5 SURFACE WATER SUPPLY

5.1 El Capitan Management Area

5.1.1 Description of Surface Water Resources, Resource Allocation, and Key Surface Water Tributaries

Surface water resources within the El Capitan Management Area include two surface water reservoirs and a number of tributary creeks (Figure 1-1).

The entire 189-square mile El Capitan Management Area is tributary to El Capitan Reservoir. Key surface water tributaries to El Capitan Reservoir include:

- San Diego River
- Conejos Creek
- King Creek
- Boulder Creek
- Cedar Creek
- Peutz Creek
- Chocolate Creek

As shown in Figure 1-1, the San Diego River originates northwest of Julian, and flows southwestward through largely uninhabited lands to El Capitan Reservoir. Conejos Creek originates on the southwestern edge of the Cuyamaca Mountains, and flows through Conejos Valley in the Capitan Grande Indian Reservation into El Capitan Reservoir. King Creek is a major tributary that joins Conejos Creek within the reservation. Boulder Creek flows from Cuyamaca Reservoir through steep canyons and uninhabited areas and joins the San Diego River immediately upstream from El Capitan Reservoir.

The entire El Capitan Management Area consists of unincorporated land. A significant portion of the El Capitan Management Area is uninhabited, with the majority of remaining lands being rural. Portions of the communities of Alpine and Julian, however, are within the El Capitan Management Area.

Storm runoff comprises the majority of flow within the tributary surface streams. Surfacing groundwater, springs, and irrigation runoff from developed areas within the El Capitan Management Area also contribute to surface flows.

One USGS stream gauging station exists along the San Diego River within the El Capitan Management Area, and total inflow from the tributary streams to El Capitan Reservoir is estimated by the City of San Diego on the basis of gauged reservoir water levels, estimated reservoir evaporation, and imported water inflows. Additionally, HWD monitors streamflow in Boulder Creek at two locations during times water is being transferred from Cuyamaca Reservoir to El Capitan Reservoir.

Because streamflows in the tributary streams within the El Capitan Management Area are highly dependent on storm runoff, streamflow is highly variable. Total annual runoff into El Capitan Reservoir during the past 25 years has ranged from more than 70,000 AFY to less than 1,000 AFY (City of San Diego 2000[1]).

No surface water diversions occur along the surface streams of the El Capitan Management Area. HWD, however, can transfer water from Cuyamaca Reservoir to El Capitan Reservoir via Boulder Creek.

Surface flows within the San Diego River, Conejos Creek, King Creek, and Boulder Creek serve as a source of water supply for riparian and aquatic habitat. Surface runoff in the tributary streams also supports non-contact recreation. Although listed in the Basin Plan for contact recreation beneficial use, there is no sanctioned recreational contact with streams on this management area. Additionally, surface runoff in the tributary streams provides recharge to local groundwater aquifers. Surface flows not infiltrating to groundwater and not taken up by vegetation or evaporation flow downstream through the tributary streams into El Capitan Reservoir.

El Capitan Reservoir. The SDWD operates El Capitan Reservoir for purposes of:

- Capturing local runoff as a source of unfiltered water supply for the City of San Diego Alvarado Water Filtration Plant
- Storing water released by HWD from Cuyamaca Reservoir

El Capitan Reservoir also provides non-contact water recreation (boating and fishing), and supports a variety of aquatic and wildlife habitat.

In addition to capturing local runoff, it is physically possible for the City to divert imported unfiltered water to El Capitan Reservoir from Pipeline Nos. 1 and 2 of the First San Diego Aqueduct. It is also possible for the City to divert surface waters from San Vicente Reservoir to El Capitan Reservoir. El Capitan Reservoir, however, has a higher spillway crest (750 feet above mean sea level) than San Vicente Reservoir (650 feet above mean sea level), making such transfers physically and economically feasible only in rare circumstances. As a result of the elevation difference, imported waters are rarely transferred to El Capitan Reservoir. Instead, El Capitan almost always comprises runoff derived from the El Capitan Management Area. Having said the rule, the exception is that because of at least five years of drought conditions and minimal local runoff, in recent years El Capitan has received significant volumes of imported water.

