

On the Cover

North County
Distribution Pipeline -
Remote Operated
Vehicle Inspection

Carlsbad Desalination
Construction
(March 2015)

Pipeline 4 - Disinfection

Pipeline 4 - Ultrasonic
Pipe Thickness
Testing

San Vicente Reservoir
Marina Construction
(April 2015)

Untreated Water Quality
Report: Online
Operations Portal

San Diego 11 FCF
36-in Cone Valve
Installation

Pipeline 3 Reline -
Installation of Steel
Liners

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Executive Summary

The annual Aqueduct Operating Plan (AOP) reflects on-going efforts to optimize the delivery, treatment, and storage of water in the San Diego region through coordination between member agency Operating Heads, Water Authority Staff, and the Metropolitan Water District of Southern California (MWD). Staff has updated the Aqueduct Operating Plan for fiscal year 2016 (FY 2016) to reflect anticipated operational opportunities and constraints, and to evaluate our performance for fiscal year 2015 (FY 2015).

The AOP includes the Water Authority's anticipated pump station operating schedules and water treatment plant outages. The AOP was developed based on information received from member agencies, historical delivery/production data, capacity constraints within the Water Authority's aqueduct system, and scheduled shutdowns. Highlights for fiscal year 2016 include:

- Anticipated allocation amounts have been considered in developing the fiscal year 2016 AOP
- System capacity will not be an issue in meeting the region's anticipated treated and untreated water requests.
- Treated water system utilization is anticipated to be between 13 and 21 percent of treated aqueduct capacity for the high demand months of June through October.
- Untreated water system utilization is anticipated to be between 59 and 72 percent of untreated aqueduct capacity for the high demand months of June through October.
- There will be 4 treated water shutdowns and 2 treated water outages*.
- There will be 3 untreated water shutdowns and 2 untreated water outages*.

**Shutdowns affect large portions of the system and affect deliveries to a significant number of metered connections; outages are more localized and have considerably smaller impact on aqueduct deliveries.*

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Water Supply/Conveyance

Based on the projected allocation levels and the anticipated Carlsbad Desalination Plant start-up, it is expected that demand for both treated and untreated water for FY 2016 will not exceed system capacity and overall will be lower than the historically high demand year of FY 2004 (see Figure 1 and Figure 2). These projections indicate that treated water deliveries for the high demand months of June through October 2015 should result in flows ranging from 13 percent to 21 percent of the 650 cfs treated water pipeline capacity (Figure 1). Likewise, untreated deliveries for the high demand months of June through October 2015 should result in flows between 59 percent and 72 percent of the 780 cfs untreated pipeline capacity (Figure 2).

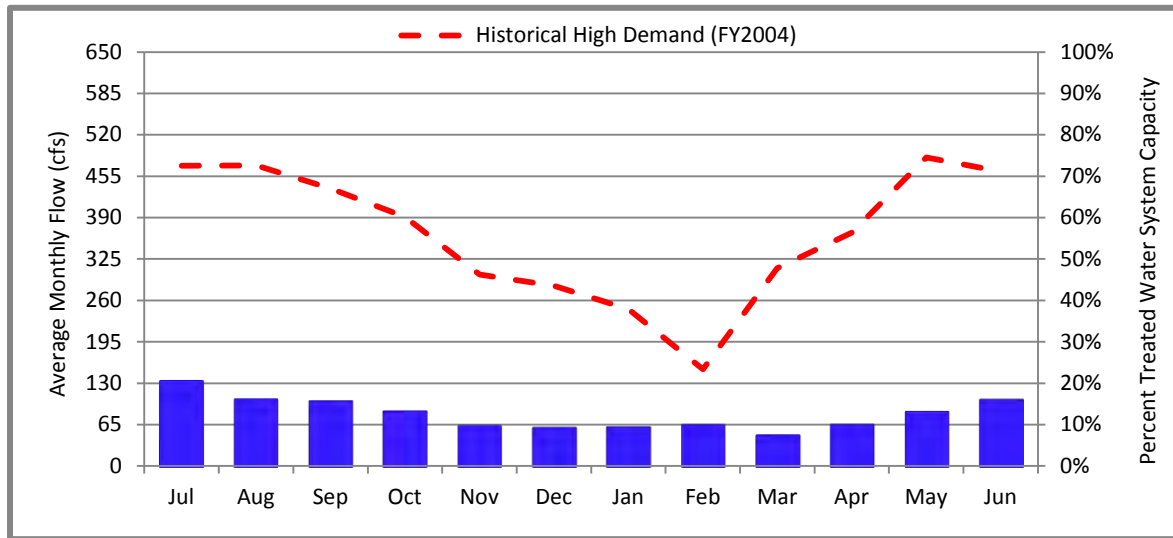


Figure 1 - FY 2016 Projected Treated Water System Utilization

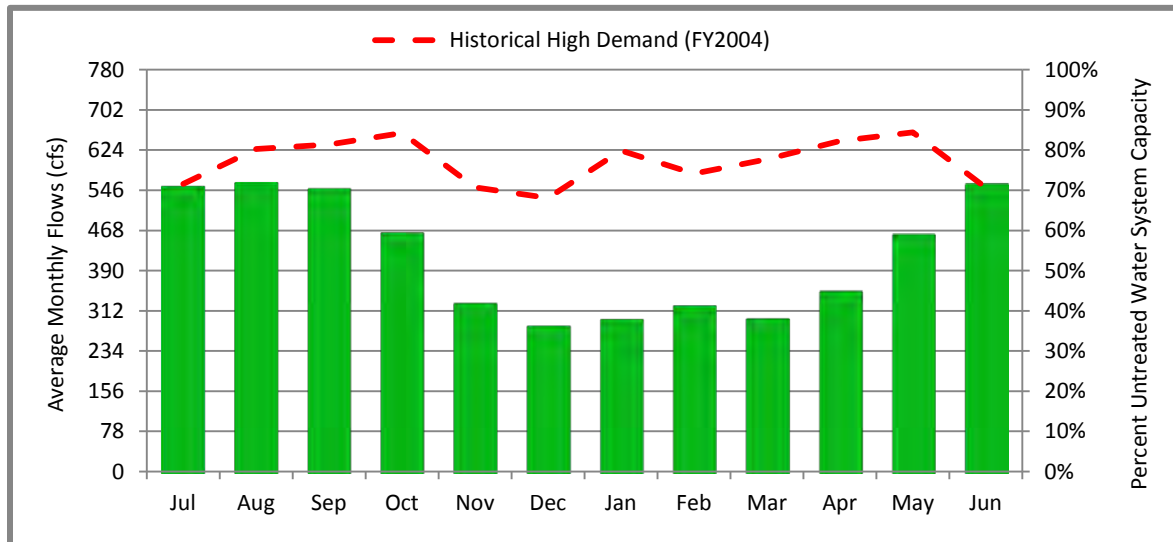


Figure 2 - FY 2016 Projected Untreated Water System Utilization

FY 2015 Water Authority demands for treated water have generally followed projected trends; however due to drier than expected weather conditions untreated deliveries were above projected demands. Treated water volumes were generally at or below the historically high demand year of FY 2004 (see Figure 3); however due to the lack available local supplies untreated water volumes are beginning to exceed the high demand year of FY 2004 during the summer months (see Figure 4).

