MEMORANDUM

DATE: ~~June 13, 2016~~ **Revised June 17, 2016**
TO: State Water Resources Control Board
FROM: John Kennedy, Executive Director of Engineering and Water Resources, and Adam S. Hutchinson, Recharge Planning Manager
CC: Kathy Frevert, SWRCB; OCWD Water Retailers; MWDOC; OCWD Website

SUBJECT: URBAN WATER WHOLESALER SUPPLY INFORMATION

Note: Revisions include adding demands from Laguna Beach County Water District and revising groundwater demands from Mesa Water District (see Retailer notes at bottom of this memorandum). These changes resulted in a slight increase in the amount of water taken out of storage. Revised text is underlined.

The Orange County Water District (OCWD) has evaluated the amount of groundwater supply available to its 19 water retailers using the assumptions required by the State Water Resources Control Board (SWRCB). The SWRCB requires a three-year projection of future supplies based on a repeat of the hydrology of 2013 through 2015. These projections are presented on Table 1, which shows the estimated groundwater supplies available to the 19 OCWD retailers for FY16-17 to FY18-19. This memorandum presents the groundwater supply data and underlying assumptions used to prepare Table 1.

Groundwater Basin Recharge

As shown on Table 1, the main sources of groundwater to the Orange County groundwater basin are:

1. Santa Ana River Base Flows
2. Santa Ana River Storm Flows
3. Incidental Recharge
4. Groundwater Replenishment System (GWRS)
5. Untreated Metropolitan Water District Water
6. Water Taken out of Storage from Ground Water Basin
7. Alamitos Seawater Barrier-Injection Well recharge

Santa Ana River Base Flows

Santa Ana River base flows are primarily comprised of waste water effluent discharged to the river from publicly owned treatment works (POTW). Each year the Santa Ana River Watermaster determines the amount of base flow and storm flow that arrives at

Prado Dam. Since SAR Base Flows have been fairly consistent over the past several years and since they are dependent on waste water discharges and are not significantly affected by rainfall, we assume that future base flows for FY16-17 to FY18-19 will continue to be approximately the same amount that arrived in 2014-15, which was 64,048 afy. The 2014-15 SAR Watermaster report can be found at: http://www.ocwd.com/media/4247/sar_watermaster_2014-15.pdf.

Santa Ana River Storm Flows

The volume of Santa Ana River storm flows that are captured and recharged into the groundwater basin varies annually and is largely dependent on the amount of rainfall received in the SAR watershed. For FY16-17 to FY18-19, the actual storm flow amounts captured and recharged by OCWD for FY12-13 to FY14-15 are used. For these years, storm flow recharge ranged from 23,380 af (FY13-14) to 48,317 af (FY12-13). To put this in perspective, in typical rainfall years, storm flow recharge is approximately 50,000 to 60,000 afy.

Incidental Recharge

Incidental recharge is natural, unmeasured recharge that comes from rainfall within the groundwater basin, percolation of irrigation water and subsurface inflow from the margins of the basin. Like storm flow, incidental recharge is related to rainfall. In an average rainfall year, incidental recharge is approximately 60,000 afy. The table below summarizes the rainfall received at OCWD's Field Headquarters in Anaheim and the amount of incidental recharge to the groundwater basin. Note that incidental recharge reported here is net recharge to the basin after accounting for outflows to Los Angeles County.

Actual Fiscal Year	Rainfall at FHQ (inches)	Incidental Recharge (af)	Projected Fiscal Year
FY12-13	5.85	19,698	FY16-17
FY13-14	5.14	31,867	FY17-18
FY14-15	9.27	49,936	FY18-19

The rainfall and incidental recharge data presented above can be found in Appendix 5 of the Annual OCWD Engineer's Report on the Groundwater Conditions, Water Supply, and Basin Utilizations in the Orange County Water District. Links to the Engineer's Reports for FY12-13 to FY14-15 are below.

http://www.ocwd.com/media/2406/ocwdengineersreport-2012-2013.pdf

http://www.ocwd.com/media/3206/ocwd-engineers-report-2013-2014.pdf

http://www.ocwd.com/media/4260/2014-15-engineers-report.pdf

Groundwater Replenishment System

OCWD's Groundwater Replenishment System (GWRS) was recently expanded to a maximum daily capacity of 100 million gallons per day (MGD). All GWRS water is recharged into the groundwater basin. For FY16-17 to FY18-19, it is projected that the GWRS will supply 103,000 afy of recharge to the basin.

