2011-2012
Report on Groundwater Recharge in the Orange County Groundwater Basin
2011-12
Report on Groundwater Recharge in the
Orange County Groundwater Basin

Orange County Water District

July 2013

Prepared by:
Adam S. Hutchinson, P.G., C.H.G.
Recharge Planning Manager
Cover Photo: View of Santa Ana River channel looking upstream at Lakeview Avenue, Anaheim, CA. The river channel has been subdivided into three "runners" to allow for wetting and drying to control insect breeding cycles. Note that the vegetation that grows on the runners provides habitat for nesting birds.

Rear Cover Photo: A Snowy Egret fishing in the shallow waters of the Santa Ana River.
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Executive Summary

A total of 8.15 inches of rain was received at the District’s Anaheim Field Headquarters in 2011-12 (OCWD fiscal year ending June 30, 2012), which is 43 percent lower than the historical average of 14.4 inches and is the 7th driest in the last 50 years.

The dry conditions resulted in the capture and recharge of only 34,531 acre-feet of storm flow, which is the lowest volume captured since 2001-02 and is 41 percent below the recent 10-year average. In addition, incidental recharge was 57 percent below average due to the dry conditions.

After leveling off at just over 100,000 acre-feet per year from 2008-09 to 2010-11, Santa Ana River base flow declined to 94,754 acre-feet in 2011-12. This is the lowest volume of base flow since the early 1980s. Compared to recent 10-year average, 2011-12 Santa Ana River base flow is 25 percent below average. The decline is attributed to increased conservation by upstream agencies, increased recycling, and reduced economic activity in upper watershed.

Imported water recharge totaled 90,122 acre-feet, which is 33 percent above the recent 10-year average. This was in large part due to MWD making discounted replenishment water available in May 2011. A total of 72,072 acre-feet of discounted replenishment water was recharged in July-September 2011. The majority of imported water recharged during the remainder of the year was placed in MWD’s groundwater storage account (CUP).

The Groundwater Replenishment System (GWRS) provided 71,679 acre-feet of recycled water to the surface water and seawater barrier recharge systems, which represents a historic high volume of GWRS water recharged to the basin. In total, recycled water from the GWRS and Alamitos Barrier provided 22 percent of water recharged to the basin in 2011-12.

Total recharge to the groundwater basin in 2011-12 equaled 319,420 acre-feet, which is 8 percent below the 10-year average of 347,620 acre-feet per year. The below average recharge was not due to OCWD activities, because for the year, OCWD recharge was 3 percent above average. Rather, the below average recharge was due to the dry conditions, which led to low storm water recharge (41 percent below average) and low incidental recharge (57 percent below average). Table ES-1 and Figure ES-1 show how 2011-12 recharge compares to the previous 10 years.
Table ES-1
Recharge Source Summary

<table>
<thead>
<tr>
<th>Source</th>
<th>FY11-12 (af)</th>
<th>10-Year Avg (af)</th>
<th>Increase/ (Decrease) (af)</th>
<th>% Increase/ (Decrease)</th>
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<tr>
<td>SAR Base Flow (1)</td>
<td>94,754</td>
<td>125,641</td>
<td>(30,887)</td>
<td>(25)</td>
</tr>
<tr>
<td>Storm Flow/Local Water (2)</td>
<td>34,531</td>
<td>58,481</td>
<td>(23,950)</td>
<td>(41)</td>
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<tr>
<td>Imported/Purchased Water</td>
<td>90,122</td>
<td>67,819</td>
<td>22,303</td>
<td>33</td>
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<tr>
<td>Groundwater (3)</td>
<td>0</td>
<td>1,425</td>
<td>(1,425)</td>
<td>(100)</td>
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<tr>
<td>Recycled Water (4)</td>
<td>72,258</td>
<td>29,289</td>
<td>42,969</td>
<td>147</td>
</tr>
<tr>
<td>Total OCWD Recharge (5)</td>
<td>291,665</td>
<td>282,654</td>
<td>9,011</td>
<td>3</td>
</tr>
<tr>
<td>Incidental Recharge</td>
<td>27,701</td>
<td>64,966</td>
<td>(37,265)</td>
<td>(57)</td>
</tr>
<tr>
<td>Grand Total</td>
<td>319,366</td>
<td>347,620</td>
<td>(28,254)</td>
<td>(8)</td>
</tr>
</tbody>
</table>

(1) SAR Base Flow based on OCWD data, which may differ slightly from the SAR Watermaster (see Section 3.2).
(2) Storm flow includes SAR storm flow and local inflow to the recharge system below Prado Dam.
(3) Groundwater was used to augment the injection supply at the Talbert Barrier until July 2006.
(4) Recycled water is produced by the GWRS as well as the Leo J. Vander Lans Water Treatment Facility, which is operated by the Long Beach Water Department. Water from the Vander Lans plant is recharged at the Alamitos Barrier.
(5) Recharge at all OCWD facilities, also referred to as Managed Aquifer Recharge (MAR).

Figure ES-1
Total Annual Recharge by Source, 2002-12
Section 1  Introduction

The Orange County Water District (OCWD or District) was formed by a special act of the California Legislature in 1933 for the purpose of managing and protecting the Orange County groundwater basin. Since its formation, the District has developed a successful managed aquifer recharge (MAR) system that has more than doubled the yield of the groundwater basin. Aquifer recharge activities conducted by OCWD fall into three categories: 1) Surface Water Recharge, 3) Seawater Barrier Recharge, 3) and In-Lieu Recharge. Naturally occurring recharge, called incidental recharge, rounds out the sources of recharge to the groundwater basin.

The purpose of this report is to present a breakdown of the water sources used to recharge the basin and which facilities were used to recharge these waters. The focus of this report is OCWD fiscal year 2011-12 (July 1, 2011 - June 30, 2012); however, historical data are provided where appropriate to provide a context for 2011-12 results. Unless otherwise noted, all volumes in this report are for the OCWD fiscal year. Acronyms are presented in Appendix A. Appendix B presents the data used to prepare this report along with a description of the data sources. Appendix C contains 2011-12 Monthly Forebay Percolation Reports prepared by Recharge Operations staff, which presents monthly data for the surface water recharge system.

Section 2  Background

The Orange County Groundwater Basin (Basin) underlies the northern half of Orange County and covers approximately 350 square miles (see Figure 2-1). The aquifers comprising the basin extend over 2,000 feet deep and form a complex series of interconnected sand and gravel deposits (DWR, 1967). In coastal and central portions of the basin, these deposits tend to be separated by extensive lower-permeability clay and silt deposits, known as aquitards (Pressure area). In the inland area of the basin, generally northeast of Interstate 5, the clay and silt deposits become thinner and more discontinuous, allowing groundwater to flow more easily between shallow and deeper aquifers (Forebay).

Shortly after the District was formed in 1933, the District, along with the Orange County Flood Control District (OCFCD), began experimenting with ways to increase the percolation capacity of the Santa Ana River (SAR) channel. These experiments included removing vegetation and re-sculpting the river bank and river bottom (OCWD, 2003a). Based on the success of these experiments, the District began purchasing portions of the SAR channel as they became available. In 1936 the District made its first purchase of 26 acres of the SAR channel for $722. The District eventually acquired six miles of the SAR channel extending from Imperial Highway (SR90) to Ball Road, as shown on Figure 2-2.
Currently the District owns over 1,500 acres of land in the Forebay on which it has constructed approximately two dozen recharge facilities that cover nearly 1,100 wetted acres (OCWD, 2003a; OCWD, 2003b) (see Figure 2-2). In addition, the District utilizes several flood control basins owned by the OCFCF for recharge. Along with land purchases, the District invested in infrastructure to maximize the ability of the facilities to recharge water, including four rubber dams, over six miles of pipelines, eight pump stations, and a fleet of earthmoving equipment.

Near the coast, seawater intrusion can occur in gaps in the Newport-Inglewood Fault zone. The fault zone is effective in preventing seawater intrusion into the Basin except in the Alamitos and Talbert Gaps. The gaps are erosional features cut by rivers that deposited permeable sediments, creating pathways for seawater to bypass the fault zone and enter Basin aquifers. To minimize seawater intrusion, the Alamitos Barrier was designed and constructed in 1965 (see Figure 2-1). The Los Angeles County Department of Public Works (LACDPW) operates and maintains Alamitos Barrier facilities under the direction and approval of the Alamitos Barrier Joint Management Committee, whose membership covers five agencies including OCWD. The Talbert Barrier was constructed by OCWD and went on-line in the mid-1970s. The Alamitos Barrier currently contains 43 injection wells while the
Talbert Barrier contains 36 injection wells. Additional injection wells are continually being added as new information about the extent of seawater intrusion becomes available.

In addition to surface water recharge and seawater injection barriers, the District recharges the Basin via in-lieu recharge. In-lieu recharge occurs when groundwater producers take imported water “in-lieu” of pumping groundwater. By turning off wells, the process indirectly recharges the groundwater basin. This program was established by the Metropolitan Water District of Southern California (MWD) in 1977-78 and has been used extensively since then by the District. This type of recharge is effective because it allows for recharge in areas distant from surface water or injection recharge facilities and it frees up capacity in the surface water recharge system for SAR and other water sources.
Section 3  Recharge Water Sources

This section presents a summary of the water sources used to recharge the Basin.

3.1 Precipitation

Orange County is located in a semi-arid region. At OCWD’s Field Headquarters rain gauge in east Anaheim, the average annual rainfall for the entire period of record from 1963-2012 is 14.4 inches. In 2011-12, 8.15 inches of rain was recorded, which is approximately 43 percent below average. Only two months, October 2011 and April 2012 received above average rainfall. In fact, in many areas of the state, record dry conditions were recorded. Figure 3-1 shows the annual historical rainfall at this location. Figure 3-2 shows the monthly rainfall received at OCWD Field Headquarters in 2011-12. Table B-1 in Appendix B presents the data used to prepare these graphs.

Figure 3-1
Annual Rainfall Totals at OCWD Field Headquarters, 1963-2012

Rain that falls within the District boundary results in storm flow and incidental recharge. Incidental recharge, which is not directly measured, tends to be widespread over the basin and consists of recharge from hills and mountains adjacent to the groundwater basin,
underflow beneath the SAR and Santiago Creek, areal recharge from precipitation, irrigation return flows, and urban runoff (OCWD, 2004; OCWD, 2007). Incidental recharge reported herein is net recharge to the Basin after losses to Los Angeles County are subtracted from total incidental recharge. The estimated volume of incidental recharge correlates with local rainfall totals. For years with average rainfall, incidental recharge is estimated to be approximately 65,000 acre-feet. For 2011-12 the estimated incidental recharge totaled 27,701 acre-feet. Figure 3-3 shows the annual estimated incidental recharge to the groundwater basin for the last 10 years. Table B-2 in Appendix B presents estimated incidental recharge for 2002 to 2012.

Precipitation that falls within the SAR watershed below Prado Dam and in the Santiago Creek watershed produces locally derived storm flow. Much of this water is captured and recharged; however, storm flow that enters the SAR channel downstream of the District’s recharge facilities is essentially lost to the ocean. During periods of no rainfall, locally derived flows, such as nuisance water, are also captured and recharged. For simplicity, all locally derived flows are categorized as storm flow regardless of the time of year the flows were generated.
In 2011-12, an estimated 3,615 acre-feet of local storm flow was captured and recharged by the surface water recharge system. This does not include SAR storm flow arriving at Prado Dam (see next section). Figure 3-4 shows the monthly volume of local storm flow captured and recharged in 2011-12. Table B-3 in Appendix B presents the data used to prepare this graph.

### 3.2 Santa Ana River

The SAR is the largest source of water to the surface water recharge system. In response to development in the upper SAR watershed, SAR base flow increased from the late 1970s to late 1990s (Figure 3-5). In the past 10 years, however, due to conservation and other factors, SAR base flow, which is comprised primarily of treated wastewater, has declined over 30 percent. Urbanization of the watershed has also affected storm flow runoff, with more flow arriving at Prado Dam for a given amount of rain (Warrick and Rubin, 2007). Figure 3-5 shows the total annual Oct.-Sept. water year base flow and storm flow that has flowed past Prado Dam since 1936. Table B-4 in Appendix B presents base flow and storm flow data for the SAR from 1936 to 2012.
**Figure 3-4**

Monthly Local Storm Flow Capture, 2011-12

*Assumes direct rainfall to 500 acres of recharge*

**Figure 3-5**

Annual Base and Storm Flow in the SAR at Prado Dam, 1936-2012

*Source: SAR Watermaster Reports*
It is assumed that the surface water recharge system captures and recharges all SAR base flow. However, the volume of SAR storm flow captured and recharged varies and is highly dependent on the distribution of rainfall during the winter months and the operation of the Prado Dam water conservation pool (discussed in the next section).

OCWD data are used to determine the total flow of SAR water reaching the recharge system in order to account for local inflows that occur below Prado Dam. As a result, flows in this report may differ slightly from what is reported by the SAR Watermaster. In addition, there may be differences in monthly volumes of SAR storm flow because the SAR Watermaster accounts for storage behind Prado Dam. SAR Watermaster data, which are based on measurements made by the United States Geological Survey (USGS), are used when OCWD’s gauges and flow meters are not operating and during the storm season to define the base flow component SAR flows. In 2011-12, 94,754 acre-feet of SAR base flow and 30,916 acre-feet of SAR storm flow were captured and recharged (SAR Watermaster, 2012; SAR Watermaster, 2013). Figure 3-6 shows the monthly variation in recharged SAR base flow and storm flow for 2011-12. Table B-5 in Appendix B presents the data used to prepare this graph.

Figure 3-6
Monthly Santa Ana River Base and Storm Flow Recharged, 2011-12
3.2.1 Prado Dam Water Conservation Pool

Through an agreement with the US Army Corps of Engineers (USACOE), OCWD is allowed to conserve storm flows captured behind Prado Dam. The Prado Dam conservation pool allows for capture and storage of multiple storm events with a maximum of 9,278 acre-feet of storage during the flood season (Oct. 1-Feb. 28) and up to 19,826 acre-feet of storage during the non-flood season (March 1 to Sept. 30) (USACOE, 1994; USFWS, 2000; USACOE, 2002). Generally, releases of water by the USACOE from the conservation pool are coordinated with the District to minimize losses to the ocean.

In 2011-12, an estimated 13,790 acre-feet of storm flow was captured in the conservation pool and subsequently recharged. Figure 3-7 shows how storage behind Prado Dam varied during 2011-12.
3.3 Santiago Creek

Most of the precipitation that falls in the Santiago Creek watershed results in runoff that is captured behind Santiago and Villa Park Dams. Santiago Dam, which creates Irvine Lake, is owned by the Irvine Ranch and Serrano Water Districts. Villa Park Dam is a flood control dam that is owned and operated by the OCFCD. Precipitation that falls within the approximately 5.5 square mile catchment area that drains the area below Villa Park Dam ends up flowing down Santiago Creek to the District’s Santiago Basins. Occasionally stored water is released from Villa Park Dam to Santiago Basins during or after storm events and during the fall to allow the OCFCD to conduct maintenance on the dam.

In 2011-12, an estimated 2,257 acre-feet of storm flow from Santiago Creek was captured and recharged in Santiago Basins. Figure 3-8 shows the monthly inflow from Santiago Creek in 2011-12. Table B-6 in Appendix B presents the data used to prepare this graph.

Figure 3-8
Monthly Inflow to Santiago Basins from Santiago Creek, 2011-12
3.4 Imported Water

Imported water, which is purchased from MWD, comes from the either the Colorado River Aqueduct (CRA) or the State Water Project (SWP). Raw, untreated MWD water can be delivered to the surface water recharge system in multiple locations, including Anaheim Lake (OC-28/28A), Santa Ana River (OC-11), Irvine Lake (OC-13), and San Antonio Creek near the City of Upland (OC-59). Connections OC-28, OC-11 and OC-13 supply OCWD with CRA water. Connection OC-59 supplies OCWD with SWP water and OC-28A supplies OCWD with a variable blend of CRA and SWP water. Treated MWD water is purchased from other MWD connections to supply the seawater barriers and in-lieu recharge.

In 2011-12, OCWD continued to recharge discounted replenishment water after MWD made 225,000 acre-feet available to all water agencies in their service area on a first-come-first-serve basis in May 2011. A total of 90,122 acre-feet of imported water was recharged in 2011-12. Of the total, 17,429 acre-feet was recharged into MWD’s groundwater storage account (Conjunctive Use Program-CUP). Imported water to support barrier recharge totaled 621 acre-feet. Figure 3-9 shows the monthly totals of imported water recharged in 2011-12. Table B-7 in Appendix B presents the data used to prepare this graph.

![Figure 3-9](imageURL)

**Figure 3-9**
**Monthly Recharge of Imported Water, 2011-12**
3.5 Recycled Water

The Basin receives recycled water from two sources. First, is the District’s Groundwater Replenishment System (GWRS) and, second, is the Leo J. Vander Lans Water Treatment Facility, which is operated by the Long Beach Water Department under contract with the Water Replenishment District of Southern California (WRD). Both facilities treat waste water using advanced water treatment processes consisting of micro-filtration (MF) followed by reverse osmosis (RO) and ultraviolet (UV) light disinfection in combination with hydrogen peroxide. GWRS water recharges the Basin via the Talbert Barrier and the surface water recharge system, namely, Kraemer and Miller Basins (see Figure 2-2). Water from the Leo J. Vander Lans facility supplies water to the Alamitos Barrier.

In 2011-12, 72,258 acre-feet of recycled water was recharged. The GWRS produced 71,790 acre-feet with 20,740 acre-feet (29%) recharged in the Talbert Barrier and 50,939 acre-feet (71%) recharged in Kraemer/Miller Basins. A total of 2,142 acre-feet of recycled water was recharged at the Alamitos Barrier with 579 acre-feet counted as recharge to the Basin with the remainder recharging the Central Basin in Los Angeles County. Figure 3-10 shows the monthly totals of recycled water recharged in 2011-12. Table B-8 in Appendix B presents the data used to prepare this graph.
3.6 Water Losses

Water losses from the surface water recharge system include flows in the SAR, Santiago Creek and Carbon Creek that flow past the recharge system. In 2011-12, 2,220 acre-feet of SAR water was lost to the ocean, with most of the loss occurring in October 2011 (Figure 3-11). No water was lost in Santiago or Carbon Creeks.

Another source of water loss is evaporation. For many of the recharge basins, evaporative losses are included in the storage change. No effort is made to estimate evaporative losses in the recharge basins because evaporative losses are minor compared to the recharge volumes involved. For other facilities, such as the SAR channel, evaporative losses are calculated based on historical average evaporation pan readings taken at Field Headquarters. Estimated evaporation is based on a water surface area is 500 acres, which is approximately half of the recharge system wetted area. Using this approach, approximately 2,064 acre-feet of water was lost to evaporation in 2011-12. Figure 3-11 shows the estimated monthly losses to the ocean and from evaporation in 2011-12. Table B-9 in Appendix B presents the data used to prepare this graph.
3.6.1 Capturable Water Losses

Most of the water that escapes capture by the District’s recharge system and is lost to the ocean occurs when releases from Prado Dam are in excess of 1,000 cubic feet per second (cfs). When flows are this high, the District’s rubber dams must be deflated. When flows are lower than 1,000 cfs, there may be periods when diversions cannot be maximized for a variety of reasons, such as clogged trash racks, construction projects, basin maintenance, reduced pumping capacity, etc. Water lost when system capacity is available but constrained for some reason is categorized as capturable water that was lost to the ocean.

As described in Section 3.6, a total of 2,220 acre-feet of SAR water was lost to the ocean in 2011-12. This volume is based on the flow measured at the District’s Ball Road gage and then subtracting 20 cfs for recharge that occurs in the short reach between Ball Road and Chapman Avenue. Any flow that makes it past Chapman Avenue is assumed to be lost to the ocean.

Also measured by the Ball Road gage are flows from Carbon Canyon Diversion. Carbon Canyon Diversion conveys flows from the upper section of Carbon Creek as well as Atwood Channel to the SAR just below the Five Coves Inflatable Dam. There is no stream gage on Carbon Canyon Diversion. There is an active stream gage on Carbon Creek just below Carbon Canyon Dam in Brea, CA. This gage is maintained by the USGS (11075720). In 2011-12, the total flow measured by this gage was 139 acre-feet. The total flow in Carbon Canyon Diversion will be greater because of additional flows that enter Carbon Creek downstream of the gage and flow from Atwood Channel. Because Carbon Canyon Diversion discharges water to the SAR downstream of the Five Coves Inflatable Dam, it is not included as capturable water.

An estimated 1,700 acre-feet of water was lost to the ocean in a two day period from Oct. 5 to 6, 2011. Due to operational issues at Prado Dam, the USACOE could not hold storm water behind the dam. As a consequence, the discharge rate from the dam forced deflation of the inflatable dams. The remaining 520 acre-feet of water lost was due to flows from Carbon Canyon Diversion. As a result, there was no capturable water lost to the ocean in 2011-12.
Section 4  Surface Water Recharge

This section provides an overview of the surface water recharge system and the volumes and sources of water used for recharge. In addition, the monthly recharge at each facility is presented. Recharge data are based on monthly Forebay Percolation Reports prepared by District’s Recharge Operations staff. Copies of the Forebay Percolation Reports for 2011-12 are presented in Appendix C.

4.1 Operations Overview

The District’s surface water recharge system is currently comprised of 25 facilities which have a combined wetted area of approximately 1,100 wetted acres and a total storage volume of over 26,000 acre-feet (see Figure 2-2 for facility locations). Table 4-1 lists the area and storage capacity of each facility.

The main source of inflow to the recharge system is the SAR. When SAR flows reach the Imperial Rubber Dam located just downstream of Imperial Highway, the flows are divided into two streams of water. The first stream is diverted from the SAR to Weir Ponds 1-4 (Desilting System). The second stream is the remaining flow, which is bypassed around the dam and placed back into the SAR channel. The maximum flow that can be diverted to the Desilting System is 500 cubic feet per second (cfs). Up to 500 cfs can also be bypassed around the dam.

Flows that pass through the Desilting System are split at Weir Pond 4 with up to 400 cfs being conveyed to Foster-Huckleberry, Conrock, Warner, and Little Warner Basins (Warner System). At Little Warner Basin, water is conveyed via the 66-inch diameter Warner Transmission Pipeline to Anaheim Lake. Water reaching Anaheim Lake can also be conveyed via pipeline around Anaheim Lake to downstream basins, including Mini-Anaheim Lake, Kraemer Basin, and Miller Basin. This same pipeline can deliver water to Carbon Creek near Miller Basin. Carbon Creek is used to convey water to La Jolla, Placentia, and Raymond Basins.

Water conveyed from Weir 4 to the Off-River Channel flows downstream where some flows into Olive Basin. Left over water that does not percolate in the Off-River Channel then flows into Five Coves Basins via tubes under Carbon Canyon Diversion.

Similar to the Imperial Highway Rubber Dam, water reaching the Five Coves Rubber Dam is split into two streams, with one stream diverted to the Five Coves Basins and the other stream bypassed around the dam back into the SAR channel. The Five Coves Rubber Dam has a maximum diversion capacity of 500 cfs and a maximum bypass capacity of 250 cfs. Water bypassed around the dam to the SAR channel must be carefully monitored so water is not lost to the ocean.