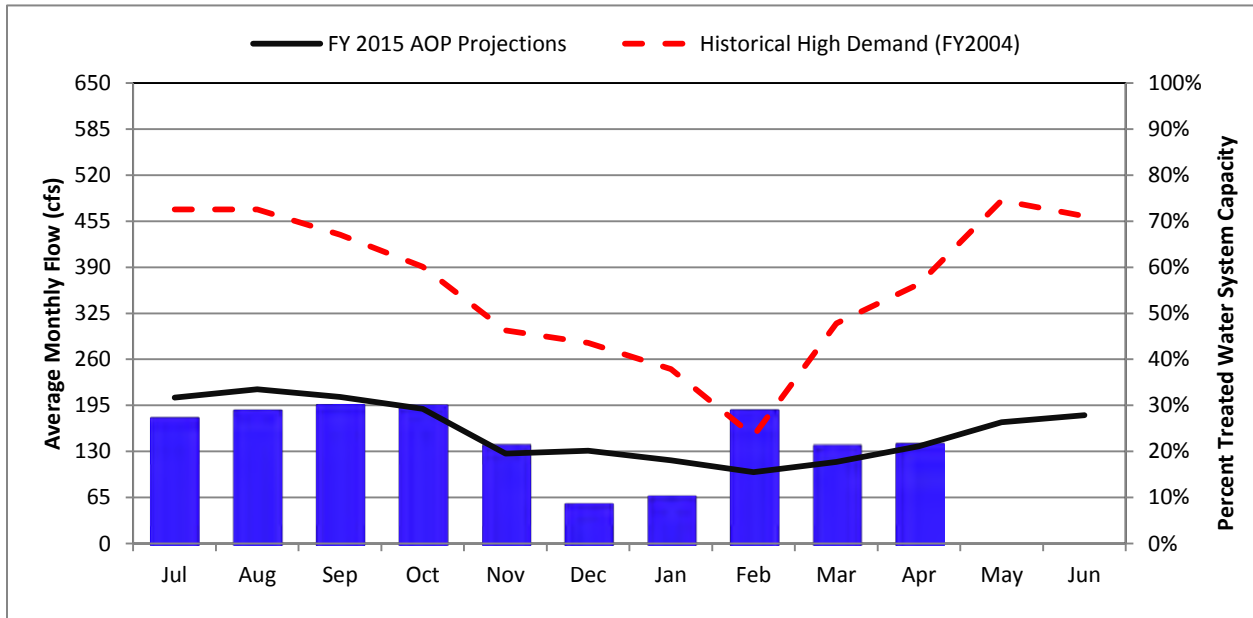


Figure 3 - FY 2015 AOP Treated Water Demand vs. Actual Deliveries

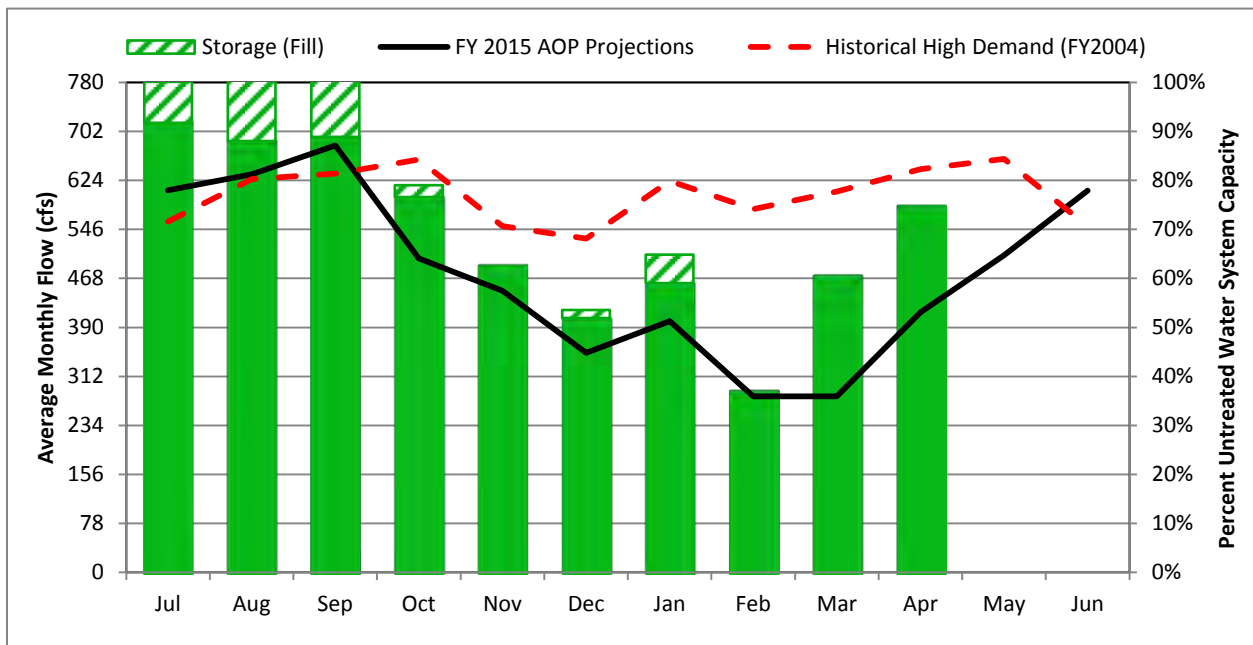


Figure 4 - FY 2015 AOP Untreated Water Demand vs. Actual Deliveries

Untreated Water Distribution Priorities

Through a series of discussions with member agency staff, key untreated operating concerns were identified and used to develop untreated water delivery priorities. These priorities are intended to provide a framework for Water Authority operators to deal with potential conflicts during untreated water high demand periods. The Board adopted interim untreated water delivery priorities at the September 8, 2005 Board meeting. This plan complies with the interim untreated water distribution priorities and is shown in Figure 5.