Untreated Metropolitan Water District Water

OCWD routinely purchases untreated imported water from the Metropolitan Water District of Southern California (MWD) for recharge to the groundwater basin. For FY12-13 to FY14-15, OCWD purchased and recharged an average of 49,748 afy of untreated MWD water. This average is assumed for future years FY16-17 to FY18-19. Amounts of untreated MWD water recharged can be found in Appendix 4 under "Forebay Recharge" of the Annual OCWD Engineer's Report on the Groundwater Conditions, Water Supply, and Basin Utilizations in the Orange County Water District. Links to the Engineer's Reports for FY12-13 to FY14-15 are below. Note that in FY14-15, we purchased 10,000 af of water from MWD from MWD's Conjunctive Use Program (see note 6 on Appendix 4 of FY14-15 report).

http://www.ocwd.com/media/2406/ocwdengineersreport-2012-2013.pdf

http://www.ocwd.com/media/3206/ocwd-engineers-report-2013-2014.pdf

http://www.ocwd.com/media/4260/2014-15-engineers-report.pdf

Water Taken Out of Storage of Groundwater Basin

OCWD has a defined operating range of groundwater in storage that ranges from 100,000 to 500,000 acre-feet below full conditions. OCWD desires to keep the storage within this range to allow for capture of water supplies during wet years (i.e., don't want basin too full) and to minimize potential for seawater intrusion or permanent land subsidence (i.e., don't want basin too low). If needed, OCWD can draw the basin down below the desired operating range for short-term emergencies. OCWD determines the amount of groundwater in storage on a monthly basis using a water budget accounting method. Annually, OCWD develops groundwater contour maps of the three main basin aquifers and uses water level changes in the three aquifers to determine the change in storage from the prior year. Contour maps of the Principal Aquifer, from which most groundwater pumping occurs, and the change in Principal Aquifer water levels are presented in the Annual Engineers Reports as Plates 1 and 2. Plate 3 shows long-term hydrographs of selected wells in the basin. Appendix 5 presents the estimated storage level of the groundwater basin (reported as Accumulated Overdraft: AOD) at the end of each Fiscal Year.

Plates 1 and 2 and Appendix 5 can be found in the Annual OCWD Engineer's Report on the Groundwater Conditions, Water Supply, and Basin Utilizations in the Orange County Water District. Links to the Engineer's Reports for FY12-13 to FY14-15 are below.

http://www.ocwd.com/media/2406/ocwdengineersreport-2012-2013.pdf

http://www.ocwd.com/media/3206/ocwd-engineers-report-2013-2014.pdf

http://www.ocwd.com/media/4260/2014-15-engineers-report.pdf

Due to the SWRCB's mandatory conservation requirements, water demands and groundwater pumping over the past year were less than expected, resulting in an increase in groundwater in storage. Based on OCWD's water budgeting method, the groundwater basin was 373,576 af below full conditions as of May 2016. This means there is 126,424 af of storage remaining in the basin, not including short-term emergency storage. The May 2016 storage data can be found at: http://www.ocwd.com/media/4303/water-resources-may-2016.pdf

To supply the groundwater producers in FY16-17 to FY18-19, a total of 119,200 af is withdrawn from groundwater storage. With this withdrawal, OCWD still remains within its preferred operating range.

Alamitos Seawater Barrier-Injection Well recharge

The Alamitos Seawater Barrier protects Los Angeles and Orange Counties from seawater intrusion. An average of 2,000 afy of injection at this barrier replenishes the Orange County groundwater basin with the remainder entering Los Angeles County.

Total Recharge and Allowable Groundwater Pumping

OCWD evaluated the amount of recharge available to the groundwater basin using the assumptions described above as well as the amount that could be withdrawn from storage and found that it could meet 70 percent of total water demand with groundwater. The remainder would need to be met with imported water or other sources. Table 1 shows the amount of groundwater that could be withdrawn from the basin. Note that this amount is slightly higher than the projected level of groundwater pumping by the 19 retail agencies.

Groundwater Basin Pumping/Total Water Demands

OCWD manages groundwater pumping using the Basin Production Percentage (BPP), which is the percentage of total demand that can be met with groundwater. It is OCWD's goal to provide a BPP of 75 percent; however, this may not be possible at times due to drought conditions and water supply availability. For this analysis, we have been able to provide a BPP of 70 percent while remaining within the safe groundwater storage operating range. As described below, there is also groundwater pumping that is in excess of the BPP; however, this pumping is taken into account when considering the overall level of pumping from the groundwater basin.

With a BPP of 70 percent, the retailers must obtain alternative supplies, such as from MWD, to meet the remaining 30 percent of their demands.

