3.13 WATER RESOURCES

This section describes the current water resources in the SCAG region, discusses the potential impacts of the 2012-2035 Regional Transportation Plan/Sustainable Communities Strategies (2012-2035 RTP/SCS or Plan) on water resources, identifies mitigation measures for the impacts, and evaluates the residual impacts.

REGULATORY FRAMEWORK

Federal

Clean Water Act (CWA). The CWA (33 U.S.C. Section 1251 et seq), formerly the Federal Water Pollution Control Act of 1972, was enacted with the intent of restoring and maintaining the chemical, physical, and biological integrity of the water of the United States. The CWA requires states to set standards to protect, maintain, and restore water quality through the regulation of point source pollution and certain non-point source discharges to waters of the U.S. Those discharges are regulated by the National Pollutant Discharge Elimination System (NPDES) permit process (CWA Section 402). In California, NPDES permitting authority is delegated to, and administered by, the nine Regional Water Quality Control Board (RWQCB), shown on **Map 3.13-1** located in Chapter 8.0 (Maps).

The U.S. Environmental Protection Agency (USEPA). The USEPA is the federal agency responsible for water quality management and administration of the CWA. The USEPA has delegated most of the administration of the CWA in California to the State Water Resources Control Board (SWRCB). Much of the responsibility for implementation of the SWRCB's policies is delegated to the RWQCB, as described below. USEPA conducts groundwater protection and contaminated site remediation programs, such as installation of groundwater cleanup systems.

Safe Drinking Water Act (SDWA). The SDWA ensures the quality of Americans' drinking water. The law requires actions to protect drinking water and its sources—rivers, lakes, reservoirs, springs and groundwater wells—and applies to public water systems serving 25 or more people. It authorizes the EPA to set national health-based standards for drinking water to protect against both naturally occurring and man-made contaminants. In addition, it oversees the states, municipalities and water suppliers that implement the standards.

USEPA standards are developed as a Maximum Contaminant Level (MCL) for each chemical or microbe. The MCL is the concentration that is not anticipated to produce adverse health effects after a lifetime of exposure, based upon toxicity data and risk assessment principles. EPA's goal in setting MCLs is to assure that even small violations for a period of time do not pose significant risk to the public's health over the long run. National Primary Drinking Water Regulations (NPDWRs, or primary standards) are legally enforceable standards that limit the levels of contaminants in drinking water supplied by public water systems.

Secondary standards are non-enforceable guidelines regulating contaminants that may cause cosmetic effects (such as skin or tooth discoloration) or aesthetic effects (such as taste, odor, or color) in drinking water. USEPA recommends secondary standards to water systems but does not require systems to comply. However, states may choose to adopt them as enforceable standards.

United States Army Corps of Engineers (Corps). Section 404 of the CWA obligates the Corps to issue permits for the movement of dredge and fill material into and from "waters of the United States." Additionally Section 404 requires permits for activities affecting hydrologically important areas. For example, alterations of wetlands, rivers or ephemeral creek beds resulting from construction activities require Section 404 permits.

The Federal Emergency Management Act (FEMA). The U.S. Congress passed the National Flood Insurance Act in 1968 and the Flood Disaster Protection Act in 1973 in order to restrict certain types of development on floodplains and provide for a national flood insurance program. The purpose of these programs is to reduce the need for large publicly funded flood control structures and disaster relief.

FEMA administers the National Flood Insurance Program. **Map 3.13-2**, located in Chapter 8.0 (Maps), identifies federally designated flood hazard zones in the SCAG region.

FEMA classifies flood hazard zones as follows:

- Zone A – Areas of 100-year flood. Base flood elevations and flood hazard factors are not determined;
- Zone B – Areas between the limits of the 100-year flood and 500-year flood; or certain areas subject to the 100-year flooding with average depth of less than one foot; or where the contributing drainage area is less than one square mile; or areas protected by levees from the base flood; and
- Zone C – Areas of minimal flooding not requiring flood insurance.

United States Bureau of Reclamation (USBR). The USBR operates the Colorado River project, an extensive network of dams, canals, and related facilities. The USBR serves as Watermaster, overseeing contentious water rights issues, and running drought protection programs.

State

The California State Water Resources Control Board (SWRCB). Section 303(d) of the CWA requires the SWRCB to list impaired water bodies in the State and determine total maximum daily loads (TMDLs) of pollutants or other stressors that are contributing excessively to these impaired waters. SWRCB is also responsible for granting water rights permits, approving water right transfers, investigating violations, and may reconsider or amend water rights.

As described above, the EPA has delegated most of the administration of the CWA in California to the SWRCB. In turn, much of the responsibility for the implementation of the SWRCB's policies is delegated to the nine RWQCBs. The nine RWQCBs develop and enforce water quality objectives and implementation plans.

Five RWQCBs have jurisdiction in the SCAG region:

- Los Angeles
- Lahontan
- Colorado River Basin
- Santa Ana
- San Diego

The Los Angeles, Lahontan, and Colorado River Basin RWQCBs also have jurisdiction in counties outside the SCAG region. The San Diego RWQCB has jurisdiction in portions of Orange County and Riverside County.

The federal CWA directs states to review water quality standards every three years and, as appropriate, modify and adopt new standards. CWA also regulates wastewater operation through state boards. CWA authorizes the EPA to administer requirements primarily to deal with the quality of effluent which may be discharged from treatment facilities, the recycling of residual solids generated in the process, the reuse of reclaimed water for irrigation and industrial uses to conserve potable water, and the nature of waste material (particularly industrial) discharged into the collection system.

The Department of Water Resources (DWR). The DWR is responsible for the planning, construction, and operation of State Water Project (SWP) facilities, including the California Aqueduct. It also sets conditions

on use of SWP facilities. In addition, DWR is responsible for statewide water planning, evaluating urban water management plans, overseeing dam safety and flood control, and transfer of certain water rights permits (e.g., pre-1914).

The California Department of Public Health (DPH). The DPH implements the SDWA. In addition, it oversees the operational permitting and regulatory oversight of public water systems. DPH requires public water systems to perform routine monitoring for regulated contaminants that may be present in their drinking water supply. To meet water quality standards and comply with regulations, a water system with a contaminant exceeding an MCL must notify the public and remove the source from service or initiate a process and schedule to install treatment for removing the contaminant. Health violations occur when the contaminant amount exceeds the safety standard (MCL) or when water is not treated properly. In California, compliance is usually determined at the wellhead or the surface water intake. Monitoring violations involve failure to conduct or to report in a timely fashion the results of required monitoring.

In addition, DPH conducts water source assessments, oversees water recycling projects, permits water treatment devices, certifies water system employees, promotes water system security, and administers grants under the State Revolving Fund and State bonds for water system improvements.

The California Department of Toxic Substances Control (DTSC). DTSC is responsible for oversight of hazardous substances and remediation of contaminated sites, including water sources in some cases.

The California Department of Fish and Game (CDFG). DFG has jurisdiction over conservation and protection of fish, wildlife, plants, and habitat. CDFG determines stream flow requirements in certain streams, acts as permitting agency for streambed alterations, presents evidence at water rights hearings on the needs of fish and wildlife, and enforces the California Endangered Species Act.

Porter Cologne Water Quality Control Act. The Porter Cologne Water Quality Control Act of 1967 (Water Code Section 13000 et seq.), requires the SWRCB and the nine RWQCBs to adopt water quality criteria to protect State waters. These criteria include the identification of beneficial uses, narrative to the applicable and numerical water quality standards, and implementation procedures.

The Porter-Cologne Water Quality Control Act authorizes the State boards to adopt, review, and revise policies for all waters of the state (including both surface and ground waters) and directs the regional boards to develop Basin Plans. The act also authorizes State boards to adopt Water Quality Control Plans. In the event of inconsistencies among State and regional board plans, the more stringent provisions apply.

Local

In addition to federal and State regulations, cities, counties, and water districts, in the SCAG region may also provide regulatory advisement regarding water resources. Many jurisdictions incorporate policies related to water resources in their municipal codes, development standards, or other regulations.

EXISTING SETTING

Climate

The climate of the SCAG region varies widely between the coastal and inland areas. Coastal areas are characterized by long, hot, dry summers, and short, mild, relatively wet winters, also known as Mediterranean climate, while inland areas experience more extreme temperatures and little precipitation. Storms that have the potential to produce significant amounts of precipitation and flooding are extra-tropical cyclones of North Pacific origin, which normally occur from December through March. As the large winter

storms move south over the ocean, they encounter colder air masses and the orographic effect of the mountains, producing widespread precipitation. These storms often last for several days. In addition to the extra-tropical cyclones, the SCAG region receives thunderstorms, which can occur at any time of the year. Comparatively, thunderstorms cover small areas, but result in high-intensity precipitation, usually lasting for shorter periods. Consequently, thunderstorms can produce flash flooding, which are more common than widespread flooding within the region. **Table 3.13-1** shows annual total precipitation throughout the SCAG region.

TABLE 3.13-1: AVERAGE TOTAL PRECIPITATION FOR SELECTED AREAS WITHIN THE SCAG REGION

	Inches												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Los Angeles (*Civic Center*) (1914-2007)	3.15	3.44	2.45	1.05	0.26	0.06	0.01	0.06	0.27	0.44	1.29	2.36	14.84
Mountain Pass (1955-2007)	0.92	0.91	0.89	0.48	0.27	0.20	1.04	1.23	0.59	0.54	0.68	0.63	8.38
El Centro (1948-2006)	0.46	0.32	0.24	0.06	0.02	0.00	0.09	0.34	0.24	0.29	0.19	0.34	2.59
Redlands (1927-2007)	2.51	2.72	2.22	1.15	0.41	0.10	0.07	0.17	0.33	0.66	1.12	1.87	13.33
Ventura (1948-2007)	2.96	3.40	2.55	0.97	0.23	0.03	0.01	0.02	0.23	0.42	1.62	2.14	14.58
Laguna Beach (1928-2007)	2.52	2.82	2.07	0.99	0.25	0.11	0.02	0.07	0.26	0.49	1.24	1.93	12.77
Eagle Mountain (1948-2007)	0.50	0.44	0.34	0.09	0.05	0.03	0.26	0.70	0.38	0.23	0.19	0.41	3.62

SOURCE: Western Regional Climate Center, 2001, available at: *www.wrcc.dri.edu*, accessed August 9, 2011.

Most precipitation within the SCAG region occurs as rainfall, although snowfall is common at higher elevations. Historically, the region receives most of its rainfall during the month of January and the least of its rainfall during the month of June. For the entire region, annual rainfall can range from 2 to 5 inches inland, 10 to 18 inches on the coastal plains, and 20 to 40 inches in the mountains. The region is also subject to multi-year cycles of wet (El Niño) and dry (La Niña) weather.

Hydrologic Regions

The Department of Water Resources (DWR) has divided the state into ten hydrologic regions, corresponding to the State's major water drainage basins. Of the ten hydrologic regions, four are – in whole or in part – within the SCAG region: Central Coast (part of Ventura County), South Lahontan (parts of Los Angeles and San Bernardino counties), South Coast (Orange County, along with parts of Los Angeles, Ventura, San Bernardino, and Riverside counties), and Colorado River (parts of Imperial, Riverside, and San Bernardino counties). These four regions are described below.

Central Coast Hydrologic Region. The Central Coast Hydrologic Region is located, as its name implies, along the central coast of California, extending from Southern San Mateo County in the north to Santa Barbara in the south and from the Pacific Ocean in the west to the edge of the Central Valley in the east. It includes all of Santa Cruz, Monterey, San Luis Obispo, and Santa Barbara counties, and parts of San Benito, San Mateo, Santa Clara, and Ventura counties. The most significant geological features are the Coast Range and the Santa Barbara Coastal Plain.

The Coastal Branch California Aqueduct – part of the SWP – brings approximately 32,000 acre-feet of water annually into Southern California through the Central Coast Region.[1] This hydrologic region currently uses more water resources than it gains throughout the year. Groundwater is the major source of water in the region, which experiences annual reductions in its groundwater storage. The region, therefore, battles the threat of saltwater intrusion into its aquifers, a problem documented as far back as the 1930s.[2]

South Lahontan Hydrologic Region.[3] The South Lahontan Hydrologic Region is located in the southeast portion of California and is characterized by desert, sand dunes, and dry lakes. The northern half of the region includes Mono Lake, Owens Valley, Panamint Valley, Death Valley, and the Amargosa River Valley. The Mojave Desert occupies the southern half of the hydrologic region, and is characterized by many small mountain ranges and valleys with playas, or dry lakes. The southern half falls within the SCAG region in San Bernardino and Los Angeles counties.

The Los Angeles Aqueduct is the region's major water development feature. The initial 223-mile long aqueduct was completed by the Los Angeles Department of Water and Power (LADWP) and began diverting water from Owens Valley into the City of Los Angeles. The aqueduct was extended 115 miles in 1940 and 137-miles in 1970. The Los Angeles Aqueduct system passes through 12 hydropower plants on its way to Los Angeles. The annual energy generated is more than 1 billion kilowatt-hours (enough to supply the energy demand of approximately 220,000 homes).

As shown in **Table 3.13-2**, five water agencies in the southwest portion of this region have contracts with the State Water Project (SWP) for a total of about 220,000 acre-feet of surface water annually. The East Branch of the SWP is used to recharge groundwater in the Mojave River Valley.

TABLE 3.13-2: WATER AGENCIES IN THE SOUTH LAHONTAN HYDROLOGIC REGION

Water Agency	State Water Project Description
Mojave Water Agency (MWA)	MWA relies predominantly from groundwater. It also receives water as one of the 29 SWP contractors, per their integrated Regional Water Management Plan update (IRWMP).
Antelope Valley East Kern Water Agency (AVEK)	Provides water to 5 major municipal agencies and 16 smaller water service agencies.
Palmdale Water District (PWD) and Little Rock Irrigation District (LRID)	Littlerock Reservoir has 2,700 acre-feet capacity and provides water to LRID. Water from Littlerock Reservoir is released into PWD's Lake Palmdale (a 42,000 acre-foot lake reservoir).
Arrowhead Lake Association	Lake Arrowhead, owned by Arrowhead Lake Association is a 48,000 acre-foot reservoir providing recreational opportunities and water to Arrowhead Woods property owners.

SOURCE: DWR, State Water Project Analysis Office website, available at: *http://www.water.ca.gov/swpao/wsc.cfm*, accessed August 11, 2011.

South Coast Hydrologic Region.[4] The South Coast Hydrologic Region compromises the southwest portion of the state and is California's most urbanized and populous region. The topography includes a series of nearly flat coastal plains and valleys, broad interior valleys, and several mountains of low and moderate elevation. The region extends from the Santa Barbara-Ventura County line south to San Diego and the US international border with Mexico. Most of this area is within the SCAG region, including portions of Ventura, Orange, Los Angeles, San Bernardino, and Riverside Counties. Several prominent rivers exist

[1] DWR. California Water Plan Update. Central Coast Section, Volume 3, 2009, available at: *http://www.waterplan.water.ca.gov/docs/cwpu2009/0310final/v3_centralcoast_cwp2009.pdf*, accessed August 10, 2011.

[2] *Ibid.*

[3] DWR. California Water Plan Update. South Lahontan Section, Volume 3, 2009, available at: *http://www.waterplan.water.ca.gov/docs/cwpu2009/0310final/v3_southlahontan_cwp2009.pdf*, accessed August 10, 2011.

[4] DWR, California Water Plan Update, South Coast Section, Volume 3, 2009, available at: *http://www.waterplan.water.ca.gov/docs/cwpu2009/1009prf/3-sc_pre-final_pdf_13oct09.pdf*, accessed August 10, 2011.

within the region including Ventura River, Santa Clara River, Los Angeles River, San Gabriel River, Santa Ana River, San Jacinto Rivers, and Santa Margarita River.

Water Supply and Use in the South Coast Hydrologic Region. The region has a diverse mix of both local and imported water supply sources. Local water sources include water recycling, groundwater storage and conjunctive use, conservation, brackish water desalination, water transfer and storage, and infrastructure enhancements. The region imports water through the SWP, the Colorado River Aqueduct (CRA), and the Los Angeles Aqueduct (LAA). These resources allow the region flexibility in managing supplies and resources in wet and dry years.

The Metropolitan Water District of Southern California (MWD) wholesales the water to a consortium of 26 member agencies, including 14 cities, 11 municipal water districts, and one county authority that serves nearly 19 million people living in six counties stretching from Ventura to San Diego. MWD imported an average of 1 million acre-feet of water per year from the SWP from 1995 to 2010, and just under 1 million acre-feet per year from the CRA during the same time period. [5]

Colorado River Hydrologic Region.[6] The Colorado River Hydrologic Region covers the southeast portion of California and contains 12 percent of the state's land area. The Colorado River, the main tributary of this hydrologic region, forms most of the region's eastern boundary and international boundary with Mexico. The region includes all of Imperial County, the eastern two-thirds of Riverside County, the southeastern one-third of San Bernardino County and about one-fourth of San Diego County. It has a variety of arid desert terrain that includes many bowl-shaped valleys, broad alluvial fans, sandy washes, and hills and mountains.

Water Supply and Use in the Colorado River Hydrologic Region. About 85 percent of the region's urban and agricultural water supply comes from surface water deliveries from the Colorado River. Water from the river is delivered to the region via the All American and Coachella canals, local diversions, and the Colorado River Aqueduct by means of an exchange for SWP water. The Colorado River is an interstate and international river whose use is apportioned among the seven Colorado River Basin states and Mexico by a complex body of statues, decrees, and court decisions known collectively as the "Law of the River." Local surface water, groundwater, and the SWP provide the reminder of water to the region. In addition, many of the alluvial valleys in the regions are underlain by groundwater aquifers that are the sole source of water for many local communities. However, some alluvial valleys contain groundwater of such poor quality it is not suitable for potable uses.

Surface Hydrology

Surface water hydrology refers to surface water systems, including watersheds, floodplains, rivers, streams, lakes and reservoirs, and the inland Salton Sea.