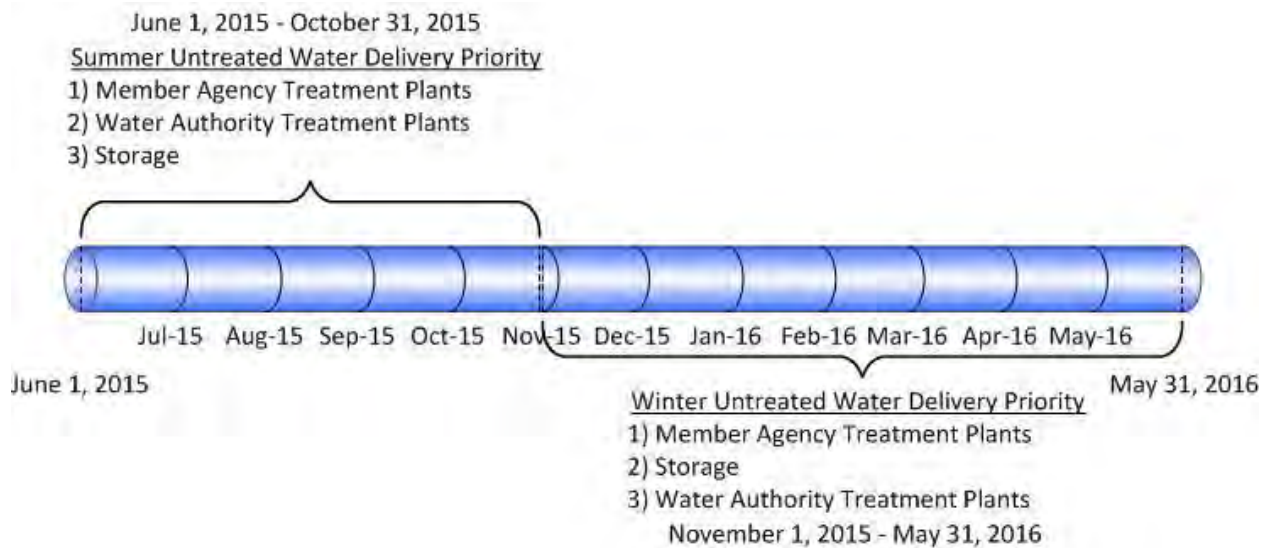


Figure 5 - Untreated Water Delivery Priorities

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Water Authority Aqueduct Shutdowns

The Water Authority conducts scheduled shutdowns of sections of pipeline for internal inspection, maintenance, and Capital Improvement Project (CIP) connections on an annual basis. These pipeline shutdowns are coordinated with MWD, member agencies, and all Water Authority Departments. The schedule includes three years of shutdowns to allow for the proper planning of maintenance and CIP activities for both the Water Authority and its member agencies. This three-year schedule is updated each January to facilitate the compilation of the Annual Aqueduct Operating Plan. At that time, the next fiscal year's (July to June) Aqueduct shutdown schedules are made available to member agency personnel for review and comment, prior to inclusion in the AOP.

For FY 2016, there are 4 treated water shutdowns, 3 untreated water shutdowns, 2 treated water outages, and 2 untreated water outages scheduled between October 2015 and June 2016. While the O&M Department will be involved in additional maintenance activities that will maximize the benefits of the shutdowns planned for FY 2016, the primary reasons for these shutdowns are to support activities related to either asset management or warranty inspections. As noted in the Executive Summary, the difference between shutdowns and outages are a matter of "scale," shutdowns affect large portions of the system and affect deliveries to a significant number of metered connections, while outages are more localized and have considerably smaller impact on aqueduct deliveries. A timeline and brief description of the shutdowns and outages are shown in Figure 6.

Based on the current construction schedule, the Carlsbad Desalination Plant and Conveyance Pipeline are projected to begin commissioning in summer/fall 2015. The facility commissioning will be conducted over a 3-4 month period and is expected to have minimal impact on the aqueduct system and our member agencies.