BEA Exempt WQ Pumping Projects above the BPP

In select case where groundwater quality conditions warrant, OCWD allows pumping above the BPP. Producers that pump above the BPP in these cases, are not assessed an additional fee called the Basin Equity Assessment (BEA). In future years, it is estimated that pumping above the BPP will be 21,500 afy in FY16-17 and FY17-18. The City of Santa Ana has a water quality project that is projected to come on-line in FY18-19 that will produce an estimated 2,000 afy, which increases the overall pumping level above the BPP to 23,500 afy as shown on Table 1. As mentioned above, this pumping is taken into account in the overall water budget for the basin.

Net Remaining Allowable Groundwater Pumping

After subtracting the BEA exempt water quality related pumping, the net remaining groundwater pumping is calculated. This groundwater is distributed evenly, except for Yorba Linda Water District, to all the retailers to meet 70 percent of their overall demand. YLWD currently has the capacity to meet 65 percent of their demand with groundwater. The remaining 35 percent of their demand will be met with imported water.

Total Average Water Demands in CYS 2013 & 2014

The total average water demands of the 19 retailers in the OCWD service area for calendar years (CYS) 2013 and 2014 was 445,974 afy. To be conservative, the additional groundwater demand of 8,604 afy due to the recent annexation of additional Irvine Ranch Water District (IRWD) area has been added to create a future total demand of 453,729 afy.

Reclaimed Water (Purple Pipe)

Reclaimed water, e.g., purple pipe water, has been subtracted from the total water demand in order to calculate the net total average water demand. It is projected that average reclaimed water production will be 20,390 afy in the future.

Net Total Average Water Demands

The calculated net total average water demands is the total water demand minus any reclaimed water (purple pipe) water used. This total demand must be met using groundwater and imported water. For each producer, the estimated amount of groundwater pumping to meet a portion of their total demand is presented.

Retailer Notes:

As mentioned above, the total demand for the Irvine Ranch Water District (IRWD) was increased by 8,604 afy due to the recent annexation of additional IRWD area into

OCWD. Average CYS 2013 & 2014 demands were reported as 64,771 afy. With the additional annexation demand, the projected future demand is 73,375 afy.

Laguna Beach County Water District (LBCWD) recently contracted with the City of Newport Beach to pump 2,025 afy of groundwater from the basin.

Mesa Water constructed the Mesa Water Reliability Facility that pumps colored groundwater and treats it to potable standards. Mesa can pump up to 8,000 afy of this water; however, for the three year projection, it only needs to pump 5,720 afy to meet its demands.

Yorba Linda Water District (YLWD) can only meet 65 percent of its demands with groundwater.

Table 1

ORANGE COUNTY WATER DISTRICT / URBAN WATER WHOLESALER

SWRCB - EMERGENCY DROUGHT REGULATIONS - SELF CERTIFICATION - ESTIMATED GROUNDWATER PUMPING

See June 13, 2016 Memorandum for Explanation of Data Sources and Assumptions.

	FY16-17	FY17-18	FY18-19
Groundwater Basin Recharge			
Santa Ana River Base Flows	64,048	64,048	64,048
Santa Ana River Storm Flows	48,317	23,380	37,742
Incidental Recharge	19,698	31,867	49,936
Groundwater Replenishment System	103,000	103,000	103,000
Untreated Metropolitan Water District Water Received	49,748	49,748	49,748
Water Taken out of storage from Ground Water Basin	41,350	54,150	23,700
Alamitos Seawater Barrier - Injection Well Recharge	2,000	2,000	2,000
Total Recharge & Allowable Groundwater Pumping	**328,161**	**328,193**	**330,174**
Groundwater Basin Pumping/Total Water Demands			
BEA Exempt WQ Pumping Projects above the BPP	21,720	21,720	23,720
Net Remaining Allowable Groundwater Pumping	306,441	306,473	306,454
Total Average Water Demands in CYS 2013 & 2014	458,153	458,153	458,153
Reclaimed Water (purple pipe)	20,390	20,390	20,390
Net Total Average Water Demands	437,763	437,763	437,763
Basin Production Percentage (BPP)	70%	70%	70%