Watersheds. Watersheds refer to areas of land, or basin, in which all waterways drain to one specific outlet, or body of water, such as a river, lake, ocean, or wetland. Watersheds have topographical divisions such as ridges, hills or mountains. All precipitation that falls within a given watershed, or basin, eventually drains into the same body of water.

There are 20 major watersheds within the SCAG region (**Map 3.13-3** located in Chapter 8.0 (Maps)), all of which are outlined and shaped by the various topographic features of the region. Given the physiographic characteristics of the SCAG region, most of the watersheds are located along the Transverse and Peninsular Ranges, and only a small number are in the desert areas (Mojave and Colorado Desert). Below is a summary

[5] MWD, Regional Urban Water Management Plan, November 2010.
[6] DWR, California Water Plan Update, Colorado River Section, Volume 3, 2009, available at: *http://www.waterplan.water.ca.gov/docs/cwpu2009/1009prf/3-rr_cr_pre-final_pdf_13oct09.pdf*, accessed August 10, 2011.

of each of the major watersheds, by county, with their corresponding Hydrologic Unit Code (HUC), which is assigned by the US Geological Survey.

Antelope-Fremont Valleys Watershed (HUC 18090206). The Antelope-Fremont Valley Watershed straddles Kern and Los Angeles County, and is bordered on the southwest by the San Gabriel Mountains, on the northwest by the Tehachapi Mountains, and on the east by a series of hills and buttes that follow the San Bernardino County line. Numerous streams originate in the mountains and foothills surrounding the valley and flow across the valley floor before eventually pooling in the dry lakes adjacent to the county line. It's located in the South Lahontan Hydrologic region.

The watershed drains a total of 12,000 square miles within Los Angeles County. Three of the major tributaries are Big Rock Creek and Little Rock Creek that run from the San Gabriel Mountains and Oak Creek that runs from the Tehachapi Mountains. The Los Angeles Aqueduct also runs 180 miles through the watershed. Reservoirs include the California Aqueduct, Fairmont Reservoir, and Littlerock Reservoir. Major cities within the Los Angeles County portion of the watershed include Lancaster and Palmdale.

Los Angeles River Watershed (HUC 18070105). The Los Angeles River watershed is bounded by the Santa Susanna Mountains to the west, the San Gabriel Mountains to the north and east, and the Santa Monica Mountains and Los Angeles coastal plain to the south. The Los Angeles River is born at the confluence of Bell Creek and Calabasas Creek in the San Fernando Valley. It drains eastward from its headwaters to the northern corner of Griffith Park where the channel then turns southward through the rocky bottleneck of Glendale Narrows. After crossing the coastal plain, the river finally drains into San Pedro Bay near Long Beach. The drainage area of Los Angeles Watershed is 834 square miles and the entire watershed falls within the South Coast Hydrologic Region.

Major tributaries of the watershed are Burbank Western Channel, Pacoima Wash, Tujunga Wash, and Verdugo Wash in the San Fernando Valley and the Arroyo Seco, Compton Creek, and Rio Hondo south of the Glendale Narrows. There are numerous lakes and reservoirs in the watershed, including Big Tujunga Reservoir, Chatsworth Reservoir, Encino Reservoir, Echo Park Lake, Los Angeles Reservoir, and Silverlake Reservoir. The upper 57 percent of the watershed is covered by forest and open space, while the remaining 43 percent is highly developed with residential and urban use. Major cities within the watershed include Long Beach and Los Angeles.

San Gabriel River Watershed (HUC 18070106). The San Gabriel Watershed lies mostly in Los Angeles County. It is bounded by the San Gabriel Mountains to the north, Puente-Chino Hills to the southeast, the division of the Los Angeles River from the San Gabriel River to the west, and the Pacific Ocean to the south. From the mouth of San Gabriel Canyon in the city of Azusa, the San Gabriel River flows south across the San Gabriel Valley and passes through Whittier Narrows, a natural gap in the hills that form the southern boundary of the San Gabriel Valley. It continues across the Pacific Coastal Plain, through the cities of Pico Rivera, Downey, Bellflower, and Lakewood to eventually meet the Pacific Ocean. Geology of the San Gabriel Valley creates an unusual flow pattern that keeps the San Gabriel River along the western edge of the watershed for most of its length. Major tributaries are San Jose Creek, San Dimas Creek, and Walnut Creek. The watershed falls within the South Coast Hydrologic Region.

The watershed drains 640 square miles. Twenty-six percent of the watershed is developed, leaving sixty-four percent as open space. The river system runs through lands in the Angeles National forest, as well as highly urbanized lands in the San Gabriel, Walnut, and Pomona Valleys. Major cities include Covina, Pomona, Whittier, Los Angeles, and Long Beach.

Santa Monica Bay Watershed (HUC 18070104). The majority of Santa Monica Bay Watershed is in Los Angeles County, and contained within the South Coast Hydrologic Region. In the north, the watershed reaches eastward from the Santa Monica Mountains to downtown Los Angeles. From there, it extends south

and west across the Los Angeles plain to include the area east of Ballona Creek and north of the Baldwin Hills. South of Ballona Creek the natural drainage area is a narrow strip of wetlands between Playa del Rey and Palos Verdes. The watershed is comprised of many sub-watersheds that cover broad alluvial valleys, coastal dunes, coastal mountains, and a number of deep and narrow canyons that flow to the Pacific Ocean. The major sub-watersheds include Ballona Creek, Malibu Creek, Topanga Canyon Creek, and Solstice Creek Watersheds. The total drainage area is 414 square miles. Santa Monica Bay Watershed is one of the nation's most highly urbanized watersheds. Major cities within the watershed include Agoura Hills, Calabasas, Malibu, Los Angeles, Culver City, Beverly Hills, Inglewood, Santa Monica, and West Hollywood.

Newport Bay Watershed (HUC 18070204). The Newport Bay Watershed is sandwiched between the San Joaquin Hills to the north and the Santiago Hills to the south, which force surface flow onto the central, flat Tustin plain. The Pacific Ocean comprises 13.5 miles of the watershed's western border. Coastal foothills accent the alluvial and coastal plains between the two mountain ranges. In total, the watershed drains 150 square miles, which encompasses all water draining to Newport Bay. Peters Canyon Wash, San Diego Creek, and Santa Ana Delhi Channel are the watershed's major tributaries. Newport Bay Watershed falls within the South Coast Hydrologic Region.

Land in the Newport Bay Watershed is highly developed. Forty-seven percent of the landscape is urban, four percent agriculture, and forty-nine percent open space. Major cities include Santa Ana, Tustin, Irvine, Costa Mesa, and Newport Beach.

Seal Beach - Westminster Watershed (HUC 1807020). The Westminster Watershed lies on a flat coastal plain in the northwestern corner of Orange County. Three main tributaries drain a total of 74 square miles in the watershed. The Los Alamitos Channel drains into the San Gabriel River, the Bolsa Chica Channel empties into the Anaheim Bay-Huntington Harbor complex, and the East Garden Grove-Wintersburg Channel drains through Bolsa Bay into Huntington Harbor. The Seal Beach – Westminster Watershed is located in the South Coast Hydrologic Region.

The Westminster Watershed is almost entirely urbanized with residential and commercial development. The watershed comprises portions of the cities of Anaheim, Cypress, Fountain Valley, Garden Grove, Huntington Beach, Los Alamitos, Santa Ana, Seal Beach, Stanton, and Westminster.

Aliso-San Onofre Watershed (HUC 18070301). The Aliso-San Onofre Watershed lies within Orange County, in the South Coast Hydrologic Region. The major waterway is Aliso Creek, which drains to the Pacific Ocean. Aliso Creek is one of three significant waterbodies in the watershed, in addition to Lake Mission Viejo and San Juan Creek. This watershed is highly urbanized, with over fifty percent of the land area classified as urban.

Mojave Watershed (HUC 18090208). The Mojave Watershed, comprised of high desert, mountains, and valleys, is located entirely within San Bernardino County and within the South Lahontan Hydrologic Region. It drains a total of 1,600 square miles. The San Bernardino, Granite, and Barstol Mountains form the southwestern borders of the watershed. Mountains in this region are the highest and include Butler Peak, which is the highest point with an elevation of 8,500 feet. The San Bernardino Mountains are the headwaters for the Mojave River system which is born of Deep Creek and West Fork, the two perennial tributaries to the Mojave River. The Mojave River traverses the watershed for 120 miles until its terminus at Soda Lake and Silver Dry Lake. Flow is from the southwest to the northeast across the watershed.

Land in the Mojave Watershed is largely recreational areas and rangeland. A small amount of the land is irrigated agricultural land and 'rural urban' areas. Major population centers in the watershed include Victorville, Hesperia, Apple Valley, and Adelanto.

Southern Mojave Watershed (HUC 18100100). The Southern Mojave Watershed lies in San Bernardino and Riverside Counties and within the Colorado River Hydrologic Region. It is bordered by a mountainous region of the Mojave Watershed to the north. The watershed is comprised of mountains, valleys, and dry lakes. A significant geographical feature of the region is the Salton Trough, which contains the Salton Sea and Imperial and Coachella Valleys. The two valleys are separated by the Salton Sea, which covers the lowest area of the depression. Major tributaries include Antelope Creek, Arrastre Creek, Homer Wash, and Pipes Canyon Creek.

Santa Ana River Watershed (HUC 18070203). The Santa Ana River Watershed includes much of Orange County, the northwestern corner of Riverside County, the southwestern corner of San Bernardino County, and a small portion of Los Angeles County, draining a total of 2,065 square miles. The Watershed is located within the South Coast Hydrologic Region. The watershed is bounded on the south by the San Jacinto Watershed, on the east by the Salton Sea and Southern Mojave watersheds, and on the north and west by the Mojave and San Gabriel watersheds. The highest elevations in the watershed occur in the San Bernardino Mountains at San Gorgonio Peak at 11,485 feet and the eastern San Gabriel Mountains at Mt. Baldy at 10,080 feet. Surface waters start in this mountainous zone and flow northeast to southwest. Further downstream, the Santa Ana Mountains and the Chino Hills form a topographic high before the river flows onto the Coastal Plain in Orange County and outlets into the Pacific Ocean in Huntington Beach. Major tributaries to the Santa Ana River include San Timoteo Creek and Santiago Creek.

Santa Ana Watershed is home to the most developed portion of Orange County and much of the built-up portions of Riverside and San Bernardino Counties. Major cities include Santa Ana, Rancho Cucamonga, Corona, and San Bernardino.

San Jacinto Watershed (HUC 18070202). The San Jacinto River Watershed covers approximately 770 square miles and is located approximately 80 miles southeast of Los Angeles. It extends from the San Jacinto Mountains in the north and east to Lake Elsinore in the west. Most of the Watershed (99.75 percent) falls within Riverside County, while the remaining portion extends into an undeveloped portion of Orange County.

Calleguas Creek Watershed (HUC 18070103). Calleguas Creek and its tributaries are located in southeast Ventura County and a small portion of western Los Angeles County. The watershed falls within the South Coast Hydrologic Region. Calleguas Creek drains an area of approximately 343 square miles from the Santa Susana Pass in the east to Mugu Lagoon in the southwest. The watershed drains from the mountains in the northeast part of the watershed toward the southwest where it flows through the Oxnard Plain before emptying into the Pacific Ocean through Mugu Lagoon. The Santa Susana Mountains, South Mountain, and Oak Ridge form the northern boundary of the watershed; the southern boundary is formed by the Simi Hills and Santa Monica Mountains.

The watershed is characterized by three major sub-watersheds: the Arroyo Simi/Las Posas in the north, Conejo Creek in the south, and Revolon Slough in the west. Major tributaries of Callegua Creek include Arroyo Simi, Arroyo Conejo, and Arroyo Santa Rosa. The watershed includes the cities of Simi Valley, Moorpark, Thousand Oaks, and Camarillo. Most of the agriculture is located in the middle and lower watershed with the major urban areas (Thousand Oaks and Simi Valley) located in the upper watershed. The current land use in the watershed is approximately 26 percent agriculture, 24 percent urban, and 50 percent open space.

Santa Clara River Watershed (HUC 18070102). Santa Clara River and its tributaries run through Ventura County and the northwestern part of Los Angeles County, and are located in the South Coast Hydrologic Region. The portion of the watershed within Los Angeles County is referred to as Upper Santa Clara and the portion within Ventura County is referred to as Lower Santa Clara. Santa Clara River drains an area of 1,634 square miles from the mountains in northern Los Angeles County to the Pacific Ocean. The watershed drains

from Pacifico Mountain in the San Gabriel Mountains westward through the Angeles National Forest System before emptying into the Pacific Ocean near the City of Ventura. Ninety percent of the watershed consists of rugged mountains. The remainder of the watershed consists of valley floor and coastal plains.

Land use in the Santa Clara Watershed is 62 percent open space, 29 percent agriculture, and 9 percent urban. Major cities include Acton, Santa Clarita, Fillmore, Santa Paula, Ventura, and Oxnard.

Ventura River Watershed (HUC 18070101). Ventura River Watershed lies entirely in Ventura County. Rugged mountains comprise the upper basin and give way to flat valleys in the lower downstream areas. Nearly half of the watershed is in Los Padres National Forest. Ventura Watershed drains 223 square miles, from its headwaters in the mountains to its outlet in the Pacific Ocean. The Ventura River bisects the watershed, flowing from north to south. Major tributaries are Matilija Creek, North Fork Matilija Creek, San Antonio Creek, Coyote Creek, and Cañada Larga. Lake Casitas and Matijila Reservoir are two major reservoirs within the watershed. The Ventura River watershed falls within the South Coast Hydrologic Region.

Land in Ventura Watershed is largely open space with little urbanization. Eighty-seven percent is open space, ten percent agriculture, and three percent urban. Major communities are Ojai, Oak View, and the western portion of the City of San Buenaventura.

Lower Colorado Watershed (HUC 15030107). The Lower Colorado Watershed straddles the border between Imperial County in California and Yuma County in Arizona, and extends into the State of Sonora in northern Mexico.

The lower Colorado River is heavily dammed for agricultural, municipal, and industrial uses, including the Imperial, Laguna, and Morelos Dams. The Imperial Dam provides water for the All American Canal, which carries over five-million acre-feet of water into California every year, mostly for agricultural uses.

Salton Sea Watershed (HUC 18100200). Immediately west of the Lower Colorado Watershed, Salton Sea Watershed extends from just north of the Salton Sea, in Riverside County, to the Mexicali Valley, near the US-Mexico border, in Imperial County. This watershed makes up the lower part of the Coachella Valley, bordered by mountains to the east and west, and extending south to the Colorado Delta in the Sea of Cortez. The main geographic feature in this watershed is California's largest lake, the Salton Sea, an inland saltwater lake approximately 380 square miles in size.

In 2001, the Imperial Valley Irrigation District, the largest recipient of Colorado River water in California, agreed to a plan to transfer up to 200,000 acre-feet of water per year to San Diego for municipal water uses.

Imperial Reservoir Watershed (HUC 15030104). North of the Lower Colorado Watershed is Imperial Reservoir Watershed, which lies on both sides of the California-Arizona border along the Colorado River. It extends north to Lake Havasu, created by the construction of Parker Dam, which was completed in 1938.

Floodplains. Much of the SCAG region's urbanized area lies within alluvial fan floodplains. Since the region is so mountainous, development often occurs in the valleys, and newer development extends into the foothills of those mountains. Floodplains in Southern California are a unique hazard area; although flooding from rain-swollen rivers can occur in valley bottoms, a more common floodplain hazard is debris flow. Debris flows are common in mountain foothill areas, especially after fire and heavy rain events, when wet, heavy soils and rock slide down steep slopes and into valleys below. Areas with a history of such slides can often be identified by sloping, fan-shaped landforms at the base of mountains and hillsides.

Rivers. Because the climate of Southern California is predominantly arid, many of the natural rivers and creeks are intermittent or ephemeral, drying up in the summer or flowing only after periods of precipitation.

For example, annual rainfall amounts vary depending on elevation and proximity to the coast. Some waterways such as Ballona Creek and the Los Angeles River maintain a perennial flow due to agricultural irrigation and urban landscape watering.

Major natural streams and rivers in the SCAG region include the Ventura River, Santa Clara River, Los Angeles River, San Gabriel River, Santa Ana River, San Jacinto River, and upstream portions of the Santa Margarita River.

The Ventura River is fed by Lake Casitas on the western border of Ventura County and empties out into the ocean. It is the northern-most river system in Southern California, supporting a large number of sensitive aquatic species. Water quality decreases in the lower reaches due to urban and industrial impacts.

The Santa Clara River flows through the center of Ventura County and remains in a relatively natural state. Threats to water quality include increasing development in floodplain areas, flood control measures such as channeling, erosion, and loss of habitat.

The Los Angeles River is a highly disturbed system due to the flood control features along much of its length. Due to the high urbanization in the area around the Los Angeles River, runoff from industrial and commercial sources as well as illegal dumping contribute to reduce the channel's water quality.

The San Gabriel River is similarly altered with concrete flood control embankments and impacted by urban runoff.

The Santa Ana River drains the San Bernardino Mountains, cuts through the Santa Ana Mountains, and flows onto the Orange County coastal plain. Recent flood control projects along the river have established reinforced embankments for much of the river's path through urbanized Orange County.

The Santa Margarita River begins in Riverside County, draining portions of the San Jacinto Mountains and flowing to the ocean through northern San Diego County.

Complete lists of surface water resources within the SCAG region, along with the beneficial uses associated with them, are contained in each of the five Basin Plans prepared by the Regional Water Quality Control Boards of the region.[7,8,9,10,11]

Lakes and Reservoirs. Since Southern California is a semi-arid region, many of its lakes are drinking water reservoirs, created either through damming of rivers, or manually dug and constructed. Reservoirs also serve as flood control for downstream communities. Some of the most significant lakes, including reservoirs, in the SCAG region are Big Bear Lake, Lake Arrowhead, Lake Casitas, Castaic Lake, Pyramid Lake, Lake Elsinore, Diamond Valley Lake, and the Salton Sea.

