Santa Ana River Wasteload Allocation Model Update

BASIN MONITORING PROGRAM TASK FORCE

January 8, 2019

Summary of Changes for Final Scenario Runs (Sent December 7, 2018)

Lake Elsinore Spill (Table 1)

- No lake spill assumptions will be included in final runs
- Bookend assumptions for Elsinore Valley Discharges capture possible water quality in Temescal Creek

Agency	Facility / Discharge Point	Current Design Capacity [MGD]	2020 Design Capacity [MGD]	2040 Design Capacity [MGD]	Permit TDS [mg/L]	Permit TIN [mg/L]	Scen A 2020 Max Discharge [MGD]	Scen B 2020 Avg Discharge [MGD]	Scen C 2020 Min Discharge [MGD]	Scen D 2040 Max Discharge [MGD]	Scen E 2040 Avg Discharge [MGD]	Scen F 2040 Min Discharge [MGD]
Elsinore Valley Municipal Water District	Regional WWRF - DP001 (Temescal Wash)	8	12	-	700	10.0	8.0	0.5	0.5	8.0	0.5	0.5

Corona Discharge TDS Concentrations (Table 1)

- TDS concentrations for discharge from Corona WWTP No. 1 will be modeled seasonally to simulate typical variability in TDS concentration (TDS of 725 mg/L for May through November and 665 mg/L for December through April) in the Plant 1 effluent and more accurately evaluate compliance with the August-only Reach 3 TDS objective

Corona Discharge TDS Concentrations (continued) (Table 1)

Agency	Facility / Discharge Point	Current Design Capacity [MGD]	2020 Design Capacity [MGD]	2040 Design Capacity [MGD]	Permit TDS [mg/L]	Permit TIN [mg/L]	Scen A 2020 Max Discharge [MGD]	Scen B 2020 Avg Discharge [MGD]	Scen C 2020 Min Discharge [MGD]	Scen D 2040 Max Discharge [MGD]	Scen E 2040 Avg Discharge [MGD]	Scen F 2040 Min Discharge [MGD]
City of Corona	Corona WWTP-1	11.5	-	15	700[G]	10.0	11.5	4.6	1.5	15.0	8.5	1.5

G. A TDS concentration of 665 mg/L is applied in wetter months (December through April) while a concentration of 725 mg/L is applied in drier months (May through November). The average TDS concentration is 700 mg/L.

Arlington Desalter Discharge (Table 1)