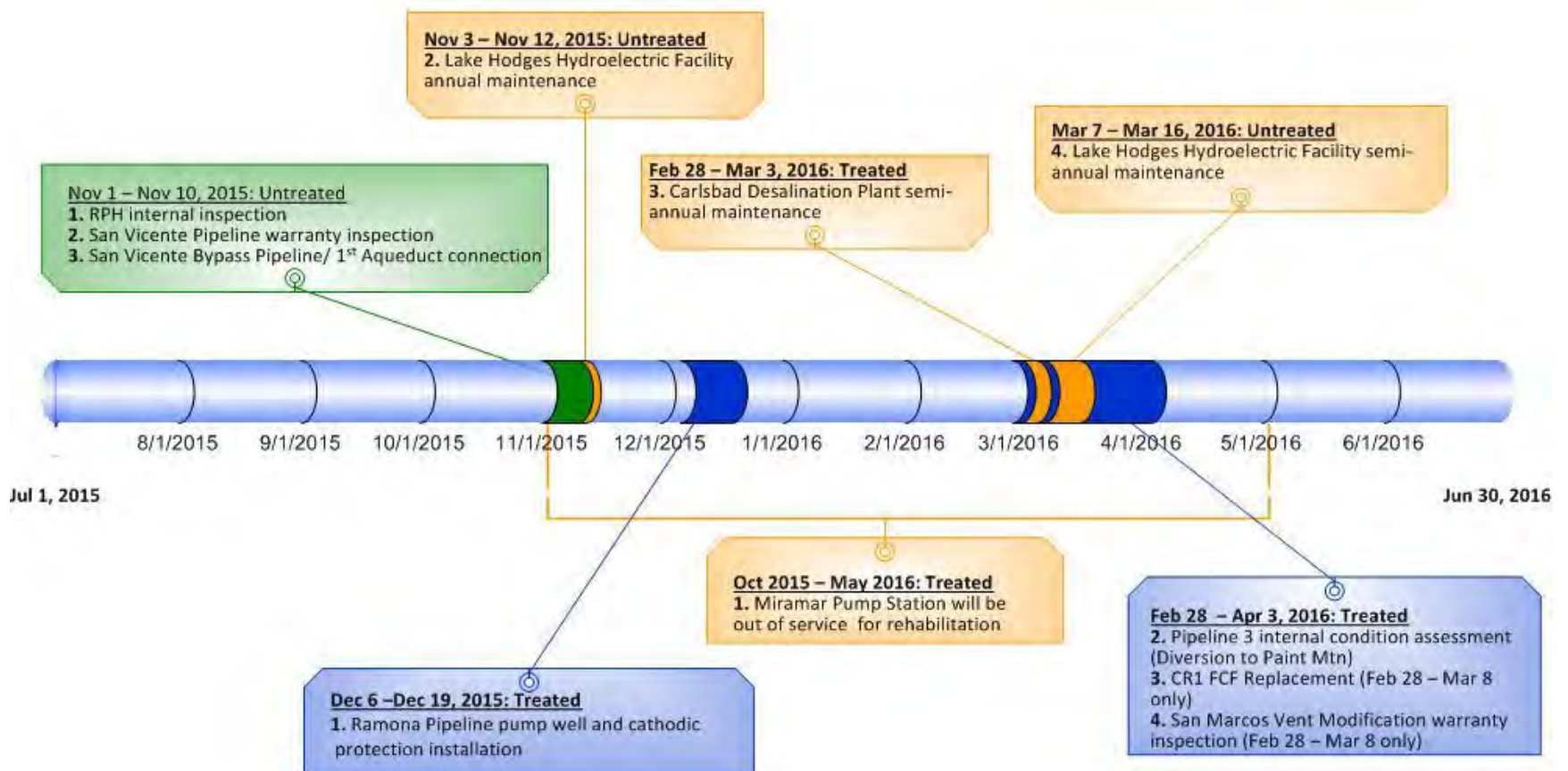


Figure 6 - Water Authority FY 2016 Pipeline Shutdowns and Outages

November 1, 2015 through November 10, 2015 - Untreated Water	
Description	Rancho Peñasquitos Hydro Electric Facility will be isolated for an internal inspection. A warranty inspection of the San Vicente Pipeline from West Shaft to Central Shaft. 1st Aqueduct will be shutdown to allow final tie-in to new Terminal Structure and the City of San Diego's Bypass pipeline.
Shutdowns	<ol style="list-style-type: none"> 1. Internal inspection of Rancho Peñasquitos Hydro Electric Facility 2. Warranty inspection of San Vicente Pipeline 3. Complete tie-in of new terminal structure on 1st Aqueduct to existing San Vicente Bypass pipeline
Affects on MWD	Reduction in untreated flow demands from MWD
Member Agency Connections Affected	The following connections will be out of service and unavailable during this shutdown – SDSF4, SDSF5, SD5A-B-C, SD12, NCSB3, NCSB1, SD7, SD20, SD6A-B, HLX1, HLX6, HLX7, HLX8, SD9, POW3, RAM1, POW1, POW4, 1, SD2, and SD Weir.

December 6, 2015 through December 19, 2015 - Treated Water	
Description	Ramona Pipeline will be isolated from Pipeline 3 and Pipeline 4 at the takeoff structures and the Ramona Pipeline inline valve to allow for installation of a new pump well and bonding cables for cathodic protection on unwelded joints.
Shutdowns	<ol style="list-style-type: none"> 1. Installation of new pump well and bonding cables at pipe joints previously unwelded to ensure continuity of the Ramona Pipeline for cathodic protection purposes.
Affects on MWD	None, potential reduction in SDCWA system demand up to 104cfs
Member Agency Connections Affected	The following connections will be affected by this shutdown: Ramona Pipeline – OLIV5, SD14, SD15, RAM 3.

February 28, 2016 through April 3, 2016 - Treated Water	
Description	<p>31 day treated water shutdown on Pipeline 3 from Diversion to Terminus. Pipeline 4 shutdown from Point of Delivery to Diversion for first 10 days. This shutdown will have 3 phases with different impacts for each phase.</p> <ul style="list-style-type: none"> • During Phase 1, all treated water flow from MWD, Carlsbad and Twin Oaks will be terminated from point of delivery to terminus. • During Phase 2, Pipeline 4 will be placed back in service and service to all flow control facilities will be restored. Carlsbad Desal and Twin Oaks TP will be back in normal operation. • Phase 3 will be to remove isolation on Pipeline 3 and will not impact Member Agencies.
Shutdowns	<ol style="list-style-type: none"> 2. Internal condition assessment of 14 miles of Pipeline 3 (Diversion to Paint Mtn) 3. Replacement of CR1 Flow Control Facility 4. San Marcos Vent Modification warranty inspection
Affects on MWD	Pipeline 4 out of service, capacity of 450 cfs unavailable from February 28, 2016 to March 8, 2016. No impact for the duration of the shutdown.
Member Agency Connections Affected	<p>The following connections will be affected by Phase 1: DLZ1, RB9, FB6, RB8, RB7, FB4, RB6, VC8, RB3, VC7, NCDP1, RB11, VAL10, Twin Oaks TP, VID3, CR1, VAL9, VAL7, OLIV 1, OLIV3, SDSF3, OLIV2, SD10, Miramar Pump P1, SD11, PD4, SD18, SD21, HLX5, SD19, OTAY11, OTAY10, OTAY12, OTAY13, OTAY13SR, Tri Agency Pipeline – VID8, VID 9, VID 10, CR3, CR4, OCS4; Ramona Pipeline – OLIV5, SD14, SD15, RAM 3. Carlsbad Desal and Twin Oaks TP will be offline during Phase 1 of shutdown.</p> <p>During Phase 2, service to all flow control facilities will be restored and Carlsbad Desal and Twin Oaks TP will be back in normal operation.</p> <p>Phase 3 will be to remove isolation on Pipeline 3 and will not impact Member Agencies.</p>

October 1, 2015 through May 1, 2016 – Treated Water	
Description	7 month outage for Miramar Pump Station Rehabilitation project
Outage	1. Miramar Pump Station will be isolated at Pipeline 4BI takeoff to allow for facility to be rehabilitated
Affects on MWD	None
Member Agency Connections Affected	The following connections will be affected: Miramar P1 pump, P3 pump, C22 pump, and P2 gravity flow connection.

November 2 through November 11, 2015 – Untreated Water	
Description	A 10-day outage of Lake Hodges Hydroelectric Facility for annual maintenance
Outage	2. Lake Hodges Hydroelectric Facility Annual Maintenance
Affects on MWD	None
Member Agency Connections Affected	None

February 28 through March 3, 2016 – Treated Water	
Description	A 5-day outage of Carlsbad Desalination Plant for semi-annual maintenance
Outage	3. Carlsbad Desalination Plant Semi-Annual Maintenance
Affects on MWD	None
Member Agency Connections Affected	The following connection will be affected by this shutdown: Desalination Conveyance Pipeline – VAL9 will not be able to receive desalinated water during shutdown; however imported treated will be available if required.

March 7 through March 16, 2016 – Untreated Water	
Description	A 10-day outage of Lake Hodges Hydroelectric Facility for semi-annual maintenance
Outage	4. Lake Hodges Hydroelectric Facility Semi-Annual Maintenance
Affects on MWD	None
Member Agency Connections Affected	None

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Member Agency Shutdowns

In order to optimize the delivery, treatment, and storage of water in San Diego County, a request was sent to the Member Agency Operating Heads to obtain schedules for member agency treatment plant expansions, CIP tie-ins, scheduled treatment plant maintenance, and shutdowns. The goal of this request is to facilitate the production of one schedule that the member agencies can use to schedule their work at times that will have the least impact on the region. Responses from member agencies confirmed upcoming maintenance activities including those shown in Figure 7. A number of other maintenance projects were also identified, but they either lacked firm schedules or did not have a significant operational impact to the region. These types of projects, as well as Treatment Plant Shutdown coordination, will be carried throughout the year as standing discussion items at the regularly scheduled Operating Head meetings.