The City of San Diego withdraws El Capitan Reservoir water through a multi-outlet tower located at the El Capitan Dam. Water from the intake tower flows by gravity into the El Capitan Pipeline, which in turn feeds the El Monte Pipeline that is connected to the City of San Diego 150 mgd Alvarado Water Filtration Plant. The Alvarado Water Filtration Plant can receive inflow from a number of sources, including:

- Unfiltered imported water from Pipeline No. 4 of the Second San Diego Aqueduct delivered directly to the Alvarado Water Filtration Plant
- Surface water from Lake Murray (within the San Diego Management Area)
- Surface diversions from San Vicente Reservoir and El Capitan Reservoir delivered via the El Capitan and El Monte Pipelines
- Unfiltered imported water from Pipeline No. 1 of the First San Diego Aqueduct delivered via a bypass into the El Monte Pipeline

Maximum deliveries of El Capitan water to the Alvarado Water Filtration Plant are dependent on reservoir water levels, the physical capacity of the El Capitan and El Monte Pipelines, and the amount of San Vicente or aqueduct imported water flow directed into the El Capitan Pipeline. Except under unusual circumstances, the maximum withdrawal capacity from El Capitan Reservoir is approximately 60 mgd, and the maximum combined withdrawal from El Capitan and San Vicente Reservoirs is approximately 80 mgd by gravity flow.

With its larger tributary area and greater storage capacity devoted to local runoff, El Capitan Reservoir serves as the primary source of local supply to the Alvarado Water Filtration Plant. During the past 25 years, City of San Diego withdrawals from El Capitan Reservoir have ranged from over 40,000 AFY to less than 5,000 AFY. When El Capitan Reservoir storage levels are high, City water operators maximize withdrawals from El Capitan Reservoir to take advantage of the local supply, minimize imported water purchases, and draw the reservoir down to create capacity to capture runoff from the upcoming year. Withdrawals from El Capitan Reservoir significantly decrease or cease during periods when reservoir water levels are low. As a result of drought conditions, El Capitan water levels are currently down to their lowest levels in years, at approximately 20 percent of the of the total 112,810-AF storage capacity (City of San Diego 2000[1]; City of San Diego et al. 2003).

The discharge of surface flow from El Capitan Reservoir to the downstream San Diego Management Area occurs only if El Capitan Reservoir spills and overflows. Because City water operators draw down the reservoir in advance of the rainy season to maximize local capture, spills from El Capitan Reservoir are rare, and have occurred only on five occasions during the past 75 years.

Cuyamaca Reservoir. Cuyamaca Reservoir drains a 12-square mile watershed within the Cuyamaca Mountains. Cuyamaca Reservoir is owned and operated by HWD, and has a storage capacity of 8,195 AF.

HWD operates Cuyamaca Reservoir to capture and store local runoff and as a recreational reservoir. Reservoir inflows are dependent on hydrologic conditions. Storage levels and reservoir releases are managed by HWD on the basis of a number of factors including: water levels within the reservoir, time of year, downstream water demands, recreational needs, available capacity within El Capitan Reservoir, and imported water availability.

Water from Cuyamaca Reservoir can be transferred to downstream HWD facilities through surface release via Boulder Creek to El Capitan Reservoir. HWD has rights to store 10,000 AF of water within El Capitan Reservoir. HWD receives El Capitan water supplies supply via a turnout in the El Capitan Pipeline. Because Cuyamaca Reservoir water levels are dependent on local runoff, the quantity of supply generated by HWD can vary significantly from year to year. During the past 10 years, local water supplies developed from within the El Capitan Management Area by HWD have ranged to approximately 2,000 AFY to approximately 10,000 AFY (CSDWA 2002) which includes water from El Capitan Reservoir and from the main stem of the San Diego River.

With no connection to the imported water supply, water levels in Cuyamaca Reservoir are entirely dependent on hydrologic conditions. Currently, water levels in Cuyamaca Reservoir are at less than 10 percent reservoir capacity (CSDWA 2002).

5.1.2 Assessment of Water Storage and Supply Needs

Tributary Surface Streams. No surface water diversions occur with the streambeds of the El Capitan Management Area, and surface waters remain after infiltration to groundwater or taken up by vegetation flow downstream to El Capitan Reservoir.

Water balances associated with maintaining the beneficial uses have not been developed for tributary streams of the El Capitan Management Area. Adequate surface water flows, however, appear to exist within the streams to support the designated beneficial uses along the surface streams of the El Capitan Management Area.