Big Bear Lake is a reservoir in San Bernardino County, in the San Bernardino Mountains. It was created by a granite dam in 1884, which was expanded in 1912, and holds back approximately 73,000 acre-feet of water. The lake has no tributary inflow, and is replenished entirely by snowmelt. It provides water for the community of Big Bear, as well as nearby communities.

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[7]Central Valley Basin Plan, available at: *http://www.swrcb.ca.gov/rwqcb5/water_issues/basin_plans/*, accessed August 9, 2011.
[8]Lahontan Basin Plan, available at: *http://www.swrcb.ca.gov/lahontan/water_issues/programs/basin_plan/*, accessed August 9, 2011.
[9]Los Angeles Basin Plan, available at: *http://www.swrcb.ca.gov/rwqcb4/water_issues/programs/basin_plan/*, accessed August 9, 2011.
[10]Santa Ana Basin Plan, available at: *http://www.waterboards.ca.gov/santaana/water_issues/programs/basin_plan/index.shtml*, accessed August 9, 2011.
[11]Colorado River Basin Plan, available at: *http://www.swrcb.ca.gov/rwqcb7/*, accessed August 9, 2011.

Lake Arrowhead is also in San Bernardino County, at the center of an unincorporated community also called Lake Arrowhead. The lake is a man-made reservoir, with a capacity of approximately 48,000 acre-feet. In 1922, the dam at Lake Arrowhead was completed, with the intention of turning the area into a resort for wealthy Angelinos. It is now used for recreation and as a potable water source for the surrounding community.

Lake Casitas is in Ventura County, and was formed by the Casitas Dam on the Coyote Creek just before it joins the Ventura River. The dam, completed in 1959, holds back nearly 255,000 acre-feet of water. The water is used for recreation, as well as drinking water and irrigation.

Castaic Lake is on the Castaic Creek, and was formed by the completion of the Castaic Dam. The lake is in northwestern Los Angeles County. It is the terminus of the West Branch of the California Aqueduct, and holds over 323,000 acre-feet of water. Much of the water is distributed throughout northern Los Angeles County, though some is released into Castaic Lagoon, which feeds Castaic Creek. The creek is a tributary of the Santa Clara River.

Pyramid Lake is just above Castaic Lake, and water flows from Pyramid into Castaic through a pipeline, generating electricity during the day. At night, when electricity demand and prices are low, water is pumped back up into Pyramid Lake. Pyramid Lake is on Piru Creek, and holds 180,000 acre-feet of water.

Lake Elsinore is in the City of Lake Elsinore, in Riverside County. The lake has dried and up and been replenished throughout the last century, it is now managed to maintain a consistent water level, with outflow piped into the Temescal Canyon Wash.

Diamond Valley Lake is Southern California's newest and largest reservoir. Located in Riverside County, it was a project of the Metropolitan Water District (MWD) to expand surface storage capacity in the region. A total of three dams were required to create the lake. Completed in 1999, it was full by 2002, holding 800,000 acre-feet of water, effectively doubling MWD's surface water stores in the region. The lake is connected to the existing water infrastructure of the SWP. The lake is situated at approximately 1,500 feet above sea level, well above most of the users of the lake's water; this enables the lake to also provide hydroelectric power, as water flows through the lowest dam.

The Salton Sea is California's largest lake, nearly 400 square miles in size. The basin is over 200 feet below sea level, and has flooded and evaporated many times over, when the Colorado overtops its banks during extreme flood years. This cycle of flooding and evaporation has re-created the Sea several times over at least the last thousand years. Its most recent formation occurred in 1905 after an irrigation canal was breached and the Colorado River flowed into the basin for 18 months, creating the current lake.

The principle inflow to the Sea is from agricultural drainage, which is high in dissolved salts; approximately four million tons of dissolved salts flow into the Sea every year. The evaporation of the Sea's water, plus the addition of highly saline water from agriculture, has created one of the saltiest bodies of water in the world. The Sea has been a highly successful fishery and is a habitat and migratory stopping and breeding area for 380 different bird species; however, the high, and ever-increasing, salinity of the Sea is a continual challenge for the fish and birds that inhabit it.

The 2001 agriculture-to-urban water transfer agreement between the Imperial Valley Irrigation District and San Diego will have significant implications for the Salton Sea, and the watershed. The reduction in agricultural water flowing into the Sea will significantly lower water levels, shrinking the overall size of the Sea.

The major surface waters in this section are presented in **Table 3.13-3**, as well as shown on **Map 3.13-4** located in Chapter 8.0 (Maps).

TABLE 3.13-3: MAJOR SURFACE WATERS

Wetlands	Rivers, Creeks, and Streams	Lakes and Reservoirs
LOS ANGELES BASIN (REGION 4)		
Ventura River Estuary	Sespe Creek	Lake Casitas
Santa Clara River Estuary	Piru Creek	Lake Piru
McGrath Lake	Ventura River	Pyramid Lake
Ormond Beach Wetlands	Santa Clara River	Castaic Lake
Mugu Lagoon	Los Angeles River	Bouquet Reservoir
Trancas Lagoon	Big Tahunga Canyon	Los Angeles Reservoir
Topanga Lagoon	San Gabriel River	Chatsworth Reservoir
Los Cerritos Wetlands		Sepulveda Reservoir
Ballona Lagoon		Hansen Reservoir
Los Angeles River		San Gabriel Reservoir
Ballona Wetlands		Morris Reservoir
		Whittier Narrows Reservoir
		Santa Fe Reservoir
LAHONTAN BASIN (REGION 6)		
	Mojave River	Silver Lake
	Amargosa River	Silverwood Lake
		Mojave River Reservoir
		Lake Arrowhead
		Soda Lake
COLORADO RIVER BASIN (REGION 7)		
	Colorado River	Lake Havasu
	Whitewater River	Gene Wash Reservoir
	Alamo River	Copper Basin Reservoir
	New River	Salton Sea
		Lake Cahulla
SANTA ANA BASIN (REGION 8)		
Hellman Ranch Wetlands	Santa Ana River	Prado Reservoir
Anaheim Bay	San Jacino River	Big Bear Lake
Bolsa Chica Wetlands		Lake Perris
Huntington Wetlands		Lake Matthews
Santa Ana River		Lake Elsinore
Laguna Lakes		Vail Lake
San Juan Creek		Lake Skinner
Upper Newport Bay		Lake Hemet
San Joaquin Marsh		
Prado Wetlands		
SAN DIEGO BASIN (REGION 9)		
	Santa Margarita River	Vail Lake
	Aliso Creek	Skinner Reservoir

SOURCES: California State Water Resources Control Board, *Regional Board Water Quality Control Plans (Basin Plans)*, available at: http://www.swrcb.ca.gov/plans_policies/, accessed August 11, 2011.

Groundwater Hydrology

Groundwater is the part of the hydrologic cycle representing underground water sources. Groundwater is present in many forms: in reservoirs, both natural and constructed, in underground streams, and in the vast movement of water in and through sand, clay, and rock beneath the earth's surface. The place where groundwater comes closest to the surface is called the water table, which in some areas may be very deep, and in others may be right at the surface. Groundwater hydrology is, therefore, connected to surface water hydrology, and cannot be treated as a separate system. One example of this is surface streams that are partly filled by groundwater. When that groundwater is pumped out and removed from the system, the stream levels will fall, or even dry up entirely, even though no water was removed from the stream itself.

Groundwater represents most of the SCAG region's fresh water supply, making up approximately 30 percent of total water use, depending on precipitation levels.[12] Groundwater basins are replenished mainly through infiltration – precipitation soaking into the ground and making its way into the groundwater. Two threats to the function of this system are increases in impervious surface and overdraft.

Impervious surface decreases the area available for groundwater recharge, as precipitation runoff flows off of streets, buildings, and parking lots directly into storm sewers, and straight into either river channels or into the ocean. This prevents the natural recharge of groundwater, effectively removing groundwater from the system without any pumping. Impervious surface also deteriorates the quality of the water, as it moves over streets and buildings, gathering pollutants and trash before entering streams, rivers, and the ocean.

Overdraft is the condition where the rate of water withdrawal exceeds the rate of water recharge in a particular basin over a period of time. Within the SCAG region, the Ventura Central Basin has been identified as being in a critical condition of overdraft.[13] In the late 1940s, increased groundwater use for agriculture and related processing operations in the Oxnard Plain reduced groundwater elevations, resulting in seawater intrusion into Ventura County as far as Moorpark and Fillmore. In an effort to provide alternatives to groundwater extraction, water is diverted from the Santa Clara River and provided for agricultural use. The water is also used as groundwater recharge to help offset groundwater demand and prevent further reduction of the water table. Currently, groundwater extractions approximately equal recharge, and the saltwater intrusion has been halted.

To prevent seawater intrusion in coastal basins in Orange County, recycled water is injected into the ground to form a mound of groundwater between the coast and the main groundwater basin. In Los Angeles County, imported and recycled water is injected to maintain a seawater intrusion barrier.

A comprehensive assessment of overdraft in California groundwater basins has not been conducted since 1980. The most recent (2003) DWR report on California's groundwater found that in most cases, there is insufficient quantitative information to identify overdrafted groundwater basins.[14] The report encourages local groundwater managers and DWR to seek funding and work cooperatively to evaluate groundwater basins for overdraft. The report recommends that local agencies take the lead in collecting and analyzing data to understand groundwater basin conditions, and points out that much of the data are needed by the agencies to effectively manage groundwater. Despite the lack of local data, DWR does provide overdraft estimates for the State as a whole, which are on the order of one to two million acre-feet per year, during average precipitation years.

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[12]DWR, *California 's Groundwater - Bulletin 118*, Update 2003, available at: *http://www.water.ca.gov/pubs/groundwater/ bulletin_118/california's_groundwater__bulletin_118_-_update_2003_/bulletin118_entire.pdf*, accessed August 10, 2011.

[13]DWR, California Water Plan Update, South Coast Section, Volume 3, 2009.

[14]DWR, *California 's Groundwater - Bulletin 118*, Update 2003, available at: *http://www.water.ca.gov/pubs/ groundwater/b ulletin_118/california's_groundwater__bulletin_118_-_update_2003_/bulletin118 _entire.pdf*, accessed August 10, 2011.

The Natural Resources Defense Council issued a 2001 report that found California's groundwater resources face a serious long-term threat from contamination. Subsequent legislation required a comprehensive assessment of groundwater quality. Groundwater wells throughout the SCAG region are being studied for contaminants and the results can be accessed on the Internet.[15] A number of the wells have contaminants, but none exceed drinking water quality standards (i.e., primary standards for maximum contaminant loads).

Volatile organic compounds have created groundwater impairments in industrialized portions of the San Gabriel and San Fernando Valley groundwater basins, where some locations have been declared federal Superfund sites. Subsequently, perchlorate contamination was found in the San Gabriel Valley. As of 2003, $99 million had been spent removing contaminants from affected aquifers. The EPA continues to oversee installation of a groundwater cleanup system, components of which were installed beneath the cities of La Puente and Industry in 2006. Similar problems exist in the Bunker Hills subbasin of the Upper Santa Ana Valley groundwater basin. Perchlorate contamination has also been found in wells in the Rialto, Colton, and Fontana areas of San Bernardino County. Groundwater continues to be used as the predominant source of water supply in these areas.

The presence of contamination in the source water does not necessarily require the closure of a groundwater well. Water systems can implement water treatment accompanied by monthly monitoring for contaminants and/or may blend the problematic water with other "cleaner" water in order to reduce the concentration of the contaminants of concern in the water that is ultimately to be delivered to the end-users.

Water Demand and Supply

Water Demand. Water demand in California can generally be divided between urban, agricultural, and environmental uses. In the SCAG region, approximately 75 percent of potable water is provided from imported sources. Annual water demand fluctuates in relation to available supplies. During prolonged periods of drought, water demand can be reduced significantly through conservation measures, while in years of above average rainfall, demand for imported water usually declines. In 2000, a 'normal' year in terms of annual precipitation, the demand for water in the State was between approximately 82 and 83 million acre feet (maf).[16] Of this total, the SCAG region accounted for approximately 9.8 maf.[17]

The increase in California's water demand is due primarily to the increase in population. By employing a multiple future scenario analysis, the California Water Plan Update 2009 provides a growth range for future annual water demand. According to the California Water Plan Update 2009, statewide future annual water demands ranges from an increase of fewer than 1.5 maf for the Slow & Strategic Growth scenario, to an increase of about 10 maf under the Expansive Growth scenario by year 2050.[18] If SCAG maintains its share of 12 percent of the state's water demand, the SCAG region could be expected to require an additional 500,000 af by 2030.

Demographics, Land Use, and Water Use. Water demand is influenced not only by population size, but also by socio-economic characteristics, geographical distribution of the population, variation in precipitation levels, and water conservation practices. According to the SCAG State of the Region 2007, average per capita water usage can range from 170 gallons per day to 285 gallons per day.[19]

Water Conservation. The results of conservation in Los Angeles have been remarkable; the Los Angeles Department of Water and Power (LADWP) reported in their *2010 Urban Water Management Plan* that

[15] State Water Resources Control Board, GeoTracker GAMA website, available at: *http://geotracker.waterboards.ca.gov/gama/,* accessed August 10, 2011.
[16] DWR, California Water Plan Update, South Coast Section, Volume 1, 2009.
[17] *Ibid.*
[18] *Ibid.*
[19] SCAG, *The State of the Region 2007.*

"[a]verage water demands in the last five years from FY 2004/2005 to 2009/2010 are about the same as they were in FY 1980/81 despite the fact that over 1.1 million additional people now live in Los Angeles."[20]

Urban conservation measures include reducing landscape water use and installing low flow toilets and showerheads in new development. In September of 1991, during a state-wide drought, the MWD and other California water agencies signed a Memorandum of Understanding Regarding Urban Water Conservation Best Management Practices. Best Management Practices (BMPs) to conserve water in commercial, institutional, and industrial uses could further reduce demand by an estimated three to five percent. Encouragement of the use of native and drought-proof plants, increased water conservation credits, funding for innovative conservation ideas in industry, tiered water rate structures, "smart" irrigation controllers, and rebates for conservation hardware are all methods being implemented for increased conservation.[21]

In the winter of 2006/2007, the SCAG region received its lowest rainfall in recorded history. As a result of this drought, combined with ongoing drought in the Colorado River basin and unpredictability of future water supply due to global warming, conservation has shifted from a purely temporary measure to a long-term water management strategy. In 2007, the City of Long Beach passed a water conservation ordinance requiring individual reductions and behavioral changes regarding water use. According to the Long Beach Water Department, these measures are not intended to be temporary, but to form the basis for ongoing management of the city's water resources. Agricultural water conservation options are growing as irrigation techniques improve and as water transfer agreements create new pressures for more efficient water management and the growth of higher value and less water-intensive crops. As a result of these developments, DWR expects agricultural water consumption to decline materially by 2030 throughout the SCAG region.

On March 29, 2011, Governor Jerry Brown declared the "end of California's drought." However, Southern California is still experiencing a shortage of water. MWD lost 1/3 of its supply since 2009 due to court rulings limiting the pumping of water to protect and endangered species of fish, in addition to three years of below-average rainfall. As a result, all cities and agencies in Southern California were asked to reduce the amount of water they buy from MWD.

Water Supply

Local Water Supply. Local sources of water account for approximately 30 percent of the total volume consumed annually in the SCAG region.[22] Local sources include surface water runoff, groundwater, and water reclamation.

Local Surface Water (within each HU Region). The infiltration of surface runoff augments groundwater and surface water supplies. However, the regional water demand exceeds the current natural recharge of runoff water. The arid climate, summer drought, and increased impervious surface associated with urbanization contribute to this reduction in natural recharge. Urban and agricultural runoff often contains pollutants that decrease the quality of local water supplies. Runoff captured in storage reservoirs varies widely from year to year depending on the amount of local precipitation. On average, precipitation contributes approximately 38,000 acre-feet per year (afy) within the MWD service area (not including San Diego County).[23] Within the desert regions, the amount is considerably less, owing to climatic differences.

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[20]Los Angeles Department of Water and Power, 2010 Urban Water Management Plan, available at: *http://www.ladwp.com/ladwp/cms/ladwp001354.jsp*, accessed August 11, 2011.

[21]Metropolitan Water District, Annual Progress to the California State Legislature, 2004, available at: *http://www.mwdh2o.com/mwdh2o/pages/yourwater/sb60/archive/SB60_04.pdf*, accessed August 10, 2011.

[22]DWR, *2009 Water Plan Update,* Vol. 1.

[23]*Ibid.*

Local Groundwater. Groundwater represents most of the SCAG region's fresh water supply, making up approximately 30 percent of total water use, depending on precipitation levels.[24] This proportion increases to roughly 40 percent in dry years. The hydrologic regions vary in their dependence on groundwater for urban and agricultural uses. These differences are reflected in **Table 3.13-4**. **Map 3.13-5**, located in Chapter 8.0 (Maps), shows the groundwater basins within the SCAG region. The California Department of Water Resources estimates that the State has a groundwater overdraft of approximately 1 to 2 maf in average years.[25]

TABLE 3.13-4: GROUNDWATER DEPENDENCE IN THE SCAG REGION

Hydrologic Region	Percentage of the Total Urban and Agricultural Water Supply Provided by Groundwater
Central Coast /a/	83%
South Coast /b/	25%
South Lahonton /c/	65%
Colorado River /d/	11%

/a/ Includes part of Ventura County. The remainder is outside of the SCAG Region.
/b/ Includes Orange County, most of San Diego and Los Angeles counties, parts of Riverside, San Bernardino, Ventura, Kern and Santa Barbara counties.
/c/ Includes most of San Bernardino County, as well as Inyo, and parts of Mono, Kern and Los Angeles counties.
/d/ Includes all of Imperial County, most of Riverside, and parts of San Bernardino and San Diego counties.
SOURCE: DWR, *2009 Water Plan Update.*

Recent efforts to store recycled water and surplus water in groundwater basins for use during drought periods have proven successful. MWD has 10 projects with various water agencies for groundwater storage, resulting in approximately 421,900 af of added capacity per year.[26] A number of agencies within the region are also active in the recharge of surface water, including the Orange County Water District, Los Angeles County Department of Water and Power, Foothill Municipal Water District, San Bernardino County Water and Flood Control District, Coachella Valley Water District, the Water Replenishment District of Southern California, the San Gabriel Valley Municipal Water District, and the Calleguas Municipal Water District.