Water that enters Five Coves Basins passes to Lincoln Basin and then into Burris Basin. From Burris Basin, water is pumped to Santiago Basins via the Burris Basin Pump Station. The pump station has four incline-turbine pumps, which have a combined pumping capacity of 235 cfs or 105,500 gallons per minute. Pumped water is conveyed to the Santiago Basins via the 60-inch diameter Santiago Pipeline, which is approximately five miles long (see Figure 2-2).
Table 4-1
Area and Storage Capacity of Surface Water Recharge Facilities

<table>
<thead>
<tr>
<th>Facility</th>
<th>Max. Wetted Area</th>
<th>Facility Invert Elev.</th>
<th>Max. Water Surface Elevation (1)</th>
<th>Max. Storage Capacity (1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facility</td>
<td>(acres)</td>
<td>(ft msl)</td>
<td>(ft msl)</td>
<td>(af)</td>
</tr>
<tr>
<td>Anaheim Lake</td>
<td>72</td>
<td>175</td>
<td>224</td>
<td>2,260</td>
</tr>
<tr>
<td>Burris Basin</td>
<td>120</td>
<td>110</td>
<td>172</td>
<td>2,670</td>
</tr>
<tr>
<td>Conrock Basin ( Warner System)</td>
<td>25</td>
<td>193</td>
<td>244</td>
<td>1,070</td>
</tr>
<tr>
<td>Five Coves Basin: Lower</td>
<td>16</td>
<td>179</td>
<td>195</td>
<td>182</td>
</tr>
<tr>
<td>Five Coves Basin: Upper</td>
<td>15</td>
<td>182</td>
<td>200</td>
<td>164</td>
</tr>
<tr>
<td>Foster-Huckleberry Basin ( Warner System)</td>
<td>21</td>
<td>210</td>
<td>246</td>
<td>630</td>
</tr>
<tr>
<td>Kraemer Basin</td>
<td>31</td>
<td>164</td>
<td>220</td>
<td>1,170</td>
</tr>
<tr>
<td>La Jolla Basin</td>
<td>6.5</td>
<td>199</td>
<td>205</td>
<td>26</td>
</tr>
<tr>
<td>Lincoln Basin</td>
<td>10</td>
<td>183</td>
<td>190</td>
<td>60</td>
</tr>
<tr>
<td>Little Warner Basin ( Warner System)</td>
<td>11</td>
<td>205</td>
<td>239</td>
<td>225</td>
</tr>
<tr>
<td>Miller Basin (2)</td>
<td>25</td>
<td>200</td>
<td>224</td>
<td>300</td>
</tr>
<tr>
<td>Mini-Anaheim Lake</td>
<td>5</td>
<td>230</td>
<td>234</td>
<td>13</td>
</tr>
<tr>
<td>Off-River Channel</td>
<td>89</td>
<td>241-205</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Olive Basin</td>
<td>5.8</td>
<td>187</td>
<td>228</td>
<td>122</td>
</tr>
<tr>
<td>Placentia Basin (2)</td>
<td>9</td>
<td>155</td>
<td>195</td>
<td>350</td>
</tr>
<tr>
<td>Raymond Basin (2)</td>
<td>19</td>
<td>145</td>
<td>170</td>
<td>370</td>
</tr>
<tr>
<td>River View Basin</td>
<td>3.6</td>
<td>186</td>
<td>190</td>
<td>11</td>
</tr>
<tr>
<td>Santa Ana River: Imperial Hwy to Orangewood Ave.</td>
<td>291</td>
<td>270-167</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Santiago Basins</td>
<td>187</td>
<td>150</td>
<td>286</td>
<td>13,720</td>
</tr>
<tr>
<td>Santiago Creek: Santiago Basins - Hart Park (3)</td>
<td>10</td>
<td>285-183</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Warner Basin</td>
<td>70</td>
<td>187</td>
<td>239</td>
<td>2,620</td>
</tr>
<tr>
<td>Weir Pond 1</td>
<td>6</td>
<td>258</td>
<td>263</td>
<td>28</td>
</tr>
<tr>
<td>Weir Pond 2</td>
<td>9</td>
<td>254</td>
<td>259</td>
<td>42</td>
</tr>
<tr>
<td>Weir Pond 3</td>
<td>14</td>
<td>247</td>
<td>259</td>
<td>160</td>
</tr>
<tr>
<td>Weir Pond 4</td>
<td>4</td>
<td>244</td>
<td>255</td>
<td>22</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td><strong>1,075</strong></td>
<td></td>
<td></td>
<td><strong>26,215</strong></td>
</tr>
</tbody>
</table>

Notes:
(1) Maximum water surface elevation is typically not achieved for most facilities due to need to reserve buffer space for system flow and level fluctuations. Elevations and storage volumes are not applicable (N/A) to stream/river channels.
(2) Owned by Orange County Flood Control District (OCFCD). Max., storage capacity shown is max. flood control storage.
(3) Various owners, including OCFCD, City of Orange, and MWD.
Water in the Santiago Pipeline also supplies River View Basin and Santiago Creek. A pump station in Santiago Basins allows the District to reverse the flow direction in the Santiago Pipeline and pump stored water from the basins to Santiago Creek, River View Basin, Burris Basin, and to the SAR channel. Pumping from the Santiago Basins is typically done during the fall months to maximize storage space for storm water capture.

Due to suspended sediment in SAR water, all of the recharge facilities clog, resulting in reduced recharge rates over time. To mitigate clogging of the SAR channel, the District stirs up the top few inches of sediment using heavy equipment, which forces the accumulated fine-grained sediments to be re-suspended and flow downstream. In the other facilities, cleaning is accomplished by draining the water from the facilities, allowing the accumulated fine-grained sediments to dry, and then removing them from the bottom using heavy equipment. The basin sidewalls, which typically have 3:1 slopes, are disturbed using bulldozers. This action breaks up the clogging layer, but does little to remove it. Eight recharge basins have permanently installed pumps that allow the District to transfer water to other facilities and to rapidly dewater the basins for cleanings. Other facilities are drained by gravity.

Generally, the District will take a basin out of service for cleaning when the recharge rate declines by 65 to 75 percent of the starting, clean recharge rate. Terminal recharge basins, including Anaheim Lake, Kraemer Basin, Miller Basin, La Jolla Basin, and River View Basin, can easily be taken off-line and cleaned without affecting other facilities. However, “flow-through” basins, such as Weir Ponds 1-4, Warner Basin, Five Coves Basins, Lincoln Basin, and Burris Basin, cannot be easily taken off-line without affecting downstream facilities. As a result, “flow-through” basins are not cleaned as often as the terminal basins.
4.2 Santa Ana River Channel

Key Facts:
Wetted Area: 291 acres
Maximum Water Depth: N/A
Maximum Storage Capacity: N/A
Year Placed Into Service: 1936
Water Sources: SAR, Imported/Purchased Water

The Santa Ana River (SAR) channel is OCWD’s single largest and oldest recharge facility. It is also one of the most effective recharge facilities due to the self-cleaning nature of the channel. The District owns six miles of the SAR channel extending from Imperial Highway (SR90) to Ball Road, as shown on Figure 2-2.

The river channel is actively managed with heavy equipment to maximize the wetted surface area of the channel and to remove accumulated fine-grained sediments that coat and clog the channel bottom. Maximizing the wetted surface area is typically done by constructing sand levees in the channel to force the water to spread out. The sand levees wash out during storm events and thus do not hinder the storm flow conveyance capacity of the channel. Following storm events, the sand levees are quickly reconstructed to maximize the recharge capacity of the channel.

Table 4-2 summarizes the monthly recharge provided by the Santa Ana River channel in 2011-12.

<table>
<thead>
<tr>
<th>Month</th>
<th>Recharge (af)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>July 2011</td>
<td>5,516</td>
<td>90 cfs average percolation rate</td>
</tr>
<tr>
<td>August 2011</td>
<td>5,221</td>
<td>85 cfs average percolation rate</td>
</tr>
<tr>
<td>September 2011</td>
<td>4,446</td>
<td>72 cfs average percolation rate</td>
</tr>
<tr>
<td>October 2011</td>
<td>5,774</td>
<td>93 cfs average percolation rate</td>
</tr>
<tr>
<td>November 2011</td>
<td>4,497</td>
<td>75 cfs average percolation rate</td>
</tr>
<tr>
<td>December 2011</td>
<td>4,340</td>
<td>71 cfs average percolation rate</td>
</tr>
<tr>
<td>January 2012</td>
<td>3,908</td>
<td>66 cfs average percolation rate</td>
</tr>
<tr>
<td>February 2012</td>
<td>4,050</td>
<td>70 cfs average percolation rate</td>
</tr>
<tr>
<td>March 2012</td>
<td>5,208</td>
<td>84 cfs average percolation rate</td>
</tr>
<tr>
<td>April 2012</td>
<td>4,310</td>
<td></td>
</tr>
<tr>
<td>May 2012</td>
<td>5,036</td>
<td></td>
</tr>
<tr>
<td>June 2012</td>
<td>3,002</td>
<td>Feeding Warner System</td>
</tr>
<tr>
<td>Total</td>
<td>55,308</td>
<td></td>
</tr>
<tr>
<td>5-Year Avg</td>
<td>61,405</td>
<td>Average for FY07-08 to FY11-12</td>
</tr>
</tbody>
</table>
4.3 Weir Ponds 1 – 4 (Desilting System)

Key Facts:
- Wetted Area: 33 acres
- Maximum Water Depth: 12 feet
- Maximum Storage Capacity: 252 af
- Year Placed Into Service: 1973
- Water Sources: SAR, Imported/Purchased Water

Water diverted from the SAR Channel at Imperial Rubber Dam enters Weir Ponds 1 to 4, which collectively comprise the Desilting System. This system mainly provides sediment removal and little to no recharge. Aside from high solids loading that clogs the system; recharge is further inhibited by shallow groundwater conditions in the area.

Weir Ponds 1 and 2 do not provide any meaningful recharge and thus are not included in the table below. Weir Pond 3 has not been cleaned in several years and thus 2011-12 recharge is below average. Table 4-3 summarizes the monthly recharge provided by Weir Pond 3 in 2011-12.

<table>
<thead>
<tr>
<th>Month</th>
<th>Recharge (af)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>July 2011</td>
<td>62</td>
<td>Estimated</td>
</tr>
<tr>
<td>August 2011</td>
<td>40</td>
<td>Estimated</td>
</tr>
<tr>
<td>September 2011</td>
<td>30</td>
<td>Estimated</td>
</tr>
<tr>
<td>October 2011</td>
<td>30</td>
<td>Estimated</td>
</tr>
<tr>
<td>November 2011</td>
<td>60</td>
<td>Estimated</td>
</tr>
<tr>
<td>December 2011</td>
<td>60</td>
<td>Estimated</td>
</tr>
<tr>
<td>January 2012</td>
<td>60</td>
<td>Estimated</td>
</tr>
<tr>
<td>February 2012</td>
<td>60</td>
<td>Estimated</td>
</tr>
<tr>
<td>March 2012</td>
<td>60</td>
<td>Estimated</td>
</tr>
<tr>
<td>April 2012</td>
<td>60</td>
<td>Estimated</td>
</tr>
<tr>
<td>May 2012</td>
<td>60</td>
<td>Estimated</td>
</tr>
<tr>
<td>June 2012</td>
<td>30</td>
<td>Estimated</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Total</th>
<th>612</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>5-Year Avg</td>
<td>678</td>
<td>Average for FY07-08 to FY11-12</td>
</tr>
</tbody>
</table>
4.4 Warner Basin System

Key Facts:
- Wetted Area: 127 acres
- Maximum Water Depth: 52 feet
- Maximum Storage Capacity: 4,545 af
- Year Placed Into Service: 1974
- Water Sources: SAR, Imported/Purchased Water

Warner Basin, named after long-time Orange County Supervisor and OCWD Board member, Willis H. Warner, is a large, deep recharge basin that was put into service in 1974. The Warner Basin System is comprised of Foster-Huckleberry, Conrock, Warner, and Little Warner Basins. Foster-Huckleberry and Conrock Basins are not cleaned or maintained and therefore serve more as desilting basins than as recharge basins.

Warner Basin was last cleaned in summer 2006. Consequently, the annual recharge for 2011-12 is below average. It is difficult to clean Warner Basin due to the large volume of water that must be evacuated and the length of time it takes to dry and clean the basin.

Table 4-4 summarizes the monthly recharge provided by the Warner Basin System in 2011-12.

<table>
<thead>
<tr>
<th>Month</th>
<th>Recharge (af)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>July 2011</td>
<td>800</td>
<td></td>
</tr>
<tr>
<td>August 2011</td>
<td>600</td>
<td></td>
</tr>
<tr>
<td>September 2011</td>
<td>400</td>
<td></td>
</tr>
<tr>
<td>October 2011</td>
<td>600</td>
<td></td>
</tr>
<tr>
<td>November 2011</td>
<td>540</td>
<td></td>
</tr>
<tr>
<td>December 2011</td>
<td>400</td>
<td></td>
</tr>
<tr>
<td>January 2012</td>
<td>410</td>
<td></td>
</tr>
<tr>
<td>February 2012</td>
<td>800</td>
<td></td>
</tr>
<tr>
<td>March 2012</td>
<td>646</td>
<td></td>
</tr>
<tr>
<td>April 2012</td>
<td>1,004</td>
<td></td>
</tr>
<tr>
<td>May 2012</td>
<td>1,192</td>
<td></td>
</tr>
<tr>
<td>June 2012</td>
<td>495</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>7,887</td>
<td></td>
</tr>
<tr>
<td>5-Year Avg</td>
<td>10,680</td>
<td>Average for FY07-08 to FY11-12</td>
</tr>
</tbody>
</table>
4.5 Anaheim Lake

Key Facts:
- Wetted Area: 72 acres
- Maximum Water Depth: 49 feet
- Maximum Storage Capacity: 2,260 af
- Year Placed Into Service: 1961
- Water Sources: SAR, Imported/Purchased Water

Anaheim Lake is the District’s oldest deep recharge basin, having been put into service in 1961. From 1961 to 1975, only imported water from MWD was recharged in the basin. Since the completion of the Warner Transmission Pipeline connecting Warner Basin with Anaheim Lake in 1975, both SAR water and MWD water have been recharged in Anaheim Lake.

Total recharge in 2011-12 was above average due to the large volumes of imported water recharged in the basin. Anaheim Lake was drained and cleaned in October 2011. It was not necessary to clean the basin for the remainder of the year due to the dry conditions and the recharge of clean (i.e., low total suspended solids concentration) imported water.

Table 4-5 summarizes the monthly recharge provided by Anaheim Lake in 2011-12.

<table>
<thead>
<tr>
<th>Month</th>
<th>Recharge (af)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>July 2011</td>
<td>4,053</td>
<td>OC-28 inflow</td>
</tr>
<tr>
<td>August 2011</td>
<td>3,953</td>
<td>OC-28 inflow</td>
</tr>
<tr>
<td>September 2011</td>
<td>3,747</td>
<td>OC-28 inflow</td>
</tr>
<tr>
<td>October 2011</td>
<td>609</td>
<td>Drained for cleaning</td>
</tr>
<tr>
<td>November 2011</td>
<td>629</td>
<td>Used 9 days</td>
</tr>
<tr>
<td>December 2011</td>
<td>2,386</td>
<td>SAR inflow</td>
</tr>
<tr>
<td>January 2012</td>
<td>2,500</td>
<td>SAR inflow</td>
</tr>
<tr>
<td>February 2012</td>
<td>2,509</td>
<td>OC-28 and SAR inflow</td>
</tr>
<tr>
<td>March 2012</td>
<td>2,262</td>
<td>OC-28 and SAR inflow</td>
</tr>
<tr>
<td>April 2012</td>
<td>2,116</td>
<td>OC-28 and SAR inflow</td>
</tr>
<tr>
<td>May 2012</td>
<td>1,818</td>
<td>OC-28 and SAR inflow</td>
</tr>
<tr>
<td>June 2012</td>
<td>626</td>
<td>OC-28 and SAR inflow</td>
</tr>
<tr>
<td>Total</td>
<td>27,208</td>
<td></td>
</tr>
<tr>
<td>5-Year Avg</td>
<td>24,779</td>
<td>Average for FY07-08 to FY11-12</td>
</tr>
</tbody>
</table>
4.6 Mini-Anaheim Lake

Key Facts:
Wetted Area: 5 acres
Maximum Water Depth: 4 feet
Maximum Storage Capacity: 13 af
Year Placed Into Service: 1995
Water Sources: SAR, Imported/Purchased Water

Mini-Anaheim Lake is a small, shallow basin that was constructed on land just east of Anaheim Lake. The basin can receive SAR water, purchased water, and imported water from the adjacent OC-28/28A connection.

Table 4-6 summarizes the monthly recharge provided by Mini-Anaheim Lake in 2011-12.

<table>
<thead>
<tr>
<th>Month</th>
<th>Recharge (af)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>July 2011</td>
<td>638</td>
<td>OC-28 inflow</td>
</tr>
<tr>
<td>August 2011</td>
<td>539</td>
<td>OC-28 inflow</td>
</tr>
<tr>
<td>September 2011</td>
<td>480</td>
<td>OC-28 inflow</td>
</tr>
<tr>
<td>October 2011</td>
<td>325</td>
<td>SAR and pumped from Kraemer Basin</td>
</tr>
<tr>
<td>November 2011</td>
<td>0</td>
<td>Not used.</td>
</tr>
<tr>
<td>December 2011</td>
<td>426</td>
<td>SAR and OC-28A</td>
</tr>
<tr>
<td>January 2012</td>
<td>216</td>
<td>SAR inflow</td>
</tr>
<tr>
<td>February 2012</td>
<td>393</td>
<td>SAR inflow</td>
</tr>
<tr>
<td>March 2012</td>
<td>446</td>
<td>SAR inflow</td>
</tr>
<tr>
<td>April 2012</td>
<td>502</td>
<td>SAR inflow</td>
</tr>
<tr>
<td>May 2012</td>
<td>476</td>
<td>SAR inflow</td>
</tr>
<tr>
<td>June 2012</td>
<td>140</td>
<td>SAR inflow</td>
</tr>
<tr>
<td>Total</td>
<td>4,581</td>
<td></td>
</tr>
<tr>
<td>5-Year Avg</td>
<td>3,736</td>
<td>Average for FY07-08 to FY11-12</td>
</tr>
</tbody>
</table>
4.7 Kraemer Basin

Key Facts:
- Wetted Area: 31 acres
- Maximum Water Depth: 56 feet
- Maximum Storage Capacity: 1,170 af
- Year Placed Into Service: 1988
- Water Sources: SAR, Imported/Purchased, Recycled Water

Kraemer Basin is a 31 acre deep basin that was put into service in 1988. Due to the coarse sands and gravels that underlie the basin and high depth to groundwater (>100 feet), Kraemer Basin is one of the most efficient recharge basins on a per-acre basis operated by OCWD.

Recharge in Kraemer Basin in 2011-12 was an all-time high of 45,502 acre-feet, which is 160 percent above the 5-year average. This was due to the fact that only GWRS or imported water was recharged in the basin. Table 4-7 summarizes the monthly recharge provided by Kraemer Basin in 2011-12.

Table 4-7
Monthly Recharge in Kraemer Basin, 2011-12

<table>
<thead>
<tr>
<th>Month</th>
<th>Recharge (af)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>July 2011</td>
<td>6,738</td>
<td>GWRS and OC-28 inflow</td>
</tr>
<tr>
<td>August 2011</td>
<td>4,476</td>
<td>GWRS and OC-28 inflow</td>
</tr>
<tr>
<td>September 2011</td>
<td>3,301</td>
<td>GWRS inflow</td>
</tr>
<tr>
<td>October 2011</td>
<td>1,403</td>
<td>GWRS inflow</td>
</tr>
<tr>
<td>November 2011</td>
<td>4,154</td>
<td>GWRS inflow</td>
</tr>
<tr>
<td>December 2011</td>
<td>4,492</td>
<td>GWRS inflow</td>
</tr>
<tr>
<td>January 2012</td>
<td>4,432</td>
<td>GWRS inflow</td>
</tr>
<tr>
<td>February 2012</td>
<td>3,474</td>
<td>GWRS inflow</td>
</tr>
<tr>
<td>March 2012</td>
<td>3,122</td>
<td>GWRS inflow</td>
</tr>
<tr>
<td>April 2012</td>
<td>3,808</td>
<td>GWRS inflow</td>
</tr>
<tr>
<td>May 2012</td>
<td>3,460</td>
<td>GWRS inflow</td>
</tr>
<tr>
<td>June 2012</td>
<td>2,642</td>
<td>GWRS inflow</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>45,502</strong></td>
<td></td>
</tr>
<tr>
<td><strong>5-Year Avg</strong></td>
<td><strong>28,506</strong></td>
<td>Average for FY07-08 to FY11-12</td>
</tr>
</tbody>
</table>
4.8 Miller Basin

Key Facts:
- Wetted Area: 25 acres
- Maximum Water Depth: 24 feet
- Maximum Storage Capacity: 300 af
- Year Placed Into Service: 1963
- Water Sources: SAR, Imported/Purchased, Recycled Water

Miller Basin is a flood retarding basin owned by the OCFCD that was constructed in 1963. The OCFCD allows OCWD to use the basin for recharge as long as water levels are kept within certain limits (OCWD, 2001; OCWD, 2003c).

Table 4-8 summarizes the monthly recharge provided by Miller Basin in 2011-12.

<table>
<thead>
<tr>
<th>Month</th>
<th>Recharge (af)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>July 2011</td>
<td>1,230</td>
<td>OC-28 inflow</td>
</tr>
<tr>
<td>August 2011</td>
<td>1,530</td>
<td>OC-28 inflow</td>
</tr>
<tr>
<td>September 2011</td>
<td>1,786</td>
<td>GWRS and OC-28 inflow</td>
</tr>
<tr>
<td>October 2011</td>
<td>2,461</td>
<td>GWRS and OC-28 inflow</td>
</tr>
<tr>
<td>November 2011</td>
<td>918</td>
<td>SAR and Anaheim Lake pumped water</td>
</tr>
<tr>
<td>December 2011</td>
<td>280</td>
<td>SAR and Anaheim Lake pumped water</td>
</tr>
<tr>
<td>January 2012</td>
<td>872</td>
<td>SAR and Anaheim Lake pumped water</td>
</tr>
<tr>
<td>February 2012</td>
<td>1,178</td>
<td>SAR and OC-28 inflow</td>
</tr>
<tr>
<td>March 2012</td>
<td>854</td>
<td>GWRS and OC-28 inflow</td>
</tr>
<tr>
<td>April 2012</td>
<td>569</td>
<td>GWRS and OC-28 inflow</td>
</tr>
<tr>
<td>May 2012</td>
<td>1,161</td>
<td>GWRS inflow</td>
</tr>
<tr>
<td>June 2012</td>
<td>1,355</td>
<td>GWRS inflow</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>14,194</strong></td>
<td></td>
</tr>
<tr>
<td><strong>5-Year Avg</strong></td>
<td><strong>18,548</strong></td>
<td>Average for FY07-08 to FY11-12</td>
</tr>
</tbody>
</table>
4.9 La Jolla Basin

Key Facts:
- Wetted Area: 6.5 acres
- Maximum Water Depth: 5 feet
- Maximum Storage Capacity: 26 af
- Year Placed Into Service: 2007
- Water Sources: Carbon Creek, SAR, Imported/Purchased Water

La Jolla Basin is the District’s newest recharge basin and was put into service in December 2007. Water is diverted to the basin via a small rubber dam in Carbon Creek. Water in Carbon Creek is typically SAR or imported water discharged to the creek near Miller Basin. Due to the highly permeable sediments underlying the basin, recharge rates on a per-acre basis, are the highest of any facility operated by OCWD.