El Capitan Reservoir. As the largest reservoir in San Diego County and the reservoir with the largest tributary area within the SDRW, El Capitan Reservoir is a significant element of the overall City of San Diego water supply system. Capture and seasonal storage of local runoff is the prime water supply function of the reservoir. City of San Diego water operators withdraw water from El Capitan Reservoir during the summer and fall to maximize the storage capacity available to capture winter runoff. When sufficient water is in storage in El Capitan, the rate of withdrawal is maximized. The pipeline carrying water from El Capitan has limited capacity, and when the reservoir is full, it may take several years to draw down to “normal” levels.

The volume of available local runoff acts as a constraint on the use of El Capitan Reservoir as a water supply source, however. During times when the reservoir level is down, the SDWD may curtail or suspend withdrawals from the reservoir until subsequent local runoff increases reservoir water levels.

While El Capitan Reservoir also serves as a recreational reservoir, water supply needs take precedence over recreational needs in City of San Diego reservoir operations.

Cuyamaca Reservoir. Cuyamaca Reservoir is operated by HWD to capture and store local runoff. While the reservoir represents approximately 30 percent of the total unfiltered water supply storage capacity of HWD, Cuyamaca Reservoir storage capacity is not as immediately accessible to HWD as Lake Jennings or El Capitan Reservoir. HWD primarily makes use of the reservoir capacity for seasonal storage of runoff instead of long-term storage and carry-over storage.

Cuyamaca Reservoir also serves as a popular recreational site operated by the Lake Cuyamaca Recreation and Park District, under a lease agreement with HWD.

5.2 San Vicente Management Area

5.2.1 Description of Surface Water Resources, Resource Allocation, and Key Surface Water Tributaries

Surface water resources within the San Vicente Management Area include San Vicente Reservoir and a number of tributary streams (Figure 1-1).

Runoff from the entire 74.2-square mile San Vicente Management Area drains into San Vicente Reservoir. Key tributaries that flow into San Vicente Reservoir include:

- Padre Barona Creek
- San Vicente Creek
- West Branch San Vicente Creek
- Tool Road Creek
- Aqueduct Creek

As described above, San Vicente Creek is the largest of these tributaries. Padre Barona Creek drains lands west of San Vicente Reservoir, including the Barona Valley. Padre Barona Creek enters San Vicente Reservoir at the westerly point of the reservoir.

Surface runoff is the primary source of streamflow within the tributary streams. Surfacing groundwater and springs also contribute to streamflow. Within developed portions of the watershed, agricultural and landscape irrigation runoff can form a significant component of the dry season base flow.

USGS gauging stations currently exist along tributary streams of the San Vicente Management Area. The City of San Diego estimates total inflow from the tributaries to San Vicente Reservoir on the basis of gauged reservoir water levels, estimated evaporation, water withdrawals, and imported water deliveries. Local runoff to San Vicente Reservoir varies significantly with hydrologic conditions. During the past 25 years, annual local runoff within the San Vicente Management Area that flows into San Vicente Reservoir (combined runoff from all San Vicente tributary streams) has ranged from a few hundred AFY to over 60,000 AFY. Median annual tributary runoff into San Vicente Reservoir during the past 25 years has been approximately 2000 AFY, while mean runoff into the reservoir has been approximately 7,000 AFY (City of San Diego 2000[2]).

Surface flows within the San Vicente Creek, Padre Barona Creek, Foster Creek, and Grace Creek support a variety of wetlands and riparian species. Surface runoff in the tributary streams also supports contact and non-contact recreation, and provides a source of recharge to local groundwater aquifers. Surface flows that are not infiltrated to groundwater or taken up by vegetation flow downstream into San Vicente Reservoir.

San Vicente Reservoir. San Vicente Reservoir is owned and operated by the City of San Diego. San Vicente Reservoir has a capacity of 90,200 AFY. CSDWA owns 10,000 AF of capacity within San Vicente Reservoir which is used as long-term storage, and the City reserves a portion of its reservoir capacity for emergency and carry-over storage. Remaining capacity in the reservoir, however, is available for the City's use in capturing and storing local runoff and seasonally storing imported water.

As noted above, the quantity of local runoff into San Vicente Reservoir varies significantly with hydrologic conditions. Except during extreme hydrologic conditions, local runoff typically contributes a small percentage of the overall reservoir inflows.

