- Difficulty providing flood control without interfering with groundwater recharge;
- Habitat and dry lakebed requirements to protect natural processes;
- Baseline flooding and sediment/erosion not well defined;
- No development guidelines for alluvial fans;
- Protection of habitat processes and sensitive habitats which rely on surface flow such as Antelope Valley Significant Ecological Areas (SEA), Piute Ponds, clay pans, mesquite woodlands, and dry lakes.

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

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

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

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

3.3.1.2 Poor Water Quality of Runoff

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

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

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

- Direct impacts such as filling of wetlands, riparian areas, drainages, and other natural waters;
- Generation of pollutants and sediment during and after construction;
- Alteration of flow regimes;
- Reduction of groundwater recharge by impervious surfaces and stormwater collector systems;
- Disruption of watershed-level aquatic functions including pollutant removal, flood water retention, and habitat connectivity.

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

3.3.1.3 Nuisance Water and Dry Weather Runoff

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

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

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

3.3.1.4 Difficulty in Providing Flood Management without Interfering with Groundwater Recharge

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

3.3.1.5 Habitat and Dry Lakebed Requirements to Protect Natural Processes

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

3.3.1.6 Baseline Flooding and Sediment/Erosion Not Well Defined

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

3.3.1.7 No Development Guidelines for Alluvial Fans

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

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

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

3.4 Environmental Resources

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

Unique Habitats

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

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

Habitat Conservation

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

SEAs are defined by Los Angeles County and generally encompass ecologically important or fragile areas that are valuable as plant or animal communities and often important to the preservation of threatened or endangered species. Preservation of biological diversity is the main objective of the SEA designation. SEAs are neither preserves nor conservation areas, but areas where Los Angeles County requires development to be designed around the existing biological resources (Los Angeles County 2006). Design criteria in SEAs include maintaining watercourses and wildlife corridors in a natural state, set-asides of undisturbed areas, and retaining natural vegetation and open space (Los Angeles County 1986).

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

Antelope Valley SEA

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

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

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

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

Joshua Tree Woodland SEA

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

San Andreas SEA

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

West Mojave Plan

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

Open Space Areas

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

Ecological Processes

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

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

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

3.4.1 Regional Environmental Resource Issues and Needs

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

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

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

As described earlier, because of its proximity to the Los Angeles Area, the Antelope Valley Region is subject to increasing demand for community development, recreation, and resource utilization. As described in Section 2.10, population in the Antelope Valley Region is expected to increase by

153 percent between 2010 and year 2035. Some of this growth will result in conversion of agricultural land, but more of this growth will occur in locations that are currently natural areas. Loss of both agricultural acreage and natural areas decreases the amount of open space in the Antelope Valley Region.

3.4.1.2 Protection of Threatened and Endangered Species

Pressures for growth and recreational activities in the Antelope Valley Region have been linked to significant declines in desert species such as the desert tortoise, Mojave ground squirrel and burrowing owl. Growth of urban areas results in loss of available or suitable habitat for sensitive species. For example, studies of the desert tortoise have shown a significant downward decline in the population from 1975 to 2000 related to urban growth (USFWS 2006).

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

3.4.1.3 Removal of Invasive Non-native Species from Sensitive Ecosystems

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

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

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

3.5 Land Use

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

Land uses within the Antelope Valley Region are provided for in local and regional policies and regulations, including the Los Angeles County General Plan (adopted in 1980), the Antelope Valley Areawide General Plan (adopted December 1986), Kern County General Plan (approved June 2004), the City of Palmdale General Plan (last updated 1993) and the City of Lancaster General Plan (last updated 1997). The Los Angeles County General Plan, last adopted in 1980; is currently being updated as part of a multi-year planning effort.

State legislation has also addressed the gap between land use planning and water resource management. In 2001, two water supply planning bills, Senate Bill 610 (SB 610) and Senate Bill 221 (SB 221), were enacted that require greater coordination and more extensive data to be shared between water suppliers and local land use agencies for large development projects and plans. SB 610, codified as Water Code sections 10910 and 10911, requires the public water system that may supply water to a proposed residential development project of more than 500 dwelling units (or a development project with similar water use), to prepare a water supply assessment for use by the lead planning agency in its compliance with CEQA. Such a water supply assessment (WSA) is performed in conjunction with the land use approval process associated with the project and must include an evaluation of the sufficiency of the water supplies available to the water supplier to meet existing and anticipated future demands. SB 221 requires projects which include tentative tract maps for over 500 dwelling units to obtain verification from the water system operator that will supply the project with water that it has a sufficient water supply to serve the proposed project and all other existing and planned future uses, including agricultural and industrial uses, in its area over a 20-year period, even in multiple dry years. SB 221 is intended as a "fail safe" mechanism to ensure that collaboration on finding the needed water supplies to serve a new large subdivision occurs before construction begins.