A record 8,505 acre-feet of water was recharged in La Jolla Basin in 2011-12, primarily due to the large amount of imported water recharged.

Table 4-9 summarizes the monthly recharge provided by La Jolla Basin in 2011-12.

Table 4-9
Monthly Recharge in La Jolla Basin, 2011-12

<table>
<thead>
<tr>
<th>Month</th>
<th>Recharge (af)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>July 2011</td>
<td>1,604</td>
<td>OC-28 inflow</td>
</tr>
<tr>
<td>August 2011</td>
<td>1,585</td>
<td>OC-28 inflow</td>
</tr>
<tr>
<td>September 2011</td>
<td>1,208</td>
<td>OC-28 inflow and pumped Anaheim Lake</td>
</tr>
<tr>
<td>October 2011</td>
<td>855</td>
<td>OC-28 inflow and pumped Anaheim Lake</td>
</tr>
<tr>
<td>November 2011</td>
<td>286</td>
<td>OC-28 inflow and pumped Anaheim Lake</td>
</tr>
<tr>
<td>December 2011</td>
<td>285</td>
<td>OC-28 inflow and pumped Anaheim Lake</td>
</tr>
<tr>
<td>January 2012</td>
<td>343</td>
<td>Pumped water from Anaheim Lake</td>
</tr>
<tr>
<td>February 2012</td>
<td>2</td>
<td>Not used</td>
</tr>
<tr>
<td>March 2012</td>
<td>760</td>
<td>SAR and OC-28 inflow</td>
</tr>
<tr>
<td>April 2012</td>
<td>358</td>
<td>SAR and OC-28 inflow</td>
</tr>
<tr>
<td>May 2012</td>
<td>606</td>
<td>SAR and OC-28 inflow</td>
</tr>
<tr>
<td>June 2012</td>
<td>613</td>
<td>SAR and OC-28 inflow</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>8,505</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Avg</strong></td>
<td><strong>6,376</strong></td>
<td>4-Year Average, FY08-09-FY11-12. Placed in service December 2007.</td>
</tr>
</tbody>
</table>
4.10 Placentia Basin

Key Facts:
- Wetted Area: 9 acres
- Maximum Water Depth: 40 feet
- Maximum Storage Capacity: 350 af
- Year Placed Into Service: 1962
- Water Sources: Carbon Creek, SAR, Imported/Purchased Water

Placentia Basin is a flood retarding basin owned by the OCFCD. The basin is designed to retard flood flows in Carbon Creek; however, the OCFCD allows OCWD to use a small amount of basin storage for water conservation (OCFCD, 1975). Even though OCWD can use the basin year-round, historically, OCWD has only used the basin during OCFCD’s non-storm season (April 15- October 15).

Placentia Basin was used for 5 months of the year, primarily for recharge of imported water.

Table 4-10 summarizes the monthly recharge provided by Placentia Basin in 2011-12.

### Table 4-10

<table>
<thead>
<tr>
<th>Month</th>
<th>Recharge (af)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>July 2011</td>
<td>585</td>
<td>OC-28 inflow</td>
</tr>
<tr>
<td>August 2011</td>
<td>521</td>
<td>OC-28 inflow</td>
</tr>
<tr>
<td>September 2011</td>
<td>373</td>
<td>OC-28 inflow and pumped Anaheim Lake</td>
</tr>
<tr>
<td>October 2011</td>
<td>30</td>
<td>OC-28 inflow and pumped Anaheim Lake</td>
</tr>
<tr>
<td>November 2011</td>
<td>0</td>
<td>Not used</td>
</tr>
<tr>
<td>December 2011</td>
<td>0</td>
<td>Not used</td>
</tr>
<tr>
<td>January 2012</td>
<td>0</td>
<td>Not used</td>
</tr>
<tr>
<td>February 2012</td>
<td>0</td>
<td>Not used</td>
</tr>
<tr>
<td>March 2012</td>
<td>0</td>
<td>Not used</td>
</tr>
<tr>
<td>April 2012</td>
<td>0</td>
<td>Not used</td>
</tr>
<tr>
<td>May 2012</td>
<td>0</td>
<td>Not used</td>
</tr>
<tr>
<td>June 2012</td>
<td>30</td>
<td>SAR and OC-28 inflow</td>
</tr>
</tbody>
</table>

**Total** 1,539

5-Year Avg 386

*Note: 5-year average in 2010-11 Annual Report was in error and should have been 636 afy.*
4.11 Raymond Basin

Key Facts:
Wetted Area: 19 acres
Maximum Water Depth: 25 feet
Maximum Storage Capacity: 370 af
Year Placed Into Service: 1962
Water Sources: Carbon Creek, SAR, Imported/Purchased Water

Raymond Basin is a flood retarding basin owned by the OCFCD that was constructed in 1962. The basin is designed to retard flood flows in Carbon Creek; however, the OCFCD allows OCWD to recharge water provided that the inflow matches the percolation rate (i.e., no stored water) (OCFCD, 1975).

In 2011-12, Raymond Basin was used for 11 months out of the year. The extensive use of the basin and recharging clean (i.e., low total suspended solids concentration), imported water resulted in above average recharge in 2011-12.

Table 4-11 summarizes the monthly recharge provided by Raymond Basin in 2011-12.

<table>
<thead>
<tr>
<th>Month</th>
<th>Recharge (af)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>July 2011</td>
<td>585</td>
<td>OC-28 inflow</td>
</tr>
<tr>
<td>August 2011</td>
<td>505</td>
<td>OC-28 inflow</td>
</tr>
<tr>
<td>September 2011</td>
<td>373</td>
<td>OC-28 inflow and pumped Anaheim Lake</td>
</tr>
<tr>
<td>October 2011</td>
<td>202</td>
<td>OC-28 inflow and pumped Anaheim Lake</td>
</tr>
<tr>
<td>November 2011</td>
<td>183</td>
<td>OC-28 inflow and pumped Anaheim Lake</td>
</tr>
<tr>
<td>December 2011</td>
<td>75</td>
<td>OC-28 inflow and pumped Anaheim Lake</td>
</tr>
<tr>
<td>January 2012</td>
<td>80</td>
<td>Pumped water from Anaheim Lake</td>
</tr>
<tr>
<td>February 2012</td>
<td>0</td>
<td>Not used</td>
</tr>
<tr>
<td>March 2012</td>
<td>268</td>
<td>SAR and OC-28 inflow</td>
</tr>
<tr>
<td>April 2012</td>
<td>111</td>
<td>SAR and OC-28 inflow</td>
</tr>
<tr>
<td>May 2012</td>
<td>295</td>
<td>SAR and OC-28 inflow</td>
</tr>
<tr>
<td>June 2012</td>
<td>400</td>
<td>SAR and OC-28 inflow</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>3,077</strong></td>
<td></td>
</tr>
<tr>
<td><strong>5-Year Avg</strong></td>
<td><strong>2,103</strong></td>
<td>Average for FY07-08 to FY11-12*</td>
</tr>
</tbody>
</table>

*Note: 5-year average in 2010-11 Annual Report was in error and should have been 1,950 afy.
4.12 Off-River Channel

Key Facts:
- Wetted Area: 89 acres
- Maximum Water Depth: N/A
- Maximum Storage Capacity: N/A
- Year Placed Into Service: 1936
- Water Sources: SAR, Imported/Purchased Water

The Off-River Channel was part of the main SAR channel prior to completion of the Santa Ana River Water Conservation and Flood Control Project in December 1973. This project included installation of the center levee which created the main SAR channel for flood control and a parallel off-river channel for water conservation.

In addition to providing recharge, the Off-River Channel serves to convey water to Burris Basin and eventually to Santiago Basins. This reduces the need to divert water to Burris Basin at the Five Coves Rubber Dam. Water that reaches the end of the Off-River Channel, flows under Carbon Canyon Diversion into the Upper Five Coves Basin. Periodic stream flow measurements are made in the Off-River Channel prior to entry into the Five Coves Basins to estimate recharge in the Off-River Channel.

Table 4-12 summarizes the monthly recharge provided by the Off-River Channel in 2011-12.

<table>
<thead>
<tr>
<th>Month</th>
<th>Recharge (af)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>July 2011</td>
<td>750</td>
<td></td>
</tr>
<tr>
<td>August 2011</td>
<td>0</td>
<td>Not used</td>
</tr>
<tr>
<td>September 2011</td>
<td>60</td>
<td>Used 8 days</td>
</tr>
<tr>
<td>October 2011</td>
<td>140</td>
<td>Used 12 days</td>
</tr>
<tr>
<td>November 2011</td>
<td>250</td>
<td>Used 29 days</td>
</tr>
<tr>
<td>December 2011</td>
<td>500</td>
<td>Used 28 days</td>
</tr>
<tr>
<td>January 2012</td>
<td>360</td>
<td></td>
</tr>
<tr>
<td>February 2012</td>
<td>383</td>
<td>Used 29 days</td>
</tr>
<tr>
<td>March 2012</td>
<td>430</td>
<td></td>
</tr>
<tr>
<td>April 2012</td>
<td>920</td>
<td></td>
</tr>
<tr>
<td>May 2012</td>
<td>1,233</td>
<td></td>
</tr>
<tr>
<td>June 2012</td>
<td>926</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>5,952</strong></td>
<td></td>
</tr>
<tr>
<td><strong>5-Year Avg</strong></td>
<td><strong>5,564</strong></td>
<td>Average for FY07-08 to FY11-12</td>
</tr>
</tbody>
</table>
4.13 Olive Basin

Key Facts:
Wetted Area: 5.8 acres
Maximum Water Depth: 41 feet
Maximum Storage Capacity: 122 af
Year Placed Into Service: 1973
Water Sources: SAR, Imported/Purchased Water

Olive Basin is a former sand and gravel borrow pit that was purchased by the District in 1972 from the State of California, Division of Highways.

A record volume of water was recharged in Olive Basin in 2011-12. One key reason for this is that the water being diverted to Olive Basin is first routed through the Desilting System and into Warner Basin. This allows the suspended sediment in the water to settle out prior to recharge.

Table 4-13 summarizes the monthly recharge provided by Olive Basin in 2011-12.

<table>
<thead>
<tr>
<th>Month</th>
<th>Recharge (af)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>July 2011</td>
<td>139</td>
<td>Inflow from Warner Basin</td>
</tr>
<tr>
<td>August 2011</td>
<td>593</td>
<td>Inflow from Warner Basin</td>
</tr>
<tr>
<td>September 2011</td>
<td>445</td>
<td>Inflow from Warner Basin</td>
</tr>
<tr>
<td>October 2011</td>
<td>134</td>
<td>Inflow from Warner Basin</td>
</tr>
<tr>
<td>November 2011</td>
<td>111</td>
<td>Inflow from Warner Basin</td>
</tr>
<tr>
<td>December 2011</td>
<td>276</td>
<td>Inflow from Warner Basin</td>
</tr>
<tr>
<td>January 2012</td>
<td>470</td>
<td>Inflow from Warner Basin</td>
</tr>
<tr>
<td>February 2012</td>
<td>263</td>
<td>Inflow from Warner Basin</td>
</tr>
<tr>
<td>March 2012</td>
<td>146</td>
<td>Inflow from Warner Basin</td>
</tr>
<tr>
<td>April 2012</td>
<td>127</td>
<td>Inflow from Warner Basin</td>
</tr>
<tr>
<td>May 2012</td>
<td>232</td>
<td>Inflow from Warner Basin</td>
</tr>
<tr>
<td>June 2012</td>
<td>52</td>
<td>Inflow from Warner Basin</td>
</tr>
<tr>
<td>Total</td>
<td>3,364</td>
<td></td>
</tr>
<tr>
<td>5-Year Avg</td>
<td>2,379</td>
<td>Average for FY07-08 to FY11-12</td>
</tr>
</tbody>
</table>
4.14 Five Coves Basins

Key Facts:
- Wetted Area: 31 acres
- Maximum Water Depth: 18 feet
- Maximum Storage Capacity: 346 af
- Year Placed Into Service: 1975
- Water Sources: SAR, Imported/Purchased Water

The Five Coves Basins were part of the main SAR channel prior to completion of the Santa Ana River Water Conservation and Flood Control Project in December 1973. This project included installation of the center levee which created the main SAR channel for flood control and a parallel set of facilities for water conservation, including the Off-River Channel and the Five Coves Basins. Because water supplied to the Five Coves Basins is diverted directly from the SAR, solids loading can be high, particularly during storm events. As a result, these basins serve more as desilting basins than recharge basins.

The Five Coves Basins were not cleaned in 2011-12, resulting in below-average recharge.

Table 4-14 summarizes the monthly recharge provided by Five Coves Basins in 2011-12.

<table>
<thead>
<tr>
<th>Month</th>
<th>Recharge (af)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>July 2011</td>
<td>62</td>
<td>Based on 1 cfs meter reading</td>
</tr>
<tr>
<td>August 2011</td>
<td>61</td>
<td>Based on 1 cfs meter reading</td>
</tr>
<tr>
<td>September 2011</td>
<td>60</td>
<td>Based on 1 cfs meter reading</td>
</tr>
<tr>
<td>October 2011</td>
<td>60</td>
<td>Based on 1 cfs meter reading</td>
</tr>
<tr>
<td>November 2011</td>
<td>60</td>
<td>Based on 1 cfs meter reading</td>
</tr>
<tr>
<td>December 2011</td>
<td>60</td>
<td>Estimated based on observations</td>
</tr>
<tr>
<td>January 2012</td>
<td>60</td>
<td>Estimated based on observations</td>
</tr>
<tr>
<td>February 2012</td>
<td>60</td>
<td>Estimated based on observations</td>
</tr>
<tr>
<td>March 2012</td>
<td>60</td>
<td>Estimated based on observations</td>
</tr>
<tr>
<td>April 2012</td>
<td>60</td>
<td>Estimated based on observations</td>
</tr>
<tr>
<td>May 2012</td>
<td>60</td>
<td>Estimated based on observations</td>
</tr>
<tr>
<td>June 2012</td>
<td>60</td>
<td>Estimated based on observations</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>723</strong></td>
<td></td>
</tr>
<tr>
<td><strong>5-Year Avg</strong></td>
<td><strong>2,915</strong></td>
<td>Average for FY07-08 to FY11-12</td>
</tr>
</tbody>
</table>
4.15 Lincoln Basin

Key Facts:
- Wetted Area: 10 acres
- Maximum Water Depth: 7 feet
- Maximum Storage Capacity: 60 af
- Year Placed Into Service: 1976
- Water Sources: SAR, Imported/Purchased Water

Lincoln Basin is a small basin that primarily serves to convey water from Five Coves Basins to Burris Basin. The District undertook a project to remove the fine-grained sedimentary layers underlie the basin in an effort to increase the recharge capacity of the basin. This project started in the summer of 2009 and was completed in the fall of 2009. Short-term percolation tests conducted after the project was completed indicated that recharge rates were lower than expected. OCWD is continuing to investigate the potential reasons for this, including over-compaction of the fill material.
4.16 Burris Basin

Key Facts:
Wetted Area: 120 acres
Maximum Water Depth: 62 feet
Maximum Storage Capacity: 2,670 af
Year Placed Into Service: 1977
Water Sources: SAR, Imported/Purchased, Santiago Basin

Burris Basin is a large basin that includes a shallow eastern side that is a remnant of the SAR channel and a deeper western side that was a former sand and gravel mine.

Burris Basin was not cleaned in 2011-12. Because the basin was not cleaned, the recharge rate is predominately related to the water level, with higher water levels resulting in greater recharge.

Table 4-15 summarizes the monthly recharge provided by Burris Basin in 2011-12.

<table>
<thead>
<tr>
<th>Month</th>
<th>Recharge (af)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>July 2011</td>
<td>995</td>
<td>Inflow from SAR</td>
</tr>
<tr>
<td>August 2011</td>
<td>1,027</td>
<td>Inflow from SAR</td>
</tr>
<tr>
<td>September 2011</td>
<td>1,005</td>
<td>Inflow from SAR</td>
</tr>
<tr>
<td>October 2011</td>
<td>502</td>
<td>Inflow from SAR</td>
</tr>
<tr>
<td>November 2011</td>
<td>448</td>
<td>Inflow from SAR</td>
</tr>
<tr>
<td>December 2011</td>
<td>526</td>
<td>Inflow from SAR</td>
</tr>
<tr>
<td>January 2012</td>
<td>198</td>
<td>Inflow from SAR</td>
</tr>
<tr>
<td>February 2012</td>
<td>504</td>
<td>Inflow from SAR</td>
</tr>
<tr>
<td>March 2012</td>
<td>897</td>
<td>Inflow from SAR</td>
</tr>
<tr>
<td>April 2012</td>
<td>807</td>
<td>Inflow from SAR</td>
</tr>
<tr>
<td>May 2012</td>
<td>724</td>
<td>Inflow from SAR</td>
</tr>
<tr>
<td>June 2012</td>
<td>908</td>
<td>Inflow from SAR</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>8,541</strong></td>
<td></td>
</tr>
<tr>
<td><strong>5-Year Avg</strong></td>
<td><strong>7,933</strong></td>
<td>Average for FY07-08 to FY11-12</td>
</tr>
</tbody>
</table>
4.17 River View Basin

Key Facts:
- Wetted Area: 3.6 acres
- Maximum Water Depth: 4 feet
- Maximum Storage Capacity: 11 af
- Year Placed Into Service: 2003
- Water Sources: SAR, Imported/Purchased, Santiago Basin

River View Basin is located on the eastern side of the SAR channel across from Burris Basin. Water is provided to the basin via the Santiago pipeline. Typically during the winter months, pumped SAR water from the Burris Basin pump station is supplied to the basin. In the summer months, pumped water from the Santiago Basins is supplied to the basin.

Table 4-16 summarizes the monthly recharge provided by River View Basin in 2011-12.

Table 4-16
Monthly Recharge in River View Basin, 2011-12

<table>
<thead>
<tr>
<th>Month</th>
<th>Recharge (af)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>July 2011</td>
<td>217</td>
<td>Inflow from Santiago and Burris Basin</td>
</tr>
<tr>
<td>August 2011</td>
<td>226</td>
<td>Inflow from Santiago and Burris Basin</td>
</tr>
<tr>
<td>September 2011</td>
<td>180</td>
<td>Inflow from Santiago and Burris Basin</td>
</tr>
<tr>
<td>October 2011</td>
<td>191</td>
<td>Inflow from Santiago and Burris Basin</td>
</tr>
<tr>
<td>November 2011</td>
<td>160</td>
<td>Inflow from Santiago and Burris Basin</td>
</tr>
<tr>
<td>December 2011</td>
<td>34</td>
<td>Inflow from Santiago and Burris Basin</td>
</tr>
<tr>
<td>January 2012</td>
<td>48</td>
<td>Inflow from Santiago and Burris Basin</td>
</tr>
<tr>
<td>February 2012</td>
<td>132</td>
<td>Inflow from Santiago and Burris Basin</td>
</tr>
<tr>
<td>March 2012</td>
<td>118</td>
<td>Inflow from Santiago and Burris Basin</td>
</tr>
<tr>
<td>April 2012</td>
<td>214</td>
<td>Inflow from Santiago and Burris Basin</td>
</tr>
<tr>
<td>May 2012</td>
<td>130</td>
<td>Inflow from Burris Basin, Cleaned</td>
</tr>
<tr>
<td>June 2012</td>
<td>0</td>
<td>Not used</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1,650</strong></td>
<td></td>
</tr>
<tr>
<td><strong>5-Year Avg</strong></td>
<td><strong>1,606</strong></td>
<td>Average for FY07-08 to FY11-12</td>
</tr>
</tbody>
</table>
4.18 Santiago Basins

Key Facts:
- Wetted Area: 187 acres
- Maximum Water Depth: 136 feet
- Maximum Storage Capacity: 13,720 af
- Year Placed Into Service: 1990
- Water Sources: SAR, Imported/Purchased, Santiago Creek

Santiago Basins are three former gravel and sand mines called Smith Pit, Blue Diamond Pit and Bond Pit (see Figure 2-2) that were purchased by OCWD in 1983-85. The combined storage capacity of the basins is over 13,000 acre-feet, which is over half of the total storage capacity of OCWD’s entire surface water recharge system.

Table 4-17 summarizes the monthly recharge provided by the Santiago Basins in 2011-12.

<table>
<thead>
<tr>
<th>Month</th>
<th>Recharge (af)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>July 2011</td>
<td>3,499</td>
<td>Inflow from Burris Basin</td>
</tr>
<tr>
<td>August 2011</td>
<td>3,680</td>
<td>Inflow from Burris Basin, Villa Park Dam</td>
</tr>
<tr>
<td>September 2011</td>
<td>2,648</td>
<td>Inflow from Burris Basin, Villa Park Dam</td>
</tr>
<tr>
<td>October 2011</td>
<td>2,394</td>
<td>Inflow from Burris Basin</td>
</tr>
<tr>
<td>November 2011</td>
<td>2,584</td>
<td>Inflow from Burris Basin</td>
</tr>
<tr>
<td>December 2011</td>
<td>3,344</td>
<td>Inflow from Burris Basin, local runoff</td>
</tr>
<tr>
<td>January 2012</td>
<td>2,964</td>
<td>Inflow from Burris Basin, local runoff</td>
</tr>
<tr>
<td>February 2012</td>
<td>2,413</td>
<td>Inflow from Burris Basin, local runoff</td>
</tr>
<tr>
<td>March 2012</td>
<td>3,029</td>
<td>Inflow from Burris Basin, local runoff</td>
</tr>
<tr>
<td>April 2012</td>
<td>4,268</td>
<td>Inflow from Burris Basin, local runoff</td>
</tr>
<tr>
<td>May 2012</td>
<td>4,555</td>
<td>Inflow from Burris Basin, Villa Park Dam</td>
</tr>
<tr>
<td>June 2012</td>
<td>3,012</td>
<td>Inflow from Burris Basin, local runoff</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>38,390</strong></td>
<td></td>
</tr>
<tr>
<td><strong>5-Year Avg</strong></td>
<td><strong>34,786</strong></td>
<td>Average for FY07-08 to FY11-12</td>
</tr>
</tbody>
</table>
4.19 Santiago Creek Channel

Key Facts:
- Wetted Area: 2.6 acres
- Maximum Water Depth: N/A
- Maximum Storage Capacity: N/A
- Year Placed Into Service: 2000
- Water Sources: SAR, Imported/Purchased, Santiago Creek

The upstream portion of Santiago Creek below Villa Park Dam drains into the Santiago Basins. So unless Santiago Basins are spilling, which can occur during wet years, upstream discharges of local runoff to the creek are captured and recharged in Santiago Basins. The downstream portion of Santiago Creek is generally fed by water pumped to the creek by OCWD.