San Vicente Reservoir serves as a key facility for storing imported water. Imported water from San Diego Aqueduct Pipeline No. 2 can be delivered to San Vicente Reservoir via a diversion structure. Imported water typically comprises a significant majority of the water stored within San Vicente Reservoir. Imported water deliveries to San Vicente Reservoir typically range from 10,000 to 20,000 AFY (City of San Diego 2000[2]). Conditions typically associated with the City's purchase and seasonally storing of larger quantities of imported water in San Vicente Reservoir include: capacity exists in San Vicente Reservoir, low-cost imported water is readily available, and local runoff for the year has been minimal.

Imported water deliveries to San Vicente Reservoir can occur on a year-round basis, but imported water deliveries to San Vicente Reservoir are typically highest during the months April through June. By April, most local runoff from winter/spring storms has occurred, and unused reservoir capacity previously allotted to capture runoff can be used for short-term storage of imported water in preparation for anticipated peak summer water demands.

In addition to imported water flow and local runoff, the City of San Diego can divert surface flows from Sutherland Reservoir (located upstream from the San Pasqual Valley in the San Dieguito River Management Area) to a pipeline that discharges to San Vicente Creek, a tributary to San Vicente Reservoir. Transfers from Sutherland Reservoir are dependent on hydrologic conditions and water storage and demand considerations, and do not occur during all years. Diversion facilities, however, have the capacity to transfer up to 65 mgd of Sutherland Reservoir water to San Vicente Reservoir. Typically, however, only a fraction of this maximum transfer capacity is utilized. During the past 15 years, annual Sutherland Reservoir water transfers to San Vicente Reservoir have ranged from zero to approximately 10,000 AFY (City of San Diego 2000[2]).

The City of San Diego withdraws San Vicente Reservoir water through an outlet tower located adjacent to the dam. From the inlet tower, withdrawn water flows by gravity to San Vicente Pipeline Nos. 1 and 2, which are connected into the El Monte Pipeline that feeds the 150 mgd Alvarado Water Filtration Plant. The maximum rate at which water can be transferred from San Vicente Reservoir to the Alvarado plant depends on water levels in the reservoir. While higher theoretical transfer capacities are possible, the reported maximum water supply withdrawal capacity from San Vicente Reservoir by gravity is approximately 65 mgd.

Because of the complex set of variables that affect City decisions to divert or withdraw water from San Vicente Reservoir, there is no such thing as "typical" reservoir operating conditions at the reservoir. Instead, City operational practices are based on maximizing storage benefits under a given set of hydrologic, economic, and water availability conditions. In general, however, the City's withdrawals of reservoir water are greatest in the summer and fall months. Withdrawals during July and August during the past 15 years have averaged 3,000 AF per month, while withdrawals during January through March have averaged less than 2,000 AF per month. During the latter portion of the calendar year, it is typical for the City to draw the reservoir storage levels down to provide capacity to capture winter storm runoff (City of San Diego 2000[2]).

Because of the ability to store imported water and Sutherland water in San Vicente Reservoir, reservoir water levels are typically maintained at approximately 55 percent capacity even during drought years. Except for periods of significant local runoff, reservoir storage levels are typically maintained at between 60,000 AF to 80,000 AFY (City of San Diego 2000[2]).

5.2.2 Assessment of Water Storage and Supply Needs

Tributary Surface Streams. No surface water diversions occur with the streambeds of the San Vicente Management Area. A portion of the surface flows in the tributary streams supplies water to support streamside vegetation, while a portion of the surface flow infiltrates to groundwater. Surface flows in excess of vegetation demands and infiltration losses continue to flow downstream to San Vicente Reservoir.

Water balances associated with maintaining the beneficial uses have not been developed for tributary streams of the San Vicente Management Area. Adequate surface water flows appear to exist within most of the streams to support the designated beneficial uses along the surface streams of the San Vicente Management Area. As discussed in

Section 4, however, overpumping of groundwaters along Padre Barona Creek has occurred that has adversely affected groundwater levels.