Reclaimed/Recycled Water (Regional Wastewater Management). Water reclamation and recycling involves the secondary, and sometimes tertiary, treatment of polluted groundwater and wastewater effluent. Recycled water is used for three main purposes: ocean outfall, in-stream discharge, or reuse. Recycled water may be reused for many purposes, including landscape irrigation, surface water amenities in public places, including parks, industrial processes, groundwater recharge, and non-potable interior uses such as toilets. The use of recycled water for these various purposes augments the region's local water supplies and reduces reliance on water imports. According to MWD, current recycled water projects, either planned or in operation in the SCAG region, will account for approximately 751,384 af annually by the year 2020.[27]

Recycled water could be a significant source of water for industry, which often needs highly processed, but non-potable water for industrial processes. Recycled water can also play a major role in replenishing saltwater intrusion barriers and other groundwater sources, but there are still significant hurdles to these uses with regards to health regulations, cost, and public acceptance of water recycling.

Storage. Water agencies in the region are also modifying existing reservoirs or creating new reservoirs to accommodate the expected future growth in water demand. MWD has completed filling Diamond Valley Lake near Hemet in Riverside County. This reservoir provides approximately 800,000 acre-feet of additional

[24]DWR, *California 's Groundwater - Bulletin 118*, Update 2003, available at: *http://www.water.ca.gov/pubs/groundwater/bulletin_118/california's_groundwater__bulletin_118_-_update_2003_/bulletin118_entire.pdf*, accessed August 10, 2011.
[25]DWR, California Water Plan Update, Volume 1, 2009.
[26]MWD, Regional Urban Water Management Plan, November 2010.
[27]Metropolitan Water District of Southern California, *The Regional Urban Water Management Plan 2010*, available at: *http://www.mwdh2o.com/mwdh2o/pages/yourwater/RUWMP/RUWMP_2010.pdf*, accessed August 11, 2011.

storage. In addition to surface storage, MWD is implementing various groundwater storage projects both within the SCAG area and in other areas of California. These "conjunctive use" projects store excess water during wet years in underground basins and can be accessed during dry years when surface water supplies are limited.

The SCAG region currently has more than 3.5 maf of storage capacity in all of its reservoirs; however, the anticipated increase in the region's population and growing uncertainty regarding water imports make increasing storage capacity a priority for the region. Increasing storage capacity can be a difficult process, with associated social and environmental impacts.

Imported Water. Imported sources of water (including the Colorado River Aqueduct, the State Water Project's California Aqueduct, and the Los Angeles Aqueduct) currently supply approximately 3 maf of water to the SCAG region annually, accounting for nearly two-thirds of the total water used in the region.[28]

Access to water in the SCAG region has traditionally been a potential constraint to growth, since local supplies alone are unable to support expansive development. Beginning with the completion of the Los Angeles Aqueduct (LAA) in 1913, the region has imported water from other parts of the state to supplement local supplies.

The All-American Canal and Coachella Canal were completed in 1940, supplying water to irrigation districts in the Imperial and Coachella Valleys for agricultural operations. The Colorado River Aqueduct, completed in 1941 by MWD, brings Colorado River water to the urban coastal areas, ranging from Ventura County to San Diego County. The California Aqueduct, completed in the 1970s, delivers water from the Sacramento Delta to MWD for distribution to retail agencies throughout Southern California. **Maps 3.13-6** through **3.13-8**, located in the map chapter, depict the areas served by these imported water supplies.

Colorado River. The Colorado River is a major source of water for Southern California, and is imported via the Colorado River Aqueduct, owned and operated by MWD.

Under water delivery contracts with the United States, California entities have enjoyed legal entitlements to Colorado River water since the early 20th century. There have been several compacts, treaties, and negotiations between the seven states that use Colorado River water, beginning with the 1922 Colorado River Compact. California was entitled to 4.4 maf, as well as half on any surplus, as defined by the Federal Department of the Interior. Typically, the river's surplus has allowed California entities to take an additional 800,000 af annually.

However, with increased urbanization in the Colorado River Basin states and limitation agreements between those states, surplus water for California was eliminated; the State will gradually return to its original allotment of 4.4 maf. Given these new terms, California water agencies are pursuing various strategies to offset this gradual, but certain loss of future water supply. Examples of these strategies include additional reservoir and storage agreements, new water transfers between agricultural and urban users, and more water conservation and recycling.[29]

State Water Project (SWP). The SWP supplies water to Southern California via the California Aqueduct, with delivery points in Los Angeles, San Bernardino, and Riverside counties. SWP was constructed and is managed by DWR, and is the largest state-owned, multi-purpose water project in the country. SWP has historically provided 25 to 50 percent of MWD's water, anywhere from 450,000 af to 1.75 maf annually.[30]

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[28] *Ibid.*
[29] *Ibid.*
[30] *Ibid.*

Southern California's maximum SWP yield is about 2.0 maf per year. SWP provides water to approximately 25 million people and irrigation water for roughly 750,000 acres of agricultural lands annually.

In 2007, a federal judge ordered the pumps that bring water from the Sacramento Bay Delta into Southern California be shut off, to protect an endangered fish species, the Delta smelt. Although pumping later resumed, it did so at only two-thirds of capacity, reducing by one-third the amount of water coming into Southern California through that system. It is unclear when, or even if, full capacity pumping will resume. The situation in the Bay Delta highlights the uncertainty and vulnerability of the region's dependence on imported water. Although the situation in the Delta will eventually be resolved, it will likely be a matter of decades before a satisfactory new system is in place.

Los Angeles Aqueduct. The Los Angeles Aqueduct, originally built in 1913, carries water 233 miles south from Owens Valley to Los Angeles. The original aqueduct project was extended in 1940 to the Mono Basin. The system was supplemented by a second project, parallel to the first, completed in 1970. These two aqueducts have historically supplied an average of approximately 256,000 af per year in normal years, and as little as 106,000 af per year in drier years.[31] Recent deliveries have been cut almost in half due to dwindling Sierra snowpack and a court decision restricting the amount of water that can be removed from the Owens Valley and Mono Basin in order to restore their damaged ecosystems.

Transfers. In an effort to diversify water sources and reduce reliance on specific water imports, water agencies have engaged in water transfer agreements. These contractual agreements, made with irrigation districts, reduce water use on agricultural lands either through agricultural conservation or fallowing land.[32] The water 'freed' by these reductions is transferred to a municipal water district, where it may be used or stored in aquifers for future use, a practice called *water banking*. Water banking is also done during wet years, when rainwater is collected and directed toward recharge facilities for future use.

Water Suppliers. The SCAG region is served by many water suppliers, both retail and wholesale; the largest of these agencies is MWD. Created by the California State legislature in 1931, MWD serves the urbanized coastal plain from Ventura to the Mexican border in the west to parts of the rapidly urbanizing counties of San Bernardino and Riverside in the east. It provides water to about 90 percent of the urban population of Southern California. MWD is comprised of 26 member agencies, 12 of which supply wholesale water to retail agencies and other wholesalers, and 14 of which are individual cities which directly supply water to their residents.[33] The Imperial Irrigation District (IID) in Imperial County, the largest irrigation district in the country, and the Palo Verde Irrigation District primarily serve agricultural users. A list of major water suppliers operating within the SCAG region is given in **Table 3.13-5**.

Water Quality

The quality of the SCAG region's surface waters, groundwater, and coastal waters are discussed below.

Surface Water. Surface water resources in the SCAG region include creeks and rivers, lakes and reservoirs, and the inland Salton Sea. Reservoirs serving flood control and water storage functions exist throughout the region. Because the climate of Southern California is predominantly arid, many of the natural rivers and creeks are intermittent or ephemeral, drying up in the summer or flowing only in reaction to precipitation. For example, annual rainfall amounts vary depending on elevation and proximity to the coast. Some waterways such as Ballona Creek and the Los Angeles River maintain a perennial flow due to agricultural irrigation and urban landscape watering.

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[31] *Ibid.*

[32] Some urban agencies also have the ability to enter "spot" water markets and to purchase water on an "as needed" basis.

[33] MWD member agency list, available at : *http://www.mwdh2o.com/mwdh2o/pages/memberag/member04.html*, accessed August 10, 2011.

The Colorado River watershed includes seven states on the western slope of the Rocky Mountains, traversing the arid southwest to the Gulf of California in Mexico. The river supplies water to 25 million people in both the U.S. and Mexico and forms the eastern border of the SCAG region. The Salton Sea, the largest inland body of water in California, was formed around 1905 when the Colorado River was diverted from its natural course. At present, the Sea serves as a drainage reservoir for agricultural runoff in the Imperial Valley and Mexico. The Salton Sea is fed by the New River and Alamo River and would dry up entirely without agricultural runoff.

TABLE 3.13-5: MAJOR WATER SUPPLIERS IN THE SCAG REGION

Water Agency	Land Area (square miles)	Sources of Water Supply
Antelope Valley and East Kern District	2,300	SWP, groundwater, reclaimed water
Bard Irrigation District (including the Yuma Project Reservation Division)	23	Colorado River
Casitas Municipal Water District	228	Groundwater
Castaic Lake Water Agency	125	SWP, Groundwater
Coachella Valley Water District	974	SWP, Colorado River, local
Crestline Lake Arrowhead	78	SWP
Desert Water Agency	324	SWP, Colorado River, groundwater
Imperial Irrigation District	1,658	Colorado River
Littlerock Creek Irrigation	16	SWP, groundwater, surface water
Metropolitan Water District of Southern California	5,200	SWP, Colorado River
Mojave Water Agency	4,900	SWA, groundwater
Palmdale Water Agency	187	SWP, groundwater
Palo Verde Irrigation District	189	Colorado River
San Bernardino Municipal Water	328	SWP, groundwater
San Gorgonio Pass Water Agency	225	Groundwater

Note: This table excludes retail agencies supplied by a regional wholesaler.
SOURCE: TAHA, 2011.

Other major natural surface waters in the SCAG region include the Ventura River, Santa Clara River, Los Angeles River, San Gabriel River, Santa Ana River, San Jacinto River, and upstream portions of the Santa Margarita River. The Ventura River is fed by Lake Casitas on the western border of Ventura County and empties out into the ocean. It is the northern-most river system in Southern California, supporting a large number of sensitive aquatic species. Water quality decreases in the lower reaches due to urban and industrial impacts. The Santa Clara River flows through the center of Ventura County and remains in a relatively natural state. Threats to water quality include increasing development in floodplain areas, flood control measures such as channeling, erosion, and loss of habitat.

The Los Angeles River is a highly disturbed system due to the flood control features along much of its length. Due to the high urbanization in the area around the Los Angeles River, runoff from industrial and commercial sources as well as illegal dumping contribute to reduce the channel's water quality. The San Gabriel River is similarly altered with concrete flood control embankments and impacted by urban runoff.

The Santa Ana River drains the San Bernardino Mountains, cuts through the Santa Ana Mountains, and flows onto the Orange County coastal plain. Recent flood control projects along the river have established reinforced embankments for much of the river's path through urbanized Orange County.

The Santa Margarita River begins in Riverside County, draining portions of the San Jacinto Mountains and flowing to the ocean through northern San Diego County.

Complete lists of surface water resources within the SCAG region along with the beneficial uses associated with them are contained in each of the five Basin Plans prepared by the Regional Water Quality Control Boards of the region.

Point and Non-Point Source Pollution. Portions of the Los Angeles River in Los Angeles County and the Santa Ana River in Orange County have been lined with concrete for flood control purposes. One of the effects of these projects has been to reduce the natural recharge of groundwater basins. A second has been to make these rivers conveyance systems that concentrate and transfer urban pollutants and waste to the ocean. With regard to the rivers themselves, the State's Water Quality Assessment Report estimated in 1992 that approximately two-thirds of California's water bodies were threatened or impaired by non-point sources of pollution.

Point source pollution refers to contaminants that enter a watershed, usually through a pipe. The location of the end of the pipe is documented and the flow out of that pipe is subject to a discharge permits issued by a Regional Water Quality Control Board. Examples of point source pollution are discharges from sewage treatment plants and industrial facilities. Because point sources are much easier to regulate than non-point sources, they were the initial focus of the 1972 Clean Water Act. Regulation of point sources since then has dramatically improved the water quality of many rivers and streams throughout the country.

In contrast to point source pollution, non-point source pollution, also known as "pollution runoff," is defuse. Non-point pollution comes from everywhere in a community and is significantly influenced by land uses. A driveway or the road in front of a house may be a source of pollution if spilled oil, leaves, pet waste or other contaminants leave the site and runoff into a storm drain. Non-point source pollution is now considered one of the major water quality problems in the United States.

Runoff Pollutants. The problem of non-point source pollution is especially acute in urbanized areas where a combination of impermeable surfaces, landscape irrigation, highway runoff and illicit dumping increase the pollutant loads in stormwater. The California State Water Quality Control Board (SWQCB) has identified the following pollutants found in urban runoff as being a particular concern.[34]

- *Sediment*. Excessive sediment loads in streams can interfere with photosynthesis, aquatic life respiration, growth and reproduction.
- *Nutrients*. Nitrogen and phosphorus can result in eutrophication of receiving waters (excessive or accelerated growth of vegetation or algae), reducing oxygen levels available for other species.
- *Bacteria and viruses*. Pathogens introduced to receiving waters from animal excrement in the watershed and by septic systems can restrict water contact activities.
- *Oxygen demanding substances.* Substances such as lawn clippings, animal excrement and litter can reduce dissolved oxygen levels as they decompose.
- *Oil and grease.* Hydrocarbons from automobiles are toxic to some aquatic life.
- *Metals*. Lead, zinc, cadmium and copper are heavy metals commonly found in stormwater. Other metals introduced by automobiles include chromium, iron, nickel and manganese. These metals can enter waterways through storm drains along with sediment, or as atmospheric deposition.
- *Toxic pollutants*. Pesticides, phenols and polynuclear aromatic hydrocarbons (PAHs) are toxic organic chemicals found in stormwater.
- *Floatables*. Trash in waterways increases metals and toxic pollutant loads in addition to undesirable aesthetic impacts.

[34]The following sections are excerpted from MWD, *The Regional Urban Water Management Plan*, Chapter IV. November 2005.

Salinity. The general quality of groundwater in the SCAG region tends to be degraded as a result of land uses and water management practices. Fertilizers and pesticides typically used on agricultural lands infiltrate and degrade groundwater. Septic systems and leaking underground storage tanks can also impact groundwater. Over-pumping can result in saltwater intrusion from the ocean, further degrading groundwater quality. In addition, wastewater discharges in inland regions can result in salt buildup from fertilizer and dairy waste.

To address the salinity problem, an increasing number of water agencies are working with other water, groundwater and wastewater agencies, state and local government agencies, and interested associations on researching and developing salinity management goals and action plans. Strategies currently in use include blending low and high salinity water and the desalination of brackish water.

Perchlorate. Ammonium perchlorate is a primary ingredient of solid rocket propellant and is used in the manufacture of some types of munitions and fireworks. Ammonium perchlorate and other perchlorate salts are readily soluble in water, dissociating into the perchlorate ion that is highly mobile in groundwater. Small amounts of perchlorate have been found in the Colorado River with higher concentrations in a number of groundwater basins in Southern California. The primary human health concern related to perchlorate is its effects on the thyroid.[35]

While perchlorate cannot be removed using conventional water treatment, nanofiltration and reverse osmosis do work effectively, but at very high cost. Rancho Cordova is using a fluidized bed biological treatment and is re-injecting the treated water back into the ground. A number of companies have developed an ion exchange process that removes perchlorate but creates hazardous waste brine. Nonetheless, a number of sites in Southern California have successfully installed ion exchange systems. Thus, while effective treatment options are available, the overriding consideration in decisions about whether to recover perchlorate-contaminated groundwater is the cost-effectiveness of available technologies.

Total Organic Carbon (TOC) and Bromide. When source water containing high levels of TOC and bromide is treated with disinfectants such as chlorine or ozone, disinfection byproducts (DBPs) form. Studies have shown a link between certain cancers and DBP exposure. In addition, some studies have shown an association between reproductive and developmental effects and chlorinated water. In December 1998, the U.S. Environmental Protection Agency (EPA) adopted more stringent regulations for DPBs.

Existing levels of TOCs and bromide in Delta water supplies present challenges to agencies receiving water from the SWP to monitor and maintain safe drinking water supplies. A primary objective of the CALFED Bay-Delta process is protection and improvement of the water quality of the SWP to ensure future drinking water regulations. Although exact future drinking water standards are unknown, significant source water protection of SWP water supplies will almost certainly be a necessary component of meeting these requirements cost-effectively.

Methyl Tertiary Butyl Ether and Tertiary Butanol (MTBE). The use of MTBE (and other oxygenates) in gasoline was mandated to achieve reductions in air pollution, including emissions of benzene, a known human carcinogen. However, this reduction in air pollution has been achieved at the expense of creating a serious groundwater and surface water problem. MTBE is very soluble in water and moves quickly into the groundwater. It is introduced into surface water bodies from the motor exhausts of recreational watercraft. MTBE is also resistant to chemical and microbial degradation in water, making treatment more difficult than the treatment of other gasoline components.