- Developed through discussions with Western

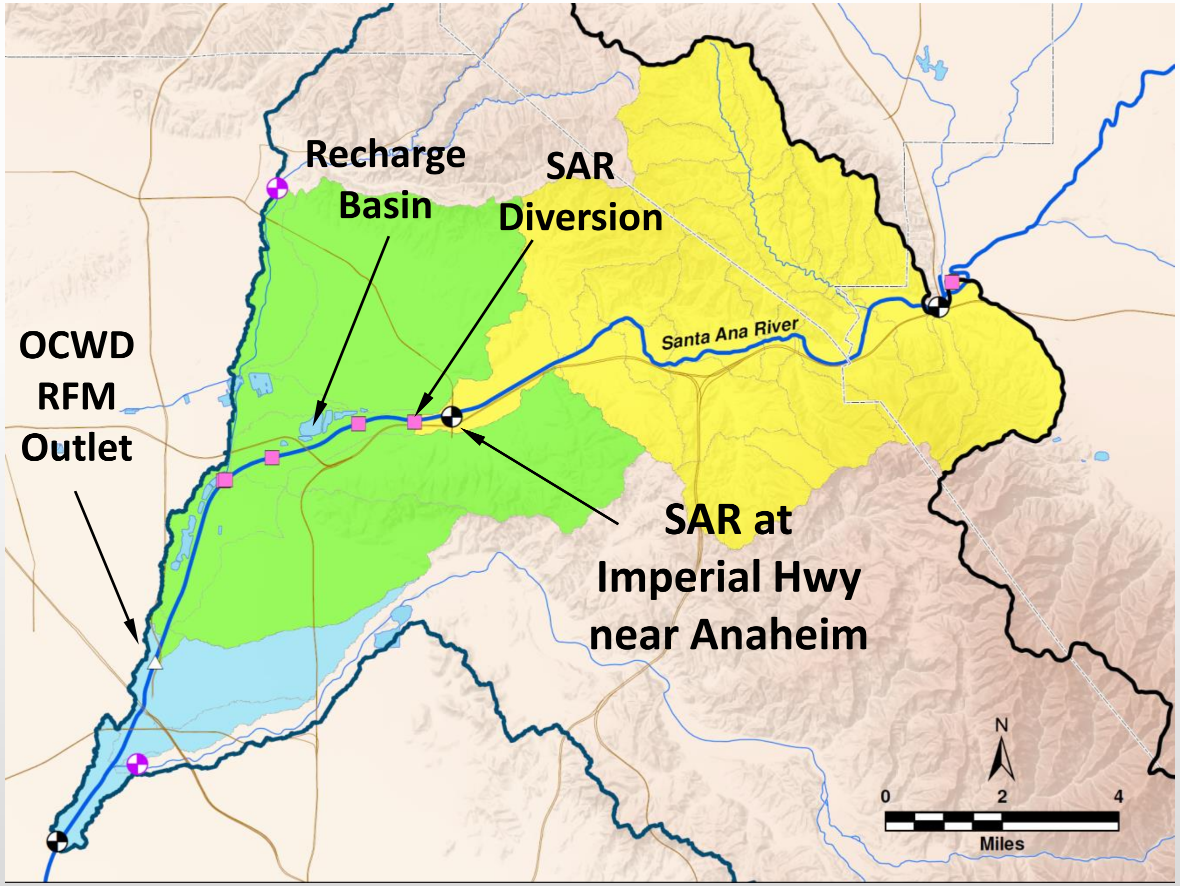
Agency	Facility / Discharge Point	Current Design Capacity [MGD]	2020 Design Capacity [MGD]	2040 Design Capacity [MGD]	Permit TDS [mg/L]	Permit TIN [mg/L]	Scen A 2020 Max Discharge [MGD]	Scen B 2020 Avg Discharge [MGD]	Scen C 2020 Min Discharge [MGD]	Scen D 2040 Max Discharge [MGD]	Scen E 2040 Avg Discharge [MGD]	Scen F 2040 Min Discharge [MGD]
Western Municipal Water District	Arlington Desalter[N]	6.9	7.25	-	260[D]	4.4[D]	7.25	6.3[O]	0	7.25	6.3[O]	0

D. Based on average of last 5 years (WY 2012-2016)

N. Currently, there are no planned discharges from the Arlington Desalter to the SAR. Discharge is included here based on permitted discharge and possible future operations.

O. Discharge of 6.3 MGD will only be applied from November through April.

Streambed Percolation in Orange County GMZ



- Recharge in the Orange County Management Zone will be based on model-calculated streambed percolation from the Imperial Gage to the outlet of the RFM.
- Water quality will reflect that calculated at the Imperial Gage, since the model was calibrated to observed data at this location.

Stormwater Capture in China Basin

- Projected stormwater capture received from Chino Basin Watermaster for 1966 – 1990 with existing facility capacities
- Correlation between the projected stormwater recharge and historical stormwater recharge was applied on either side of this simulation period (i.e., 1950 – 1965 and 1991 – 2016)

Dry Weather Runoff to Off-Channel Percolation Basins

- No data available from SBCFCD. A note will be made in the draft final report.

Summary of Comments on Scenario Assumptions

Summary of Response to Final Scenario Assumptions

- Chino Basin Watermaster/IEUA
- City of Corona
- East Valley Water District (Woodard & Curran)
- Orange County Water District
- Risk Sciences

Comments from Chino Basin Watermaster/IEUA

Comment	GEOSCIENCE Response
1) Exactly what data from Watermaster was used to prepare the stormwater diversion totals in Table 3? The 12/5/18 email states that Watermaster provided the data in Table 3, but since the presentation of the response to comments on draft of TM3, IEUA and Watermaster have not been contacted by GSSI to obtain the appropriate stormwater data for the WLAM. We contacted GSSI earlier this week and asked them to provide the stormwater data they obtained from Watermaster and they were unable to produce the information. We are aware that (1) we have provided multiple datasets to GSSI for other modeling work they are doing in the SAR Watershed and (2) that there are many published reports that describe and report on Watermaster and IEUA's stormwater recharge facilities and expected recharge volumes. …continued on next slide	IEUA contacted Geoscience on December 12, 2018 to request written correspondence between Geoscience and IEUA as well as information provided by IEUA in support of the development of the WLAM discharge assumptions. This information was provided.