Existing San Vicente Operations. Because of its storage capacity and connection with the imported water system, San Vicente Reservoir is arguably the most important storage reservoir in the City of San Diego water supply system. In addition to its use to capture local runoff, the reservoir provides seasonal storage of imported water to allow the City to meet peak summer water demands. Additionally, the reservoir allows the City to make use of supplies developed by Lake Sutherland within the San Dieguito River Watershed. The reservoir also provides a significant degree of emergency and carry-over storage, as imported water deliveries to San Vicente Reservoir allow the City to maintain reservoir water levels at 60 percent or more of the maximum reservoir storage capacity of 90,200 AF. Because of these features, San Vicente Reservoir provides a high degree of flexibility to City of San Diego water operations.

San Vicente Reservoir also serves as a recreational reservoir, but water supply needs take precedence over recreational needs in reservoir operations.

Proposed Expanded San Vicente Reservoir. Recognizing that from 75 to 95 percent of San Diego County water demands are met using imported water, CSDWA has embarked on a program to increase local emergency storage of water. The CSDWA Emergency Storage Program (ESP) involves construction of a series of pipelines, pump stations, and reservoirs designed to make water available to all CSDWA agencies in the event of interruption of imported water deliveries. Included in the ESP is the County-wide construction of 90,000 AF of additional reservoir capacity devoted to emergency storage. The ESP would be implemented in four phases. Phases 2 and 4 of the ESP involve San Vicente Reservoir and associated facilities.

Under ESP Phase 2, CSDWA would construct an inter-connector pipeline, the San Vicente pump station, and the San Vicente Pipeline. The 12-mile-long San Vicente Pipeline would connect San Vicente Reservoir with Pipeline No. 5 of the Second San Diego Aqueduct. With this pipeline, additional imported aqueduct waters could be diverted to San Vicente Reservoir for storage and subsequent withdrawal during periods of either emergency or normal operations. The San Vicente Pipeline and San Vicente Pump Station would also allow San Vicente waters to be transferred back into Pipeline No. 5 for distribution to the City of San Diego Miramar Filtration Plant and to other CSDWA member agencies. (Currently, San Vicente waters can only be directed to the Alvarado Water Filtration Plant.)

Under Phase 4 of the ESP, CSDWA would raise the San Vicente Dam by 54 feet to increase the storage capacity of San Vicente Reservoir by 52,200 AF. The additional storage capacity created by the expanded San Vicente Reservoir would be devoted to emergency storage for use in the event of disruption of imported water supplies. CSDWA proposes to initiate construction of the expanded San Vicente Reservoir in 2008.

In order to construct the San Vicente Reservoir expansion, the City of San Diego would have to drain the reservoir and take the reservoir offline during construction of the new dam. Once ESP facilities were constructed, however, San Vicente Reservoir capacity would be increased by more than 50 percent. Additionally, ESP facilities would allow the City of San Diego and CSDWA to:

- Significantly increase the rate at which imported waters could be recharged to the reservoir
- Significantly increase the rate at which waters could be withdrawn from the reservoir
- Expand the potable water service area served by San Vicente Reservoir

Further, with an elevation increase of 54 feet, the expanded San Vicente Reservoir could increase the City's flexibility in being able to transfer water between El Capitan Reservoir and San Vicente Reservoir.

5.3 San Diego Management Area

5.3.1 Description of Surface Water Resources, Resource Allocation, and Key Surface Water Tributaries

As discussed above, the San Diego Management Area receives overflow spillage from El Capitan and San Vicente Reservoirs only on rare occasions. Except for these rare spill events, the San Diego Management Area can be considered hydrologically separate from the upstream management areas (Figure 1-2).

The lower portion of the San Diego River is the dominant surface water feature within the San Diego Management Area. A number of tributary streams contribute to flow in the San Diego River. Two surface reservoirs, Lake Jennings and Lake Murray, also exist within the management area. These two reservoirs are not located on the main stem of the San Diego River, rather, they are off-stream reservoirs.

San Diego River. Downstream from El Capitan Reservoir, the San Diego River flows westward through the Santee/El Monte basin, Mission Gorge, Mission Valley, and into the San Diego River Estuary. Hydraulically, the San Diego River can be divided into three segments within the San Diego Management Area:

- Santee/El Monte basin
- Mission Gorge
- Mission Valley

The San Diego River is largely unchanneled or contained by earthen berms within the broad, alluvial Santee/El Monte basin. Hydraulic gradients are relatively flat within this segment of the river, and average 0.3 percent. Within unchanneled portions of the river, river hydraulic characteristics can vary significantly from location to location. A number of standing bodies of water exist along the river course, the largest of which is Kumeyaay Lake at the west end of the Santee/El Monte basin.