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[35]As stated in the 2010 RUWMP, "Perchlorate interferes with the thyroid gland's ability to produce hormones required for normal growth and development." MWD, *Regional Urban Water Management Plan 2010*, Chapter 4, page 4-8, available at: *http://www.mwdh2o.com/mwdh2o/pages/yourwater/RUWMP/RUWMP_2010.pdf* , accessed August 11, 2011.

MTBE presents a significant problem for local groundwater basins. Leaking underground storage tanks and poor fuel-handling practices at local gas stations may provide a large source for MTBE. One gallon of MTBE alone (11 percent MTBE by volume) is enough to contaminate about 16.5 million gallons of water at 5 μg/L.[36] Such contamination has caused some water agencies to close wells. The City of Santa Monica, for example, lost about 50 percent of its production wells as a result of MTBE contamination during the 1990s.

A combination of advanced oxidation processes followed by granular activated carbon has been found to be effective in reducing the levels of MTBE contaminants by 80 to 90 percent. This may make it possible for local water agencies to treat their groundwater sources to comply with water quality standards. The cost of such treatment, however, could cause some agencies to increase imports as a means of avoiding this cost.

Arsenic. Arsenic, a naturally occurring substance in drinking water, has been identified as a risk factor for lung and urinary bladder cancer. A number of Southern California water sources have been identified as containing arsenic concentrations exceeding the current federal standard of 10 μg/L. Monitoring results submitted to the California Department of Health Services in 2001-2003 showed that the affected areas included the counties of San Bernardino (61 sources), Los Angeles (50 sources), Riverside (24 sources) and Orange (4 sources).

It appears likely that current treatment standards will increase cost but not necessarily decrease local water supplies. However, if treatment cost increases are sufficient, some water agencies in Southern California may choose to increase their use of imported water to avoid this additional cost.

Radon. Radon, a naturally occurring substance in groundwater, has not been a significant problem for most water agencies with the SCAG region. Where radon is a problem, air-stripping through aeration is the cost-effective treatment option. However, stripping results in outgassing of radon into the air. Currently, the US EPA has determined that the risk posed by this outgassing is less than that posed by radon in the water.

Uranium. A ten-and-a-half-million-ton pile of uranium mine tailings at Moab, Utah lies 600 feet from the Colorado River. Rainwater has been seeping through the pile and contaminating the local groundwater, causing a flow of contaminants into the river. It also has the potential to wash millions of tons of material containing uranium into the Colorado River as a result of a flood or other natural disaster.

Operations and maintenance activities at the site include intercepting some of the contaminated groundwater before it discharges into the river. The interim action became fully active in September 2003 and is currently being evaluated. As of 2010, 1,408,000 gallons of contaminated water had been collected and evaporated.[37]

At the recommendation of the National Research Council, the Department of Energy (DOE) conducted a study to evaluate remediation actions and released an environmental impact statement in July 2005. The DOE has agreed to move the tailings, but remediating the site will require Congressional appropriations, and maintaining support for a cleanup will require close coordination and cooperation with other Colorado River users.

Land Use and Water Quality. Buildings, roads, sidewalks, parking lots, and other impervious surfaces define the urban landscape. But impervious surfaces also alter the natural hydrology and prevent the infiltration of water into the ground. Impervious surfaces change the flow of stormwater over the landscape. In underdeveloped areas, vegetation holds down soil, slows the flow of stormwater over land, and filters out some pollutants by both slowing the flow of the water and trapping some pollutants in the root system. Additionally, some stormwater filters through the soil, replenishing underground aquifers.

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[36] μg/L is a unit of weight equal to one-millionth (10^{-6}) of a gram.

[37] Department of Energy, Uranium Mill Tailings Remedial Action website, available at: *http://www.gjem.energy.gov/moab/project_docs/tailings_dewatering.htm*, accessed August 11, 2011.

As land is converted to other uses such as commercial developments, many of these natural processes are eliminated as vegetation is cleared and soil is paved over. As more impervious surface coverage is added to the landscape, more stormwater flows faster off the land. The greater volume of stormwater increases the possibility of flooding, and the high flow rates of stormwater do not allow for pollutants to settle out, meaning that more pollution gets concentrated in the stormwater runoff.

Research on urban stream protection has found that stream degradation occurs at relatively low levels of imperviousness—in the range of 10 to 20 percent. Wetlands suffer impairment when impervious surface coverage surpasses 10 percent. Fish habitat, spawning, and diversity suffer when imperviousness is greater than 10 to 12 percent. Wetland plants and amphibian populations diminish when impervious surfaces are greater than 10 percent. Generally, the higher the percentage of impervious surface, the greater the degradation in stream water quality. Based on this research, streams can be considered stressed in watersheds when the impervious coverage exceeds 10 to 15 percent.

The link between impervious surfaces and degraded water quality points to the need for careful comparisons between dispersed and compact development strategies. On a regional or watershed level, greater overall water quality protection is achieved through more concentrated or clustered development. Concentrated development protects the watershed by leaving a larger percentage of it in its natural condition.

Groundwater. The general quality of groundwater in the SCAG region is degraded as a result of land uses and water management practices in the Basins. Fertilizers and pesticides typically used on agricultural lands infiltrate and degrade groundwater. Septic systems and leaking underground storage tanks can also impact groundwater quality. Urban runoff is also a significant source of pollution.

Coastal Waters. Coastal waters in the region include bays, harbors, estuaries, beaches, and open ocean. Deep craft commercial harbors include the Los Angeles/Long Beach Harbor complex and Port Hueneme. Shallower small craft harbors are prevalent along the coast line including Dana Point Harbor, Newport Beach Harbor, Huntington Harbor, Marina Del Rey Harbor, and Ventura Harbor. Several small estuaries and saltwater marshes exist along the coast and are generally considered sensitive ecological areas. These include Newport Bay, Bolsa Chica Wetlands, Ballona Wetlands, Malibu Lagoon, and Mugu Lagoon. These coastal waters are impacted by previously described wastewater discharges, non-point source runoff, dredging, bilge water discharges, illicit discharges, and spills. Impaired coastal areas are shown in the map of SWRCB 303(d) impaired waterbodies (**Map 3.13-9** located in Chapter 8.0 (Maps)).

Wastewater. Wastewater flows and capacities of major treatment facilities are shown in **Table 3.13-6**. Much of the urbanized areas of Los Angeles and Orange Counties are serviced by three large publicly owned treatment works (POTWs): the City of Los Angeles Bureau of Sanitation Hyperion Facility, the Joint Outfall System of the Los Angeles County Sanitation Districts, and the Orange County Sanitation District treatment plant. These three facilities handle more than 70 percent of the wastewater generated in the entire SCAG region.

In addition to these large facilities, medium sized POTWs (greater than 10 mgd) and small treatment plants (less than 10 mgd) service smaller communities in Ventura County, southern Orange County, and in the inland regions. Many of these treatment systems recycle their effluent through local landscape irrigation and groundwater recharge projects. Other treatment systems discharge to local creeks on a seasonal basis, effectively matching the natural conditions of ephemeral and intermittent stream habitats.

Many rural communities utilize individually owned and operated septic tanks rather than centralized treatment plants. The Regional Water Quality Control Board (RWQCB) generally delegates oversight of septic systems to local authorities. However, Water Discharge Requirements (WDRs) are generally required for multiple-dwelling units and in areas where groundwater is used for drinking water. These WDRs are only issued to properties greater than one acre and are not required for properties greater than five acres in size.

TABLE 3.13-6: WASTEWATER FLOW AND CAPACITY OF MAJOR TREATMENT FACILITIES IN THE SCAG REGION

Wastewater Agency	Current Flow (mgd)	Capacity Flow (mgd)
IMPERIAL COUNTY		
City of El Centro	4.0	8.0
City of Brawley	4.0	5.9
City of Calexico	2.7	4.2
LOS ANGELES COUNTY		
Los Angeles County Sanitation Districts		
Joint Outfall System	406.1	590.2
Lancaster Water Reclamation Plant	12.0	16.0
Palmdale Water Reclamation Plant	8.0	15.0
Santa Clarita Water Reclamation Plant	20.0	28.6
City of Los Angeles	554.5	580.0
Las Virgenes Municipal Water District	9.5	16.0
City of Burbank	9.0	9.0
ORANGE COUNTY		
Orange County Sanitation District	221.0	699.0
Irvine Ranch Water District	12.3	23.5
South Orange County Wastewater Authority	26.5	37.7
El Toro Water District	5.4	6.0
RIVERSIDE COUNTY		
Eastern Municipal Water District	37.3	59.0
City of Riverside	36.0	40.0
Coachella Valley Water District	18.0	31.0
SAN BERNARDINO COUNTY		
Inland Empire Utilities Agency	60.0	84.0
City of San Bernardino	25.5	33.0
Victor Valley Wastewater Reclamation Authority	12.5	14.5
City of Redlands	6.0	9.5
VENTURA COUNTY		
City of Oxnard	22.5	31.7
City of Simi Valley	10.0	12.5
City of Thousand Oaks	10.5	14.0
City of Ventura	9.0	12.0
Camarillo Sanitation District	4.0	7.3
Total	**1,546.3**	**2,387.6**

SOURCE: TAHA, 2011.

THRESHOLDS OF SIGNIFICANCE

Based on CEQA Appendix G and as appropriate for the 2012-2035 RTP/SCS, the Plan would have a significant impact related to water resources if it would:

- Violate any water quality standards or waste discharge requirements or otherwise substantially degrade water quality, or substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site;

- Substantially interfere with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted);
- Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map; or place within a 100-year flood hazard area structures which would impede or redirect flood flows; or expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam; and/or inundation by seiche, tsunami, or mudflow.
- Exceed the capacity of existing or planned wastewater treatment systems;
- Substantially increase demand for water such that existing supplies and facilities would not be able to accommodate demand.

Methodology

This PEIR identifies the potential impacts of the Plan on water resources. The water quality analysis evaluates the regional-scale impact of the 2012-2035 RTP/SCS and the cumulative impact of the 2012-2035 RTP/SCS projects and the associated growth on water quality. The analysis includes a programmatic-level assessment of the expected urbanized land use and the associated impervious surfaces. Subsequent, project-specific water quality assessments will be conducted by implementing agencies to determine site-specific water quality impacts for individual transportation projects, as projects in the 2012-2035 RTP/SCS are implemented.

The methodology for determining the significance of the impacts on water quality, water supply, and wastewater compares the future Plan conditions to the existing setting, as required in *CEQA Guidelines* § 15126.2(a).

Long-term, regional-scale, cumulative impacts of the 2012-2035 RTP/SCS on water quality were evaluated based on relative estimates of vacant land consumption based on the long-term regional growth forecast for 2035. Impacts to water supply were assessed by comparing the existing water supplies to the expected water demand in 2035 with the Plan. Likewise, the PEIR analyzes impacts to wastewater services by comparing existing capacity of wastewater systems to the expected demand in future Plan conditions.

Cumulative Analysis

The 2012-2035 RTP/SCS addresses transportation projects and land use distribution patterns, including land use scenarios. These land use distribution patterns identify growth distribution and anticipated land use development to accommodate growth projections. The Regional Travel Demand Model (RTDM) used for this analysis captures pass-through traffic that does not have an origin or destination in the region, but does impact the region, so that too is included in the project analysis. Although a similar level of development is anticipated even without the 2012-2035 RTP/SCS, this Plan would influence growth, including distribution patterns, throughout the region. To address this, the analysis in the PEIR covers overall impacts of all transportation projects and land development described in the 2012-2035 RTP/SCS. In addition, this PEIR considers cumulative impacts from other regional plans (e.g., South Coast Air Quality Management Plan), which could result in additional impacts inside and outside the region.

Comparison with the No Project Alternative

The analysis of water resources includes a comparison of the expected future conditions if no Plan were adopted (No Project). This evaluation is not included in the determination of the significance of impacts (which is based on a comparison to existing conditions) however it provides a meaningful perspective on the expected effects of the 2012-2035 RTP/SCS.

Project-specific studies will be necessary to determine the actual potential for significant impacts on water resources resulting from implementation of individual projects. The following analysis identifies general program-level impacts. Below are descriptions of the types of direct impacts foreseeable from new transportation projects proposed in the 2012-2035 RTP/SCS as well as anticipated development under the Plan. Indirect impacts due to the changes in population distribution expected to occur due to the 2012-2035 RTP/SCS's transportation investments, and transportation and land use policies are also discussed.

Determination of Significance

To assess potential impacts to water resources, Geographic Information Systems (GIS) were used to compare projects in the 2012-2035 RTP/SCS as well as anticipated development patterns to existing water resources. Additional data relating to water resources compiled within the GIS format included surface hydrology, 100-year flood plains, impaired water bodies identified by the SWRCB, and regional groundwater basins. The assessment of impacts also includes relative estimates of vacant land consumption based on the long-term regional growth forecast for 2035. Impacts to water supply were assessed by comparing the existing water supplies to the expected water demand in 2035 with the Plan. Likewise, the PEIR analyzes impacts to wastewater services by comparing existing capacity of wastewater systems to the expected demand in future Plan conditions.

IMPACTS

Impact 3.13-1: Potential to degrade local surface water quality by increased roadway and urban runoff created by 2012-2035 RTP/SCS projects, potentially violating water quality standards associated with wastewater and stormwater permits. The 2012-2035 RTP/SCS could alter the existing drainage patterns in ways that would result in substantial erosion or siltation.

Projects that increase impervious surface areas increase urban runoff, resulting in the transport of greater quantities of contaminants to receiving waters that may currently be impaired. Construction activities related to the Plan could increase pollutant loads carried by storm water runoff. For example, road cut erosion can increase long-term siltation in local receiving waters. Studies from across the country report that roads, parking lots, and sidewalks comprise 55 to 75 percent of existing impervious surface areas. Residential, commercial, and industrial structures constitute the remaining 25 to 45 percent. These factors explain the inverse relationship between water quality and impervious area, which tends to become problematic when impervious surfaces within a watershed exceed 10 percent of land area. Where this percentage is greater than 25 percent, water quality is generally degraded and inhospitable for habitat or for recreation activities.[38] In addition, many of the pollutants in urban runoff are attributable to landscape irrigation, highway runoff, and illicit dumping. Highway runoff is a component of urban runoff contributing oil and grease, sediment, nutrients, heavy metals, and toxic substances. **Table 3.13-7** lists the pollutants commonly associated with transportation.

[38] Center for Watershed Protection. (1988). *Rapid Watershed Planning Handbook – A Resource Guide for Urban Subwatershed Management.* Ellicott City, MD.

TABLE 3.13-7: POLLUTANTS ASSOCIATED WITH TRANSPORTATION

Pollutant	Source
Asbestos	Clutch plates, brake linings
Cadmium	Tire wear and insecticides
Copper	Thrust-bearing, bushing, brake linings, and fungicides and insecticides
Chromium	Pavement materials, metal plating, rocker arms, crankshafts, rings, and brake linings
Cyanide	Anti-caking compound in de-icing salt
Lead	Leaded gasoline, motor oil, transmission babbit metal bearings, tire wear
Iron	Auto-body rust, steel highway structures, moving engine parts
Manganese	Moving engine parts
Nickel	Diesel fuel and gasoline, pavement material, lubricating oil, metal plating, bushing wear, and brake linings
Nitrogen and Phosphorus	Motor oil additives, fertilizers
Sulphates	Roadway beds, fuel, and de-icing salt
Zinc	Motor oil and tires
Grease and Hydrocarbons	Spills and leaks of oil and n-parafin lubricants, antifreeze, hydraulic fluids
Rubber	Tire wear
Sediment	Pavement wear, construction and maintenance activities

SOURCE: USEPA Office of Water. (1995) *Controlling Nonpoint Source Runoff Pollution from Roads, Highways, and Bridges*. (EPA-841-F-95-008a). Washington DC

Map 3.13-9, located in the map chapter, shows the impaired water bodies identified within the SCAG region. The SWRCB has developed trash, metal, and bacteria TMDLs for many of the watersheds in the region, including Dominguez Channel, Santa Monica Bay, Los Angeles River, Santa Clara River, Ventura River, Malibu Creek, Calleguas Creek, and Ballona Creek. The TMDLs provide a numerical threshold for each pollutant within each watershed to be used for regulating both point and non-point source discharges and is implemented through the NPDES permit process. Future methods for quantifying highway runoff will assist regulators with applying appropriate management practices in areas where highway runoff impacts impaired water bodies. The inclusion of runoff control measures in the design of future roadway projects will improve water quality and eliminate further impairments of the local receiving waters.

As discussed above, the 2012-2035 RTP/SCS would increase impervious surfaces in the SCAG region through a combination of transportation projects and development. **Table 3.13-8** identifies proposed lane mile additions planned for each county under the Plan.

TABLE 3.13-8: 2035 PLAN LANE MILES BY COUNTY

County	Freeway Lane Miles	Toll Lane Miles	Major Arterial Lane Miles	Minor Arterial Lane Miles	Collector Lane Miles	HOV Lane Miles	Truck Lane	Total Lane Miles in Each County
Imperial	417	0	455	729	2,435	0	0	4,036
Los Angeles	4,681	476	9,234	9,155	3,780	413	193	27,931
Orange	1,426	704	3,261	3,184	604	188	0	9,367
Riverside	1,988	228	1,606	3,976	4,569	125	11	12,503
San Bernardino	2,742	192	2,379	5,030	6,535	168	226	17,271
Ventura	558	0	930	1,010	683	8	0	3,188
Total Lane Miles by Project Type	**11,811**	**1,599**	**17,866**	**23,084**	**18,606**	**902**	**430**	**74,297**

SOURCE: SCAG Transportation Modeling, 2011,

Some of the lane additions may be constructed using re-striping and existing right of way, reducing the contribution to increased impervious surfaces. Rail lines and their associated structures, would not be expected to result in a substantial change in the amount of impervious surface as most would be located within existing rights of way. This would be the case for at-grade and elevated light rail as well as heavy rail. Proposed goods movement enhancement projects would be expected to increase the amount of impervious surfaces depending on the alignment, as many of the proposed alignments are within existing rights-of-way.