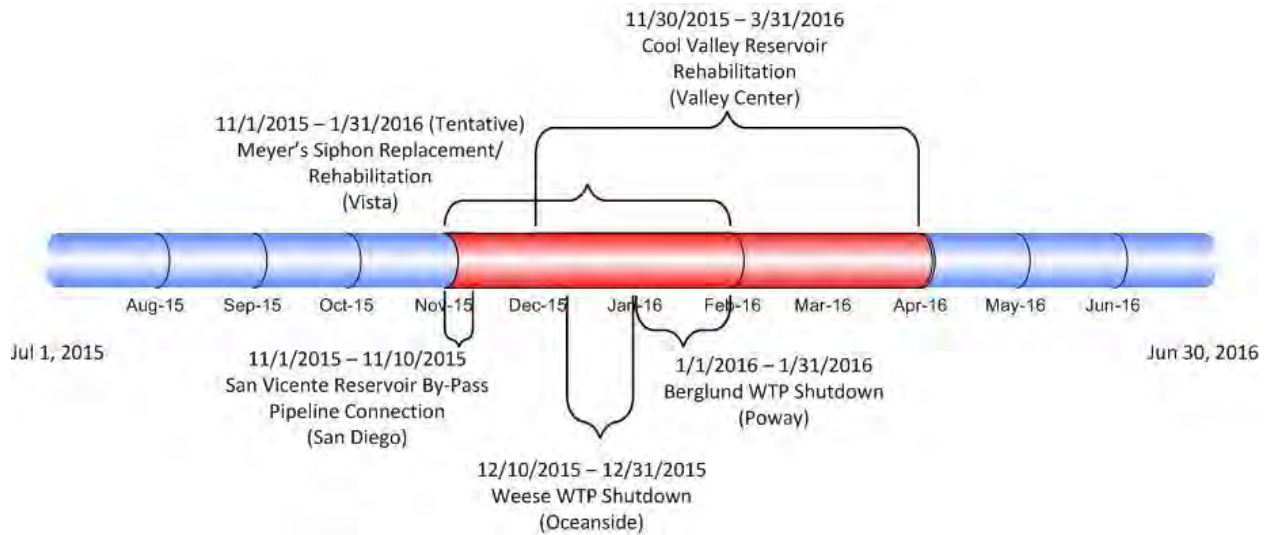


Figure 7 - Scheduled Member Agency Maintenance Coordination

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Water Authority Aqueduct Energy Production/Consumption

The Water Authority will have two power generation facilities operating during FY 2016. The Water Authority will continue operation of the Rancho Peñasquitos Hydroelectric Facility, with the Lake Hodges Pumped Storage Facility (LHH) operations contracted out to ProTrans USA. The Water Authority will be operating six pump stations and CH2M Hill/OMI will be operating the Twin Oaks Valley Water Treatment Plant in FY 2016. Following is a list of those facilities along with their anticipated operation schedules and costs:

➤ **Rancho Peñasquitos Pressure Control and Hydroelectric Facility**

- Projected months of operation: July 2015 to June 2016
- Power generating capacity: 4.5 megawatts.
- Estimated Power: 16,800 megawatt (MW) hours
- Estimated Revenue: \$700,000
- Projected power consumption cost per month: \$1,680
- Total operational power consumption cost per year: \$20,174

➤ **Lake Hodges Pumped Storage Facility**

- Projected months of operation: As dispatched
- Power generating capacity: 20 megawatts (single turbine operation), 40 megawatts (two turbine operation)
- Estimated Power: On call, based on SDG&E demands
- Estimated Revenue (for availability): \$2,800,000
- Projected auxiliary power consumption cost per month: \$17,744
- Projected pump cost per year: \$0
- Total operational power consumption cost per year: \$212,932

➤ **Olivenhain Pump Station**

- Projected months of operation: None (only planned to be operated for quarterly maintenance)
- Pumps (three available): One pump operation
- Projected base facility operational power cost per month: \$4,383
- Projected pump test cost for FY 2016: \$0 (runs on generators only)
- Total operational power consumption cost per year: \$52,590

➤ **Escondido Pump Station**

- Projected months of operation: None (only planned to be operated if aqueduct flows are too high)
- Pumps: Two pump operation
- Projected base facility operational power cost per month: \$760
- Projected pump cost per month: \$0
- Projected pump cost for the year: \$0
- Total operational power consumption cost per year: \$9,120

- **Pipeline 2A Pump Station**
 - Projected months of operation: October 2015 to June 2016
 - Pumps: Three pump operation
 - Projected base facility operational cost per month: \$760
 - Projected pump cost per month: \$43,900
 - Projected pump cost for the year: \$395,100
 - Total operational power consumption cost per year: \$404,220

- **Miramar Pump Station** (paid by the City of San Diego)
 - Projected months of operation: July 2015 through June 2016
 - Pumps: One pump operation
 - Projected base facility operational cost per month: \$0
 - Projected Water Authority pump cost per month: \$0
 - Projected Water Authority pump cost for the year: \$0
 - Total operational power consumption cost per year : \$0

- **San Vicente Pump Station**
 - Projected months of operation: (only planned to be operated for quarterly maintenance)
 - Pumps(three available): Two pump operation
 - Projected base facility operational cost per month: \$3,590
 - Projected quarterly pump test cost for FY 2016: \$7,820
 - Total operational cost per year: \$50,907
 - Total operational power consumption cost per year: \$58,727

- **Twin Oaks Valley Pump Station**
 - Projected months of operation: None (only operated for monthly maintenance)
 - Projected base facility operational cost per month: \$0 (included in Twin Oaks Valley Treatment Plant costs)
 - Projected pump test cost for FY 2016: \$0 (runs on generators only)
 - Projected pump cost for the year: \$0
 - Total operational power consumption cost per year: \$0

- **Twin Oaks Valley Water Treatment Plant**
 - Projected months of operation: July 2015 to June 2016
 - Projected operational cost per month (average): \$84,230
 - Total power consumption cost per year: \$1,010,763

The total power cost to operate the LHH, Rancho Hydro facility, the six pump stations, and Twin Oaks Valley WTP are estimated to be \$1,768,500 for FY 2016. The FY 2016 revenue for all Water Authority hydroelectricity generation is estimated to be \$3,500,000.

As of the end of April, the Water Authority is projecting a \$230,000 shortfall at the Rancho Hydro Facility from the FY 2015 forecast due to unplanned maintenance requirements and low flows (see Figure 8 and Table 1).