Storm runoff provides the primary source of river flow. Dry season flow is contributed by surfacing groundwater and agricultural and landscape runoff. A USGS stream gauging station exists within the Santee/El Monte segment of the San Diego River at Mast Boulevard. The Mast Boulevard station measures San Diego River streamflow at the downstream end of the Santee/El Monte basin. Table 5-1 summarizes San Diego River streamflows at the Mast Boulevard gauging station. As shown in Table 5-1, significant differences exist in dry season (June through November) streamflows in the post-1975 period, as compared to the entire historical flow record. While historic dry season median streamflows in the San Diego River are essentially zero, post-1975 streamflows in the river are in excess of 3 cubic feet per second (cfs). This difference in dry season flow is attributed to (1) increased development and use of imported water within the San Diego Management Area, and (2) decreased use of groundwater, resulting in increased water table elevations within the Santee/El Monte basin.

Table 5-1
Monthly Breakdown of Gauged Streamflow San Diego River at Mast Boulevard

Month	San Diego River at Mast Boulevard - Streamflow in cfs[1]					
	Mean Daily Values		Median Daily Values		Maximum Daily Value	
	1912-2001[2]	1975-2001[3]	1912-2001[2]	1975-2001[3]	1912-2001[2]	1975-2001[3]
Jan	32.4	56.1	4.9	12.0	2,060	1,950
Feb	93.9	87.3	8.6	17.0	27,300	3,000
Mar	80.4	109.3	10.0	21.0	5,350	2,270
Apr	48.2	40.4	6.1	13.0	7,130	778
May	17.9	19.0	2.6	6.8	2,120	278
Jun	4.8	11.8	0.9	3.8	188	188
Jul	3.0	9.0	0.1	2.3	181	181
Aug	2.7	8.0	0.1	2.4	144	144
Sep	1.9	5.3	0.1	2.3	160	160
Oct	2.2	5.6	0.1	2.8	218	218
Nov	5.8	13.8	0.3	5.0	872	798
Dec	20.7	19.5	1.9	8.0	10,600	359
Mean Flow	26.0	32.0	---	---	---	---
Median Flow	---	---	1.7	6.2	---	---

Notes: 1 USGS stream gauging records for the San Diego River near Mast Boulevard in Santee.
2 Streamflow gauging records for the period May 1, 1912 through September 30, 2001. (Within this 1912 to 2001 data period, data are missing for the period 1/1/1915 through 3/31/1915 and the period 10/1/1923 through 9/30/1925.)
3 Streamflow gauging records for the period January 1, 1975 through September 30, 2001 (USGS 2001).

No municipal water supply diversions of San Diego River flow occur within the Santee/El Monte basin. In the west end of the basin, however, the Carlton Oaks Golf Course maintains a series of ponds within the river channel which serve as a source of supply for golf course irrigation.

Mission Gorge represents the second of the three San Diego River segments within the San Diego Management Area. Mission Gorge is characterized by a rugged river channel with steep hydraulic gradients averaging nearly 1 percent. Bedrock near the ground surface at the west end of the Santee/El Monte basin forms a “groundwater dam” and results in surfacing groundwater overflowing from the Santee/El Monte basin and contributing to San Diego River flow in Mission Gorge.

The Mission Gorge zone of the San Diego River is predominantly a zone of flowing water, but several features (including Old Mission Dam) form impoundments. A USGS gauging station exists at the San Diego River at Old Mission Dam. No water supply diversions occur in the Mission Gorge segment of the San Diego River.

Downstream from Mission Gorge, the San Diego River flows into the relatively narrow and flat Mission Valley. Mission Valley soils are porous, and surface water moves freely between ground and surface water. As a result, the water surface of standing water within the river channel represents the groundwater table.

No municipal water supply diversions of San Diego River flow occurs within Mission Valley, but Admiral Baker Field maintains an irrigation lake along the river that serves a source of irrigation supply for the golf course. Downstream from Admiral Baker Field and the San Diego Mission, the San Diego River is channelized throughout all but the downstream portion of Mission Valley. A USGS gauging station exists at the San Diego River at Fashion Valley.