Typically water discharged to the creek in the winter months is pumped SAR water from the Burris Basin pump station. When there is sufficient local rainfall, discharge to the creek is curtailed or stopped to allow for the recharge of local runoff and to minimize discharges through Hart Park. During the summer months, water supplied to the creek is pumped water from Santiago Basins.

Table 4-18 summarizes the monthly recharge provided by Santiago Creek in 2011-12.

Table 4-18
Monthly Recharge in Santiago Creek Channel, 2011-12

<table>
<thead>
<tr>
<th>Month</th>
<th>Recharge (af)</th>
<th>Notes</th>
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<tbody>
<tr>
<td>July 2011</td>
<td>577</td>
<td>Inflow from Burris and Santiago Basins</td>
</tr>
<tr>
<td>August 2011</td>
<td>669</td>
<td>Inflow from Burris and Santiago Basins</td>
</tr>
<tr>
<td>September 2011</td>
<td>282</td>
<td>Inflow from Burris and Santiago Basins</td>
</tr>
<tr>
<td>October 2011</td>
<td>358</td>
<td>Inflow from Burris and Santiago Basins</td>
</tr>
<tr>
<td>November 2011</td>
<td>163</td>
<td>Inflow from Burris and Santiago Basins</td>
</tr>
<tr>
<td>December 2011</td>
<td>228</td>
<td>Inflow from Burris and Santiago Basins</td>
</tr>
<tr>
<td>January 2012</td>
<td>384</td>
<td>Inflow from Burris and Santiago Basins</td>
</tr>
<tr>
<td>February 2012</td>
<td>257</td>
<td>Inflow from Burris and Santiago Basins</td>
</tr>
<tr>
<td>March 2012</td>
<td>310</td>
<td>Inflow from Burris and Santiago Basins</td>
</tr>
<tr>
<td>April 2012</td>
<td>318</td>
<td>Inflow from Burris and Santiago Basins</td>
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<tr>
<td>May 2012</td>
<td>543</td>
<td>Inflow from Burris and Santiago Basins</td>
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<tr>
<td>June 2012</td>
<td>539</td>
<td>Inflow from Burris and Santiago Basins</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>4,628</strong></td>
<td></td>
</tr>
<tr>
<td><strong>5-Year Avg</strong></td>
<td><strong>3,403</strong></td>
<td>Average for FY07-08 to FY11-12</td>
</tr>
</tbody>
</table>
Section 5  Seawater Barrier Recharge

This section summarizes the operation of the seawater barrier facilities in 2011-12.

5.1 Talbert Gap Seawater Barrier

To hold back seawater intrusion in the Talbert Gap, the District constructed the Talbert Gap Seawater Barrier (Talbert Barrier) in the mid-1970s in the city of Fountain Valley (Figure 5-1). The Talbert Barrier currently has 36 injection sites with 108 injection well casings. Some of the older injection well sites have a large borehole with multiple injection well casings completed at different depths. Newer injection wells are single casings installed in a single borehole.

Historically, a mixture of recycled water, potable imported water, and groundwater has been used to supply the Talbert Barrier. From 1976 to June 2004, recycled water was produced by Water Factory 21 (WF21). Since January 2008, recycled water has been supplied to the barrier by the Groundwater Replenishment System (GWRS).

Total injection at the Talbert Barrier in 2011-12 was 20,742 acre-feet, which is slightly higher than the 10-year average of 19,850 acre-feet per year (see Table B-10 in Appendix B). Injection was reduced in 2011-12 because of reduced pumping in the vicinity of the barrier.
due to in-lieu recharge (see Section 6). Virtually all of the water injected in 2011-12 was recycled water. The higher rate of injection over the past several years is mainly due to the lack of clogging caused by the GWRS water compared to sources used previously as well as refinements to how the barrier wells are operated.

Figure 5-2 shows annual injection at the Talbert Barrier over the last 10 years. Table B-10 in Appendix B presents the data used to prepare this graph. Table B-11 in Appendix B presents the monthly injection at the Talbert Barrier for 2011-12.

Figure 5-2 Annual Injection at the Talbert Barrier, 2002-12

5.2 Alamitos Gap Seawater Barrier

The first segment of the Alamitos Barrier was designed and constructed in 1965 to create a freshwater pressure ridge intended to protect the groundwater supplies of both the Orange County groundwater basin and Central Basin in Los Angeles County from seawater intrusion. As shown in Figure 5-3, the barrier straddles the Orange-Los Angeles County line and spans the approximately 1.8-mile wide Alamitos Gap between Bixby Ranch Hill and Landing Hill. The barrier is comprised of 43 injection wells and more wells are added as needed to minimize further seawater intrusion. Since the barrier straddles the LA-OC county line, only a third of total injection recharges the Orange County groundwater basin.
Total injection at the Alamitos Barrier in 2011-12 was 4,351 acre-feet, which is lower than the recent 10-year average of 4,960 acre-feet per year (see Table B-12 in Appendix B) (LACDPW, 2012). Of the water injected, 1,199 acre-feet was injected on the Orange County side of the barrier. This is approximately 25 percent lower than the recent 10-year average of 1,600 acre-feet per year recharged into the Orange County side of the barrier.

Alamitos Barrier recharge was below average due to in-lieu recharge by agencies in Orange and Los Angeles counties and three temporary barrier shutdowns.

Figure 5-4 shows annual injection to the Orange County groundwater basin from the Alamitos Barrier from 2002 to 2012. Table B-12 in Appendix B presents the data used to prepare this graph. Table B-13 in Appendix B presents the monthly injection at the Alamitos Barrier for 2011-12.
Figure 5-4
Annual Injection at the Alamitos Barrier, 2002-12

Note: Only recharge to OC groundwater basin is shown.

**Data adjusted by LACDPW.
Section 6  In-Lieu Recharge

Since the in-lieu program was put into place by MWD in 1977, the District has recharged over 963,000 acre-feet of imported water as shown on Figure 6-1. The program is administered by the Municipal Water District of Orange County (MWDOC) and is the most successful in-lieu program in MWD’s service territory. When surplus water is available from MWD, OCWD initiates the program and asks groundwater pumpers to turn off their wells and take treated, imported water in-lieu of groundwater. Pumpers that participate in the program are paid by OCWD to make the cost equivalent to groundwater.

MWD suspended the in-lieu program in May 2007. In May 2010, MWD reinstated the in-lieu program when it made 225,000 acre-feet of discounted replenishment water available for recharge on a first-come-first serve basis to all agencies within its service area. OCWD immediately started deliveries and was able to recharge 10,435 acre-feet in 2010-11 and 30,844 acre-feet in early 2011-12. In March-June 2012, OCWD recharged 9,720 acre-feet of in-lieu water for MWD’s Conjunctive Use Program (CUP). Table B-14 in Appendix B presents the data used to prepare Figure 6-1.

Figure 6-1
Annual In-Lieu Recharge, 1978-2012

*July 1-June 30, Other years Oct. 1 - Sept. 30.
Section 7  Recharge Summary

This section summarizes the sources used to recharge the basin and the facilities used to recharge these sources in 2011-12.

7.1  Recharge Sources

A total of 8.15 inches of rain was received at the District’s Anaheim Field Headquarters (FHQ) in 2011-12, which is 43 percent lower than the historical average of 14.4 inches and is the 7th driest in the last 50 years.

The dry conditions resulted in the capture and recharge of only 34,531 acre-feet of storm flow, which is the lowest volume captured since 2001-02 and is 41 percent below the recent 10-year average. Incidental recharge was 57 percent below average due to the dry conditions.

From 2004-05 to 2007-08, Santa Ana River base flows declined by 32 percent; however, flows leveled off from 2008-09 to 2010-11 at just over 100,000 acre-feet per year. In 2011-12, base flows declined further to 94,754 acre-feet, which is the lowest volume of base flow since the early 1980s. Compared to recent 10-year average, 2011-12 Santa Ana River base flow is 25 percent below average. The decline is attributed to increased conservation by upstream agencies, increased recycling, and reduced economic activity in upper watershed.

Imported water recharge totaled 90,122 acre-feet, which is 33 percent above the 10-year average. This was in large part due to MWD making discounted replenishment water available in May 2011. Discounted replenishment water was recharged in July-September 2011. Imported water recharge during the remainder of the year was placed in MWD’s storage account (CUP). For the third year in a row, recycled water recharge exceeded the previous record, and reached 72,258 acre-feet in 2011-12.

Figure 7-1 shows the monthly contribution of recharge sources in 2011-12. This figure shows that imported water recharge dominated the first three months of the year. Recycled water from the GWRS continues to provide a steady and significant recharge source throughout the year. Table B-17 in Appendix B presents the data used to prepare Figure 7-1.
Figure 7-1
Total Monthly Recharge by Source, 2011-12
In 2011-12, SAR base flow provided 30 percent of total recharge, with SAR storm flow and local inflow providing only 11 percent. Taken together, SAR and local flows provided 41 percent of total recharge to the basin. Imported water provided 28 percent of total recharge while recycled water provided 22 percent. Incidental recharge was well below average and only provided 9 percent of total recharge to the basin. Figure 7-2 shows the relative contribution of each recharge source in 2011-12.

Total recharge to the basin in 2011-12 was 319,366 acre-feet, which is 8 percent lower than the recent 10-year average of 347,6250acre-feet per year. Table 7-1 summarizes the recharge sources to the basin in 2011-12 and how they compare to the recent 10-year average. Figure 7-3 shows how total recharge in 2011-12 compared to the last 10 years. Tables B-17 and B-18 in Appendix B present the data used to prepare Table 7-1, Figure 7-1 and Figure 7-3.
Table 7-1
Recharge Source Summary

<table>
<thead>
<tr>
<th>Source</th>
<th>FY11-12 (af)</th>
<th>10-Year Avg (af)</th>
<th>Increase/Decrease (af)</th>
<th>% Increase/Decrease</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAR Base Flow (1)</td>
<td>94,754</td>
<td>125,641</td>
<td>(30,887)</td>
<td>(25)</td>
</tr>
<tr>
<td>Storm Flow/Local Water (2)</td>
<td>34,531</td>
<td>58,481</td>
<td>(23,950)</td>
<td>(41)</td>
</tr>
<tr>
<td>Imported/Purchased Water</td>
<td>90,122</td>
<td>67,819</td>
<td>22,303</td>
<td>33</td>
</tr>
<tr>
<td>Groundwater (3)</td>
<td>0</td>
<td>1,425</td>
<td>(1,425)</td>
<td>(100)</td>
</tr>
<tr>
<td>Recycled Water (4)</td>
<td>72,258</td>
<td>29,289</td>
<td>42,969</td>
<td>147</td>
</tr>
<tr>
<td><strong>Total OCWD Recharge (5)</strong></td>
<td><strong>291,665</strong></td>
<td><strong>282,654</strong></td>
<td><strong>9,011</strong></td>
<td>3</td>
</tr>
<tr>
<td>Incidental Recharge</td>
<td>27,701</td>
<td>64,966</td>
<td>(37,265)</td>
<td>(57)</td>
</tr>
<tr>
<td><strong>Grand Total</strong></td>
<td><strong>319,366</strong></td>
<td><strong>347,620</strong></td>
<td><strong>(28,254)</strong></td>
<td>(8)</td>
</tr>
</tbody>
</table>

(1) SAR Base Flow based on OCWD data, which may differ slightly from the SAR Watermaster (see Section 3.2).
(6) Storm flow includes SAR storm flow and local inflow to the recharge system below Prado Dam.
(7) Groundwater was used to augment the injection supply at the Talbert Barrier until July 2006.
(8) Recycled water is produced by the GWRS as well as the Leo J. Vander Lans Water Treatment Facility, which is operated by the Long Beach Water Department. Water from the Vander Lans plant is recharged at the Alamitos Barrier.
(9) Recharge at all OCWD facilities, also referred to as Managed Aquifer Recharge (MAR).

Figure 7-3
Total Annual Recharge by Source, 2002-12
7.2 Recharge Facilities

In 2011-12, the surface water recharge system provided 78 percent of recharge, seawater barriers provided 8 percent and in-lieu recharge provided the remaining 14 percent, as shown in Figure 7-4.

The recharge of SAR and local water in the surface water recharge system was 30 percent below the recent 10-year average in 2011-12 due to the very dry conditions. Recharge of imported water in the surface water system was 94 percent above the recent 10-year average due to large purchases of discounted replenishment water and recharge to fill MWD’s storage account (CUP).

In-lieu recharge was also above average due to the large purchases of imported water and filling MWD’s storage account. Recharge of recycled water in the surface water recharge system was an all-time high of 50,393 acre-feet. Table 7-2 summarizes the contribution of the different recharge facilities to basin recharge in 2011-12 and how they compare to the recent 10-year average.

![Figure 7-4: Recharge by Facility, 2011-12](image-url)
Table 7-2
Recharge Facility Summary

<table>
<thead>
<tr>
<th>Facility</th>
<th>FY11-12 (af)</th>
<th>10-Year Avg (af)</th>
<th>Increase/ (Decrease) (af)</th>
<th>% Increase/ (Decrease)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surface Water System: SAR/Local Water</td>
<td>129,285</td>
<td>184,121</td>
<td>(54,836)</td>
<td>(30)</td>
</tr>
<tr>
<td>Surface Water System: Imported/Purchased Water</td>
<td>48,938</td>
<td>25,215</td>
<td>23,723</td>
<td>94</td>
</tr>
<tr>
<td>Surface Water System: Recycled Water (GWRS)*</td>
<td>50,939</td>
<td>14,598</td>
<td>36,341</td>
<td>249</td>
</tr>
<tr>
<td>In-Lieu System</td>
<td>40,564</td>
<td>37,420</td>
<td>3,144</td>
<td>8</td>
</tr>
<tr>
<td>Seawater Barrier System</td>
<td>21,941</td>
<td>21,450</td>
<td>491</td>
<td>2</td>
</tr>
<tr>
<td>Total OCWD Recharge</td>
<td>291,666</td>
<td>282,805</td>
<td>8,862</td>
<td>3</td>
</tr>
</tbody>
</table>

* Recharge of recycled water from GWRS in surface water system started in January 2008.

Figure 7-5 shows how recharge at each of the facilities has varied over the past 10 years. Table B-18 in Appendix B presents the data used to prepare Figures 7-4 and 7-5 and Table 7-2.
Section 8 References


Orange County Water District (OCWD), 2003a. A History of Orange County Water District. Published by OCWD.


Appendix A

Acronyms/Definitions
af. Acre-foot. The amount of water needed to cover an acre of land with one foot of water (43,560 cubic feet, 325,900 gallons).

afy. Acre-feet per year.

Base flow. The portion of river surface flow which remains after deduction of storm flow and/or purchased imported water.

cfs. Cubic-feet-per-second. Measure of water flow in a channel. Equivalent to 450 gallons per minute. In one 24-hour period, a flow of 1 cfs equals 1.98 acre-feet of water.

Ft msl. Elevation in feet mean sea level.

GWRS. Groundwater Replenishment System.

LACDPW. Los Angeles County Department of Public Works.

MWD. Metropolitan Water District of Southern California.

MWDOC. Municipal Water District of Orange County.

OCFCD. Orange County Flood Control District.

OCWD. Orange County Water District.

SAR. Santa Ana River.

Storm flow. The portion of river surface flow that is attributed to rainfall.

SWRCB. California State Water Resources Control Board.

USACOE. United States Army Corps of Engineers.

USGS. United States Geological Survey.

WRD. Water Replenishment District of Southern California.
Appendix B

Data Tables
The data presented in the tables within this appendix were derived from the following sources:

**Santa Ana River Watermaster**

Each year the SAR Watermaster prepares a report for the Superior Court of Orange County that presents the findings for the prior water year (WY, Oct. 1 to Sept. 30). The SAR Watermaster uses the final USGS record for the SAR below Prado Dam (Station No. 11074000) to determine the daily volume of base flow and storm flow that arrived at Prado Dam.

**Orange County Water District**

As part of its aquifer recharge operations, OCWD collects a wide variety of data. Each of these data sources and their limitations are described in this section.

**Precipitation/Evaporation**

OCWD has been collecting precipitation data at its Anaheim Field Headquarters location since 1963. Formerly included in OCFCD’s annual report, it was assigned Station no. 174. Prior to 2007, precipitation was measured using a National Weather Service approved non-recording 8-inch rain gage. In 2007, a tipping bucket rain gage was added to determine rainfall intensities and add accuracy. Evaporation data was collected by OCWD staff from 1988 to 2010 using a National Weather Service approved 48-inch evaporation pan. Since 2010, evaporative losses have been calculated using historical averages collected at this location.

**Surface Water Flows**

A wide variety of methods are used to measure surface water flows in the recharge system, including flumes, weirs, ultrasonic flow meters, propeller meters, and magnetic flow meters. The data collection using these methods is done so according to standard hydrologic techniques. Every effort is made to ensure that the data collected are as accurate as possible. Where possible, flows from one area are cross-checked with flows measured at downstream facilities. Nevertheless, during the course of any year, there are periods when instrumentation problems and rapid changes in flow rates can make accurately identifying the recharge performance of individual facilities difficult, particularly over short time periods.
Recharge Facility Water Levels

Water levels in the recharge facilities are measured using several methods including pressure transducers, air pressure in orifice lines, and staff gages. At many sites, the water levels are collected on a continuous basis and stored electronically. Water level data are used to operate the recharge system and to calculate storage changes. Storage changes, along with inflow and outflow rates, are used to calculate percolation rates.

The water storage vs. water level elevation relationship for each facility is based on digitized topographic maps.

Talbert Gap Seawater Barrier

From 1976 to 2006, water recharged in the Talbert Barrier was measured using a 30-inch differential pressure flow meter. Since 2007, flows have been measured using a 54-inch ultrasonic flow meter.

Incidental Recharge

Incidental recharge is estimated by comparing changes in basin water levels from year to year. Recently, this method has been improved by calculating the change in storage from each of the basins three main aquifer systems.

Imported Water

Volumes of imported water purchased by OCWD for recharge are reported to OCWD by the selling agency, which could include the Municipal Water District of Orange County (MWDOC), Western Municipal Water District, San Bernardino Valley Municipal Water District, and Elsinore Valley Municipal Water District.

Los Angeles County Department of Public Works

The LACDPW provides OCWD with data on the water recharged at the Alamitos Seawater Barrier. Because the Alamitos Barrier straddles the Los Angeles and Orange County lines, the LACDPW presents the volume of water recharged on both sides of the county line in its annual report on the control of seawater intrusion at the Alamitos Gap.
<table>
<thead>
<tr>
<th>YEAR</th>
<th>JULY</th>
<th>AUG</th>
<th>SEPT</th>
<th>OCT</th>
<th>NOV</th>
<th>DEC</th>
<th>JAN</th>
<th>FEB</th>
<th>MAR</th>
<th>APR</th>
<th>MAY</th>
<th>JUNE</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1963-64</td>
<td>0</td>
<td>0</td>
<td>0.98</td>
<td>3.8</td>
<td>0</td>
<td>1.41</td>
<td>0</td>
<td>1.74</td>
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<td>1.9</td>
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<td>1966-67</td>
<td>0</td>
<td>0.09</td>
<td>1.42</td>
<td>6.63</td>
<td>3.78</td>
<td>0</td>
<td>2.12</td>
<td>3.78</td>
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<td>0.03</td>
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<td>1.73</td>
<td>0.77</td>
<td>0.59</td>
<td>3.22</td>
<td>0.57</td>
<td>0.06</td>
<td>0</td>
<td>9.40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1968-69</td>
<td>0.35</td>
<td>0.2</td>
<td>0.47</td>
<td>1.41</td>
<td>12.69</td>
<td>9.55</td>
<td>1.44</td>
<td>0.77</td>
<td>0.05</td>
<td>0</td>
<td>26.93</td>
<td></td>
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<td>0</td>
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<td>0.17</td>
<td>2.14</td>
<td>1.25</td>
<td>3.02</td>
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<td>1970-71</td>
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<td>0.39</td>
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<td>1971-72</td>
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<td>0.3</td>
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<td>0.19</td>
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**Table B-1**

**Monthly Rainfall at OCWD Field Headquarters, 1963-2012**

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*Orange County Flood Control District.*

Guage is maintained by OCWD staff and data reported to OCFCD.
Table B-2
Annual Incidental Recharge, 2002-12

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<th>Fiscal Year (Jul-June)</th>
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*Losses to Los Angeles County are subtracted from total incidental recharge to yield net incidental recharge.
### Table B-3
Monthly Local Inflow Summary, 2011-12

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<th>Local Storm Flow to SAR Below Imperial Rubber Dam (1) (af/mo)</th>
<th>Local Storm Flow Captured in Santiago Basins (2) (af/mo)</th>
<th>Direct Rainfall to Recharge Basins (3) (af/mo)</th>
<th>Total Local Inflow Captured and Recharged (af/mo)</th>
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(1) Includes estimated flow from Carbon Canyon Diversion. Local storm flow below Imperial Dam is assumed to be captured. Lost SAR water assumed to originate above Prado Dam.

(2) Includes inflow from Santiago Creek and releases from Villa Park Dam (Table B-6). December 2010 losses to ocean of 988 af is subtracted (see Table B-9).