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

3.5.1 Regional Land Use Issues and Needs

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

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

3.5.1.1 Growing Public Demand for Recreational Opportunities

The Antelope Valley Region offers many recreational opportunities. The Antelope Valley Region has over 410 acres of developed park land including 27 parks, 22 softball fields, five baseball fields, 21 soccer fields and 17 tennis courts. In addition there are over 3,000 acres of natural park land and approximately 5,600 acres of upland and wetland natural areas at Piute Ponds. The Antelope Valley Region is also home to the 1,700 acre California Poppy Reserve and the Arthur B. Ripley Desert Woodland State Park. A portion of the Sierra Highway between Avenue H and the Kern County line is designated as a bikeway in the Antelope Valley Areawide Plan. Many recreational activities take place in the eastern, less populated areas of the Antelope Valley Region. BLM has identified the following types of recreational activities in the high desert: motorcycle activities, four wheel drive exploring, sightseeing, target shooting, hunting, experimental vehicles/aircraft, model rocketry, dry land wind sailing, endurance equestrian rides, hiking, mountain biking, bird watching, botany, rockhounding, camping, and picnicking.

The Antelope Valley Region is located only 90 miles from downtown Los Angeles; the proximity allows residents to utilize the Antelope Valley Region as their "recreational backyard." The high desert Antelope Valley Region has attracted nearly 2 million visitor-trips a year for off-highway vehicle recreation and nearly 1.5 million visitors to State and National Parks in the area (BLM 2005). BLM estimates that 85 percent of recreational visitors to the high desert are from the urban areas of Southern California. Demand for recreational resources in the Antelope Valley Region is particularly acute due to the lack of other similar resources near these urban areas and due to a decrease in recreational opportunities elsewhere. For example, since 1980 the number of acres of off-highway vehicle recreation areas has decreased by 48 percent in California. In the same time period off-highway vehicle registrations in California increased by 108 percent (BLM 2005). As population increases in Southern California and the Antelope Valley Region, there will be increasing pressure to maintain and expand the Antelope Valley Region's recreational opportunities.

3.5.1.2 Pressure for Growth in the Antelope Valley Region

Historically, land uses within the Antelope Valley Region have focused primarily on agriculture. This is partly dependent on the types of soils found in the area, the majority of which have been classified by the U.S. Soil Conservation Service as prime soils, which are best for agricultural production. Coupled with lower water costs and favorable climatic conditions, productivity has been maintained throughout the years, although pressures for developable land have also increased (Los Angeles County 1993). Approximately 73,000 acres of land in the Antelope Valley Region were in agricultural production in the early 1950s (USGS 1995). There was a surge in irrigated acreage when AVEK introduced SWP water to the western Antelope Valley Region in 1972 at prices competitive with the costs of pumping

ground water (LACDPW 1989). However, the overall trend for agricultural land use continued to decrease through the 1980s and 1990s. During the late 1980s, carrot farmers in the San Joaquin Valley undertook marketing efforts to assess the acceptability of a potential new product, "baby carrots," to the public. Response was so positive that within only a few years, an entirely new market was created. Demand for these new, smaller carrots was so high, and they were so profitable, that farmers expanded into the Antelope Valley Region and other desert regions in search of additional planting acreage. The profit margin of this crop is such that cost of water is not a limiting factor for carrot farmers.

Currently, land uses within the Antelope Valley Region are in transition as the predominant land use is shifting from agriculture to residential and industrial. The increase in residential land use is evident from the population growth in the Antelope Valley Region. As presented in Section 2.10, growth in the Antelope Valley Region was slow until 1985, but increased rapidly (approximately 1,000 percent of the average growth rate between the years 1956 to 1985) as these land uses shifted. Population projections for the Antelope Valley Region indicate that nearly 550,000 people will reside in the Antelope Valley Region by the year 2035, an increase of approximately 153 percent from the 2010 population (refer to Section 2.10.2 for population projections analysis). The two most populous cities in the Valley Region are Lancaster and Palmdale. As residential development continues to grow within the middle of the Antelope Valley Region, the agricultural operations are now found farther to the west and east than in previous decades.

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

Development in the Antelope Valley is also projected to be influenced by the construction of California’s high-speed rail. The rail is planned to head northbound from Los Angeles to Bakersfield through a station in Palmdale. With the addition of high-speed rail station connecting the Antelope Valley to the rest of the state, development pressures in the Region are likely to increase.