Comments from Chino Basin Watermaster/IEUA (continued)

Comment	GEOSCIENCE Response
1) …GSSI may have attempted to use either of these types of information for the WLAM, but in either case, these sources do not contain the precise information that is needed for accurate evaluation of the WLA. If instead of diversion projections provided by Watermaster, the GSSI's WLAM HSPF is simulating the diversions directly, as we recommended in our comments on TM3, we would like to understand the assumptions in the model for the basin operations. Whatever the source of the information, please provide a written explanation of how the data was sourced and also provide us with an excel file, or similar format, of the daily diversions to each stormwater basin for the planning period.	Since the scope of work to develop an accounting of recharge in off channel basins (Task 4) was cancelled, Table 3 consists of a collection of assumptions made with available data. Monthly stormwater projections provided by Watermaster/WEI for the Integrated SAR Model were used for the period from 1966 through 1990, as discussed at the October Task Force meeting. A correlation between the projected stormwater recharge and historical stormwater recharge was applied on either side of this simulation period (i.e., 1950-1965 and 1991-2016). Therefore, the interpolated values reflect the historical monthly stormwater recharge data provided by Watermaster and IEUA, which were the same for the period from 1978 through 2000. A written explanation of these assumptions will be provided in the final report.

Projected Annual Volume of Stormwater Recharge in Chino Basin with Existing Stormwater Recharge Capacity

Fiscal Year[1]	Volume of Stormwater Recharge under Scenario Conditions (acre-ft/yr)	Volume of Undiverted Flow under Scenario Conditions (acre-ft/yr)
1951	7,262	19,682
1952	24,189	86,665
1953	10,263	31,662
1954	12,457	52,925
1955	11,416	38,088
1956	11,848	49,494
1957	10,385	29,729
1958	20,110	80,270
1959	4,608	18,280
1960	6,746	35,399
1961	3,496	14,532
1962	8,418	50,782
1963	5,545	26,892
1964	6,526	34,562
1965	7,840	36,997
1966	11,134	56,120
1967	17,226	67,080
1968	10,908	30,906
1969	22,999	126,147
1970	8,540	25,418
1971	9,568	25,571
1972	5,563	25,490
1973	18,433	41,489
1974	10,709	16,600
1975	12,355	24,069
1976	6,433	20,662
1977	12,598	28,426
1978	25,738	114,366
1979	17,699	48,563
1980	21,213	111,784
1981	7,961	20,177
1982	15,554	47,797
1983	27,460	115,733
1984	12,581	26,961
1985	9,876	33,840
1986	13,986	50,686
1987	7,881	24,785
1988	11,717	14,469
1989	9,326	21,721
1990	6,847	25,993
1991	14,314	43,048
1992	14,314	55,171
1993	14,314	170,483
1994	14,314	29,266
1995	14,314	106,743
1996	14,314	43,853
1997	14,314	55,155
1998	14,314	76,343
1999	14,314	18,711
2000	14,314	26,354
2001	14,093	16,927
2002	14,093	6,931
2003	14,093	52,721
2004	14,093	22,488
2005	40,880	98,552
2006	30,499	27,375
2007	12,429	5,065
2008	24,605	34,928
2009	18,541	31,292
2010	33,264	56,840
2011	39,566	76,909
2012	22,409	20,156
2013	13,648	13,513
2014	11,445	10,035
2015	19,597	25,087
2016	22,325	22,184
Average	**14,760**	**43,893**

[1] Fiscal Year listed represents the year in which the fiscal year ends (e.g., FY 1950 = July 1940 - June 1950)

Comments from Chino Basin Watermaster/IEUA (continued)

Comment	GEOSCIENCE Response
2) Though we are unclear as to the source of the data, we can tell that at least some of the annual stormwater values provided in Table 3 do not make sense. For this reason, we reiterate our request to understand exactly how the numbers were generated and exactly how the annual diversions will be allocated on a daily basis to ensure accurate tracking of TDS and N mass on the tributaries to the SAR. Examples of the data that do not make sense in Table 3: • From FY 1991 to 2000 – the stormwater diversion amount is exactly the same value of 14,314 af. It is not logical to have ten consecutive years of equal recharge in a variable hydrology.	See response to previous comment.