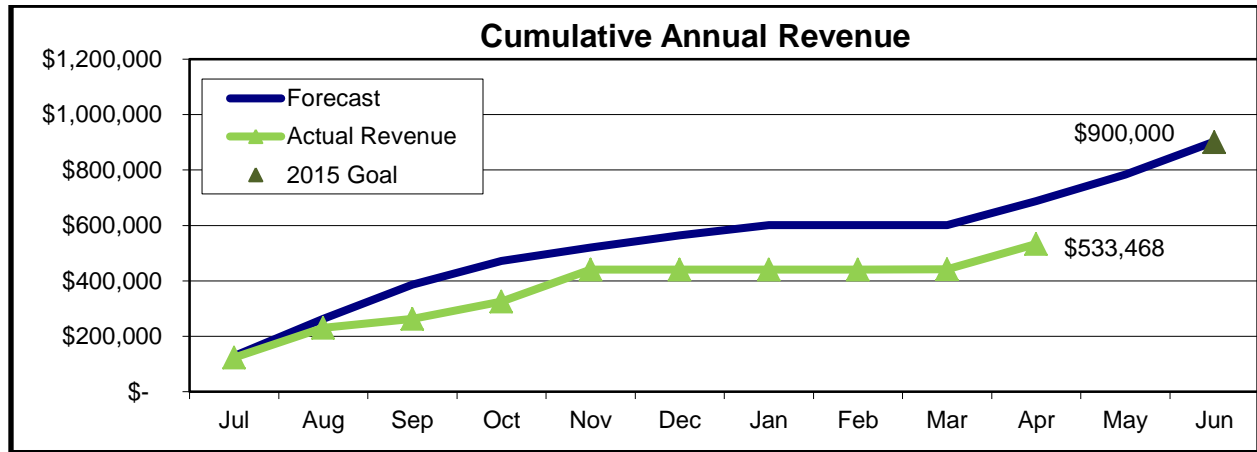


Figure 8 - Rancho Hydro Revenues vs. Projections FY 2015

Table 1 - Rancho Hydro Revenues vs. Projections FY 2015

Month	Revenue				Comments
	Monthly Goal	Monthly Revenue	YTD Revenue	Goal %	
July	\$128,664	\$122,859	\$122,859	14 %	Actuator Communication Errors
Aug	\$134,034	\$107,930	\$230,789	26 %	Low Flows
Sept	\$123,294	\$31,940	\$262,729	29 %	Forced Outage (Actuator Communication Errors)
Oct	\$85,704	\$62,201	\$324,929	36 %	Cooling Water Modification, Inspection
Nov	\$48,114	\$116,186	\$441,115	49 %	High Flows
Dec	\$42,744	\$0	\$441,115	49 %	Actuator Repairs, Low Flows
Jan	\$37,374	\$0	\$441,115	49 %	Low Flows
Feb	\$0	\$0	\$441,115	49 %	2/5/15 – 3/30/15 Planned Pipeline 5 Shutdown
Mar	\$0	\$460	\$441,575	49 %	2/5/15 – 3/30/15 Planned Pipeline 5 Shutdown
April	\$85,704	\$91,893	\$533,468	59 %	Estimated Revenue
May	\$96,444				
June	\$117,924				

The Lake Hodges Pump Storage Facility has been operating well and has exceeded its revenue goal of \$2,600,000 in April 2015 (Figure 9). FY 2015 revenues are projected to be approximately \$3,000,000 for the year.

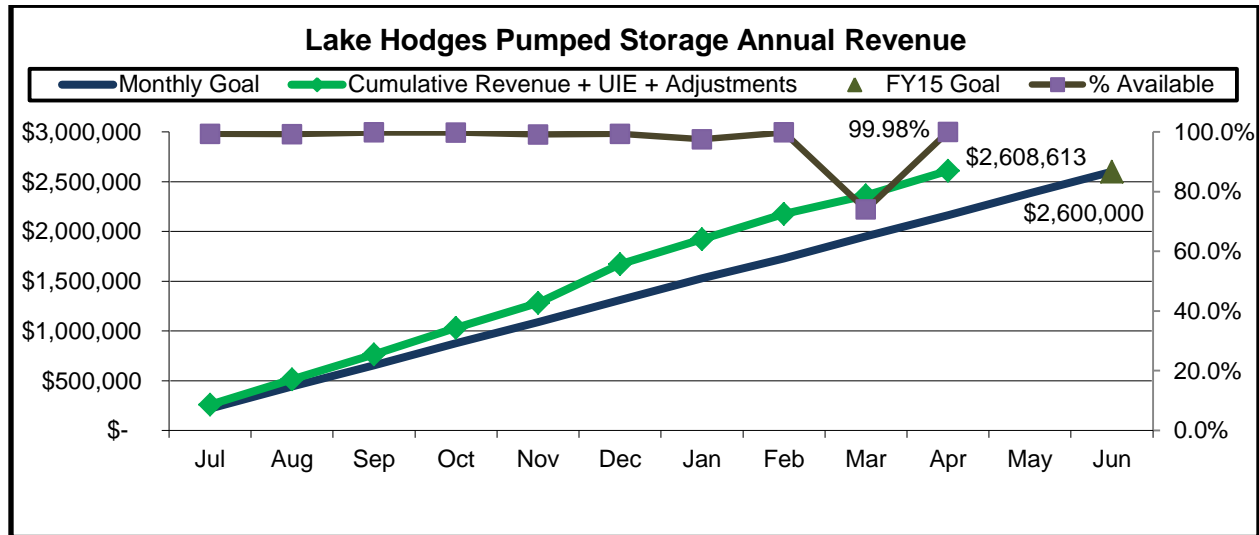


Figure 9 - Annual revenue generated at Lake Hodges Pump Storage Facility.

Solar Generation

In October of 2010, a Solar Power and Services Agreement was signed between the Water Authority and Borrego Solar Systems Incorporated (Borrego) which allowed Borrego to install solar systems at the Kearny Mesa Headquarters, Escondido Operations Center, and the Twin Oaks Valley Water Treatment Plant. The Water Authority purchases the power generated at these sites at rates lower than the projected utility rate. The systems are owned, financed, and maintained by Borrego so that there are no expenses to the Water Authority other than the staff time required to monitor the agreements. As SDGE rates have increased, the savings from solar have increased dramatically as the solar rate remains relatively stable. Following is a list of the three solar facilities along with their anticipated operation schedules, and estimated savings to the Water Authority based on Borrego’s contract:

- **Escondido Operations Center**
 - Projected Months of Operation: July 2015 to June 2016
 - Estimated Generation: 256,500 kWh
 - Estimated Savings: \$17,470

- **Twin Oaks Valley Water Treatment Plant**
 - Projected Months of Operation: July 2015 to June 2016
 - Estimated Generation: 1,995,000 kWh
 - Estimated Savings: \$207,000

- **Kearny Mesa Headquarters**
 - Projected Months of Operation: July 2015 to June 2016
 - Estimated Generation: 587,600 kWh
 - Estimated Savings: \$40,400

Reservoirs and Storage Opportunities

Member agency and Water Authority reservoirs serve multiple functions including: surface water capture, seasonal shift water storage, carryover storage, and local sources of emergency water supplies. Member agency and Water Authority reservoirs function as system capacity buffers during peak demand periods and offer a level of security for short and long-term emergency situations. The size and location of each reservoir affects the extent to which it can perform the various functions, as does the individual agencies' operational plan (see Figure 10, Figure 11, and Table 2).