Tributary Surface Streams. A number of tributary streams contribute flow to the San Diego River, including:

- Forester Creek
- San Vicente Creek
- Los Coches Creek
- Sycamore Canyon
- Alvarado Canyon
- Murphy Canyon

Forester Creek drains a watershed of approximately 13 square miles. Forester Creek originates north of the community of Crest, and flows westward approximately 5.5 miles along the I-8 corridor and through the Cities of El Cajon and Santee to its confluence with the San Diego River immediately upstream from the Carlton Oaks Country Club. The upstream portion of Forester Creek flows through urbanized areas of El Cajon and is contained within a concrete channel while the 1.2 mile reach of Forester Creek through Santee remains fully naturalized. No surface water diversions or USGS gauging stations exist along Forester Creek, although a historic gauging station existed prior to 1993.

Los Coches Creek originates west of El Capitan Reservoir and flows westward along the I-8 corridor through Flinn Springs and Lakeside, then northward along Los Coches Road through Lakeside prior to joining the San Diego River south of the Willowbrook

Country Club. A USGS gauging station exists at Los Coches Creek at Lakeside. No known surface water supply diversions exist along Los Coches Creek.

No gauging stations or water supply diversions exist on San Vicente Creek, Sycamore Canyon, Alvarado Canyon, or Murphy Canyon. San Vicente Creek extends southward from San Vicente Reservoir in Moreno Valley, and drains into the San Diego River in Lakeside. Sycamore Canyon drains a watershed of approximately 17 square miles. Sycamore Canyon flows southward and joins the San Diego River immediately upstream from the Mast Boulevard gauging station. Alvarado Canyon flows westward and drains a tributary area east of Mission Valley area along I-8, while Murphy Canyon drains a tributary area north of Qualcomm Station along Interstate 15.

Lake Murray. Lake Murray is located in the San Carlos area of San Diego, and is owned and operated by the City of San Diego. Lake Murray is located adjacent to the City's Alvarado Water Filtration Plant, and serves as a forebay to the filtration plant. Lake Murray has a capacity of 4,818 AF. The reservoir is filled almost exclusively with imported water transferred by pipeline from San Vicente or El Capitan Reservoirs and backflush water from the Alvarado plant, and receives little runoff from its small tributary area.

Lake Jennings. Lake Jennings is located in a small tributary watershed in Lakeside, and is owned and operated by HWD. Lake Jennings has a storage capacity of 9,790 AF. Imported water transferred by pipeline from San Vicente or El Capitan Reservoirs from the First San Diego Aqueduct comprises almost all of the inflow to the lake. Lake Jennings serves as the forebay to the HWD R.M. Levy Water Filtration Plant.

5.3.2 Assessment of Water Storage and Supply Needs

Tributary Surface Streams. No surface water diversions for municipal water supply occur with the streambeds of the San Diego Management Area, but diversions at Carlton Oaks Country Club and Admiral Baker Field provide irrigation supply. Streamflows in excess of diversions, evaporation, vegetation transpirative demands, and groundwater recharge losses to flow downstream and exit to the Pacific Ocean.

Water balances associated with maintaining the beneficial uses have not been developed for tributary streams within the San Diego Management Area. As discussed above, however, increases in San Diego River dry season streamflow are evident since the introduction of imported water into the San Diego Management Area. Dry season (June through November) median streamflow in the San Diego River at Mast Boulevard during 1912 to 1975 was essentially zero. Post-1975 median streamflow at this location was 3.4 cfs. Similar increases in surface flows in San Diego Management Area tributaries are also attributed to imported water use.

The presence of flows on a year-round basis in the downstream portion of the Santee basin, Mission Gorge, and Mission Valley segments of the San Diego River indicates that surface flows appear adequate to meet the water supply needs of existing diversions and stream course vegetation along the tributary streams within the San Diego Management Area. Further study and modeling is warranted to better understand the Mission Valley aquifer.

Surface Water Reservoirs. Two water supply reservoirs exist within the San Diego Management Area: Lake Jennings and Lake Murray. Each of the reservoirs, however are small, and tributary areas associated with the reservoirs are minimal. Additionally, the reservoirs are filled primarily with imported water and serve as forebays to water filtration treatment plants. Because of this, for all practical purposes, the reservoirs can be considered more a part of the water supply system than a part of the San Diego Management Area hydrologic system.