Development associated with the 2012-2035 RTP/SCS would also increase imperious surfaces. Much of the development that would occur under the 2012-2035 RTP/SCS would be located in urban areas where little pervious surfaces exist and pollution of urban waterways is a serious problem. The growth projection associated with the Plan would substantially increase the amount of urbanized land in the SCAG region. With the 2012-2035 RTP/SCS, the amount of new urbanized acreage (consuming previously vacant land) would be approximately 213,000 acres.[39] Pollutant loading in surface and groundwater correlates closely with land use patterns. Suspended sediments, oxygen demanding substances, and oil and grease would constitute a substantial part of these pollutant loads. Total nitrogen and total phosphorous would increase less than these other pollutants, but would have the potential for influencing algal growth, reducing dissolved oxygen, and affecting aquatic species abundance and composition.[40] Additional impervious surfaces would increase the potential for pollutants to enter impaired receiving waters. Each project contributing to new impervious area would be subject to a Municipal Separate Storm Sewer System (MS4) permit requiring that pollutants be removed from the runoff to the maximum extent practicable. TMDL requirements are now included in all MS4 (Municipal Separate Storm Sewer System) permits, further strengthening a permit's controls of runoff.

Most of the Plan projects would occur within watersheds that have impaired water bodies. Any increase in contaminant loading in these water bodies by constituents of concern appearing in a 303(d) list and contributed by a Plan project would be considered a significant impact. **Table 3.13-9** lists many of the impaired water bodies located near a freeway, transit, or rail project proposed in the 2012-2035 RTP/SCS. Several projects may impact water bodies by placing fill material within a stream channel. For example, several of the lane widening projects and new facilities could cross existing creeks or be expanded into wetland areas. These potential intrusions would be subject to permitting by the USACE and a RWQCB pursuant to Sections 404 and 401 of the CWA.

Construction activities can be a major source of sediment loading and hydrocarbon contamination in local waterways. Unprotected soil easily erodes with rainwater. In addition, fueling procedures and maintenance of heavy equipment on construction sites can spill diesel and oil and grease. In 2003, the SWRCB adopted a state-wide storm water permit for construction sites that downsized compliance requirements from sites over five acres to sites over one acre. Prior to commencement of construction activities, a project applicant must submit a Storm Water Pollution Prevention Plan (SWPPP) to the SWRCB that identifies the Best Management Practices (BMPs) that will be used in the planned project construction. The applicant must receive approval of the SWPPP and submit a Notice of Intent prior to initiating construction. Each individual project in the 2012-2035 RTP/SCS is expected to adopt BMPs appropriate to local conditions and to the proposed construction techniques that will reduce pollution runoff.

The Plan's new roadway projects would create new impervious areas. The runoff from these new impervious areas would contribute to local water impairments by degrading the water quality of the receiving waters, both in the short-term (during project construction) and in the long-term (during the project's operation). Implementation of Mitigation Measures **MM-W1** through **MM-W30** would reduce impacts to surface water quality, runoff, wastewater, stormwater, drainage patterns, erosion, and siltation; however, impacts would remain significant.

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[39] SCAG, 2011.
[40] Keller, Arturo A. and Yi Zheng. (2003). Personal communication. University of California. Santa Barbara, CA.

TABLE 3.13-9: IMPAIRED WATER BODIES (303(D)) NEAR A FREEWAY, TRANSIT, OR RAIL PROJECT IN THE 2012-2035 RTP/SCS

Impaired Water Body	Pollutants
Aliso Creek	Indicator bacteria, Phosphorus, Toxicity
Ballona Creek	Cadmium (sediment), Coliform Bacteria, Copper, Dissolved Cyanide, Lead Selenium, Shellfish Harvesting Advisory, Silver (sediment), Toxicity, Trash, Viruses (enteric), Zinc
Ballona Creek Estuary	Cadmium, Chlordane (tissue and sediment), Copper, DDT, Lead, PAHs, PCBs, Sediment Toxicity, Shellfish Harvesting Advisory, Silver, Zinc (sediment)
Burbank Western Channel	Ammonia, Copper, Cyanide, Lead, Trash
Calleguas Creek Reach 7 (Arroyo Simi Reaches 1 and 2 on 1998 303d list)	Ammonia, Boron, Chloride, Chlorpyrifos, Diazinon, Fecal Coliform, Organophosphorus, Pesticides, Sedimentation/Siltation, Sulfates, Total Dissolved Solids, Toxicity
Calleguas Creek Reach 11 (Arroyo Santa Rosa, part of Conejo Creek Reach 3 on 1998 303d list)	Ammonia, Chem A (tissue), Chlordane, DDT, Dieldrin, Endosulfan (tissue), Fecal Coliform, PCBs, Sedimentation/Siltation, Sulfates, Total Dissolved Solids, Toxaphene (tissue and sediment), Toxicity
Calleguas Creek Reach 12 (Conejo Creek/Arroyo Conejo North Fork on 1998 303d list)	Ammonia, Chlordane (tissue), DDT (tissue), Dieldrin, PCBs, Sulfates, Total Dissolved Solids, Toxaphene
Calleguas Creek Reach 13 (Conejo Creek South Fork, was Conejo Creek Reach 4 and part of Reach 3 on 1998 303d list)	Ammonia, Chem A (tissue), Chlordane, DDT, Dieldrin, Endosulfan (tissue), Fecal Coliform, PCBs, Sulfates, Total Dissolved Solids, Toxaphene (tissue and sediment), Toxicity
Compton Creek	Coliform Bacteria, Copper, Lead, pH, Trash
Coyote Creek	Ammonia, Coliform Bacteria, Copper, Dissolved, Diazinon, Lead, pH, Toxicity, Zinc
Imperial Valley Drains	DDT, Dieldrin, Endosulfan (tissue), PCBs, Sedimentation/Siltation, Selenium, Toxphene
Laguna Canyon Channel	Sediment Toxicity
Los Angeles River Reach 1 (Estuary to Carson St)	Ammonia, Cadmium, Coliform Bacteria, Copper, Dissolved Cyanide, Diazinon, Lead, Nutrients (Algae), pH, Trash, Zinc, Dissolved
Los Angeles River Reach 2 (Carson to Figueroa St)	Ammonia, Coliform Bacteria, Copper, Lead, Nutrients (Algae), Oil, Trash
Los Angeles River Reach 3 (Figueroa St to Riverside Dr)	Ammonia, Copper, Lead, Nutrients (Algae), Trash
Los Angeles River Reach 4 (Sepulveda Dr to Sepulveda Dam)	Ammonia, Coliform Bacteria, Copper, Lead, Nutrients (Algae), Trash
Los Angeles River Reach 6 (Above Sepulveda Flood Control Basin)	1, 1-Dichloroethane (1, 1-DCE)/Vinylidene-chlori, Coliform Bacteria, Selenium, Tetrachloroethylene/PCE, Trychloroethylene/TCE
Lytle Creek	Pathogens
San Jose Creek Reach 2 (Temple to I-10 at White Ave)	Coliform Bacteria
Sawpit Creek	Bis(2ethylhexyl)phthalate/DEHP, Fecal Coliform
Tujunga Wash (LA River to Hansen Dam)	Ammonia, Coliform Bacteria, Copper, Trash
Verdugo Wash Reach 1 (LA River to Verdugo Rd)	Coliform Bacteria, Trash
Walnut Creek Wash (Drains from Puddingstone Reservoir)	pH, Toxicity
Dominguez Channel Estuary (unlined portion below Vermont Ave)	Ammonia, Benthic Community Effects, Benzo(a)pyrene (PAHs), Benzo(a)anthracene, Chlordane (tissue), Chrysene (C1-C4), Coliform Bacteria, DDT (tissue and sediment), Lead (tissue), PCBs, Phenanthrene, Pyrene, Zinc

SOURCE: SCAG analysis of California State Water Resources Control Board 303d List of Water Quality Limited Segments that: 1) require TMDLS, 2) are being addressed by USEPA approved TMDLs, and 3) are being addressed by actions other than TMDLs.

Impact 3.13-2: Potential to reduce groundwater infiltration.

The 2012-2035 RTP/SCS would include additional impervious surfaces installed through new roadway projects. **Table 3.13-8**, above, provides information on the lane mile additions expected in each county. With the implementation of the 2012-2035 RTP/SCS, approximately 6,500 new lane miles would be added to the region (for a total of 74,300 lane miles). These additions would include new facilities, additional right-of-way on existing facilities and/or re-striping of existing facilities. Rail projects involving construction of new rail lines, new stations, and upgrades to existing stations are not included in this calculation. Where these projects involve installation of additional impervious surfaces they would potentially have adverse impacts on groundwater infiltration.

Under natural conditions, vegetation intercepts and retains rainfall before infiltration or runoff occurs. Without hard-surfaced land areas, this hydrology cycle favors groundwater recharge. With a roadway or other hard surface this infiltration dynamic is significantly impeded. The magnitude of this effect is reported by studies indicating that the volume of storm water washed off one-acre of roadway is about sixteen times greater than that of a comparably sized meadow.[41]

The increase in impervious surfaces due to 6,500 additional miles of roadway, in addition to urban development associated with the population distribution in 2035 would increase runoff and potentially affect groundwater recharge rates. Implementation of Mitigation Measures **MM-W31** through **MM-W35** would reduce groundwater impacts; however, impacts would remain significant.

Impact 3.13-3: Potential to increase flooding hazards, by placing projects on alluvial fans and within 100-year flood hazard areas.

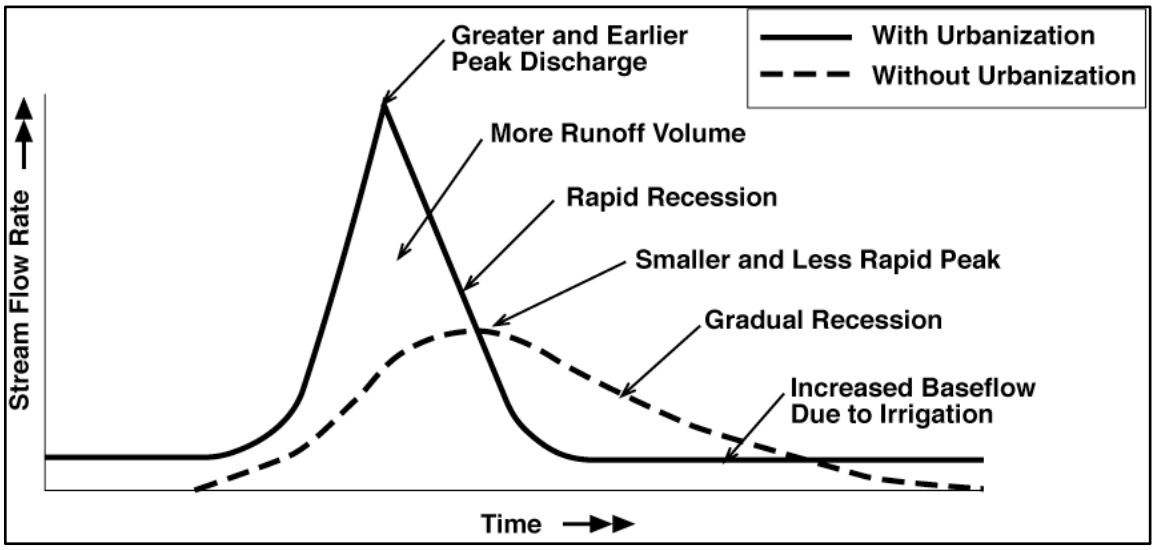
The Plan could alter existing drainage patterns or substantially increase the rate or amount of surface runoff in a manner that would result in flooding or produce or contribute runoff water that would exceed the capacity of existing or planned storm water drainage systems.

Storm water runoff is influenced by rainfall intensity, ground surface permeability, watershed size and shape, and physical barriers. The introduction of impermeable surfaces greatly reduces natural infiltration, allowing for a greater volume of runoff. In addition, paved surfaces and drainage conduits can accelerate the velocity of runoff, concentrating peak flows in downstream areas faster than under natural conditions. Significant increases to runoff and peak flow can overwhelm drainage systems and alter flood elevations in downstream locations. Increased runoff velocity can promote scouring of existing drainage facilities, reducing system reliability and safety. **Figure 3.13-1** depicts a typical hydrograph showing the effects of urbanization on peak flow rates.

The 2012-2035 RTP/SCS would result in increased impervious surfaces through transportation projects and development. Additional impervious surfaces increases storm water runoff volumes and peak flow rates. This increase has the potential to create or contribute runoff flows that would exceed the capacity of existing or planned storm water drainage systems. In addition, placing new structures within an existing floodplain can impede flood waters, altering the flood risks both upstream and downstream.

[41] Scheuler, T.R. (1994). The importance of imperviousness. *Watershed Protection Techniques 1(3)*: 100-111.

Figure 3.13-1: Hydrograph Comparison of Urbanized and Non-Urbanized Land Cover



SOURCE: Schueler, Thomas. (1997). *Controlling Urban Runoff: A Practical Manual For Planning And Designing Urban Bmps.* Metropolitan Washington Council Of Governments, Washington, D.C.

Natural desert conditions promote runoff that can cause flash flooding. In those areas of the SCAG region where soils have naturally low permeability and are subject to quick saturation, high rain volumes remain on the surface as runoff. When impervious surfaces such as highways are placed within these areas of an existing flood plain the public is exposed to the hazards of flash flooding. As discussed above, **Map 3.13-2** located in Chapter 8.0 (Maps), identifies federally designated flood hazard zones in the SCAG region. Many of the proposed highway projects would pass through these floodplain areas as currently delineated.

The highway and arterial projects proposed in the 2012-2035 RTP/SCS generally include widening existing highways, constructing new interchanges, new highway segments, new rail lines and the HRT projects. **Table 3.13-8** summarizes additional lane miles proposed for each county. Some of the proposed transit projects would involve construction of new rail lines, new stations, and upgrades to existing stations, and are not included in the calculation presented in **Table 3.13-8**.

Placing new structures within an existing floodplain can impede flood waters, altering the flood risks both upstream and downstream. The flooding risks associated with projects located in flood zones can be modified with appropriate design and alignment considerations. The amount of new urbanized acreage (consuming previously vacant land) would be on the order of 210,000 acres.[42] The additional urbanized acreage expected by 2035 could increase stormwater runoff, and could be located in areas with the potential for alluvial fan flooding or other flood hazards. Several HQTAs are include areas that are also flood hazard zones, in particular these areas on located along the coasts of Orange, Los Angeles and Ventura Counties. Implementation of Mitigation Measures **MM-W36** through **MM-W38** would reduce flooding impacts; however, impacts would remain significant.

Impact 3.13-4: Potential to exceed capacity of wastewater treatment services.

Given that wastewater generation rates are closely tied to population growth and that the total population is expected to grow by approximately 21 percent across the SCAG region by 2035, wastewater generation could increase by up to 21 percent, however, water conservation is likely to substantially reduce increases in

[42] *Ibid.*

wastewater (see below). The remaining wastewater treatment capacity derived from the data in **Table 3.15-6**, is estimated at 54 percent. Broadly assuming that wastewater capacity can be shared among the agencies in each county and that population growth would be somewhat dispersed throughout the SCAG region, it is estimated that the SCAG region would not outgrow its wastewater treatment capacity by the year 2035 especially given aggressive water conservation strategies. Therefore, cumulative impacts to wastewater treatment capacity would be less than significant. Regardless, implementation of Mitigation Measures **MM-W2** through **MM-W7** would reduce wastewater impacts.

Impact 3.13-5: Potential to contribute to an increased demand for water supply and its associated infrastructure.

Water agencies in the SCAG region produce Urban Water Management Plans (UWMPs) and other long-range planning studies to provide a system adequate to supply water demand. At existing usage rates, the existing water supplies and infrastructure would not be sufficient to meet demand in 2035. The volume of water and water delivery infrastructure currently available within the SCAG region would not be sufficient to meet the future multiple dry year or average year water demand in 2035. As population increases in the SCAG region, the demand for municipal water could increase. Increased commercial and industrial land uses could also increase water demand. However, many agencies are implementing aggressive water conservation, recycling and planning strategies (water transfer and water banking) to reduce demand and even out supply in wet and dry years. The City of Los Angeles for example has maintained relatively constant water demand over the past ten years as a result of water conservation, and the 2010 UWMP anticipates that water demand will continue to remain relatively constant through the year 2035 despite increasing population.

Reduction in water supply, as well as uncertainty in the reliability of that supply, could result from increased temperatures due to global climate change, as well as regulatory or legislative decisions that affect the availability of imported water.

Meeting future water demand is the responsibility of local and regional water agencies. Water supplies are either produced locally from groundwater and surface water sources or are imported via the Los Angeles Aqueduct, the California Aqueduct, the Colorado River Aqueduct, the All American Canal, or the Coachella Canal. Other means of providing water without increasing imported supplies include reclamation and recycling, conservation, water transfers, groundwater banking, developing brackish groundwater, and ocean desalination.

The Urban Water Management Plan Act of 1990 requires that local water agencies prepare plans showing projected water supplies and demands for average years and multiple dry years. These plans are updated every five years. Some water agencies project average year water deficits by the year 2020 if current management and supply efforts are not augmented. Other agencies project no deficits owing to the development of new supplies and management efforts. These projections all face the same uncertainty in regard to the long-term affects of global climate change on the region's water supply.

MWD has prepared the 2010 Integrated Water Resources Plan that provides a roadmap for maintaining regional water supply reliability over the next 25 years. The framework places an increased emphasis on regional collaboration. Earlier plans dating back to 1996 set a regional reliability goal of meeting full-service demands at the retail level under all foreseeable hydrologic conditions. This updated plan seeks to stabilize Metropolitan's traditional imported water supplies and to continue developing additional local resources.