Projected Annual Volume of Stormwater Recharge in Chino Basin with Existing Stormwater Recharge Capacity

Fiscal Year[1]	Volume of Stormwater Recharge under Scenario Conditions (acre-ft/yr)	Volume of Undiverted Flow under Scenario Conditions (acre-ft/yr)
1951	7,262	19,682
1952	24,189	86,665
1953	10,263	31,662
1954	12,457	52,925
1955	11,416	38,088
1956	11,848	49,494
1957	10,385	29,729
1958	20,110	80,270
1959	4,608	18,280
1960	6,746	35,399
1961	3,496	14,532
1962	8,418	50,782
1963	5,545	26,892
1964	6,526	34,562
1965	7,840	36,997
1966	11,134	56,120
1967	17,226	67,080
1968	10,908	30,906
1969	22,999	126,147
1970	8,540	25,418
1971	9,568	25,571
1972	5,563	25,490
1973	18,433	41,489
1974	10,709	16,600
1975	12,355	24,069
1976	6,433	20,662
1977	12,598	28,426
1978	25,738	114,366
1979	17,699	48,563
1980	21,213	111,784
1981	7,961	20,177
1982	15,554	47,797
1983	27,460	115,733
1984	12,581	26,961

Fiscal Year[1]	Volume of Stormwater Recharge under Scenario Conditions (acre-ft/yr)	Volume of Undiverted Flow under Scenario Conditions (acre-ft/yr)
1985	9,876	33,840
1986	13,986	50,686
1987	7,881	24,785
1988	11,717	14,469
1989	9,326	21,721
1990	6,847	25,993
1991	14,314	43,048
1992	14,314	55,171
1993	14,314	170,483
1994	14,314	29,266
1995	14,314	106,743
1996	14,314	43,853
1997	14,314	55,155
1998	14,314	76,343
1999	14,314	18,711
2000	14,314	26,354
2001	14,093	16,927
2002	14,093	6,931
2003	14,093	52,721
2004	14,093	22,488
2005	40,880	98,552
2006	30,499	27,375
2007	12,429	5,065
2008	24,605	34,928
2009	18,541	31,292
2010	33,264	56,840
2011	39,566	76,909
2012	22,409	20,156
2013	13,648	13,513
2014	11,445	10,035
2015	19,597	25,087
2016	22,325	22,184
Average	**14,760**	**43,893**

[1] Fiscal Year listed represents the year in which the fiscal year ends (e.g., FY 1950 = July 1940 - June 1950)

Comments from Chino Basin Watermaster/IEUA (continued)

Comment	GEOSCIENCE Response
3) • The stormwater diversion volumes for the very dry period from FY 2012 through 2017 are far too high. The reported values are 140% to 170% higher than actual stormwater diversions during the drought period. Although we expect the future facilities to increase recharge, an over 100% increase in a dry period is not possible.	The scope of work for the scenario runs assumed that discharge (or recharge values in the case of stormwater diversions) would be supplied by the various agencies. Therefore, any values for stormwater recharge that you think would be appropriate can be used instead of the assumptions summarized in Table 3. If you would like the assumptions to be revised, please provide the daily or monthly stormwater diversion data for the hydrologic period from 1950 through 2016 that you would like to be included in the scenario runs.