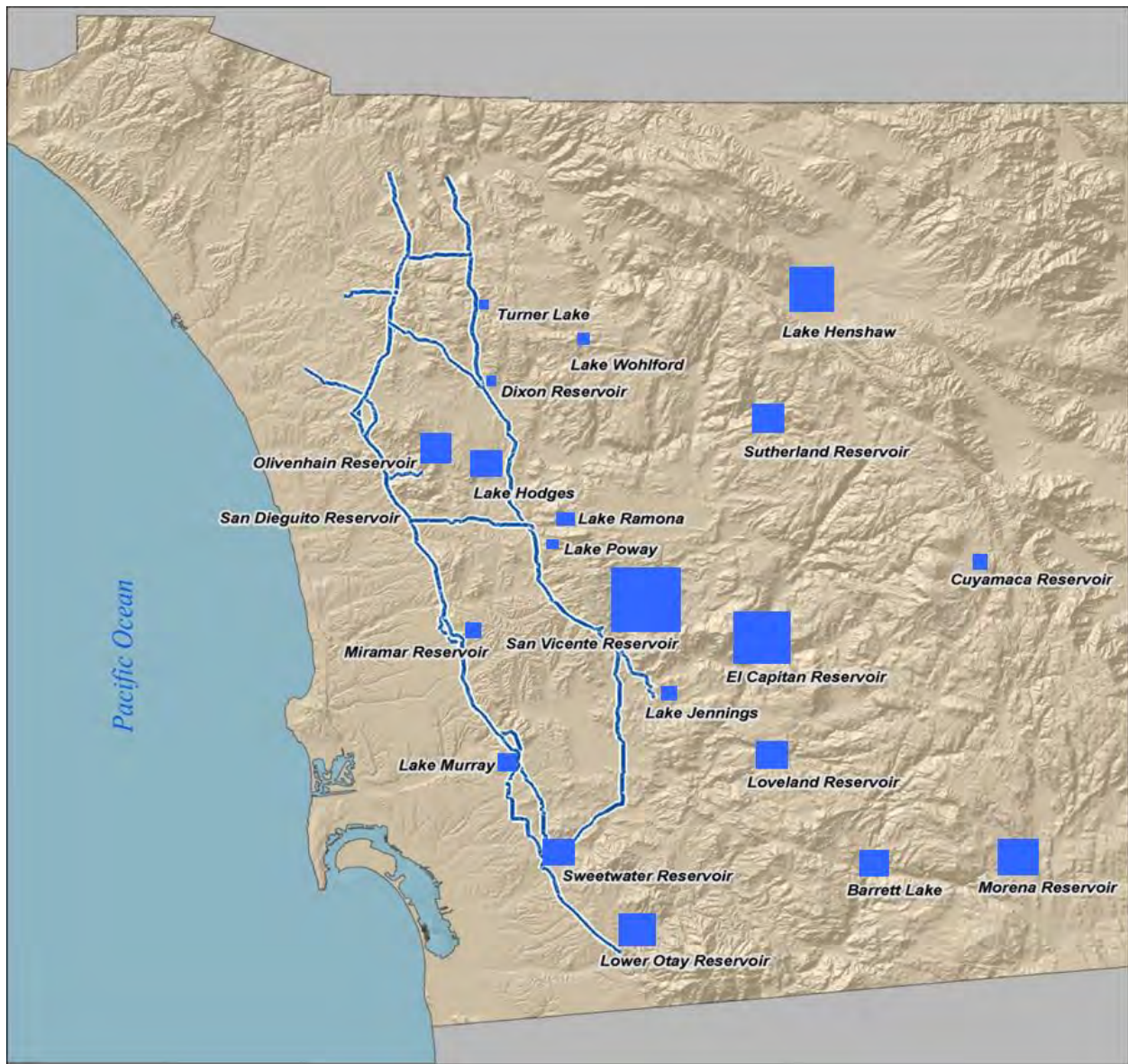


Figure 10 - Location and Relative Capacities of San Diego County Reservoirs

Table 2 - Storage/Capacity in Member Agency and Water Authority Reservoirs (AF)

Reservoir	¹ Total	Usable	Dead (unusable)	Storage as of May 4, 2015				
				Member Agency	Water Authority			Total
					Carryover	ESP	Operational	
Henshaw	51,774	51,768	6	5,249				5,249
Wohlford	6,506	6,156	350	1,934				1,934
Dixon	2,606	2,541	65	2,265				2,265
Sutherland	29,508	29,396	112	1,975				1,975
Hodges	30,632	28,422	1,829	3,145		8,475		11,620
San Dieguito	883	717	166	482				482
² San Vicente	249,358	90,041	5,228	48,839		35,195		84,034
El Capitan	112,807	109,992	2,815	32,064				32,064
Murray	4,684	4,292	392	4,067				4,067
Cuyamaca	8,195	8,195		438				438
Jennings	9,790	9,790		9,013				9,013
Loveland	25,400	25,225	175	7,624				7,624
Sweetwater	28,079	27,179	900	3,550				3,550
Morena	50,694	50,020	674	1,624				1,624
Barrett	34,806	34,207	599	1,958				1,958
Lower Otay	49,849	46,026	3,823	37,015				42,799
Miramar	6,682	5,774	908	5,465				5,465
Poway	3,330	2,560	770	3,072				3,072
Ramona	12,000	11,800	200	2,353				2,353
Turner	1,612	1,552	60	1,125				1,125
Olivenhain	24,789	24,746	43	-		18,000	3,328	21,328

Notes:

1. Capacity information: JMM Consulting Engineers, Inc. (1990), *San Diego County Water Authority Optimal Storage Study: Reservoir Summary Report*, unless updated by Member Agency staff.
2. Maximum reservoir elevation is limited to Elev. 650 (90,041 AF) until DSOD certification and completion of San Vicente By-Pass Pipeline Project.

In addition to meeting local storage and operational demands, Olivenhain, San Vicente, and Hodges reservoirs play a significant role in the Water Authority's Emergency Storage Program (ESP), in response to regional emergency situations related to water supply availability. The San Vicente Reservoir will also be utilized as a regional carryover storage facility.