It also advances long-term planning for potential future contingency resources, such as storm water capture and large-scale seawater desalination, in close coordination with MWD's 26 member public agencies and other utilities. The updated IRP strikes a balance through a three-component approach:

- A core resources strategy represents baseline efforts to manage water supply and demand conditions and to stabilize MWD's traditional imports from the Colorado River and Northern California through the Sacramento-San Joaquin Delta. This strategy is based on known factors, including detailed planning assumptions about future demographic scenarios, water supply yields, and a range of observed historical weather patterns. Under this strategy, MWD and its member agencies will advance water use efficiency through conservation and recycling, and with further local development such as groundwater recovery and seawater desalination.

- A cost-effective "supply buffer" will enable the region to adapt to future circumstances and foreseeable challenges. The buffer seeks to help protect the region from possible shortages caused by conditions that exceed the core resources strategy, starting with increased conservation and water-use efficiency on a region-wide basis.

- Foundational actions guide the region in determining alternative supply options for long-range planning. If future changed conditions—such as climate change or the availability of resources—exceed what is covered by MWD's core resources and supply buffer, these alternatives would provide a greater contribution to water reliability than MWD's imported water sources or any other single supply. These actions - including feasibility studies, research and regulatory review - would provide the foundation to develop alternative resources, if needed.

Over 80 percent of the projected population in the SCAG region in 2035 is within the MWD service area.

Supplying the water necessary to meet future demand and/or minimizing that demand would mitigate anticipated impacts. Each water district develops its own policy for determining its planning horizon and for acquiring and building water facilities. Water districts provide water for the growth planned and authorized by the appropriate land use authority. However, given the challenges to imported water supplies, meeting future demand is difficult. Implementation of Mitigation Measures **MM-W39** through **MM-W68** would reduce water supply impacts, however, impacts would remain potentially significant as a result of uncertainties in water supply.

Impact 3.13-6: Potential to contribute to cumulatively considerable demand on water resources.

As described in the existing setting, much of the water that is consumed in the SCAG region is imported from other parts of the State. As a result, any increase in water demand in the SCAG region would affect areas outside the region by consuming water that could be used in other areas. As noted above, it is anticipated that aggressive water conservation as well as other water management strategies (water transfers, water banking, etc.) will result in adequate supplies to the region. Due to the uncertainties associated with water supply and management this impact is considered cumulatively considerable.

Impacts described above such as flooding would be site specific and would not result in cumulative effects.

MITIGATION MEASURES

Mitigation Measures **MM-W1**, **MM-W14**, **MM-W41**, **MM-W42**, **MM-W45**, and **MM-W67** shall be implemented by SCAG over the lifetime of the 2012-2035 RTP/SCS to address water issues as indicated below. Mitigation Measures **MM-W2** through **MM-W13**, **MM-W15** through **MM-W40**, **MM-W43**, **MM-W44**, **MM-W46** through **MM-W65**, and **MM-W68** can and should be implemented by local agencies, water districts and project sponsors (for both development and transportation projects) as applicable. Project-specific environmental documents may adjust these mitigation measures as necessary to respond to site-specific conditions. Projects taking advantage of CEQA Streamlining provisions of SB 375 can and should apply mitigation measures as appropriate to site-specific conditions.

Water Quality

MM-W1: SCAG shall continue to work with local jurisdictions and water quality agencies, and other means, to encourage regional-scale planning for improved water quality management and pollution prevention. Future impacts to water quality shall be avoided to the extent practical and feasible through cooperative planning, information sharing, and comprehensive pollution control measure development within the SCAG region. This cooperative planning shall occur as part of current and existing coordination, an integral part of SCAG's ongoing regional planning efforts.

Wastewater

MM-W2: Local jurisdictions can and should encourage new development and industry to locate in those service areas with existing wastewater infrastructure and treatment capacity, making greater use of those facilities prior to incurring new infrastructure costs.

MM-W3: Local jurisdictions can and should promote reduced wastewater system demand by: designing wastewater systems to minimize inflow and increase upstream treatment and infiltration to the extent feasible, reducing overall source water generation by domestic and industrial users, deferring development approvals for industries that generate high volumes of wastewater until wastewater agencies have expanded capacity.

MM-W4: Wastewater treatment agencies are encouraged to have expansion plans, approvals and financing in place once their facilities are operating at 80 percent of capacity. SCAG shall provide opportunities for information sharing and program development.

MM-W5: Project sponsors can and should coordinate with the local wastewater provider in order to ensure that existing and/or planned sewer conveyance and treatment facilities are capable of meeting wastewater flow capacity requirements. Each project sponsor can and should identify specific on- and off-site improvements needed to ensure that impacts related to wastewater conveyance capacity are addressed prior to issuance of plans. Sewer capacity clearance from the local wastewater provider will be required at the time that a sewer connection permit application is submitted.

MM-W6: As appropriate, confirmation of the capacity of the surrounding stormwater and sanitary sewer system and state of repair can and should be completed by a qualified civil engineer with funding from the project sponsor. The project sponsor can and should be responsible for the necessary stormwater and sanitary sewer infrastructure improvements to accommodate the proposed project. In addition, the sponsor can and should be required to pay any fees to improve sanitary sewer infrastructure as may be required by the applicable local agencies. Improvements to the existing sanitary sewer collection system can and should specifically include, but are not limited to, mechanisms to control or minimize increases in infiltration/inflow to offset sanitary sewer increases associated with the proposed project. To the maximum extent practicable, the sponsor will be required to implement Best Management Practices to reduce the peak stormwater runoff from the project site. Additionally, the project sponsor can and should be responsible for payment of any required installation or hook-up fees to the affected service providers.

MM-W7: Wastewater treatment agencies can and should maximize efficiency of wastewater treatment and pumping equipment.

Riparian Habitats and Waters of the US

MM-W8: Project sponsors with projects requiring the discharge of dredged or fill materials into U.S. waters, including wetlands, can and should comply with sections 404 and 401 of the Clean Water Act including the requirement to obtain a permit from the U.S. Army Corps of Engineers and the governing Regional Water Quality Control Board.

MM-W9: Project sponsor can and should ensure that natural riparian conditions near projects are maintained, wherever feasible, to minimize the effects of stormwater flows at stream crossings. Where feasible, riparian areas can and should be restored or expanded to mitigate additional impervious surface and associated runoff.

MM-W10: Prior to construction within the vicinity of a watercourse, the project sponsor can and should obtain all necessary regulatory permits and authorizations from the U.S. Army Corps of Engineers (Corps), Regional Water Quality Control Board (RWQCB), California Department of Fish and Game, California Coastal Commission, and local jurisdictions, and should comply with all conditions issued by applicable agencies. Required permit approvals and certifications may include, but not be limited to the following:

- U.S. Army Corps of Engineers (Corps): Section 404. Permit approval from the Corps should be obtained for the placement of dredge or fill material in Waters of the U.S., if any, within the interior of the project site, pursuant to Section 404 of the federal Clean Water Act.
- Regional Walter Quality Control Board (RWQCB): Section 401 Water Quality Certification. Certification that the project will not violate state water quality standards is required before the Corps can issue a 404 permit, above.
- California Department of Fish and Game (CDFG): Section 1602 Lake and Streambed Alteration Agreement. Work that will alter the bed or bank of a stream requires authorization from CDFG.

A qualified environmental consultant can and should be retained and paid for by the project sponsor to make site visits as necessary; and as a follow-up, submit to the Lead Agency a letter certifying that all required conditions have been instituted during the grading activities.

MM-W11: Prior to issuance of a demolition, grading, or building permit within vicinity of a watercourse project sponsors can and should develop a final detailed landscaping and irrigation plan for review and approval by the appropriate local jurisdiction prepared by a licensed landscape architect or other qualified person. Such a plan should include a planting schedule, detailing plant types and locations, and a system for temporary irrigation of plantings.

- Plant and maintain only drought-tolerant plants on the site where appropriate, as well as native and riparian plants in and adjacent to riparian corridors. Along the riparian corridor, native plants should not be disturbed to the maximum extent feasible. Any areas disturbed along the riparian corridor should be replanted with mature native riparian vegetation and be maintained to ensure survival.
- All landscaping indicated on the approved landscape plan should be installed prior to the issuance of a Final inspection of the building permit, otherwise permitted. .
- All landscaping areas shown on the approved plans should be maintained in neat and safe conditions, and all plants should be maintained in good growing condition and, whenever necessary replaced with new plant materials to ensure continued compliance with all applicable landscaping requirements. All paving or impervious surfaces should occur only on approved areas.

Runoff/Drainage

MM-W12: Project sponsors can and should comply with the State-wide construction storm water discharge permit requirements including preparation of Storm Water Pollution Prevention Plans for transportation improvement construction projects. Roadway construction projects can and should comply with the Caltrans storm water discharge permit. Best Management Practices can and should be identified and implemented to manage site erosion, wash water runoff, and spill control.

MM-W13: Project sponsors can and should comply with the requirements of the National Pollutant Discharge Elimination System (NPDES). The project sponsor can and should submit with the application for a building permit (or other construction-related permit) a completed Construction-Permit-Phase Stormwater Supplemental Form. The project drawings submitted for the building permit (or other construction-related permit) should contain a stormwater management plan, for review and approval by the appropriate agency, to manage stormwater run-off and to limit the discharge of pollutants in stormwater after construction of the project to the maximum extent practicable. The post-construction stormwater management plan should include and identify the following:

- All proposed impervious surface on the site;
- Anticipated directional flows of on-site stormwater runoff; and
- Site design measures to reduce the amount of impervious surface area and directly connected impervious surfaces; and
- Source control measures to limit the potential for stormwater pollution;
- Stormwater treatment measures to remove pollutants from stormwater runoff; and
- Hydromodification management measures so that post-project stormwater runoff does not exceed the flow and duration of pre-project runoff, if required under the NPDES permit.

The following additional information should be submitted with the post-construction stormwater management plan:

- Detailed hydraulic sizing calculations for each stormwater treatment measure proposed; and
- Pollutant removal information demonstrating that any proposed manufactured/ mechanical (i.e. non-landscape-based) stormwater treatment measure, when not used in combination with a landscape-based treatment measure, is capable or removing the range of pollutants typically removed by landscape-based treatment measures and/or the range of pollutants expected to be generated by the project.

All proposed stormwater treatment measures can and should incorporate appropriate planting materials for stormwater treatment (for landscape-based treatment measures) and should be designed with considerations for vector/mosquito control. Proposed planting materials for all proposed landscape-based stormwater treatment measures should be included on the landscape and irrigation plan for the project. The sponsor is not required to include on-site stormwater treatment measures in the post-construction stormwater management plan if he or she secures approval from an appropriate agency that an alternate approach is appropriate. The project sponsor can and should implement the approved stormwater management plan.

MM-W14: SCAG shall continue to work with local jurisdictions and water agencies, to encourage regional-scale planning for improved stormwater management and groundwater recharge, including consideration of alternative recharge technologies and practices. Future adverse impacts shall be avoided through cooperative planning, information sharing, and comprehensive implementation efforts within the SCAG region.

MM-W15: Project sponsors can and should consult with the RWQCB and Storm Water Management Plan permit holders as projects are designed to ensure that projects protect the goals of the Clean Water Act and comply with federal storm water NPDES permits.

MM-W16: Project sponsors can and should ensure that new facilities include structural water quality control features such as drainage channels, detention basins, oil and grease traps, filter systems, and vegetated buffers to prevent pollution of adjacent water resources by polluted runoff where required by applicable urban storm water runoff discharge permits.

MM-W17: Structural storm water runoff treatment can and should be provided according to the applicable urban storm water runoff permit where facilities will be operated by a permitted municipality or county. Where Caltrans is the operator, the statewide permit applies.

MM-W18: Project sponsors can and should ensure that operational best management practices for street cleaning, litter control, and catch basin cleaning are implemented to prevent water quality degradation in compliance with applicable storm water runoff discharge permits. Efforts can and should be made to assure treatment controls are in place as early as possible, such as during the acquisition process for rights-of-way, not just later during the facilities design and construction phase.

MM-W19: In compliance with applicable municipal separate storm sewer system discharge permits as well as Caltrans' storm water discharge permit, long-term sediment control can and should be affected through erosion control and revegetation programs designed to allow reestablishment of native vegetation on slopes and undeveloped areas.

MM-W20: Drainage of roadway runoff can and should comply with Caltrans' storm water discharge permit. Wherever possible, roadways can and should be designed to convey storm water through vegetated median strips that provide detention capacity and allow for infiltration before reaching culverts.

MM-W21: Treatment and control features such as detention basins, infiltration strips, and porous paving, other features to control surface runoff and facilitate groundwater recharge can and should be incorporated into the design of new transportation projects early on in the process to ensure that adequate acreage and elevation contours are provided during the right-of-way acquisition process.

MM-W22: Project sponsors can and should assure projects mitigate for changes to the volume of runoff, where any downstream receiving water body has not been designed and maintained to accommodate the increase in flow velocity, rate, and volume without impacting the water's beneficial uses. Pre-project flow velocities, rates, and volumes must not be exceeded. This applies not only to increases in storm water runoff from the project site, but also to hydrologic changes induced by flood plain encroachment. Projects should not cause or contribute to conditions that degrade the physical integrity or ecological function of any downstream receiving waters.

MM-W23: Impacts can and should be reduced to the extent possible by providing culverts and facilities that do not increase the flow velocity, rate, or volume and/or acquiring sufficient storm drain easements that accommodate an appropriately vegetated earthen drainage channel.

MM-W24: Project sponsors of improvement projects on existing facilities can and should include upgrades to stormwater drainage facilities to accommodate any increased runoff volumes. These upgrades may include the construction of detention basins or structures that will delay peak flows and reduce flow velocities, including expansion and restoration of wetlands and riparian buffer areas. System designs can and should be completed to eliminate increases in peak flow rates from current levels.

MM-W25: Local jurisdictions can and should encourage Low Impact Development and incorporation of natural spaces that reduce, treat, infiltrate and manage stormwater runoff flows in all new developments, where practical and feasible.

MM-W26: Project sponsor can and should ensure that for sites less than one acre, project drawings submitted for a building permit (or other construction-related permit) contain a final site plan to be reviewed and approved by the appropriate local agency. The final site plan should incorporate appropriate site design measures to manage stormwater runoff and minimize impacts to water quality after the construction of the project. These measures may include, but are not limited to, the following:

- Minimize impervious surfaces, especially directly connected impervious surfaces;
- Utilize permeable paving in place of impervious paving where appropriate;
- Cluster buildings;
- Preserve quality open space; and
- Establish vegetated buffer areas.

The approved plan should be implemented and the site design measures shown on the plan should be permanently maintained.

MM-W27: Project sponsors can and should implement BMPs to reduce erosion, sedimentation, and water quality impacts during construction to the maximum extent practicable. Plans demonstrating BMPs should be submitted for review and approval by the Lead Agency. At a minimum, the project sponsor can and should provide filter materials deemed acceptable to the Lead Agency at nearby catch basins to prevent any debris and dirt from flowing into the local storm drain system and creeks.

MM-W28: Project sponsors for sites over one acre, must obtain coverage under the General Construction Activity Storm Water Permit (General Construction Permit) issued by the State Water Resources Control Board (SWRCB). The project sponsor must file a notice of intent (NOI) with the SWRCB. The project sponsor will be required to prepare a stormwater pollution prevention plan (SWPPP) and submit the plan for review and approval by the Lead Agency. At a minimum, the SWPPP should include a description of construction materials, practices, and equipment storage and maintenance; a list of pollutants likely to contact stormwater; site-specific erosion and sedimentation control practices; a list of provisions to eliminate or reduce discharge of materials to stormwater; BMPs, and an inspection and monitoring program. Prior to the issuance of any construction-related permits, the project sponsor should submit to the lead agency a copy of the SWPPP and evidence of submittal of the NOI to the SWRCB. Implementation of the SWPPP should start with the commencement of construction and continue though the completion of the project. After

construction is completed, the project sponsor can and should submit a notice of termination to the SWRCB.

MM-W29: Project sponsors can and should ensure that project drawings submitted for a building permit (or other construction-related permit) contain a drainage plan to be reviewed and approved by the appropriate agency. The drainage plan should include measures to reduce the post-construction volume and velocity of stormwater runoff to the maximum extent practicable. Stormwater runoff should not be augmented to adjacent properties or creeks. The drainage plan should include and identify the following:

- All proposed impervious surface on the site;
- Anticipated directional flows of on-site stormwater runoff;
- Site design measures to reduce the amount of impervious surface area and directly connected impervious surfaces;
- Source control measures to limit the potential for stormwater pollution; and
- Stormwater treatment measures to remove pollutants from stormwater runoff.

MM-W30: Project sponsors can and should submit an erosion and sedimentation control plan for review and approval by the appropriate government agency. All work should incorporate all applicable BMPs for the construction industry, including BMP's for dust, erosion and water quality. The measures should include, but are not limited to, the following:

- On sloped properties, the downhill end of the construction area must be protected with silt fencing (such as sandbags, filter fabric, silt curtains, etc.) and hay bales oriented parallel to the contours of the slope (at a constant elevation) to prevent erosion into the street, gutters, stormdrains.
- In accordance with an approved erosion control plan, the project sponsor should implement mechanical and vegetative measures to reduce erosion and sedimentation, including appropriate seasonal maintenance. One hundred (100) percent degradable erosion control fabric should be installed on all graded slopes to protect and stabilize the slopes during construction and before permanent vegetation gets established. All graded areas should be temporarily protected from erosion by seeding with fast growing annual species. All bare slopes must be covered with staked tarps when rain is occurring or is expected.
- Minimize the removal of natural vegetation or ground cover from the site in order to minimize the potential for erosion and sedimentation problems. Maximize the replanting of the area with native vegetation as soon as possible.
- Install filter materials acceptable to the appropriate agency at the storm drain inlets nearest to the project site prior to the start of the wet weather season (October 15); site dewatering activities; street washing activities; saw cutting asphalt or concrete; and in order to retain any debris flowing into the storm drain system. Filter materials should be maintained and/or replaced as necessary to ensure effectiveness and prevent street flooding.
- Ensure that concrete/granite supply trucks or concrete/plaster finishing operations do not discharge wash water into water courses, street gutters, or storm drains.
- Direct and locate tool and equipment cleaning so that wash water does not discharge into the street, gutters, or stormdrains.
- Create a contained and covered area on the site for storage of bags of cement, paints, flammables, oils, fertilizers, pesticides, or any other materials used on the project site that have the potential for being discharged to the storm drain system by the wind or in the event of a material spill. No hazardous waste material should be stored on-site.