(3) Assumes direct rainfall to 500 acres of recharge basins.
<table>
<thead>
<tr>
<th>Oct-Sept</th>
<th>Water Year</th>
<th>SAR Base Flow (afy)</th>
<th>SAR Storm Flow (afy)</th>
<th>Total SAR Supply (afy)</th>
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<td>2001-02</td>
<td>2002</td>
<td>145,891</td>
<td>10,615</td>
<td>156,506</td>
</tr>
<tr>
<td>2002-03</td>
<td>2003</td>
<td>146,113</td>
<td>97,810</td>
<td>243,923</td>
</tr>
<tr>
<td>2003-04</td>
<td>2004</td>
<td>143,510</td>
<td>57,317</td>
<td>200,827</td>
</tr>
<tr>
<td>2005-06</td>
<td>2006</td>
<td>147,736</td>
<td>85,734</td>
<td>233,470</td>
</tr>
<tr>
<td>2006-07</td>
<td>2007</td>
<td>129,830</td>
<td>12,901</td>
<td>142,731</td>
</tr>
<tr>
<td>2007-08</td>
<td>2008</td>
<td>116,483</td>
<td>68,896</td>
<td>185,379</td>
</tr>
<tr>
<td>2008-09</td>
<td>2009</td>
<td>102,711</td>
<td>53,662</td>
<td>156,373</td>
</tr>
<tr>
<td>2009-10</td>
<td>2010</td>
<td>103,099</td>
<td>135,775</td>
<td>238,874</td>
</tr>
<tr>
<td>2010-11</td>
<td>2011</td>
<td>102,031</td>
<td>205,568</td>
<td>307,599</td>
</tr>
<tr>
<td>2011-12</td>
<td>2012</td>
<td>93,068</td>
<td>27,325</td>
<td>120,393</td>
</tr>
</tbody>
</table>

| Maximum  | 158,637    | 469,515             | 623,822               |
| Minimum  | 26,190     | 760                 | 26,950                |
| Recent 10-yr Avg. | 123,889 | 121,450 | 245,339 |

(1) Data from Santa Ana River Water Master Reports.
Table B-5
Monthly SAR Base and Storm Flow Recharged, 2011-12 (1)

<table>
<thead>
<tr>
<th>Month</th>
<th>SAR Base Flow (af/mo)</th>
<th>SAR Storm Flow (2) (af/mo)</th>
<th>Total SAR Water Recharged (af/mo)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jul-11</td>
<td>6,059</td>
<td>283</td>
<td>6,342</td>
</tr>
<tr>
<td>Aug-11</td>
<td>5,403</td>
<td>240</td>
<td>5,643</td>
</tr>
<tr>
<td>Sep-11</td>
<td>5,052</td>
<td>-</td>
<td>5,052</td>
</tr>
<tr>
<td>Oct-11</td>
<td>7,365</td>
<td>1,481</td>
<td>8,846</td>
</tr>
<tr>
<td>Nov-11</td>
<td>8,879</td>
<td>4,481</td>
<td>13,360</td>
</tr>
<tr>
<td>Dec-11</td>
<td>10,054</td>
<td>3,136</td>
<td>13,190</td>
</tr>
<tr>
<td>Jan-12</td>
<td>10,218</td>
<td>1,552</td>
<td>11,770</td>
</tr>
<tr>
<td>Feb-12</td>
<td>9,827</td>
<td>2,893</td>
<td>12,720</td>
</tr>
<tr>
<td>Mar-12</td>
<td>9,808</td>
<td>4,192</td>
<td>14,000</td>
</tr>
<tr>
<td>Apr-12</td>
<td>8,666</td>
<td>6,294</td>
<td>14,960</td>
</tr>
<tr>
<td>May-12</td>
<td>8,063</td>
<td>6,197</td>
<td>14,260</td>
</tr>
<tr>
<td>Jun-12</td>
<td>5,360</td>
<td>167</td>
<td>5,527</td>
</tr>
<tr>
<td>Totals</td>
<td>94,754</td>
<td>30,916</td>
<td>125,670</td>
</tr>
</tbody>
</table>

(1) OCWD data is used to determine SAR flows and thus may differ from SAR Watermaster data.

(2) SAR storm flow capture may differ from SAR Watermaster because there is inflow to the SAR below Prado Dam and storage behind the dam is not considered.
Table B-6
Monthly Santiago Creek Inflow, 2011-12

<table>
<thead>
<tr>
<th></th>
<th>Santiago Creek Inflow</th>
<th>Water Released from Villa Park Dam</th>
<th>Total Santiago Creek Inflow</th>
<th>Losses to Ocean (1)</th>
<th>Total Santiago Creek Inflow Captured and Recharged</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(af/mo)</td>
<td>(af/mo)</td>
<td>(af/mo)</td>
<td>(af/mo)</td>
<td>(af/mo)</td>
</tr>
<tr>
<td>Jul-11</td>
<td>65</td>
<td>0</td>
<td>65</td>
<td>0</td>
<td>65</td>
</tr>
<tr>
<td>Aug-11</td>
<td>65</td>
<td>465</td>
<td>530</td>
<td>0</td>
<td>530</td>
</tr>
<tr>
<td>Sep-11</td>
<td>32</td>
<td>331</td>
<td>363</td>
<td>0</td>
<td>363</td>
</tr>
<tr>
<td>Oct-11</td>
<td>150</td>
<td>0</td>
<td>150</td>
<td>0</td>
<td>150</td>
</tr>
<tr>
<td>Nov-11</td>
<td>150</td>
<td>0</td>
<td>150</td>
<td>0</td>
<td>150</td>
</tr>
<tr>
<td>Dec-11</td>
<td>115</td>
<td>0</td>
<td>115</td>
<td>0</td>
<td>115</td>
</tr>
<tr>
<td>Jan-12</td>
<td>200</td>
<td>0</td>
<td>200</td>
<td>0</td>
<td>200</td>
</tr>
<tr>
<td>Feb-12</td>
<td>105</td>
<td>0</td>
<td>105</td>
<td>0</td>
<td>105</td>
</tr>
<tr>
<td>Mar-12</td>
<td>246</td>
<td>0</td>
<td>246</td>
<td>0</td>
<td>246</td>
</tr>
<tr>
<td>Apr-12</td>
<td>173</td>
<td>0</td>
<td>173</td>
<td>0</td>
<td>173</td>
</tr>
<tr>
<td>May-12</td>
<td>60</td>
<td>40</td>
<td>100</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>Jun-12</td>
<td>60</td>
<td>0</td>
<td>60</td>
<td>0</td>
<td>60</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td><strong>1,421</strong></td>
<td><strong>836</strong></td>
<td><strong>2,257</strong></td>
<td><strong>0</strong></td>
<td><strong>2,257</strong></td>
</tr>
</tbody>
</table>

Note: Santiago Creek inflow is categorized as storm flow, even though it may include nuisance flow during the summer months and releases from Villa Park Dam.

(1) See Table B-9
Table B-7
Monthly Recharge of Imported and Purchased Water, 2011-12 (af)

<table>
<thead>
<tr>
<th>Month</th>
<th>OC-59*</th>
<th>OC-28 (CUP**)</th>
<th>MWD OC-28A (CUP**)</th>
<th>WMWD Arlington Desalter</th>
<th>Total Surface Recharge</th>
<th>OCWD In-Lieu (CUP**)</th>
<th>MWD In-Lieu (CUP**)</th>
<th>Total In-Lieu Recharge</th>
<th>Talbert Barrier</th>
<th>Alamitos Barrier</th>
<th>Total Barrier Recharge</th>
<th>Grand Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jul-11</td>
<td>4,827</td>
<td>11,899</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>16,726</td>
<td>10,060</td>
<td>0</td>
<td>10,060</td>
<td>0</td>
<td>80</td>
<td>80</td>
</tr>
<tr>
<td>Aug-11</td>
<td>5,492</td>
<td>9,832</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>15,323</td>
<td>10,653</td>
<td>0</td>
<td>10,653</td>
<td>0</td>
<td>26</td>
<td>26</td>
</tr>
<tr>
<td>Sep-11</td>
<td>1,902</td>
<td>7,277</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>9,179</td>
<td>10,130</td>
<td>0</td>
<td>10,130</td>
<td>0</td>
<td>27</td>
<td>27</td>
</tr>
<tr>
<td>Oct-11</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>25</td>
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</tr>
<tr>
<td>Nov-11</td>
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<td>0</td>
<td>0</td>
<td>0</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>Dec-11</td>
<td>0</td>
<td>164</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>164</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>49</td>
<td>49</td>
</tr>
<tr>
<td>Jan-12</td>
<td>0</td>
<td>8</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>8</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>38</td>
<td>38</td>
<td>76</td>
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<tr>
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<td>407</td>
<td>0</td>
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<td>0</td>
<td>407</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>47</td>
<td>47</td>
<td>94</td>
</tr>
<tr>
<td>Mar-12</td>
<td>0</td>
<td>2,409</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2,409</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>47</td>
<td>47</td>
<td>94</td>
</tr>
<tr>
<td>Apr-12</td>
<td>0</td>
<td>1,076</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1,076</td>
<td>0</td>
<td>0</td>
<td>2,125</td>
<td>0</td>
<td>97</td>
<td>97</td>
</tr>
<tr>
<td>May-12</td>
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<td>1,211</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1,211</td>
<td>0</td>
<td>4,321</td>
<td>4,321</td>
<td>0</td>
<td>62</td>
<td>62</td>
</tr>
<tr>
<td>Jun-12</td>
<td>0</td>
<td>2,434</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2,434</td>
<td>0</td>
<td>3,274</td>
<td>3,274</td>
<td>0</td>
<td>87</td>
<td>87</td>
</tr>
<tr>
<td>Totals</td>
<td>12,221</td>
<td>29,007</td>
<td>7,709</td>
<td>0</td>
<td>0</td>
<td>48,937</td>
<td>30,844</td>
<td>9,720</td>
<td>40,564</td>
<td>2</td>
<td>619</td>
<td>621</td>
</tr>
</tbody>
</table>

Notes:
- Imported water is purchased from MWD (from outside SAR watershed). Purchased water is from WMWD (from within SAR watershed).
- OC-28 only provides CRA water from Lake Matthews.
- OC-28A provides a mix of SWP and CRA water.
- OC-59 provides SWP water.
- **MWD Conjunctive Use Program (CUP)
## Table B-8
### Monthly Recharge of Recycled Water, 2011-12

<table>
<thead>
<tr>
<th>Month</th>
<th>Surface Water Recharge System (af/mo)</th>
<th>Talbert Barrier (af/mo)</th>
<th>Alamitos Barrier (1) (af/mo)</th>
<th>Total Recycled Water (af/mo)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jul-11</td>
<td>4,068</td>
<td>2,102</td>
<td>59</td>
<td>6,228</td>
</tr>
<tr>
<td>Aug-11</td>
<td>4,090</td>
<td>1,975</td>
<td>33</td>
<td>6,098</td>
</tr>
<tr>
<td>Sep-11</td>
<td>3,749</td>
<td>1,770</td>
<td>29</td>
<td>5,548</td>
</tr>
<tr>
<td>Oct-11</td>
<td>4,142</td>
<td>1,938</td>
<td>25</td>
<td>6,105</td>
</tr>
<tr>
<td>Nov-11</td>
<td>4,278</td>
<td>1,743</td>
<td>27</td>
<td>6,048</td>
</tr>
<tr>
<td>Dec-11</td>
<td>4,710</td>
<td>1,599</td>
<td>5</td>
<td>6,313</td>
</tr>
<tr>
<td>Jan-12</td>
<td>4,563</td>
<td>1,656</td>
<td>63</td>
<td>6,282</td>
</tr>
<tr>
<td>Feb-12</td>
<td>4,352</td>
<td>1,507</td>
<td>38</td>
<td>5,897</td>
</tr>
<tr>
<td>Mar-12</td>
<td>3,648</td>
<td>1,318</td>
<td>73</td>
<td>5,039</td>
</tr>
<tr>
<td>Apr-12</td>
<td>4,510</td>
<td>1,608</td>
<td>76</td>
<td>6,194</td>
</tr>
<tr>
<td>May-12</td>
<td>4,671</td>
<td>1,565</td>
<td>70</td>
<td>6,306</td>
</tr>
<tr>
<td>Jun-12</td>
<td>4,158</td>
<td>1,959</td>
<td>82</td>
<td>6,199</td>
</tr>
<tr>
<td>Totals</td>
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<td><strong>20,740</strong></td>
<td><strong>579</strong></td>
<td><strong>72,258</strong></td>
</tr>
</tbody>
</table>

Note:
(1) Only that portion of Alamitos Gap Barrier recharge attributed to the Orange County groundwater basin is shown.
## Table B-9
### Monthly Losses to Ocean and Evaporation, 2011-12

<table>
<thead>
<tr>
<th></th>
<th>Losses to Ocean in SAR (1)</th>
<th>Losses to Ocean in Santiago Creek</th>
<th>Losses to Ocean in Carbon Creek</th>
<th>Evaporation Losses (2)</th>
<th>Total Losses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(af/mo)</td>
<td>(af/mo)</td>
<td>(af/mo)</td>
<td>(af/mo)</td>
<td>(af/mo)</td>
</tr>
<tr>
<td>Jul-11</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>250</td>
<td>250</td>
</tr>
<tr>
<td>Aug-11</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>208</td>
<td>208</td>
</tr>
<tr>
<td>Sep-11</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>208</td>
<td>208</td>
</tr>
<tr>
<td>Oct-11</td>
<td>1,700</td>
<td>0</td>
<td>0</td>
<td>167</td>
<td>1,867</td>
</tr>
<tr>
<td>Nov-11</td>
<td>50</td>
<td>0</td>
<td>0</td>
<td>167</td>
<td>217</td>
</tr>
<tr>
<td>Dec-11</td>
<td>100</td>
<td>0</td>
<td>0</td>
<td>146</td>
<td>246</td>
</tr>
<tr>
<td>Jan-12</td>
<td>160</td>
<td>0</td>
<td>0</td>
<td>125</td>
<td>285</td>
</tr>
<tr>
<td>Feb-12</td>
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<td>0</td>
<td>0</td>
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<td>125</td>
</tr>
<tr>
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<td>110</td>
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<td>0</td>
<td>167</td>
<td>277</td>
</tr>
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<td>100</td>
<td>0</td>
<td>0</td>
<td>167</td>
<td>267</td>
</tr>
<tr>
<td>May-12</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>167</td>
<td>167</td>
</tr>
<tr>
<td>Jun-12</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<td>Total</td>
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<td>0</td>
<td>2,064</td>
<td>4,284</td>
</tr>
</tbody>
</table>

(1) As measured by OCWD at Ball Road gauge.
(2) Evaporation losses estimated to occur over 500 wetted acres. These losses are not accounted for in the overall total recharge calculations due to the small value and uncertainty related to the estimate.
Table B-10
Annual Injection for Talbert Barrier, 1992-2012

<table>
<thead>
<tr>
<th>Fiscal Year (Jul-Jun)</th>
<th>Imported Water (afy)</th>
<th>Recycled Water (afy)</th>
<th>Groundwater (afy)</th>
<th>Total (afy)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1991-92</td>
<td>0</td>
<td>6,829</td>
<td>8,193</td>
<td>15,022</td>
</tr>
<tr>
<td>1992-93</td>
<td>0</td>
<td>8,161</td>
<td>6,695</td>
<td>14,856</td>
</tr>
<tr>
<td>1993-94</td>
<td>0</td>
<td>5,042</td>
<td>3,937</td>
<td>8,979</td>
</tr>
<tr>
<td>1994-95</td>
<td>0</td>
<td>2,738</td>
<td>2,614</td>
<td>5,353</td>
</tr>
<tr>
<td>1995-96</td>
<td>0</td>
<td>3,068</td>
<td>2,330</td>
<td>5,397</td>
</tr>
<tr>
<td>1996-97</td>
<td>0</td>
<td>1,814</td>
<td>1,272</td>
<td>3,086</td>
</tr>
<tr>
<td>1997-98</td>
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<td>2,153</td>
<td>1,706</td>
<td>3,859</td>
</tr>
<tr>
<td>1998-99</td>
<td>0</td>
<td>3,489</td>
<td>2,543</td>
<td>6,031</td>
</tr>
<tr>
<td>1999-00</td>
<td>0</td>
<td>5,773</td>
<td>4,837</td>
<td>10,610</td>
</tr>
<tr>
<td>2000-01</td>
<td>941</td>
<td>1,630</td>
<td>8,242</td>
<td>10,812</td>
</tr>
<tr>
<td>2001-02</td>
<td>2,656</td>
<td>4,143</td>
<td>7,186</td>
<td>13,985</td>
</tr>
<tr>
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<td>1,490</td>
<td>3,867</td>
<td>5,708</td>
<td>11,065</td>
</tr>
<tr>
<td>2003-04</td>
<td>5,072</td>
<td>1,784</td>
<td>4,094</td>
<td>10,950</td>
</tr>
<tr>
<td>2004-05</td>
<td>10,821</td>
<td>4,155</td>
<td>2,920</td>
<td>17,897</td>
</tr>
<tr>
<td>2005-06</td>
<td>6,506</td>
<td>4,086</td>
<td>1,169</td>
<td>11,761</td>
</tr>
<tr>
<td>2006-07</td>
<td>7,534</td>
<td>218</td>
<td>358</td>
<td>8,110</td>
</tr>
<tr>
<td>2007-08</td>
<td>4,581</td>
<td>10,072</td>
<td>0</td>
<td>14,653</td>
</tr>
<tr>
<td>2008-09</td>
<td>4,140</td>
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<td>2010-11</td>
<td>100</td>
<td>33,634</td>
<td>0</td>
<td>33,734</td>
</tr>
<tr>
<td>2011-12</td>
<td>2</td>
<td>20,740</td>
<td>0</td>
<td>20,742</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>44,020</strong></td>
<td><strong>188,680</strong></td>
<td><strong>63,805</strong></td>
<td><strong>296,505</strong></td>
</tr>
<tr>
<td><strong>Annual Avg.</strong>*</td>
<td><strong>3,668</strong></td>
<td><strong>8,985</strong></td>
<td><strong>3,038</strong></td>
<td><strong>14,119</strong></td>
</tr>
<tr>
<td><strong>10-Yr. Avg.</strong></td>
<td><strong>4,042</strong></td>
<td><strong>14,384</strong></td>
<td><strong>1,425</strong></td>
<td><strong>19,851</strong></td>
</tr>
</tbody>
</table>

*Imported water average starts in 2000.
<table>
<thead>
<tr>
<th></th>
<th>Recycled Water (af/mo)</th>
<th>Imported Water (af/mo)</th>
<th>Total (af/mo)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jul-11</td>
<td>2,102</td>
<td>0</td>
<td>2,102</td>
</tr>
<tr>
<td>Aug-11</td>
<td>1,975</td>
<td>2</td>
<td>1,977</td>
</tr>
<tr>
<td>Sep-11</td>
<td>1,770</td>
<td>0</td>
<td>1,770</td>
</tr>
<tr>
<td>Oct-11</td>
<td>1,938</td>
<td>0</td>
<td>1,938</td>
</tr>
<tr>
<td>Nov-11</td>
<td>1,743</td>
<td>0</td>
<td>1,743</td>
</tr>
<tr>
<td>Dec-11</td>
<td>1,599</td>
<td>0</td>
<td>1,599</td>
</tr>
<tr>
<td>Jan-12</td>
<td>1,656</td>
<td>0</td>
<td>1,656</td>
</tr>
<tr>
<td>Feb-12</td>
<td>1,507</td>
<td>0</td>
<td>1,507</td>
</tr>
<tr>
<td>Mar-12</td>
<td>1,318</td>
<td>0</td>
<td>1,318</td>
</tr>
<tr>
<td>Apr-12</td>
<td>1,608</td>
<td>0</td>
<td>1,608</td>
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<tr>
<td>May-12</td>
<td>1,565</td>
<td>0</td>
<td>1,565</td>
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<tr>
<td>Jun-12</td>
<td>1,959</td>
<td>0</td>
<td>1,959</td>
</tr>
<tr>
<td>Total</td>
<td>20,740</td>
<td>2</td>
<td>20,742</td>
</tr>
<tr>
<td>Fiscal Year (June-July)</td>
<td>OC Total (afy)</td>
<td>LAC (WRD) Total (afy)</td>
<td>Grand Total (afy)</td>
</tr>
<tr>
<td>------------------------</td>
<td>----------------</td>
<td>-----------------------</td>
<td>------------------</td>
</tr>
<tr>
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<td>1,614</td>
<td>3,627</td>
<td>5,241</td>
</tr>
<tr>
<td>1993-94</td>
<td>1,433</td>
<td>2,712</td>
<td>4,145</td>
</tr>
<tr>
<td>1994-95</td>
<td>798</td>
<td>2,697</td>
<td>3,496</td>
</tr>
<tr>
<td>1995-96</td>
<td>1,692</td>
<td>3,651</td>
<td>5,342</td>
</tr>
<tr>
<td>1996-97</td>
<td>1,885</td>
<td>3,854</td>
<td>5,739</td>
</tr>
<tr>
<td>1997-98</td>
<td>1,614</td>
<td>3,722</td>
<td>5,336</td>
</tr>
<tr>
<td>1998-99</td>
<td>1,494</td>
<td>3,837</td>
<td>5,330</td>
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<tr>
<td>1999-00</td>
<td>1,874</td>
<td>4,294</td>
<td>6,070</td>
</tr>
<tr>
<td>2000-01</td>
<td>1,673</td>
<td>3,721</td>
<td>5,393</td>
</tr>
<tr>
<td></td>
<td>2,282</td>
<td>3,780</td>
<td>6,062</td>
</tr>
<tr>
<td>2002-03</td>
<td>1,449</td>
<td>3,564</td>
<td>5,012</td>
</tr>
<tr>
<td>2003-04</td>
<td>1,938</td>
<td>3,964</td>
<td>5,878</td>
</tr>
<tr>
<td>2004-05</td>
<td>1,915</td>
<td>3,151</td>
<td>5,066</td>
</tr>
<tr>
<td>2005-06**</td>
<td>888</td>
<td>2,631</td>
<td>3,458</td>
</tr>
<tr>
<td>2006-07**</td>
<td>616</td>
<td>650</td>
<td>1,265</td>
</tr>
<tr>
<td>2007-08**</td>
<td>1,850</td>
<td>4,121</td>
<td>5,971</td>
</tr>
<tr>
<td>2008-09**</td>
<td>2,721</td>
<td>5,216</td>
<td>7,936</td>
</tr>
<tr>
<td>2009-10**</td>
<td>1,720</td>
<td>3,909</td>
<td>5,629</td>
</tr>
<tr>
<td>2010-11</td>
<td>1,690</td>
<td>3,382</td>
<td>5,072</td>
</tr>
<tr>
<td></td>
<td>1,199</td>
<td>3,153</td>
<td>4,351</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>32,342</strong></td>
<td><strong>69,634</strong></td>
<td><strong>101,793</strong></td>
</tr>
<tr>
<td><strong>Annual Avg.</strong></td>
<td><strong>1,617</strong></td>
<td><strong>3,482</strong></td>
<td><strong>5,090</strong></td>
</tr>
<tr>
<td><strong>10-Yr Avg.</strong></td>
<td><strong>1,598</strong></td>
<td><strong>3,374</strong></td>
<td><strong>4,964</strong></td>
</tr>
</tbody>
</table>

Source: LACDPW

*ABP did not use recycled water until October, 2005.

