- *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

- *Watershed Management* – promotes integrative projects and planning that enhance ecosystem functions such as stormwater capture and infiltration

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
- *Economic Incentives* – used to implement projects that can provide multiple integrated flood management benefits
- *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
- *Watershed Management* – promotes integrative projects and planning that enhance ecosystem functions such as stormwater capture and infiltration

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
- *Economic Incentives* – used to conserve, restore, and maintain natural habitats and open space

- *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
- *Water-Dependent Recreation* – protects and maintains open space areas, both urban and natural, that have water-related recreational benefits
- *Watershed Management* – promotes integrative projects and planning that enhance the water resources functions provided by ecosystems

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
- *Economic Incentives* – used to support agricultural practices and stewardship projects
- *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.

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
- *Economic Incentives* – used to implement projects that expand or enhance recreational space
- *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
- *Water-dependent Recreation* – protects and maintains open space areas that have water-related recreational benefits
- *Watershed Management* - promotes integrative projects and planning that enhance ecosystem services

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

Spreading facilities will allow the Region to recharge the aquifer when imported, recycled, and storm waters are available.

- *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
- *Economic Incentives* – used to support land use planning projects
- *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
- *Water-dependent Recreation* – protects and maintains open space areas that have water-related recreational benefits
- *Watershed Management* – promotes integrative projects and planning that enhance ecosystem services

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
- *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
- *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
- *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

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 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 5-8 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 Decreased dry weather runoff and pollutant loads to waterways Reduced pumping costs 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 Improved air quality through decreased GHG and other emissions associated with imported water 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 Decreased dry weather runoff and pollutant loads to waterways Reduced pumping costs Improved ability to meet water supply needs and decreased dependence on imported supply	None identified	Increased available Bay-Delta supply and/or environmental flows Improved air quality through decreased GHG and other emissions associated with imported water 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 Improved water system reliability Improved ability to meet water supply needs and decreased dependence on imported supply	None identified	Increased available Bay-Delta supply and/or environmental flows Improved air quality through decreased GHG and other emissions associated with imported water 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 Improved ability to meet water supply needs and decreased dependence on imported supply Decreased energy consumption and associated GHG emissions for water conveyance	None identified	Increased available Bay-Delta supply and/or environmental flows Improved air quality through decreased GHG and other emissions associated with imported water Decreased energy consumption for water treatment and conveyance associated with imported water
Water Transfers	Reduced return flows Loss of agricultural land	Increased water supply in normal, drought and emergency conditions Improved economic stability and environmental conditions	Reduced return flows Loss of agricultural land	Financial (for seller of water) 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 Increased local energy and GHG emissions associated with pumping levels Environmental impacts to natural habitats and open space from removing flood flows Reduction in sediment for downstream needs Increased air pollution from deteriorating lakebed surfaces	Improved ability to meet water supply needs and decreased dependence on imported supply Improved water supply reliability Increased available water supply to meet demand from growth Improved groundwater basin yield and production flexibility Increased water quality protection	Increased air pollution from deteriorating lakebed surfaces	Increased available Bay-Delta supply and/or environmental flows Improved air quality through decreased GHG and other emissions associated with imported water 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 Increased local energy use, and GHG emissions associated with higher treatment levels Reduced effluent discharge available for in-stream flows Increased need for recharge facility capacity Increased need for brine disposal	Improved ability to meet water supply needs and decreased dependence on imported supply Increased water quality and beneficial use of WWTP/ recycled water flows Improved groundwater basin yield and production flexibility Advancement of technology and application for use by other entities Decreased long-term water costs	None identified	Increased available Bay-Delta supply and/or environmental flows Improved air quality through decreased GHG and other emissions associated with imported water Decreased energy consumption for water treatment and conveyance associated with imported water Advancement of technology and application for use by other entities
Surface Storage – Regional/ Local	Increased short-term construction and site-specific impacts Altered riparian flows and habitat quality Increased evaporative losses Increased air pollution from deteriorating lakebed surfaces	Increased system operational flexibility Improved access to previously untapped local supply and increased reliability Increased capacity for flood management	Increased air pollution from deteriorating lakebed surfaces	Increased available Bay-Delta supply and/or environmental flows Improved air quality through decreased GHG and other emissions associated with imported water 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 Increased local energy use, and GHG emissions associated with higher treatment levels	Improved water quality and local water supply availability Reduced drinking water-related health problems	None identified	Increased available Bay-Delta supply and/or environmental flows Decreased energy consumption for water treatment and conveyance associated with imported water
Groundwater and Aquifer Remediation	Increased short-term construction and site-specific impacts Increased local energy use, and GHG emissions associated with higher treatment levels	Improved water quality and local water supply availability Reduced drinking water-related health problems	None identified	Increased available Bay-Delta supply and/or environmental flows Decreased energy consumption for water treatment and conveyance associated with imported water
Matching Water Quality to Use	None Identified	Decreased water treatment costs Improved ability to meet water supply needs and decreased dependence on imported supply	None Identified	Increased available Bay-Delta supply and/or environmental flows 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 Increased local energy, and GHG emissions associated with higher treatment levels	Improved water quality Reduced need for other water management and treatment options Enhanced recreation, water supply and habitat	None identified	Reduced pollutant loads Enhanced recreation, water supply and habitat
Salt & Salinity Management	Increased brine/ salt disposal issues	Decreased damage to crop yields and farmland Reduced corrosive damage to equipment Improved water quality Increased local water supply	None identified	Increased available Bay-Delta supply and/or environmental flows Decreased energy consumption for water treatment and conveyance associated with imported water
Urban Runoff Management	Increased construction of individual projects Reduced in-stream flows Natural habitat and open space deterioration from reduced flows Increased air pollution from deteriorating lakebed surfaces	Decreased urban runoff Reduced pollutants to receiving waters Improved habitat and recreation Improved ability to meet water supply needs and decreased dependence on imported supply 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 Improved air quality through decreased GHG and other emissions associated with imported water 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 Changes in sediment loads and distribution Natural habitat and open space deterioration from reduced flows Increased air pollution from deteriorating lakebed surfaces	Reduced risk to property and life Reduced flood insurance costs Increased water supply, water quality, habitat and recreation 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 Reduced soil erosion	None identified	None identified
Economics Incentives	None identified	Increased project implementation	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 Limiting urban land use development	Reduced invasive species, and increased native and endangered species Improved passive recreation, education, water quality, water supply and flood control 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
Water-dependent Recreation	Increased human activity in natural areas Increased potential for water quality degradation Increased potential impacts to cultural resources Increased potential for disrupting or displacing wildlife	Increased water supply, water quality, flood control, habitat and recreation benefits Reduced overuse and improved quality of existing recreation facilities, enhancing the recreational experience Improved potential economic benefits to recreation-supporting businesses	None identified	None Identified

Strategy	Within IRWM Region		Inter-regional	
	Potential Impacts	**Potential Benefits**	**Potential Impacts**	**Potential Benefits**
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