- Gather all construction debris on a regular basis and place them in a dumpster or other container which is emptied or removed on a weekly (or other interval approved by the Lead Agency) basis. When appropriate, use tarps on the ground to collect fallen debris or splatters that could contribute to stormwater pollution.
- Remove all dirt, gravel, refuse, and green waste from the sidewalk, street pavement, and storm drain system adjoining the project site. During wet weather, avoid driving vehicles off paved areas and other outdoor work.
- As appropriate, broom sweep the street pavement adjoining the project site on a daily basis. Caked-on mud or dirt should be scraped from these areas before sweeping. At the end of each workday, the entire site must be cleaned and secured against potential erosion, dumping, or discharge to the street, gutter, and/or stormdrains.
- All erosion and sedimentation control measures implemented during construction activities, as well as construction site and materials management should be in strict accordance with the control standards listed in the latest edition of the Erosion and Sediment Control Field Manual published by the RWQB.
- All erosion and sedimentation control measures should be monitored regularly by the project sponsor. If measures are insufficient to control sedimentation and erosion then the project sponsor should develop and implement additional and more effective measures immediately.

Groundwater

MM-W31: Project sponsors can and should ensure that projects requiring continual dewatering facilities implement monitoring systems and long-term administrative procedures to ensure proper water management that prevents degrading of surface water and minimizes, to the greatest extent possible, adverse impacts on groundwater for the life of the project. Construction designs can and should comply with appropriate building codes and standard practices including the Uniform Building Code.

MM-W32: Project sponsors, lead agencies, and local jurisdictions can and should maximize, where practical and feasible, permeable surface area in existing urbanized areas to protect water quality, reduce flooding, allow for groundwater recharge, and preserve wildlife habitat. New impervious surfaces can and should be minimized to the greatest extent possible, including the use of in-lieu fees and off-site mitigation.

MM-W33: Project sponsors can and should avoid designs that require continual dewatering where feasible.

MM-W34: Where feasible, transportation facilities can and should not be sited in groundwater recharge areas, to prevent conversion of those areas to impervious surface.

MM W35: Project sponsors can and should reduce hardscape to the extent feasible to facilitate groundwater recharge as appropriate.

Flood Protection

MM-W36: Project sponsor can and should ensure that all roadbeds for new highway and rail facilities be elevated at least one foot above the 100-year base flood elevation. Since alluvial fan flooding is not often identified on FEMA flood maps, the risk of alluvial fan flooding should be evaluated and projects should be sited to avoid alluvial fan flooding. Delineation of floodplains and alluvial fan boundaries should attempt to account for future hydrologic changes caused by global climate change.

MM-W37: Project sponsors of transportation improvements can and should comply with local, state, and federal floodplain regulations. Projects requiring federal approval or funding should comply with Executive Order 11988 on Floodplain Management, which requires avoidance of incompatible floodplain development, restoration and preservation of the natural and beneficial floodplain values, and maintenance of consistency with the standards and criteria of the National Flood Insurance Program.

MM-W38: Local jurisdictions can and should, to the extent feasible and appropriate, prevent development in flood hazard areas that do not have appropriate protections, especially in alluvial fan areas of the region.

Water Supply

MM-W39: Local water agencies can and should continue to evaluate future water demands and establish the necessary supply and infrastructure to meet that demand, as documented in their Urban Water Management Plans.

MM-W40: Project sponsors, local jurisdictions, and water agencies can and should include conjunctive use as a water management strategy when feasible.

MM-W41: SCAG, in coordination with regional water agencies and other stakeholders, shall encourage the kind of regional coordination throughout California and the Colorado River Basin that develops and supports sustainable policies in accommodating growth.

MM-W42: SCAG, in coordination with regional water agencies and other stakeholders, shall facilitate information sharing about the management and status of the Sacramento River Delta, the Colorado River Basin, and other water supply source areas of importance to local water supply.

MM-W43: Regional water agencies can and should consider, to the greatest extent feasible, potential climate change hydrology and attendant impacts on available water supplies and reliability in the process of creating or modifying systems to manage water resources for both year-round use and ecosystem health. As the methodology and base data for such decisions is still developing, agencies can and should use the best currently available science in decision making. Local jurisdictions and water agencies can and should rely on current regional analyses when making local decisions regarding future water supply and reliability.

MM-W44: Project sponsors and local jurisdictions can and should reduce exterior uses of water in public areas, and should promote reductions in private homes and businesses, by shifting to drought-tolerant native landscape plantings (xeriscaping), using weather-based irrigation systems, educating other public agencies about water use, and installing related water pricing incentives. Local jurisdictions can and should also work with local retailers and vendors to promote the availability of drought resistant landscaping options and provide information on where these can be purchased. Use of reclaimed water especially in median landscaping and hillside landscaping can and should be implemented where feasible.

MM-W45: Future impacts to water supply shall be minimized through cooperation, information sharing, and program development as part of SCAG's on-going regional planning efforts, in coordination with regional water agencies and other stakeholders.

MM-W46: Project sponsors can and should coordinate with the local water provider to ensure that existing and/or planned water supply and water conveyance facilities are capable of meeting water demand/pressure requirements. In accordance with State Law, a Water Supply Assessment can and should be required for projects that meet the size requirements specified in the regulations. In coordination with the local water provider, each project sponsor will identify specific on- and off-site improvements needed to ensure that impacts related to water supply and conveyance demand/pressure requirements are addressed prior to issuance of a certificate of occupancy. Water supply and conveyance demand/pressure clearance from the local water provider will be required at the time that a water connection permit application is submitted.

MM-W47: Project sponsors can and should coordinate with the local fire service provider in order to ensure that existing and/or planned fire hydrants are capable of meeting fire flow demand/pressure requirements. The issuance of building permits will be dependent upon submission, review, approval, and testing of fire flow demand and pressure requirements, as established by the local fire service provider prior to occupancy.

MM-W48: Project sponsors can and should implement water conservation measures in new development that should include but not be limited to the following:

- Installation of high-efficiency toilets (1.28 gallons per flush or less, includes dual flush.
- High-efficiency urinals (0.125 gallons per flush or less, includes waterless)
- Restroom faucet flow rate of 1.5 gallons per minute or less
- Public restroom faucet flow rate of 0.5 gallons per minute or less and self-closing
- Showerhead flow rate of 2.0 gallons per minute or less
- Limit of one showerhead per shower stall
- High efficiency clothes washers (water factor of 4.0 or less)
- High efficiency dishwashers (Energy Star rated)
- Domestic water heating system located in close proximity to point(s) of use, as feasible; use of tankless and on-demand water heaters as feasible
- Cooling towers must be operated at a minimum of 5.5 cycles of concentration
- Install on-site water recycling as feasible
- Use of recycled water (if available) for appropriate end uses (irrigation, cooling towers, sanitary)
- Single pass cooling should be prohibited (e.g. any vacuum pumps or ice machines)
- Irrigation should include:
  - Weather-based irrigation controller with rain shutoff
  - Flow sensor and master valve shutoff (for large landscaped areas)
  - Matched precipitation (flow) rates for sprinkler heads
  - Drip/microspray/subsurface irrigation where appropriate
  - Minimum irrigation system distribution uniformity of 75%
  - Proper hydro-zoning, turf minimization and use of native/drought tolerant plant materials
  - Use of landscape contouring to minimize precipitation runoff

MM-W49: Project sponsors can and should consult with the local water provider to identify feasible and reasonable measures to reduce water consumption, including, but not limited to, systems to use reclaimed water for landscaping, drip irrigation, re-circulating hot water systems, water conserving landscape techniques (such as mulching, installation of drip irrigation systems, landscape design to group plants of similar water demand, soil moisture sensors, automatic

irrigation systems, clustered landscaped areas to maximize the efficiency of the irrigation system), water conserving kitchen and bathroom fixtures and appliances, thermostatically controlled mixing valves for baths and showers, and insulated hot water lines.

MM-W50: Project sponsors can and should incorporate compliance with local drought measures as appropriate including prohibiting hose watering of driveways and associated walkways; requiring decorative fountains to use recycled water, and repairing water leaks in a timely manner.

MM-W51: Project sponsors can and should incorporate automatic sprinkler systems that irrigate landscaping during morning hours or during the evening to reduce water losses from evaporation. Sprinklers should be required to reset to water less often in cooler months and during the rainfall season, so that water is not wasted in excessive landscape irrigation.

MM-W52: Prior to issuance of building permits, project sponsors can and should pay any appropriate fees imposed by local water providers to off-set any fair share project costs as identified by the local water provider.

MM-W53: As part of the general plan update process, local jurisdictions can and should coordinate with water providers to identify water budgets for development within their jurisdiction. Local water providers may provide for new water supply through a combination of water conservation (on and potentially off-site) and recycled water, such that the net increase in water demand (not including demand for recycled water) does not exceed the calculated demand anticipated in the most recent Urban Water Management Plan or other similar document.

MM-W54: Project sponsors can and should create water-efficient landscapes.

MM-W55: Project sponsors can and should install water-efficient irrigation systems and devices, such as soil moisture-based irrigation controls and use water-efficient irrigation methods.

MM-W56: Project sponsors can and should incorporate water-reducing features into building and landscape design.

MM-W57: Project sponsors should make effective use of graywater for landscape irrigation. (Graywater is untreated household wastewater from bathtubs, showers, bathroom wash basins, and water from clothes washing machines.)

MM-W58: Project sponsors can and should implement low-impact development practices that maintain the existing hydrology of the site to manage storm water and protect the environment by doing the following:

- Devise a comprehensive water conservation strategy appropriate for the project and location.
- Design buildings to be water-efficient. Install water-efficient fixtures and appliances.
- Offset water demand from new projects so that there is no net increase in water use.
- Provide education about water conservation and available programs and incentives.

MM-W59: Local jurisdictions can and should adopt and implement a comprehensive strategy to increase water conservation and the use of recycled water that includes similar measure to the following:

- **Water Consumption Reduction Target:** Regional water agencies should work together to set a target for to reduce per capita water consumption by 2020.
- **Water Conservation Plan:** Regional water agencies should establish a water conservation plan that may include such policies and actions as:
  - Tiered rate structures for water use;
  - Restrictions on time of use for landscape watering, and other demand management strategies;
  - Performance standards for irrigation equipment and water fixtures;
  - Requirements that increased demand from new construction be offset with reductions so that there is no net increase in water use.
- **Recycled Water Use:** Local jurisdictions and regional water agencies should establish programs and policies to increase the use of recycled water, including:
  - Create an inventory of non-potable water uses within the jurisdiction that could be served with recycled water;
  - Produce and promote the use of recycled water for agricultural, industrial, and irrigation purposes, including grey water systems for residential irrigation;
  - Produce and promote the use of treated, recycled water for potable uses where GHG emissions from producing such water are lower than from other potable sources.
- **Water Conservation Outreach:** Local jurisdictions and regional water agencies should implement a public education and outreach campaign to promote water conservation, and highlights specific water-wasting activities to discourage, such as the watering of non-vegetated surfaces and using water to clean sidewalks and driveways.

MM-W60: Local jurisdictions can and should ensure that building standards and permit approval processes promote and support water conservation.

MM-W61: Local jurisdictions can and should establish building design guidelines and criteria to promote water-efficient building design, including minimizing the amount of non-roof impervious surfaces around the building(s).

MM-W62: Local jurisdictions can and should establish menus and check-lists for developers and contractors to ensure water-efficient infrastructure and technology are used in new construction, including low-flow toilets and shower heads, moisture-sensing irrigation, and other such advances.

MM-W63: SCAG, in coordination with the State Water resources Board, shall encourage cities, counties and water districts to develop local sources of potable water including recycling where feasible.

MM-W64: Local jurisdictions can and should establish criteria and standards to permit the safe and effective use of gray water (on-site water recycling), and review and appropriately revise, without compromising health and safety, other building code requirements that might prevent the use of such systems.

MM-W65: Local jurisdictions can and should establish programs and policies to ensure landscaping and forests are installed and managed to optimize their climate benefits.

MM-W66: Project sponsors can and should install water efficient landscapes and irrigation, including:

- Planting drought-tolerant and native species, and covering exposed dirt with moisture-retaining mulch;
- Installing water-efficient irrigation systems and devices, including advanced technology such as moisture-sensing irrigation controls; and/or
- Installing edible landscapes that provide local food.

MM-W67: SCAG, as part of its on-going outreach and technical assistance efforts, shall organize workshops on water conservation activities, such as selecting and planting drought tolerant, native plants in landscaping, and installing advanced irrigation systems.

MM-W68: Regional water agencies can and should maximize efficiency at drinking water treatment, pumping, and distribution facilities, including development of off-peak demand schedules for heavy commercial and industrial users.

SIGNIFICANCE OF IMPACTS AFTER MITIGATION

Water Quality

Implementation of Mitigation Measure **MM-W1** would reduce the potential impacts to water quality; however, due to the regional scale of the Plan, the impacts remain significant.

Wastewater

Implementation of Mitigation Measures **MM-W2** through **MM-W7** would reduce the potential impacts to wastewater; however, due to the regional scale of the Plan, the impacts remain significant.

Riparian Habitats and Waters of the U.S.

Implementation of Mitigation Measures **MM-W8** through **MM-W11** would reduce the potential impacts to riparian habitats and waters of the U.S. in the SCAG region; however, due to the regional scale of the Plan, the impact remains significant.

Runoff/Drainage

Implementation of Mitigation Measures **MM-W12** through **MM-W30** would reduce the potential impacts to runoff/drainage; however, due to the regional scale of the Plan, the impacts remain significant.

Groundwater

Implementation of Mitigation Measures **MM-31** through **MM-W35** would reduce the potential impacts to groundwater; however, due to the regional scale of the Plan, the impacts remain significant.

Flood Protection

Implementation of Mitigation Measures **MM-W36** through **MM-W38** would reduce the potential impacts to flooding; however, due to the regional scale of the Plan, the impacts remain significant.

Water Supply

Implementation of Mitigation Measures **MM-W39** through **MM-W68** would reduce the potential impacts related to water supply; however, due to the regional scale of the Plan and uncertainty in water supply, the impacts remain potentially significant.

Cumulative Effects Outside the Region

Mitigation Measures **MM-W1** through **MM-W68** would reduce cumulative impacts related to water resources outside the region. However, water resources impacts outside the region would remain cumulatively considerable.

COMPARISON WITH THE NO PROJECT ALTERNATIVE

Under the No Project Alternative, the population of the SCAG region would grow by 3.9 million people, however, only the transportation projects that received federal environmental clearance by December 2010, projects in the 2011 FTIP, and projects currently under construction or right of way approval would be developed. The population distribution would follow past trends, uninfluenced by additional transportation investments.

Direct Impacts

With fewer transportation projects than the 2012-2035 RTP/SCS, the direct effects of the No Project Alternative on water resources would be reduced when compared with the 2012-2035 RTP/SCS. As the currently planned projects included in the No Project alternative (those transportation projects that would occur regardless of the 2012-2035 RTP/SCS adoption) are built, the impacts resulting from increased roadway runoff and drainage patterns would remain significant. Likewise, the impacts to groundwater infiltration caused by the increased impervious surfaces of roadway projects, and to increased flooding hazards, would remain significant. While the Plan and the No Project would result in the same total population, the more dispersed growth pattern under the No Project Alternative would result in less efficient use of water (more single-family homes with landscaping) and therefore would result in a greater per capita use of water. As the Plan's more compact growth pattern would be more water efficient, the Plans water supply impacts would be less than the No Project.

Similar to water supply, wastewater could be increased through the less efficient land use patterns. More new development would be located in areas that are not served by existing infrastructure which could result in additional impacts. The impacts to water quality would be greater under the No Project alternative as the difference in projected urbanized acreage between the Plan and No Project is significant, with the Plan converting 334 square miles of open space to urbanized land within the region. In comparison, the No Project Alternative is projected to convert 742 square miles of open space to urbanized land in the region. Because of the significant difference in urbanization and vacant land consumption, the impacts associated with urban development would be reduced in the Plan compared with the No Project alternative. Due to a more dispersed growth pattern, the No Project Alternative's impacts to both water quality and flood risk would be greater than those associated with the 2012-2035 RTP/SCS. Flooding impacts would generally be site specific although with greater consumption of vacant land, the No Project Alternative has a greater risk of locating RTP projects and/or development in flood prone areas.

Overall, it is anticipated that the Plan would result in fewer impacts to water resources because of a compact growth pattern that would result in less impervious surfaces and less demand for water.

Cumulative Impacts

Cumulatively, both the Plan and the No Project Alternative would impact water quality, groundwater recharge, flood hazards, and water supply. The No Project Alternative would accommodate the same increase in population as projected for the Plan but in a more dispersed pattern. To reduce land consumption, the Plan includes land use measures that encourage development targeted in HQTAs. These measures are largely absent in the No Project alternative. As discussed above, the large lot development associated with the No Project Alternative would result in greater demands on water supply. This increase in water consumption would pull additional water from imported sources, thereby limiting water available for other parts of the State. **Therefore, the No Project Alternative would result in greater cumulative impacts to water supply than the Plan.**

Additional impacts described above include water quality effects. These impacts would be greater under the No Project Alternative as increased impervious surface (which contributes to water quality impacts) would be greater under the No Project. This would result in greater impacts to water quality and could affect water in areas outside the SCAG region. **Therefore, cumulative water quality impacts would be greater under the No Project than the Plan alternative.**