**Note that volumes changed from FY09-10 report based on adjustments made to Point C flow meter corrections by LACDPW.
Annual averages for recycled water use starts in FY05-06.
### Table B-13
**Monthly Injection for Alamitos Barrier**, 2011-12

<table>
<thead>
<tr>
<th></th>
<th>Recycled Water (af/mo)</th>
<th>Imported Water (af/mo)</th>
<th>Total (af/mo)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jul-11</td>
<td>59</td>
<td>80</td>
<td>139</td>
</tr>
<tr>
<td>Aug-11</td>
<td>33</td>
<td>36</td>
<td>69</td>
</tr>
<tr>
<td>Sep-11</td>
<td>29</td>
<td>27</td>
<td>56</td>
</tr>
<tr>
<td>Oct-11</td>
<td>25</td>
<td>26</td>
<td>51</td>
</tr>
<tr>
<td>Nov-11</td>
<td>27</td>
<td>25</td>
<td>52</td>
</tr>
<tr>
<td>Dec-11</td>
<td>5</td>
<td>48</td>
<td>53</td>
</tr>
<tr>
<td>Jan-12</td>
<td>63</td>
<td>38</td>
<td>101</td>
</tr>
<tr>
<td>Feb-12</td>
<td>38</td>
<td>47</td>
<td>85</td>
</tr>
<tr>
<td>Mar-12</td>
<td>73</td>
<td>47</td>
<td>119</td>
</tr>
<tr>
<td>Apr-12</td>
<td>76</td>
<td>97</td>
<td>173</td>
</tr>
<tr>
<td>May-12</td>
<td>70</td>
<td>62</td>
<td>132</td>
</tr>
<tr>
<td>Jun-12</td>
<td>82</td>
<td>87</td>
<td>169</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>579</strong></td>
<td><strong>619</strong></td>
<td><strong>1,199</strong></td>
</tr>
</tbody>
</table>

*Only injection attributed to the OC groundwater basin is shown.*
Table B-14
Annual In-Lieu Recharge of Imported Water, 1978-2012

<table>
<thead>
<tr>
<th>Year</th>
<th>In-lieu Recharge of Imported Water (afy)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1977-78</td>
<td>48,290</td>
</tr>
<tr>
<td>1978-79</td>
<td>23,792</td>
</tr>
<tr>
<td>1979-80</td>
<td>24,861</td>
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<tr>
<td>1980-81</td>
<td>36,373</td>
</tr>
<tr>
<td>1981-82</td>
<td>0</td>
</tr>
<tr>
<td>1982-83</td>
<td>0</td>
</tr>
<tr>
<td>1983-84</td>
<td>52,822</td>
</tr>
<tr>
<td>1984-85</td>
<td>25,198</td>
</tr>
<tr>
<td>1985-86</td>
<td>0</td>
</tr>
<tr>
<td>1986-87</td>
<td>0</td>
</tr>
<tr>
<td>1987-88</td>
<td>18,856</td>
</tr>
<tr>
<td>1988-89</td>
<td>15,022</td>
</tr>
<tr>
<td>1989-90</td>
<td>38,961</td>
</tr>
<tr>
<td>1990-91*</td>
<td>44,588</td>
</tr>
<tr>
<td>1991-92*</td>
<td>39,789</td>
</tr>
<tr>
<td>1992-93*</td>
<td>38,900</td>
</tr>
<tr>
<td>1993-94*</td>
<td>48,134</td>
</tr>
<tr>
<td>1994-95*</td>
<td>15,622</td>
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<tr>
<td>1995-96*</td>
<td>5,542</td>
</tr>
<tr>
<td>1996-97*</td>
<td>7,883</td>
</tr>
<tr>
<td>1997-98*</td>
<td>15,096</td>
</tr>
<tr>
<td>1998-99*</td>
<td>13,352</td>
</tr>
<tr>
<td>1999-00*</td>
<td>38,007</td>
</tr>
<tr>
<td>2000-01*</td>
<td>18,640</td>
</tr>
<tr>
<td>2001-02*</td>
<td>19,472</td>
</tr>
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<td>2003-04*</td>
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<td>2004-05*</td>
<td>69,617</td>
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<tr>
<td>2005-06*</td>
<td>89,239</td>
</tr>
<tr>
<td>2006-07*</td>
<td>50,740</td>
</tr>
<tr>
<td>2007-08*</td>
<td>0</td>
</tr>
<tr>
<td>2008-09*</td>
<td>0</td>
</tr>
<tr>
<td>2009-10*</td>
<td>0</td>
</tr>
<tr>
<td>2010-11*</td>
<td>10,435</td>
</tr>
<tr>
<td>2011-12*</td>
<td>40,564</td>
</tr>
</tbody>
</table>

Totals \[963,426\]

10-Yr. Avg. \[37,423\]

From 1977-1990, Year ending Sept. 30.
* Year Ending June 30

From Column C of Section 4 of Basic Data, OCWD Engineer’s Report.
<table>
<thead>
<tr>
<th>Month</th>
<th>OCWD In-Lieu (af/mo)</th>
<th>MWD In-Lieu (CUP*) (af/mo)</th>
<th>Totals (af/mo)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jul-11</td>
<td>10,060</td>
<td>0</td>
<td>10,060</td>
</tr>
<tr>
<td>Aug-11</td>
<td>10,653</td>
<td>0</td>
<td>10,653</td>
</tr>
<tr>
<td>Sep-11</td>
<td>10,130</td>
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<td>10,130</td>
</tr>
<tr>
<td>Oct-11</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Nov-11</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Dec-11</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Jan-12</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Feb-12</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Mar-12</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Apr-12</td>
<td>0</td>
<td>2,125</td>
<td>2,125</td>
</tr>
<tr>
<td>May-12</td>
<td>0</td>
<td>4,321</td>
<td>4,321</td>
</tr>
<tr>
<td>Jun-12</td>
<td>0</td>
<td>3,274</td>
<td>3,274</td>
</tr>
<tr>
<td>Totals</td>
<td>30,844</td>
<td>9,720</td>
<td>40,564</td>
</tr>
</tbody>
</table>

*MWD Conjunctive Use Program
## Table B-16
Annual Recharge by Source, 2002-12

<table>
<thead>
<tr>
<th>Fiscal Year (July-June)</th>
<th>SAR Base Flow (1)</th>
<th>Storm Flow/Local Water</th>
<th>Total SAR and other Local Water (1)</th>
<th>Total Imported/Purchase Water</th>
<th>Recycled Water</th>
<th>Groundwater (2)</th>
<th>Subtotal of OCWD Recharge (3)</th>
<th>Incidental Recharge</th>
<th>Total Recharge</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(afy)</td>
<td>(afy)</td>
<td>(afy)</td>
<td>(afy)</td>
<td>(afy)</td>
<td>(afy)</td>
<td>(afy)</td>
<td>(afy)</td>
<td>(afy)</td>
</tr>
<tr>
<td>2000-01</td>
<td>153,915</td>
<td>28,879</td>
<td>182,794</td>
<td>88,357</td>
<td>1,630</td>
<td>8,242</td>
<td>281,022</td>
<td>50,273</td>
<td>331,295</td>
</tr>
<tr>
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<td>145,891</td>
<td>24,327</td>
<td>170,218</td>
<td>67,610</td>
<td>4,143</td>
<td>7,186</td>
<td>249,157</td>
<td>37,555</td>
<td>286,712</td>
</tr>
<tr>
<td>2002-03</td>
<td>146,113</td>
<td>49,098</td>
<td>195,211</td>
<td>108,553</td>
<td>3,867</td>
<td>5,708</td>
<td>313,339</td>
<td>57,731</td>
<td>371,070</td>
</tr>
<tr>
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<td>143,510</td>
<td>41,119</td>
<td>184,629</td>
<td>84,166</td>
<td>1,784</td>
<td>4,094</td>
<td>274,672</td>
<td>58,747</td>
<td>333,419</td>
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<tr>
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<td>154,307</td>
<td>80,072</td>
<td>234,379</td>
<td>86,732</td>
<td>4,155</td>
<td>2,920</td>
<td>328,186</td>
<td>158,733</td>
<td>486,919</td>
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<tr>
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<td>147,736</td>
<td>89,097</td>
<td>236,833</td>
<td>107,286</td>
<td>4,341</td>
<td>1,169</td>
<td>349,629</td>
<td>38,671</td>
<td>388,300</td>
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<tr>
<td>2006-07</td>
<td>133,338</td>
<td>36,090</td>
<td>169,428</td>
<td>102,805</td>
<td>368</td>
<td>358</td>
<td>272,959</td>
<td>14,172</td>
<td>287,131</td>
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<tr>
<td>2007-08</td>
<td>124,090</td>
<td>60,670</td>
<td>184,760</td>
<td>9,887</td>
<td>18,142</td>
<td>0</td>
<td>212,789</td>
<td>46,826</td>
<td>259,615</td>
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<tr>
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<td>105,490</td>
<td>53,007</td>
<td>158,497</td>
<td>28,000</td>
<td>54,674</td>
<td>0</td>
<td>241,170</td>
<td>69,352</td>
<td>310,522</td>
</tr>
<tr>
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<td>102,599</td>
<td>61,035</td>
<td>163,634</td>
<td>21,586</td>
<td>66,506</td>
<td>0</td>
<td>251,726</td>
<td>83,239</td>
<td>334,965</td>
</tr>
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<td>104,469</td>
<td>80,087</td>
<td>184,556</td>
<td>39,053</td>
<td>66,795</td>
<td>0</td>
<td>290,404</td>
<td>94,484</td>
<td>384,888</td>
</tr>
<tr>
<td>2011-12</td>
<td>94,754</td>
<td>34,531</td>
<td>129,285</td>
<td>90,122</td>
<td>72,258</td>
<td>0</td>
<td>291,665</td>
<td>27,701</td>
<td>319,366</td>
</tr>
<tr>
<td>Totals</td>
<td>1,256,406</td>
<td>584,805</td>
<td>1,841,211</td>
<td>678,189</td>
<td>292,890</td>
<td>14,250</td>
<td>2,826,540</td>
<td>649,656</td>
<td>3,476,196</td>
</tr>
<tr>
<td>10 year Avg.</td>
<td>125,641</td>
<td>58,481</td>
<td>184,121</td>
<td>67,819</td>
<td>29,289</td>
<td>0</td>
<td>282,654</td>
<td>64,966</td>
<td>347,620</td>
</tr>
</tbody>
</table>

(1) Recharge of SAR and other Local Water based on monthly reports prepared by OCWD Recharge Operations staff and may differ from what is reported by the SAR Watermaster.

(2) Deep aquifer groundwater used for injection at the Talbert Barrier, which was stopped in August 2006.

(3) Recharge due to the activity of OCWD (aka Artificial Recharge).
Table B-17
Monthly Recharge Source Summary, 2011-12

<table>
<thead>
<tr>
<th>Month</th>
<th>Local Water</th>
<th>Imported/Purchased Water</th>
<th>Recycled Water</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SAR Base Flow (1)</td>
<td>Storm Flow/Local Water (2)</td>
<td>Subtotal Local Water</td>
</tr>
<tr>
<td></td>
<td>af/mo</td>
<td>af/mo</td>
<td>af/mo</td>
</tr>
<tr>
<td>Jul-11</td>
<td>6,059</td>
<td>348</td>
<td>6,407</td>
</tr>
<tr>
<td>Aug-11</td>
<td>5,403</td>
<td>770</td>
<td>6,173</td>
</tr>
<tr>
<td>Sep-11</td>
<td>5,052</td>
<td>364</td>
<td>5,416</td>
</tr>
<tr>
<td>Oct-11</td>
<td>7,365</td>
<td>1,829</td>
<td>9,194</td>
</tr>
<tr>
<td>Nov-11</td>
<td>8,879</td>
<td>4,829</td>
<td>13,708</td>
</tr>
<tr>
<td>Dec-11</td>
<td>10,054</td>
<td>3,410</td>
<td>13,464</td>
</tr>
<tr>
<td>Jan-12</td>
<td>10,218</td>
<td>1,955</td>
<td>12,173</td>
</tr>
<tr>
<td>Feb-12</td>
<td>9,827</td>
<td>3,116</td>
<td>12,943</td>
</tr>
<tr>
<td>Mar-12</td>
<td>9,808</td>
<td>4,667</td>
<td>14,475</td>
</tr>
<tr>
<td>Apr-12</td>
<td>8,666</td>
<td>6,717</td>
<td>15,383</td>
</tr>
<tr>
<td>May-12</td>
<td>8,063</td>
<td>6,297</td>
<td>14,360</td>
</tr>
<tr>
<td>Jun-12</td>
<td>5,360</td>
<td>227</td>
<td>5,587</td>
</tr>
<tr>
<td>Totals</td>
<td>94,754</td>
<td>34,531</td>
<td>129,285</td>
</tr>
</tbody>
</table>

Note:
(1) SAR base flow totals based on OCWD data unless otherwise noted (See Table B-5).
(2) Storm flow/local water includes SAR storm flow originating above Prado Dam, local SAR inflow below Prado Dam, Santiago Creek inflow, precipitation to water surfaces. Storm flow totals only show what portion of storm flow that was captured and recharged.
(3) Only that portion of Alamitos Gap Barrier recharge attributed to the Orange County groundwater basin is shown.
(4) The annual estimated incidental recharge is divided evenly over the 12 months of the year.
Table B-18
Annual Recharge by Facility, 2002-12

<table>
<thead>
<tr>
<th>Fiscal Year (July-June)</th>
<th>Surface Water Recharge System</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SAR Base Flow</td>
<td>Storm Flow/Local Water</td>
<td>Total SAR/Local Water</td>
<td>Imported/Purchase Water</td>
<td>Recycled Water</td>
<td>Total Surface Water Recharge</td>
<td>In-Lieu System</td>
<td>Seawater Barrier System (2)</td>
<td>Total OCWD Recharge (3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(afy)</td>
<td>(afy)</td>
<td>(afy)</td>
<td>(afy)</td>
<td>(afy)</td>
<td>(afy)</td>
<td>(afy)</td>
<td>(afy)</td>
<td>(afy)</td>
<td></td>
</tr>
<tr>
<td>2002-03</td>
<td>146,113</td>
<td>49,098</td>
<td>195,211</td>
<td>44,151</td>
<td>0</td>
<td>239,362</td>
<td>61,463</td>
<td>12,514</td>
<td>313,339</td>
<td></td>
</tr>
<tr>
<td>2003-04</td>
<td>143,510</td>
<td>41,119</td>
<td>184,629</td>
<td>24,987</td>
<td>0</td>
<td>209,616</td>
<td>52,168</td>
<td>12,888</td>
<td>274,672</td>
<td></td>
</tr>
<tr>
<td>2004-05</td>
<td>154,307</td>
<td>80,072</td>
<td>234,379</td>
<td>4,378</td>
<td>0</td>
<td>238,757</td>
<td>69,617</td>
<td>19,812</td>
<td>328,186</td>
<td></td>
</tr>
<tr>
<td>2005-06</td>
<td>147,736</td>
<td>89,097</td>
<td>236,833</td>
<td>10,986</td>
<td>0</td>
<td>247,819</td>
<td>89,216</td>
<td>12,649</td>
<td>349,684</td>
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</tr>
<tr>
<td>2006-07</td>
<td>133,338</td>
<td>36,090</td>
<td>169,428</td>
<td>44,147</td>
<td>0</td>
<td>213,575</td>
<td>69,617</td>
<td>8,726</td>
<td>273,041</td>
<td></td>
</tr>
<tr>
<td>2007-08</td>
<td>124,090</td>
<td>60,670</td>
<td>184,760</td>
<td>4,149</td>
<td>7,722</td>
<td>196,631</td>
<td>0</td>
<td>16,504</td>
<td>213,135</td>
<td></td>
</tr>
<tr>
<td>2008-09</td>
<td>105,490</td>
<td>53,007</td>
<td>158,497</td>
<td>22,237</td>
<td>25,248</td>
<td>205,982</td>
<td>0</td>
<td>36,813</td>
<td>241,795</td>
<td></td>
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<tr>
<td>2009-10</td>
<td>102,599</td>
<td>61,035</td>
<td>163,634</td>
<td>20,642</td>
<td>29,617</td>
<td>213,893</td>
<td>0</td>
<td>38,230</td>
<td>252,123</td>
<td></td>
</tr>
<tr>
<td>2010-11</td>
<td>104,469</td>
<td>80,087</td>
<td>184,556</td>
<td>27,539</td>
<td>32,450</td>
<td>244,545</td>
<td>10,435</td>
<td>35,425</td>
<td>290,405</td>
<td></td>
</tr>
<tr>
<td>2011-12</td>
<td>94,754</td>
<td>34,531</td>
<td>129,285</td>
<td>48,938</td>
<td>50,939</td>
<td>229,162</td>
<td>40,564</td>
<td>21,941</td>
<td>291,666</td>
<td></td>
</tr>
<tr>
<td>Totals</td>
<td>1,307,543</td>
<td>574,601</td>
<td>1,882,144</td>
<td>95,037</td>
<td>2,223,597</td>
<td>393,676</td>
<td>208,828</td>
<td>2,785,537</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 year Avg.</td>
<td>125,641</td>
<td>58,481</td>
<td>184,121</td>
<td>25,248</td>
<td>223,934</td>
<td>37,420</td>
<td>21,450</td>
<td>282,805</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percent of Total</td>
<td>68%</td>
<td>9%</td>
<td>1%</td>
<td>80%</td>
<td>14%</td>
<td>7%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(1) Recharge of SAR and other Local Water based on monthly reports prepared by OCWD Recharge Operations Staff. May differ from what is reported by the SAR Watermaster.
(2) Only that portion of Alamitos Gap Barrier recharge attributed to the Orange County groundwater basin is shown.
(3) This is recharge due solely to OCWD activities. Does not include incidental recharge.
Appendix C

Monthly Forebay Percolation Reports
### FOREBAY PERCOLATION REPORT
#### July-11

<table>
<thead>
<tr>
<th>Facility</th>
<th>Actual</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>RIVER SYSTEM</td>
<td>5,516</td>
<td>90 cfs average perc</td>
</tr>
<tr>
<td>DESILTING SYSTEM</td>
<td>62</td>
<td>Estimated based on observations</td>
</tr>
<tr>
<td>OFF-RIVER SYSTEM</td>
<td>750</td>
<td>Used est of 12 cfs for days with flow</td>
</tr>
<tr>
<td>WARNER SYSTEM</td>
<td>800</td>
<td>Includes Foster Huckleberry and Conrock basins</td>
</tr>
<tr>
<td>OLIVE BASIN</td>
<td>139</td>
<td>Inflow from Warner basin</td>
</tr>
<tr>
<td>ANAHEIM LAKE</td>
<td>4,053</td>
<td>Inflow from OC-28</td>
</tr>
<tr>
<td>MINI-ANA LAKE</td>
<td>638</td>
<td>Inflow from OC-28</td>
</tr>
<tr>
<td>KRAEMER BASIN</td>
<td>6,738</td>
<td>Inflow from GWR, and OC-28</td>
</tr>
<tr>
<td>MILLER BASIN</td>
<td>1,230</td>
<td>Inflow OC-28</td>
</tr>
<tr>
<td>LA JOLLA BASIN</td>
<td>1,604</td>
<td>Inflow from OC-28</td>
</tr>
<tr>
<td>PLACENTIA BASIN</td>
<td>585</td>
<td>Inflow to basin assumed as half of total to</td>
</tr>
<tr>
<td>RAYMOND BASIN</td>
<td>585</td>
<td>Placentia and Raymond basins (no flowmeters)</td>
</tr>
<tr>
<td>FIVE COVES BASIN</td>
<td>62</td>
<td>Based on estimate of 1 cfs from meter readings</td>
</tr>
<tr>
<td>BURRIS BASIN</td>
<td>995</td>
<td>Inflow from SAR</td>
</tr>
<tr>
<td>RIVER VIEW BASIN</td>
<td>217</td>
<td>Inflow from Burris Pit and Santiago</td>
</tr>
<tr>
<td>SANTIAGO BASINS</td>
<td>3,499</td>
<td>Inflow from Burris Pit</td>
</tr>
<tr>
<td>SANTIAGO CREEK</td>
<td>577</td>
<td>Inflow from Burris Pit and Santiago</td>
</tr>
<tr>
<td><strong>TOTALS</strong></td>
<td>28,050</td>
<td></td>
</tr>
</tbody>
</table>

#### TABLE 1

<table>
<thead>
<tr>
<th>AVAILABLE FLOWS TO RECHARGE SYSTEMS (AF)</th>
<th>LOSSES FROM RECHARGE SYSTEM (AF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Imperial Headgates</td>
<td>11,169</td>
</tr>
<tr>
<td>GWRS</td>
<td>4,067.7</td>
</tr>
<tr>
<td>OC-59 (MWD)</td>
<td>4,827.1</td>
</tr>
<tr>
<td>OC-28 (MWD)</td>
<td>11,898.5</td>
</tr>
<tr>
<td>OC-28a (MWD)</td>
<td>0.00</td>
</tr>
<tr>
<td>Est'd local Forebay inflow below Imperial</td>
<td>0</td>
</tr>
<tr>
<td>Est'd local Santiago inflow (estimated)</td>
<td>65</td>
</tr>
<tr>
<td>Irvine lake releases (OC-13 MWD)</td>
<td>0</td>
</tr>
<tr>
<td>Villa Park Dam releases (estimated)</td>
<td>0</td>
</tr>
<tr>
<td>Precip at Warner Basin (inches)</td>
<td>0</td>
</tr>
<tr>
<td>Precip direct to open water surfaces</td>
<td>0</td>
</tr>
<tr>
<td><strong>TOTAL INFLOW</strong></td>
<td>27,200</td>
</tr>
<tr>
<td><strong>TOTAL LOSSES</strong></td>
<td>250</td>
</tr>
</tbody>
</table>

#### TABLE 3

<table>
<thead>
<tr>
<th>STORAGE CHANGES (AF)</th>
<th>SUMMARY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facility</td>
<td>Begin</td>
</tr>
<tr>
<td>Deep basins</td>
<td>9,675</td>
</tr>
<tr>
<td>Santiago Pits</td>
<td>13,083</td>
</tr>
<tr>
<td>River</td>
<td>0</td>
</tr>
<tr>
<td>Off-river</td>
<td>0</td>
</tr>
<tr>
<td>Irvine Lake</td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>22,758</td>
</tr>
</tbody>
</table>

#### NOTES:
1) Warner system includes est monthly perc values for Foster-Huckleberry and Conrock basins.
2) No instrumentation in Olive Basin; perc estimated.
3) Placentia and Raymond are County of Orange RDMD flood control basins.
4) Carbon Diversion included.
5) Estimated Precipitation and Evaporation is based on 500 acres of open water surface.
6) Net "negative" storage is water volume moving from basins to underground recharge.
## FOREBAY PERCOLATION REPORT

**August-11**

<table>
<thead>
<tr>
<th>Facility</th>
<th>Begin</th>
<th>End</th>
<th>Net</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deep basins</td>
<td>9,782</td>
<td>10,352</td>
<td>570</td>
</tr>
<tr>
<td>Santiago Pits</td>
<td>11,877</td>
<td>11,459</td>
<td>-418</td>
</tr>
<tr>
<td>River</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Off-river</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Irvine Lake</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>21,659</td>
<td>21,811</td>
<td>152</td>
</tr>
</tbody>
</table>

### AVAILABLE FLOWS TO RECHARGE SYSTEMS (AF)

<table>
<thead>
<tr>
<th>Facility</th>
<th>Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Imperial Headgates (Prado)</td>
<td>11,135</td>
</tr>
<tr>
<td>GWRS</td>
<td>4,090.1</td>
</tr>
<tr>
<td>OC-59 (MWD)</td>
<td>3,668.6</td>
</tr>
<tr>
<td>OC-28 (MWD)</td>
<td>9,831.5</td>
</tr>
<tr>
<td>CB-11</td>
<td>960.2</td>
</tr>
<tr>
<td>CB-18</td>
<td>863.1</td>
</tr>
<tr>
<td>Est'd local Forebay inflow below Imperial</td>
<td>0</td>
</tr>
<tr>
<td>Est'd local Santiago inflow (estimated)</td>
<td>65</td>
</tr>
<tr>
<td>Irvine lake releases (OC-13 MWD)</td>
<td>0</td>
</tr>
<tr>
<td>Villa Park Dam releases (estimated)</td>
<td>465</td>
</tr>
<tr>
<td>Precip at Warner Basin (inches)</td>
<td>0</td>
</tr>
<tr>
<td>Precip direct to open water surfaces</td>
<td>0</td>
</tr>
</tbody>
</table>