3.5.1.3 Local Culture and Values Could be Lost

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

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

Mining operations also contribute to the Antelope Valley Region’s industrial land uses. Mining, a large part of the history of the Antelope Valley, has been less prominent in recent years, yet there are several mines that still produce quantities of gold and silver. One such mine, the Golden Queen Mine (formerly known as the Silver Queen mine) is beginning a full scale recovery of gold, silver and aggregate within the next two years. A formal grand opening of the Golden Queen headquarters was completed in mid- October 2013 in the community of Mojave and many jobs are expected to come from the mining operation. Rio Tinto’s Borax mine in the community of Boron is considered one of the largest employers in the Antelope Valley aside from the U.S. Government, employing over

300 workers. Aside from these operations, rock and gravel quarrying is also conducted in the southeastern part of the Antelope Valley Region along the mountain foothills.

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

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

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

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

3.5.1.4 Dust Control

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

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

Other environmental impacts from soil disturbance and vegetation cover loss include increased dust storms and lifestyle disturbance. Dust storms can cause road closures, a decline of populations in rural areas, and loss of utility services among other things. As land use in the Antelope Valley changes impacts to these resources need to be considered and balanced. As flood control and surface flow runoff diversion projects are considered, impacts to the dry lakebeds also need to be considered. A lack of surface water flow to maintain the cryptobiotic surface layer will cause breakdown of the lakebed surface structure and add to regional dust storm issues.

3.5.2 AB 3030 Land Use Considerations

The following AB 3030 elements also concern land use planning within the Antelope Valley Region. A discussion of how these elements are addressed in this IRWM Plan is provided below.

Development of Relationships with State and Federal Regulatory Agencies. As discussed in Section 1.2 several State regulatory agencies have participated in the development of this IRWM Plan and thus a relationship with these agencies has been established.

Review of Land Use Plans and Coordination with Land Use Planning Agencies to Assess Activities which Create a Reasonable Risk of Groundwater Contamination. As discussed in Section 1.2 several land use planning departments and agencies have participated in the development of this IRWM Plan and thus a level of coordination has been established. Additionally, as part of this IRWM Plan, projects selected for implementation are assessed for water quality and land-use impacts and integration, as well as for consistency with local and regional General Plan documents.

3.6 Climate Change

3.6.1 Identification of Vulnerabilities

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

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

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

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

3.6.2 Prioritization of Vulnerabilities

The vulnerability issues identified in the climate change analysis discussed above were reviewed by the Climate Change Subcommittee, and some of the language was refined to better articulate the vulnerability issues of the Region. The revised vulnerability issues were then prioritized into three tiers based upon the perceived risk and importance of the issue. Those vulnerabilities posing the greatest risk of occurrence and resulting in the greatest impacts upon occurrence were ranked as the highest priority.

The list of prioritized vulnerabilities developed by the Workgroup is shown in Table 3-19, and they are discussed further below. Note that the vulnerability issues shown in Appendix H do not exactly match those in Table 3-19 since refinements and edits were made to the vulnerabilities during the prioritization process.

Table 3-19: Prioritized Regional Vulnerability Issues

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

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

- *Limited ability to meet summer demand and decrease in seasonal reliability*: The Region has high irrigation demands during summers. Increases in temperature due to climate change would likely increase this already high demand, as well as decrease supplies available.
- *Increases in flash flooding, with particular attention paid to the balance of flood control with habitat and lakebed needs which EAFB depends on*: As discussed previously, flooding is common in the Region, particularly in the foothill areas. The projected increase in storm intensity will likely increase the occurrence and intensity of flash flooding. This increase

will need to be managed carefully in light of habitats that depend on these seasonal flash floods and the needs of EAFB.

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

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

3.7 DAC Issues and Needs

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

- *DAC Water Supply, Quality and Flooding Data Final Draft TM* (August 2, 2013) – This document explains the methodology used to identify DAC areas in the Region with census and Geographical Information System (GIS) tools; develops maps for DACs; documents the DAC outreach efforts undertaken as a part of the 2013 IRWMP Updates; and outlines specific issues for DACs related to water supply, water quality, and flooding. Maps are included that further illustrate the scope of these issues. The document also provides a preview of monitoring studies that are needed to address data gaps in these three water-related areas.
- *DAC Monitoring Plan Final Draft TM* (September 25, 2013) – This document summarizes the water supply, water quality, and flood protection issues for DACs in the Region; develops monitoring objectives; and provides guidance for data dissemination and reporting.

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

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

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