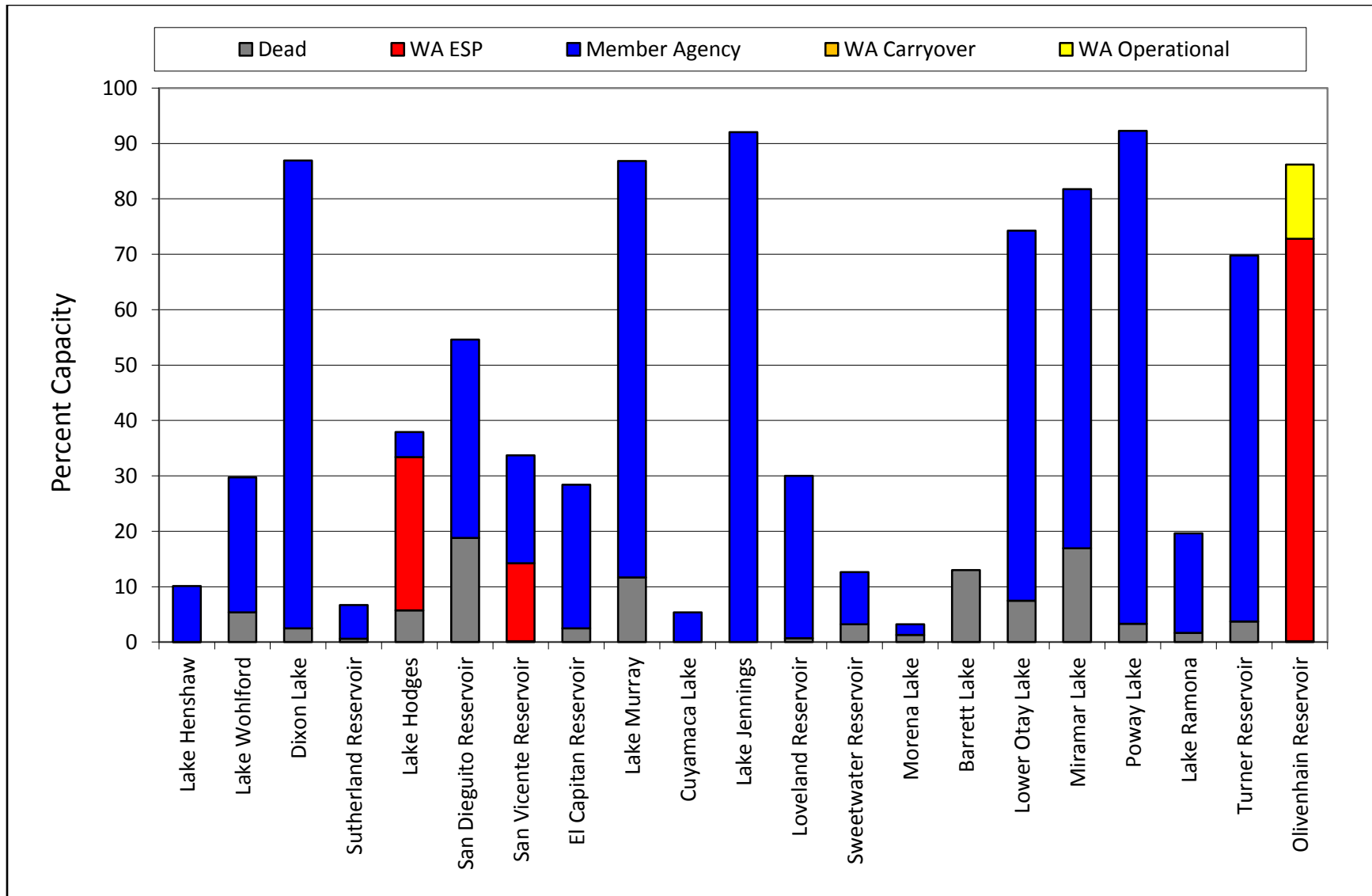


Figure 11- Regional Reservoir Levels (% of Capacity) as of May 1, 2015

(This Figure represents the Water Authority Carryover Storage and Regional ESP Storage)

Note: San Vicente Reservoir’s total storage capacity prior to the dam raise was 90,200 AF. Following the completion of the dam the total storage capacity will be 249,358 AF. Maximum reservoir elevation is limited to Elev. 650 until DSOD certification and completion of San Vicente By-Pass Pipeline Project.

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Asset Management and Major Maintenance Activities

In addition to ongoing corrective maintenance (CM) that is undertaken in response to specific needs or events, the O&M Department is also engaged in a rigorous program of preventative maintenance (PM) that ensures optimal performance of Water Authority assets throughout their life cycles. These PM activities can include inspection, rehabilitation/upkeep, and/or lubrication of assets where appropriate. In addition to routine CM and PM work, the O&M Department undertakes additional Asset Management projects and “major” projects that fall outside the scope of routine maintenance. Some of the activities undertaken during FY2015 included:

- Installation of a new valve actuator at Oceanside 6 flow control facility
- Installation of new control valve and venturi meter at San Diego 11 flow control facility
- Demolition of Otay 9 flow control facility. This facility was no longer in service and was not needed by our Member Agency
- Cathodic protection repair of North County Distribution Pipeline Facilities
- Pipeline 5EII cathodic protection improvements at San Dieguito Creek
- Painting of San Diego 11 Flow Control Facility and Turnout
- Rancho Peñasquitos Hydroelectric Facility electric actuator replacements
- Pipeline 3 Comprehensive Condition Assessment (MFL) from Point of Delivery to Twin Oaks Diversion Structure
- Remote Operated Vehicle (ROV) and visual inspection of the North County Distribution Pipeline
- Leak Detection survey of the Tri-Agencies Pipeline (Smart Ball)



Figure 12 – San Diego 11 Meter and Control Valve Replacement

The Asset Management and major maintenance activities planned by the O&M Department for FY 2016 include:

- Pipeline 3 Comprehensive Condition Assessment San Marcos to Rancho Peñasquitos
- Ramona Pipeline Cathodic Protection Project
- Flow control facility electric actuator replacements (30 locations)
- Painting of Poway 2 Turnout, Ramona Pipeline P3 and P4 Turnouts, VID 3 Flow Control Facility, and Tri-Agency Pipeline P3 and P4 Turnouts
- Access road improvements at Otay 12FCF and along the Crossover Pipeline
- Conversion of 37 facilities to an encrypted 3G/4G wireless technology for communication to the SCADA system
- Condition assessment of turbines, generators, pumps and motors at Olivenhain Pump Station, San Vicente Pump Station and Rancho Peñasquitos Hydroelectric Facility.