### LOSSES FROM RECHARGE SYSTEM (AF)

<table>
<thead>
<tr>
<th>Remarks</th>
<th>Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Est'd SAR flow past Chapman Ave.</td>
<td>0</td>
</tr>
<tr>
<td>Est'd Santiago Cr. flow to SAR</td>
<td>0</td>
</tr>
<tr>
<td>Est'd flows past Raymond Basin</td>
<td>0</td>
</tr>
<tr>
<td>Calc'd evap (inches) Estimated</td>
<td>5</td>
</tr>
<tr>
<td>Est'd evaporative losses</td>
<td>208</td>
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</table>

### TOTAL INFLOW

<table>
<thead>
<tr>
<th></th>
<th>Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Imperial Headgates (Prado)</td>
<td>11,135</td>
</tr>
<tr>
<td>GWRS</td>
<td>4,090.1</td>
</tr>
<tr>
<td>OC-59 (MWD)</td>
<td>3,668.6</td>
</tr>
<tr>
<td>OC-28 (MWD)</td>
<td>9,831.5</td>
</tr>
<tr>
<td>CB-11</td>
<td>960.2</td>
</tr>
<tr>
<td>CB-18</td>
<td>863.1</td>
</tr>
<tr>
<td>Est'd local Forebay inflow below Imperial</td>
<td>0</td>
</tr>
<tr>
<td>Est'd local Santiago inflow (estimated)</td>
<td>65</td>
</tr>
<tr>
<td>Irvine lake releases (OC-13 MWD)</td>
<td>0</td>
</tr>
<tr>
<td>Villa Park Dam releases (estimated)</td>
<td>465</td>
</tr>
<tr>
<td>Precip at Warner Basin (inches)</td>
<td>0</td>
</tr>
<tr>
<td>Precip direct to open water surfaces</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total Infow</strong></td>
<td><strong>25,587</strong></td>
</tr>
</tbody>
</table>

### TOTAL LOSSES

<table>
<thead>
<tr>
<th>Remarks</th>
<th>Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Est'd SAR flow past Chapman Ave.</td>
<td>0</td>
</tr>
<tr>
<td>Est'd Santiago Cr. flow to SAR</td>
<td>0</td>
</tr>
<tr>
<td>Est'd flows past Raymond Basin</td>
<td>0</td>
</tr>
<tr>
<td>Calc'd evap (inches) Estimated</td>
<td>5</td>
</tr>
<tr>
<td>Est'd evaporative losses</td>
<td>208</td>
</tr>
<tr>
<td><strong>Total Losses</strong></td>
<td><strong>208</strong></td>
</tr>
</tbody>
</table>

### TABLE 3

<table>
<thead>
<tr>
<th>Facility</th>
<th>Begin</th>
<th>End</th>
<th>Net</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deep basins</td>
<td>9,782</td>
<td>10,352</td>
<td>570</td>
</tr>
<tr>
<td>Santiago Pits</td>
<td>11,877</td>
<td>11,459</td>
<td>-418</td>
</tr>
<tr>
<td>River</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Off-river</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Irvine Lake</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>21,659</td>
<td>21,811</td>
<td>152</td>
</tr>
</tbody>
</table>

### SUMMARY

<table>
<thead>
<tr>
<th>Remarks</th>
<th>Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Inflow (Table 1)</td>
<td>25,587</td>
</tr>
<tr>
<td>Total Losses (Table 2)</td>
<td>208</td>
</tr>
<tr>
<td>Storage Change (Table 3)</td>
<td>152</td>
</tr>
<tr>
<td>Calc'd Percolation</td>
<td>25,226</td>
</tr>
</tbody>
</table>

### NOTES:

1) Warner system includes est monthly perc values for Foster-Huckleberry and Conrock basins.
2) No instrumentation in Olive Basin; perc estimated.
3) Placentia and Raymond are County of Orange RDMD flood control basins.
4) Carbon Diversion included.
5) Estimated Precipitation and Evaporation is based on 500 acres of open water surface.
6) Net "negative" storage is water volume moving from basins to underground recharge.
**FOREBAY PERCOLATION REPORT**  
**September-11**

<table>
<thead>
<tr>
<th>Facility</th>
<th>Actual</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>RIVER SYSTEM</td>
<td>4,446</td>
<td>72 cfs average perc</td>
</tr>
<tr>
<td>DESILTING SYSTEM</td>
<td>30</td>
<td>Estimated based on observations</td>
</tr>
<tr>
<td>OFF-RIVER SYSTEM</td>
<td>60</td>
<td>Used 8 days</td>
</tr>
<tr>
<td>WARNER SYSTEM 1</td>
<td>400</td>
<td>Includes Foster Huckleberry and Conrock basins</td>
</tr>
<tr>
<td>OLIVE BASIN 2</td>
<td>445</td>
<td>Inflow from Warner basin</td>
</tr>
<tr>
<td>ANAHEIM LAKE</td>
<td>3,747</td>
<td>Inflow from OC-28</td>
</tr>
<tr>
<td>MINI-ANA LAKE</td>
<td>480</td>
<td>Inflow from OC-28</td>
</tr>
<tr>
<td>KRAEMER BASIN</td>
<td>3,301</td>
<td>Inflow from GWR</td>
</tr>
<tr>
<td>MILLER BASIN</td>
<td>1,786</td>
<td>Inflow OC-28 and GWR</td>
</tr>
<tr>
<td>LA JOLLA BASIN</td>
<td>1,208</td>
<td>Inflow from OC-28 and Anaheim dewater</td>
</tr>
<tr>
<td>PLACENTIA BASIN 3</td>
<td>373</td>
<td>Inflow to basin assumed as half of total to</td>
</tr>
<tr>
<td>RAYMOND BASIN 3</td>
<td>373</td>
<td>Placentia and Raymond basins (no flowmeters)</td>
</tr>
<tr>
<td>FIVE COVES BASIN</td>
<td>60</td>
<td>Based on estimate of 1 cfs from meter readings</td>
</tr>
<tr>
<td>BURRIS BASIN</td>
<td>1,005</td>
<td>Inflow from SAR</td>
</tr>
<tr>
<td>RIVER VIEW BASIN</td>
<td>180</td>
<td>Inflow from Burris Pit and Santiago</td>
</tr>
<tr>
<td>SANTIAGO BASINS</td>
<td>2,648</td>
<td>Inflow from Burris Pit and Villa Park Dam</td>
</tr>
<tr>
<td>SANTIAGO CREEK</td>
<td>282</td>
<td>Inflow from Burris Pit and Santiago</td>
</tr>
</tbody>
</table>

**TOTALS**  
20,824

### TABLE 1  
**AVAILABLE FLOWS TO RECHARGE SYSTEMS (AF)**

<table>
<thead>
<tr>
<th>Facility</th>
<th>Begin</th>
<th>End</th>
<th>Net</th>
</tr>
</thead>
<tbody>
<tr>
<td>Imperial Headgates</td>
<td>6,873</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GWRS</td>
<td>3,749.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OC-59 (MWD)</td>
<td>1,902.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OC-28 (MWD)</td>
<td>7,277.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CB-11</td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CB-18</td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Est'd local Forebay inflow below Imperial</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Est'd local Santiago inflow (estimated)</td>
<td>32</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Irvine lake releases (OC-13 MWD)</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Villa Park Dam releases (estimated)</td>
<td>331</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Precip at Warner Basin (inches)</td>
<td>0.03</td>
<td></td>
<td></td>
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<tr>
<td>Precip direct to open water surfaces</td>
<td>1</td>
<td></td>
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</table>

**TOTAL INFLOW**  
18,264

### TABLE 2  
**LOSSES FROM RECHARGE SYSTEM (AF)**

<table>
<thead>
<tr>
<th>Facility</th>
<th>Begin</th>
<th>End</th>
<th>Net</th>
</tr>
</thead>
<tbody>
<tr>
<td>Imperial Headgates</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Est'd SAR flow past Chapman Ave.</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Est'd Santiago Cr. flow to SAR</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Est'd flows past Raymond Basin</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Calc'd evap (inches) Estimated</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Est'd evaporative losses</td>
<td>208</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**TOTAL LOSSES**  
208

### TABLE 3  
**STORAGE CHANGES (AF)**

<table>
<thead>
<tr>
<th>Facility</th>
<th>Begin</th>
<th>End</th>
<th>Net</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deep basins</td>
<td>10,352</td>
<td>9,516</td>
<td>-836</td>
</tr>
<tr>
<td>Santiago Pits</td>
<td>11,459</td>
<td>9,526</td>
<td>-1,933</td>
</tr>
<tr>
<td>River</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Off-river</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Irvine Lake</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**TOTAL**  
21,811 19,042 -2,769

### SUMMARY

<table>
<thead>
<tr>
<th>Facility</th>
<th>Begin</th>
<th>End</th>
<th>Net</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOTAL INFLOW (TABLE 1)</td>
<td>18,264</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL LOSSES (TABLE 2)</td>
<td>208</td>
<td></td>
<td></td>
</tr>
<tr>
<td>STORAGE CHANGE (TABLE 3)</td>
<td></td>
<td>-2,769</td>
<td></td>
</tr>
<tr>
<td>CAL'C'D PERCOLATION</td>
<td></td>
<td>20,824</td>
<td></td>
</tr>
</tbody>
</table>

**NOTES:**

1) Warner system includes est monthly perc values for Foster-Huckleberry and Conrock basins.
2) No instrumentation in Olive Basin; perc estimated.
3) Placentia and Raymond are County of Orange RDMD flood control basins.
4) Carbon Diversion included.
5) Estimated Precipitation and Evaporation is based on 500 acres of open water surface.
6) Net "negative" storage is water volume moving from basins to underground recharge.
### FOREBAY PERCOLATION REPORT
#### October-11

<table>
<thead>
<tr>
<th>Facility</th>
<th>Begin</th>
<th>End</th>
<th>Net</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Deep basins</strong></td>
<td>9,516</td>
<td>6,595</td>
<td>-2,921</td>
</tr>
<tr>
<td><strong>Santiago Pits</strong></td>
<td>9,526</td>
<td>9,548</td>
<td>22</td>
</tr>
<tr>
<td><strong>River</strong></td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Off-river</strong></td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Irvine Lake</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>19,042</td>
<td>16,143</td>
<td>-2,899</td>
</tr>
</tbody>
</table>

**NOTES:**

1) Warner system includes est monthly perc values for Foster-Huckleberry and Conrock basins.
2) No instrumentation in Olive Basin; perc estimated.
3) Placentia and Raymond are County of Orange RDMD flood control basins.
4) Carbon Diversion included.
5) Estimated Precipitation and Evaporation is based on 500 acres of open water surface.
6) Net "negative" storage is water volume moving from basins to underground recharge.
## AVAILABLE FLOWS TO RECHARGE SYSTEMS (AF)

<table>
<thead>
<tr>
<th>Facility</th>
<th>Actual</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Imperial Headgates (estimated)</td>
<td>13,410</td>
<td></td>
</tr>
<tr>
<td>GWRS</td>
<td>4,277.9</td>
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</tr>
<tr>
<td>OC-59 (MWD)</td>
<td>0.00</td>
<td>Est'd SAR flow past Chapman Ave. 50</td>
</tr>
<tr>
<td>OC-28 (MWD)</td>
<td>0.00</td>
<td>Est'd Santiago Cr. flow to SAR 0</td>
</tr>
<tr>
<td>CB-11</td>
<td>0.00</td>
<td>Est'd flows past Raymond Basin 0</td>
</tr>
<tr>
<td>CB-18</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>Est'd local Forebay inflow below Imperial</td>
<td>150</td>
<td>Calc'd evap (inches) Estimated 4</td>
</tr>
<tr>
<td>Est'd local Santiago inflow (estimated)</td>
<td>150</td>
<td>Est'd evaporative losses 5 167</td>
</tr>
<tr>
<td>Irvine lake releases (OC-13 MWD)</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Villa Park Dam releases (estimated)</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Precip at Warner Basin (inches)</td>
<td>1.15</td>
<td></td>
</tr>
<tr>
<td>Precip direct to open water surfaces 5</td>
<td>48</td>
<td></td>
</tr>
<tr>
<td>TOTAL INFLOW</td>
<td>18,036</td>
<td></td>
</tr>
</tbody>
</table>

## LOSSES FROM RECHARGE SYSTEM (AF)

<table>
<thead>
<tr>
<th>Remarks</th>
<th>Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Est'd SAR flow past Chapman Ave.</td>
<td>50</td>
</tr>
<tr>
<td>Est'd Santiago Cr. flow to SAR</td>
<td>0</td>
</tr>
<tr>
<td>Est'd flows past Raymond Basin</td>
<td>0</td>
</tr>
<tr>
<td>Calc'd evap (inches) Estimated</td>
<td>4</td>
</tr>
<tr>
<td>Est'd evaporative losses</td>
<td>167</td>
</tr>
<tr>
<td>TOTAL LOSSES</td>
<td>217</td>
</tr>
</tbody>
</table>

## STORAGE CHANGES (AF)

<table>
<thead>
<tr>
<th>Facility</th>
<th>Begin</th>
<th>End</th>
<th>Net</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deep basins</td>
<td>6,595</td>
<td>7,356</td>
<td>761</td>
</tr>
<tr>
<td>Santiago Pits</td>
<td>9,548</td>
<td>11,563</td>
<td>2,015</td>
</tr>
<tr>
<td>River</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Off-river</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Irvine Lake</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>TOTAL</td>
<td>16,143</td>
<td>18,919</td>
<td>2,776</td>
</tr>
</tbody>
</table>

## SUMMARY

<table>
<thead>
<tr>
<th>Remarks</th>
<th>Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOTAL INFLOW (TABLE 1)</td>
<td>18,036</td>
</tr>
<tr>
<td>TOTAL LOSSES (TABLE 2)</td>
<td>217</td>
</tr>
<tr>
<td>STORAGE CHANGE 6 (TABLE 3)</td>
<td>2,776</td>
</tr>
<tr>
<td>CALC'D PERCOLATION</td>
<td>15,043</td>
</tr>
</tbody>
</table>

### NOTES:
1. Warner system includes est monthly perc values for Foster-Huckleberry and Conrock basins.
2. No instrumentation in Olive Basin; perc estimated.
3. Placentia and Raymond are County of Orange RDMD flood control basins.
4. Carbon Diversion included.
5. Estimated Precipitation and Evaporation is based on 500 acres of open water surface.
6. Net "negative" storage is water volume moving from basins to underground recharge.
### FOREBAY PERCOLATION REPORT
#### December-11

<table>
<thead>
<tr>
<th>Facility</th>
<th>Begin</th>
<th>End</th>
<th>Net</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>RIVER SYSTEM</td>
<td>4,340</td>
<td></td>
<td></td>
<td>Average perc 71 cfs</td>
</tr>
<tr>
<td>DESILTING SYSTEM</td>
<td>60</td>
<td></td>
<td></td>
<td>Estimated based on observations</td>
</tr>
<tr>
<td>OFF-RIVER SYSTEM</td>
<td>500</td>
<td></td>
<td></td>
<td>Used 28 days</td>
</tr>
<tr>
<td>WARNER SYSTEM(^1)</td>
<td>400</td>
<td></td>
<td></td>
<td>Includes Foster Huckleberry and Conrock basins</td>
</tr>
<tr>
<td>OLIVE BASIN(^2)</td>
<td>276</td>
<td></td>
<td></td>
<td>Inflow from Warner basin</td>
</tr>
<tr>
<td>ANAHEIM LAKE</td>
<td>2,386</td>
<td></td>
<td></td>
<td>Inflow from Warner basin</td>
</tr>
<tr>
<td>MINI-ANA LAKE</td>
<td>426</td>
<td></td>
<td></td>
<td>Inflow from Warner basin and OC-28a</td>
</tr>
<tr>
<td>KRAEMER BASIN</td>
<td>4,492</td>
<td></td>
<td></td>
<td>Inflow from GWR</td>
</tr>
<tr>
<td>MILLER BASIN</td>
<td>280</td>
<td></td>
<td></td>
<td>Inflow from OC-28 and Anaheim dewater pumps</td>
</tr>
<tr>
<td>LA JOLLA BASIN</td>
<td>285</td>
<td></td>
<td></td>
<td>Inflow from OC-28 and Anaheim dewater pumps</td>
</tr>
<tr>
<td>PLACENTIA BASIN(^3)</td>
<td>0</td>
<td></td>
<td></td>
<td>Not used</td>
</tr>
<tr>
<td>RAYMOND BASIN(^3)</td>
<td>75</td>
<td></td>
<td></td>
<td>Inflow from OC-28 and Anaheim dewater pumps</td>
</tr>
<tr>
<td>FIVE COVES BASIN</td>
<td>60</td>
<td></td>
<td></td>
<td>Estimated based on observations</td>
</tr>
<tr>
<td>BURRIS BASIN</td>
<td>526</td>
<td></td>
<td></td>
<td>Inflow from SAR</td>
</tr>
<tr>
<td>RIVER VIEW BASIN</td>
<td>34</td>
<td></td>
<td></td>
<td>Inflow from Burris and Santiago Basins</td>
</tr>
<tr>
<td>SANTIAGO BASINS</td>
<td>3,344</td>
<td></td>
<td></td>
<td>Inflow from Burris Basin</td>
</tr>
<tr>
<td>SANTIAGO CREEK</td>
<td>228</td>
<td></td>
<td></td>
<td>Inflow from Burris and Santiago Basins</td>
</tr>
<tr>
<td><strong>TOTALS</strong></td>
<td>17,712</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### TABLE 1

<table>
<thead>
<tr>
<th>AVAILABLE FLOWS TO RECHARGE SYSTEMS (AF)</th>
<th>LOSSES FROM RECHARGE SYSTEM (AF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Imperial Headgates 13,290</td>
<td>Est'd SAR flow past Chapman Ave. 100</td>
</tr>
<tr>
<td>GWRS 4,709.7</td>
<td>Est'd Santiago Cr. flow to SAR 0</td>
</tr>
<tr>
<td>OC-59 (MWD) 0.0</td>
<td>Est'd flows past Raymond Basin 0</td>
</tr>
<tr>
<td>OC-28a (MWD) 164.3</td>
<td>Calc'd evap (inches) Estimated 3.5</td>
</tr>
<tr>
<td>CB-11 0.00</td>
<td>Est'd evaporative losses(^5) 146</td>
</tr>
<tr>
<td>CB-18 0.00</td>
<td></td>
</tr>
<tr>
<td>Est'd local Forebay inflow below Imperial(^4) 120</td>
<td></td>
</tr>
<tr>
<td>Est'd local Santiago inflow (estimated) 115</td>
<td></td>
</tr>
<tr>
<td>Irvine lake releases (OC-13 MWD) 0</td>
<td></td>
</tr>
<tr>
<td>Villa Park Dam releases (estimated) 0</td>
<td></td>
</tr>
<tr>
<td>Precip at Warner Basin (inches) 0.94</td>
<td></td>
</tr>
<tr>
<td>Precip direct to open water surfaces(^5) 39</td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL INFLOW</strong> 18,438</td>
<td><strong>TOTAL LOSSES</strong> 246</td>
</tr>
</tbody>
</table>

#### TABLE 3

<table>
<thead>
<tr>
<th>SUMMARY</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOTAL INFLOW (TABLE 1) 18,438</td>
</tr>
<tr>
<td>TOTAL LOSSES (TABLE 2) 246</td>
</tr>
<tr>
<td>STORAGE CHANGE(^6) (TABLE 3) 480</td>
</tr>
<tr>
<td>CALC'D PERCOLATION 17,712</td>
</tr>
</tbody>
</table>

### NOTES:
1) Warner system includes est monthly perc values for Foster-Huckleberry and Conrock basins.
2) No instrumentation in Olive Basin; perc estimated.
3) Placentia and Raymond are County of Orange RDMD flood control basins.
4) Carbon Diversion included.
5) Estimated Precipitation and Evaporation is based on 500 acres of open water surface.
6) Net "negative" storage is water volume moving from basins to underground recharge.
### FOREBAY PERCOLATION REPORT
January-12

<table>
<thead>
<tr>
<th>Facility</th>
<th>Begin</th>
<th>End</th>
<th>Net</th>
</tr>
</thead>
<tbody>
<tr>
<td>RIVER SYSTEM</td>
<td>3,908</td>
<td>Average perc 66 cfs</td>
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</tr>
<tr>
<td>DESILTING SYSTEM</td>
<td>60</td>
<td>Estimated based on observations</td>
<td></td>
</tr>
<tr>
<td>OFF-RIVER SYSTEM</td>
<td>360</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WARNER SYSTEM</td>
<td>410</td>
<td>Includes Foster Huckleberry and Conrock basins</td>
<td></td>
</tr>
<tr>
<td>OLIVE BASIN</td>
<td>470</td>
<td>Inflow from Warner basin</td>
<td></td>
</tr>
<tr>
<td>ANAHEIM LAKE</td>
<td>2,500</td>
<td>Inflow from Warner basin</td>
<td></td>
</tr>
<tr>
<td>MINI-ANA LAKE</td>
<td>216</td>
<td>Inflow from Warner basin</td>
<td></td>
</tr>
<tr>
<td>KRAEMLER BASIN</td>
<td>4,432</td>
<td>Inflow from GWR</td>
<td></td>
</tr>
<tr>
<td>MILLER BASIN</td>
<td>872</td>
<td>Inflow from Warner basin and Ana dewater pumps</td>
<td></td>
</tr>
<tr>
<td>LA JOLLA BASIN</td>
<td>343</td>
<td>Inflow from Warner basin and Ana dewater pumps</td>
<td></td>
</tr>
<tr>
<td>PLACENTIA BASIN</td>
<td>0</td>
<td>Not used</td>
<td></td>
</tr>
<tr>
<td>RAYMOND BASIN</td>
<td>80</td>
<td>Inflow from Warner basin and Ana dewater pumps</td>
<td></td>
</tr>
<tr>
<td>FIVE COVES BASIN</td>
<td>60</td>
<td>Estimated based on observations</td>
<td></td>
</tr>
<tr>
<td>BURRIS BASIN</td>
<td>198</td>
<td>Inflow from SAR</td>
<td></td>
</tr>
<tr>
<td>RIVER VIEW BASIN</td>
<td>48</td>
<td>Inflow from Burris and Santiago Basins</td>
<td></td>
</tr>
<tr>
<td>SANTIAGO BASINS</td>
<td>2,964</td>
<td>Inflow from Burris Basin</td>
<td></td>
</tr>
<tr>
<td>SANTIAGO CREEK</td>
<td>384</td>
<td>Inflow from Burris and Santiago Basins</td>
<td></td>
</tr>
</tbody>
</table>

| TOTALS | 17,305 |

### TABLE 1
AVAILABLE FLOWS TO RECHARGE SYSTEMS (AF)

<table>
<thead>
<tr>
<th>Item</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Imperial Headgates (estimated)</td>
<td>11,930</td>
</tr>
<tr>
<td>GWRS</td>
<td>4,563.37</td>
</tr>
<tr>
<td>OC-59 (MWD)</td>
<td>0.00</td>
</tr>
<tr>
<td>OC-28a (MWD)</td>
<td>8.20</td>
</tr>
<tr>
<td>CB-11</td>
<td>0.00</td>
</tr>
<tr>
<td>CB-18</td>
<td>0.00</td>
</tr>
<tr>
<td>Est'd local Forebay inflow below Imperial</td>
<td>150</td>
</tr>
<tr>
<td>Est'd local Santiago inflow (estimated)</td>
<td>200</td>
</tr>
<tr>
<td>Irvine lake releases (OC-13 MWD)</td>
<td>0</td>
</tr>
<tr>
<td>Villa Park Dam releases (estimated)</td>
<td>0</td>
</tr>
<tr>
<td>Precip at Warner Basin (inches)</td>
<td>1.26</td>
</tr>
<tr>
<td>Precip direct to open water surfaces</td>
<td>53</td>
</tr>
<tr>
<td>TOTAL INFLOW</td>
<td>16,904</td>
</tr>
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</table>