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Year 1 - FY16-17 **Urban Water Supplier (1)**	**Average 2013 & 2014 Total Water Demands**	**Purple Pipe Reclamation**	**Net Total Water Demands**	**BPP Pumping**	**BEA Exempt Pumping above BPP**	**Total Groundwater Pumping**
Anaheim	66,505	100	66,405	46,485		46,485
Buena Park	14,959		14,959	10,471		10,471
East Orange County Water District (Production)	1,035		1,035	724		724
Fountain Valley	11,444	1,350	10,094	7,066		7,066
Fullerton	29,232		29,232	20,463		20,463
Garden Grove	25,906		25,906	18,135		18,135
Golden State Water Company	26,935		26,935	18,855		18,855
Huntington Beach	30,305		30,305	21,214		21,214
Irvine Ranch Water District*	73,375	17,000	56,375	39,463	14,000	53,463
Laguna Beach County Water District*	3,838		3,838	2,025		2,025
La Palma	2,141		2,141	1,499		1,499
Mesa Water*	20,355	1,286	19,069	13,349	5,720	19,069
Newport Beach	17,042	490	16,552	11,587		11,587
Orange	31,595		31,595	22,117		22,117
Santa Ana	39,812	350	39,462	27,624	-	27,624
Seal Beach	3,792		3,792	2,654		2,654
Serrano Water District	3,260		3,260	2,282		2,282
Tustin	12,186		12,186	8,530	2,000	10,530
Westminster	12,400		12,400	8,680		8,680
Yorba Linda Water District*	21,921		21,921	14,249		14,249
Other	10,115		10,115	7,081		7,081
Total	**458,153**	**20,576**	**437,577**	**304,553**	**21,720**	**326,273**

(1) For suppliers with asterisk, see June 13, 2016 memorandum for more information.

Table 1

Year 2 - FY17-18 Urban Water Supplier (1)	Average 2013 & 2014 Total Water Demands	Purple Pipe Reclamation	Net Total Water Demands	BPP Pumping	BEA Exempt Pumping above BPP	Total Groundwater Pumping
Anaheim	66,505	100	66,405	46,489		46,489
Buena Park	14,959		14,959	10,473		10,473
East Orange County Water District (Production)	1,035		1,035	724		724
Fountain Valley	11,444	1,350	10,094	7,067		7,067
Fullerton	29,232		29,232	20,465		20,465
Garden Grove	25,906		25,906	18,137		18,137
Golden State Water Company	26,935		26,935	18,857		18,857
Huntington Beach	30,305		30,305	21,216		21,216
Irvine Ranch Water District*	73,375	17,000	56,375	39,463	14,000	53,463
La Palma	2,141		2,141	1,499		1,499
Laguna Beach County Water District*	3,838		3,838	2,025		2,025
Mesa Water*	20,355	1,286	19,069	13,350	5,720	19,070
Newport Beach	17,042	490	16,552	11,588		11,588
Orange	31,595		31,595	22,119		22,119
Santa Ana	39,812	350	39,462	27,627	-	27,627
Seal Beach	3,792		3,792	2,655		2,655
Serrano Water District	3,260		3,260	2,282		2,282
Tustin	12,186		12,186	8,531	2,000	10,531
Westminster	12,400		12,400	8,681		8,681
Yorba Linda Water District*	21,921		21,921	14,249		14,249
Other	10,115		10,115	7,082		7,082
Total	**458,153**	**20,576**	**437,577**	**304,578**	**21,720**	**326,298**

(1) For suppliers with asterisk, see June 13, 2016 memorandum for more information.

Year 3 - FY18-19 Urban Water Supplier (1)	Average 2013 & 2014 Total Water Demands	Purple Pipe Reclamation	Net Total Water Demands	BPP Pumping	BEA Exempt Pumping above BPP	Total Groundwater Pumping
Anaheim	66,505	100	66,405	46,487		46,487
Buena Park	14,959		14,959	10,472		10,472
East Orange County Water District (Production)	1,035		1,035	724		724
Fountain Valley	11,444	1,350	10,094	7,066		7,066
Fullerton	29,232		29,232	20,464		20,464
Garden Grove	25,906		25,906	18,135		18,135
Golden State Water Company	26,935		26,935	18,856		18,856
Huntington Beach	30,305		30,305	21,215		21,215
Irvine Ranch Water District*	73,375	17,000	56,375	39,463	14,000	53,463
Laguna Beach County Water District*	3,838		3,838	2,025		2,025
La Palma	2,141		2,141	1,499		1,499
Mesa Water*	20,355	1,286	19,069	13,349	5,720	19,069
Newport Beach	17,042	490	16,552	11,587		11,587
Orange	31,595		31,595	22,118		22,118
Santa Ana*	39,812	350	39,462	27,625	2,000	29,625
Seal Beach	3,792		3,792	2,655		2,655
Serrano Water District	3,260		3,260	2,282		2,282
Tustin	12,186		12,186	8,531	2,000	10,531
Westminster	12,400		12,400	8,681		8,681
Yorba Linda Water District*	21,921		21,921	14,249		14,249
Other	10,115		10,115	7,081		7,081
Total	**458,153**	**20,576**	**437,577**	**304,563**	**23,720**	**328,283**