### TABLE 2
LOSSES FROM RECHARGE SYSTEM (AF)

<table>
<thead>
<tr>
<th>Item</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Est'd SAR flow past Chapman Ave.</td>
<td>160</td>
</tr>
<tr>
<td>Est'd Santiago Cr. flow to SAR</td>
<td>0</td>
</tr>
<tr>
<td>Est'd flows past Raymond Basin</td>
<td>0</td>
</tr>
<tr>
<td>Calc'd evap (inches) Estimated</td>
<td>3</td>
</tr>
<tr>
<td>Est'd evaporative losses</td>
<td>125</td>
</tr>
<tr>
<td>TOTAL LOSSES</td>
<td>285</td>
</tr>
</tbody>
</table>

### TABLE 3
STORAGE CHANGES (AF)

<table>
<thead>
<tr>
<th>Facility</th>
<th>Begin</th>
<th>End</th>
<th>Net</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deep basins</td>
<td>8,425</td>
<td>7,946</td>
<td>-478</td>
</tr>
<tr>
<td>Santiago Pits</td>
<td>10,975</td>
<td>10,768</td>
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<tr>
<td>River</td>
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<td>Off-river</td>
<td>0</td>
<td>0</td>
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</tr>
<tr>
<td>Irvine Lake</td>
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<tr>
<td>TOTAL</td>
<td>19,400</td>
<td>18,714</td>
<td>-685</td>
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### SUMMARY

<table>
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<tr>
<th>Item</th>
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<tr>
<td>CALC'D PERCOLATION</td>
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### NOTES:
1) Warner system includes est monthly perc values for Foster-Huckleberry and Conrock basins.
2) No instrumentation in Olive Basin; perc estimated.
3) Placentia and Raymond are County of Orange RDMD flood control basins.
4) Carbon Diversion included.
5) Estimated Precipitation and Evaporation is based on 500 acres of open water surface.
6) Net “negative” storage is water volume moving from basins to underground recharge.
FOREBAY PERCOLATION REPORT
February-12

<table>
<thead>
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<th>Facility</th>
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<td>9,467</td>
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<td>10,348</td>
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<tr>
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<tr>
<td>Warner System¹</td>
<td>800</td>
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<tr>
<td>Olive Basin²</td>
<td>263</td>
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</tr>
<tr>
<td>Anaheim Lake</td>
<td>2,509</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mini-Ana Lake</td>
<td>393</td>
<td></td>
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</tr>
<tr>
<td>Kraemer Basin</td>
<td>3,474</td>
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</tr>
<tr>
<td>Miller Basin</td>
<td>1,178</td>
<td></td>
<td></td>
</tr>
<tr>
<td>La Jolla Basin</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Placentia Basin³</td>
<td>60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Raymond Basin³</td>
<td>0</td>
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<tr>
<td>Five Coves Basin</td>
<td>383</td>
<td></td>
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</tr>
<tr>
<td>Burris Basin</td>
<td>504</td>
<td></td>
<td></td>
</tr>
<tr>
<td>River View Basin</td>
<td>132</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Santiago Basins</td>
<td>2,413</td>
<td></td>
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<tr>
<td>Santiago Creek</td>
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<td>Totals</td>
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<th>Actual</th>
<th>Remarks</th>
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<td>70 cfs avg perc</td>
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<tr>
<td>Desilting System</td>
<td>60</td>
<td>Estimated based on observations</td>
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<tr>
<td>Off-River System</td>
<td>383</td>
<td>Use 29 days</td>
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<tr>
<td>Warner System¹</td>
<td>800</td>
<td>Includes Foster Huckleberry and Conrock basins</td>
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<tr>
<td>Olive Basin²</td>
<td>263</td>
<td>Inflow from Warner basin</td>
</tr>
<tr>
<td>Anaheim Lake</td>
<td>2,509</td>
<td>Inflow from Warner basin and OC28</td>
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<tr>
<td>Mini-Ana Lake</td>
<td>393</td>
<td>Inflow from Warner basin</td>
</tr>
<tr>
<td>Kraemer Basin</td>
<td>3,474</td>
<td>Inflow from GWR</td>
</tr>
<tr>
<td>Miller Basin</td>
<td>1,178</td>
<td>Inflow from Warner basin and OC28</td>
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<tr>
<td>La Jolla Basin</td>
<td>2</td>
<td>Not used</td>
</tr>
<tr>
<td>Placentia Basin³</td>
<td>0</td>
<td>Not used</td>
</tr>
<tr>
<td>Raymond Basin³</td>
<td>0</td>
<td>Not used</td>
</tr>
<tr>
<td>Five Coves Basin</td>
<td>60</td>
<td>Estimated based on observations</td>
</tr>
<tr>
<td>Burris Basin</td>
<td>504</td>
<td>Inflow from SAR</td>
</tr>
<tr>
<td>River View Basin</td>
<td>132</td>
<td>Inflow from Burris Pit and Santiago</td>
</tr>
<tr>
<td>Santiago Basins</td>
<td>2,413</td>
<td>Inflow from Burris Pit</td>
</tr>
<tr>
<td>Santiago Creek</td>
<td>257</td>
<td>Inflow from Burris Pit and Santiago</td>
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<table>
<thead>
<tr>
<th>Table 1</th>
<th>Available Flows to Recharge Systems (AF)</th>
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<tbody>
<tr>
<td>Imperial Headgates</td>
<td>12,720</td>
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<tr>
<td>GWRS</td>
<td>4,351.7</td>
</tr>
<tr>
<td>OC-59 (MWD)</td>
<td>0.0</td>
</tr>
<tr>
<td>OC-28 (MWD)</td>
<td>406.6</td>
</tr>
<tr>
<td>CB-11</td>
<td>0.00</td>
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<tr>
<td>CB-18</td>
<td>0.00</td>
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<tr>
<td>Est'd local Forebay inflow below Imperial⁴</td>
<td>100</td>
</tr>
<tr>
<td>Est'd local Santiago inflow (estimated)</td>
<td>105</td>
</tr>
<tr>
<td>Irvine lake releases (OC-13 MWD)</td>
<td>0</td>
</tr>
<tr>
<td>Villa Park Dam releases (estimated)</td>
<td>0</td>
</tr>
<tr>
<td>Precip at Warner Basin (inches)</td>
<td>0.49</td>
</tr>
<tr>
<td>Precip direct to open water surfaces⁵</td>
<td>20</td>
</tr>
<tr>
<td><strong>TOTAL INFLOW</strong></td>
<td><strong>17,704</strong></td>
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</table>

<table>
<thead>
<tr>
<th>Table 2</th>
<th>Losses from Recharge System (AF)</th>
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</thead>
<tbody>
<tr>
<td>Imperial Headgates</td>
<td>Est'd SAR flow past Chapman Ave. 0</td>
</tr>
<tr>
<td>GWRS</td>
<td>Est'd Santiago Cr. flow to SAR    0</td>
</tr>
<tr>
<td>OC-59 (MWD)</td>
<td>Est'd flows past Raymond Basin    0</td>
</tr>
<tr>
<td>OC-28 (MWD)</td>
<td>Calc'd evap (inches) Estimated    3</td>
</tr>
<tr>
<td>CB-11</td>
<td>Est'd evaporative losses⁵         125</td>
</tr>
<tr>
<td>CB-18</td>
<td></td>
</tr>
<tr>
<td>Est'd local Forebay inflow below Imperial⁴</td>
<td></td>
</tr>
<tr>
<td>Est'd local Santiago inflow (estimated)</td>
<td></td>
</tr>
<tr>
<td>Irvine lake releases (OC-13 MWD)</td>
<td></td>
</tr>
<tr>
<td>Villa Park Dam releases (estimated)</td>
<td></td>
</tr>
<tr>
<td>Precip at Warner Basin (inches)</td>
<td></td>
</tr>
<tr>
<td>Precip direct to open water surfaces⁵</td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL LOSSES</strong></td>
<td><strong>125</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 3</th>
<th>Storage Changes (AF)</th>
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<tbody>
<tr>
<td>Facility</td>
<td>Begin</td>
</tr>
<tr>
<td>Deep basins</td>
<td>7,946</td>
</tr>
<tr>
<td>Santiago Pits</td>
<td>10,768</td>
</tr>
<tr>
<td>River</td>
<td>0</td>
</tr>
<tr>
<td>Off-river</td>
<td>0</td>
</tr>
<tr>
<td>Irvine Lake</td>
<td>0</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>18,714</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Summary</th>
<th>Summary</th>
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</thead>
<tbody>
<tr>
<td>TOTAL INFLOW (Table 1)</td>
<td>17,704</td>
</tr>
<tr>
<td>TOTAL LOSSES (Table 2)</td>
<td>125</td>
</tr>
<tr>
<td>STORAGE CHANGE⁶ (Table 3)</td>
<td>1,101</td>
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<tr>
<td>CALC'D PERCOLATION</td>
<td>16,478</td>
</tr>
</tbody>
</table>

**NOTES:**
1) Warner system includes est monthly perc values for Foster-Huckleberry and Conrock basins.
2) No instrumentation in Olive Basin; perc estimated.
3) Placentia and Raymond are County of Orange RDMD flood control basins.
4) Carbon Diversion included.
5) Estimated Precipitation and Evaporation is based on 500 acres of open water surface.
6) Net "negative" storage is water volume moving from basins to underground recharge.
<table>
<thead>
<tr>
<th>Facility</th>
<th>Begin</th>
<th>End</th>
<th>Net</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deep basins</td>
<td>9,467</td>
<td>9,797</td>
<td>330</td>
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<td>Santiago Pits</td>
<td>10,348</td>
<td>11,768</td>
<td>1,420</td>
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<tr>
<td>River</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Off-river</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Irvine Lake</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>19,815</td>
<td>21,565</td>
<td>1,750</td>
</tr>
</tbody>
</table>

**NOTES:**
1) Warner system includes est monthly perc values for Foster-Huckleberry and Conrock basins.
2) No instrumentation in Olive Basin; perc estimated.
3) Placentia and Raymond are County of Orange RDMD flood control basins.
4) Carbon Diversion included.
5) Estimated Precipitation and Evaporation is based on 500 acres of open water surface.
6) Net “negative” storage is water volume moving from basins to underground recharge.
### RIVER SYSTEM
- DESILTING SYSTEM: 60 days
- OFF-RIVER SYSTEM: 920 days
- WARNER SYSTEM: 1,004
- OLIVE BASIN: 127
- ANAHEIM LAKE: 2,116
- MINI-ANA LAKE: 502
- KRAEMER BASIN: 3,808
- MILLER BASIN: 569
- LA JOLLA BASIN: 358
- PLACENTIA BASIN: 0
- RAYMOND BASIN: 111
- FIVE COVES BASIN: 60
- BURRIS BASIN: 807
- RIVER VIEW BASIN: 214
- SANTIAGO BASINS: 4,268
- SANTIAGO CREEK: 318

### TOTALS
- Imperial Headgates (estimated): 15,060
- GWRS: 4,509.8
- OC-59 (MWD): 0
- OC-28 (MWD): 1,075.8
- CB-11: 0.00
- CB-18: 0.00
- Est'd local Forebay inflow below Imperial: 200
- Est'd local Santiago inflow: 173
- Irvine lake releases (OC-13 MWD): 0
- Villa Park Dam releases (estimated): 0
- Precip at Warner Basin (inches): 1.19
- Precip direct to open water surfaces: 50

### TOTAL INFLOW
- Imperial Headgates: 15,060
- GWRS: 4,509.8
- OC-59 (MWD): 0
- OC-28 (MWD): 1,075.8
- CB-11: 0.00
- CB-18: 0.00
- Est'd local Forebay inflow below Imperial: 200
- Est'd local Santiago inflow: 173
- Irvine lake releases: 0
- Villa Park Dam releases: 0
- Precip at Warner Basin: 1.19
- Precip direct to open water surfaces: 50

### TOTAL LOSSES
- Imperial Headgates: 100
- GWRS: 0
- OC-59 (MWD): 0
- OC-28 (MWD): 0
- CB-11: 0
- CB-18: 0
- Est'd local Forebay inflow below Imperial: 4
- Est'd local Santiago inflow: 0
- Irvine lake releases: 0
- Villa Park Dam releases: 0
- Precip at Warner Basin: 0
- Precip direct to open water surfaces: 0

### TOTAL LOSSES
- Imperial Headgates: 267
- GWRS: 0
- OC-59 (MWD): 0
- OC-28 (MWD): 0
- CB-11: 0
- CB-18: 0
- Est'd local Forebay inflow below Imperial: 4
- Est'd local Santiago inflow: 0
- Irvine lake releases: 0
- Villa Park Dam releases: 0
- Precip at Warner Basin: 0
- Precip direct to open water surfaces: 0

### SUMMARY
- TOTAL INFLOW (TABLE 1): 21,068
- TOTAL LOSSES (TABLE 2): 267
- STORAGE CHANGE (TABLE 3): 1,249
- CALC'D PERCOLATION: 19,552

### NOTES:
1) Warner system includes est monthly perc values for Foster-Huckleberry and Conrock basins.
2) No instrumentation in Olive Basin; perc estimated.
3) Placentia and Raymond are County of Orange RDMD flood control basins.
4) Carbon Diversion included.
5) Estimated Precipitation and Evaporation is based on 500 acres of open water surface.
6) Net “negative” storage is water volume moving from basins to underground recharge.
## FOREBAY PERCOLATION REPORT
### May-12

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<th>Facility</th>
<th>Actual</th>
<th>Remarks</th>
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<tr>
<td>RIVER SYSTEM</td>
<td>5,036</td>
<td>Estimated based on observations</td>
</tr>
<tr>
<td>DESILTING SYSTEM</td>
<td>60</td>
<td>Used 31 days</td>
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<tr>
<td>OFF-RIVER SYSTEM</td>
<td>1,233</td>
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<tr>
<td>WARNER SYSTEM&lt;sup&gt;1&lt;/sup&gt;</td>
<td>1,192</td>
<td>Includes Foster Huckleberry and Conrock basins</td>
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<tr>
<td>OLIVE BASIN&lt;sup&gt;2&lt;/sup&gt;</td>
<td>232</td>
<td>Inflow from Warner basin</td>
</tr>
<tr>
<td>ANAHEIM LAKE</td>
<td>1,818</td>
<td>Inflow from Warner basin and OC28</td>
</tr>
<tr>
<td>MINI-ANA LAKE</td>
<td>476</td>
<td>Inflow from Warner basin</td>
</tr>
<tr>
<td>KRAEMER BASIN</td>
<td>3,460</td>
<td>Inflow from GWR</td>
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<td>MILLER BASIN</td>
<td>1,161</td>
<td>Inflow from GWR</td>
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<tr>
<td>LA JOLLA BASIN</td>
<td>606</td>
<td>Inflow from LW outflow and OC-28</td>
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<tr>
<td>PLACENTIA BASIN&lt;sup&gt;3&lt;/sup&gt;</td>
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<td>Not used</td>
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<tr>
<td>RAYMOND BASIN&lt;sup&gt;3&lt;/sup&gt;</td>
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<td>Inflow from LW outflow and OC-28</td>
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<tr>
<td>FIVE COVES BASIN</td>
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<td>Estimated based on observations</td>
</tr>
<tr>
<td>BURRIS BASIN</td>
<td>724</td>
<td>Inflow from SAR</td>
</tr>
<tr>
<td>RIVER VIEW BASIN</td>
<td>130</td>
<td>Inflow from Burris Pit and Santiago</td>
</tr>
<tr>
<td>SANTIAGO BASINS</td>
<td>4,555</td>
<td>Inflow from Burris Pit</td>
</tr>
<tr>
<td>SANTIAGO CREEK</td>
<td>543</td>
<td>Inflow from Burris Pit and Santiago</td>
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<td><strong>TOTALS</strong></td>
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### TABLE 1

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<th>LOSSES FROM RECHARGE SYSTEM (AF)</th>
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<td>CB-11</td>
<td>0.00</td>
</tr>
<tr>
<td>CB-18</td>
<td>0.00</td>
</tr>
<tr>
<td>Est'd local Forebay inflow below Imperial&lt;sup&gt;4&lt;/sup&gt;</td>
<td>0.00</td>
</tr>
<tr>
<td>Est'd local Santiago inflow (estimated)</td>
<td>60.00</td>
</tr>
<tr>
<td>Irvine lake releases (OC-13 MWD)</td>
<td>40.00</td>
</tr>
<tr>
<td>Villa Park Dam releases (estimated)</td>
<td>0.00</td>
</tr>
<tr>
<td>Precip at Warner Basin (inches)</td>
<td>0.00</td>
</tr>
<tr>
<td>Precip direct to open water surfaces&lt;sup&gt;5&lt;/sup&gt;</td>
<td>0.00</td>
</tr>
<tr>
<td><strong>TOTAL INFLOW</strong></td>
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### TABLE 2

<table>
<thead>
<tr>
<th>SUMMARY</th>
<th>LOSSES FROM RECHARGE SYSTEM (AF)</th>
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<tbody>
<tr>
<td>Est'd SAR flow past Chapman Ave.</td>
<td>0.00</td>
</tr>
<tr>
<td>Est'd Santiago Cr. flow to SAR</td>
<td>0.00</td>
</tr>
<tr>
<td>Est'd flows past Raymond Basin</td>
<td>0.00</td>
</tr>
<tr>
<td>Calc'd evap (inches) Estimated&lt;sup&gt;6&lt;/sup&gt;</td>
<td>4.00</td>
</tr>
<tr>
<td>Est'd evaporative losses&lt;sup&gt;5&lt;/sup&gt;</td>
<td>167.00</td>
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<td><strong>TOTAL LOSSES</strong></td>
<td><strong>167.00</strong></td>
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### TABLE 3

<table>
<thead>
<tr>
<th>STORAGE CHANGES (AF)</th>
<th>SUMMARY</th>
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<tbody>
<tr>
<td><strong>Facility</strong></td>
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</tr>
<tr>
<td>Deep basins</td>
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<td>Santiago Pits</td>
<td>12,730</td>
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<tr>
<td>River</td>
<td>0</td>
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<tr>
<td>Off-river</td>
<td>0</td>
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<tr>
<td>Irvine Lake</td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>22,814</strong></td>
</tr>
</tbody>
</table>

**NOTES:**

1) Warner system includes est monthly perc values for Foster-Huckleberry and Conrock basins.
2) No instrumentation in Olive Basin; perc estimated.
3) Placentia and Raymond are County of Orange RDMD flood control basins.
4) Carbon Diversion included.
5) Estimated Precipitation and Evaporation is based on 500 acres of open water surface.
6) Net "negative" storage is water volume moving from basins to underground recharge.
## FOREBAY PERCOLATION REPORT
### June-12

<table>
<thead>
<tr>
<th>Facility</th>
<th>Begin</th>
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<th>Net</th>
<th>Remarks</th>
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</thead>
<tbody>
<tr>
<td>Imperial Headgates</td>
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<td>Starved river to feed Warner Fishing concession</td>
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<tr>
<td>GWRS</td>
<td>4,157.9</td>
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<td>Estimated based on observations</td>
</tr>
<tr>
<td>OC-59 (MWD)</td>
<td>2,433.7</td>
<td></td>
<td></td>
<td>Used 30 days</td>
</tr>
<tr>
<td>OC-28 (MWD)</td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CB-11</td>
<td>0.00</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>CB-18</td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Est'd local Forebay inflow below Imperial</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Est'd local Santiago inflow (estimated)</td>
<td>60</td>
<td></td>
<td></td>
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<tr>
<td>Irvine lake releases (OC-13 MWD)</td>
<td>0</td>
<td></td>
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</tr>
<tr>
<td>Villa Park Dam releases (estimated)</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Precip at Warner Basin (inches)</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Precip direct to open water surfaces</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL INFLOW</td>
<td>12,179</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Facility</th>
<th>Begin</th>
<th>End</th>
<th>Net</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Est'd SAR flow past Chapman Ave.</td>
<td>0</td>
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<td></td>
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<tr>
<td>Est'd Santiago Cr. flow to SAR</td>
<td>0</td>
<td></td>
<td></td>
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<tr>
<td>Est'd flows past Raymond Basin</td>
<td>0</td>
<td></td>
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<tr>
<td>Calc'd evap (inches) Estimated</td>
<td>4</td>
<td></td>
<td></td>
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<tr>
<td>Est'd evaporative losses</td>
<td>167</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL LOSSES</td>
<td>167</td>
<td></td>
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</tr>
</tbody>
</table>

### TABLE 3

<table>
<thead>
<tr>
<th>Storage Changes (AF)</th>
<th>Begin</th>
<th>End</th>
<th>Net</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deep basins</td>
<td>9,075</td>
<td>8,975</td>
<td>-100</td>
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<tr>
<td>Santiago Pits</td>
<td>12,234</td>
<td>9,515</td>
<td>-2,719</td>
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<tr>
<td>River</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Off-river</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Irvine Lake</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>21,309</td>
<td>18,490</td>
<td>-2,819</td>
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</tbody>
</table>

### SUMMARY

<table>
<thead>
<tr>
<th>Remarks</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOTAL INFLOW (TABLE 1)</td>
<td>12,179</td>
</tr>
<tr>
<td>TOTAL LOSSES (TABLE 2)</td>
<td>167</td>
</tr>
<tr>
<td>STORAGE CHANGE (TABLE 3)</td>
<td>-2,819</td>
</tr>
<tr>
<td>CALC'D PERCOLATION</td>
<td>14,830</td>
</tr>
</tbody>
</table>

### NOTES:

1) Warner system includes est monthly perc values for Foster-Huckleberry and Conrock basins.
2) No instrumentation in Olive Basin; perc estimated.
3) Placentia and Raymond are County of Orange RDMD flood control basins.
4) Carbon Diversion included.
5) Estimated Precipitation and Evaporation is based on 500 acres of open water surface.
6) Net "negative" storage is water volume moving from basins to underground recharge.