Comments from Chino Basin Watermaster/IEUA (continued)

Comment	GEOSCIENCE Response
4) While we were able to confirm with GSSI the general assumptions used for IEUAs recycled water discharges for the range of planning simulations, we would like to request a table that shows the monthly distribution of discharge by discharge point for each of the three levels of discharge (min, average, max) to ensure that the assumptions were accurately captured.	Discharges from the IEUA outfalls were assumed to be the rates provided by IEUA and developed further through conversations between IEUA and Geoscience staff. These flow rates are summarized in Table 1. In general, the discharge rates provided by each agency were applied constantly in the WLAM scenario runs (same discharge each month). The only exception to this approach was made for Eastern Municipal Water District (discharge applied during the wettest month of the year or wettest 6 months of the wettest ½ of years, depending on the scenario) and the seasonal change in discharge concentration for the City of Corona. While discharge may vary slightly by season under actual operational conditions, this fluctuation is captured by the bookend scenario approach; the maximum and minimum scenarios describe the worst and best case recharge and water quality.

Comments from Chino Basin Watermaster/IEUA (continued)

Comment	GEOSCIENCE Response
5) Due to the above issues, we request that the planning runs remain on hold until we reach a reasonable consensus on the stormwater diversions that will be simulated in the Chino Basin.	We will hold off on making the final scenario runs until we get approval from all Task Force members.

Comments from City of Corona

Comment	GEOSCIENCE Response
1) Beaumont - the current design capacity in Table 1 is 4 and in Appendix B it is 6	The plant design capacity submitted in the original data request form was 4 MGD. In the updated data request form (included in Appendix B), the plant design capacity was listed as 6 MGD with a note indicating that plant expansion construction would begin in 2018 and be completed in 2020. Therefore, we assigned a current design capacity of 4 MGD and a 2020 design capacity of 6 MGD.
2) Beaumont - table 1 includes 2020 and 2040 design capacity for Beaumont but Appendix B does not include 2020 or 2040 design capacity so it is unclear where this information came from	We received an email from Cindy Li (Regional Board) on June 1, 2018, requesting that we list Beaumont's 2020 design capacity as 6 MGD and 2040 design capacity as 8 MGD. A footnote will be added to Appendix B to document this change.

Comments from City of Corona (continued)

Comment	GEOSCIENCE Response
3) East Valley - the 2040 average should have changed to 8.5 per Appendix B	The 2040 average expected discharge was changed to 8.5 MGD after a follow-up conversation to the June Progress Meeting with Woodard & Curran (engineers for SNRC project) on July 3, 2018. This change is reflected in the annotation for Appendix B and the model scenario input files, but was not updated in this table. This change will be made
4) Temescal Valley- appendix B does not include a 2040 design capacity but table 1 does	The 2040 design capacity was added to Table 1 at the request of Risk Sciences during a conference call, to reflect the maximum discharge under 2040 conditions. This design capacity value can be removed since it does not affect the modeling assumptions.

Updated Scenario Assumptions - SNRC

Agency	Facility / Discharge Point	Current Design Capacity [MGD]	2020 Design Capacity [MGD]	2040 Design Capacity [MGD]	Permit TDS [mg/L]	Permit TIN [mg/L]	Scen A 2020 Max Discharge [MGD]	Scen B 2020 Avg Discharge [MGD]	Scen C 2020 Min Discharge [MGD]	Scen D 2040 Max Discharge [MGD]	Scen E 2040 Avg Discharge [MGD]	Scen F 2040 Min Discharge [MGD]
East Valley Water District	Sterling Natural Resource Center (SNRC)[B]	0	8.0	10.0	500	6[C]	8.0	6.4	0.0	10.0	8.5	0.0

Updated Scenario Assumptions - TVWD

Agency	Facility / Discharge Point	Current Design Capacity [MGD]	2020 Design Capacity [MGD]	2040 Design Capacity [MGD]	Permit TDS [mg/L]	Permit TIN [mg/L]	Scen A 2020 Max Discharge [MGD]	Scen B 2020 Avg Discharge [MGD]	Scen C 2020 Min Discharge [MGD]	Scen D 2040 Max Discharge [MGD]	Scen E 2040 Avg Discharge [MGD]	Scen F 2040 Min Discharge [MGD]
Temescal Valley Water District	Temescal Valley WRF	1.57	-	-	650	10.0	2.3	1.2	1.0	2.3	2.3	1.9

Comments from City of Corona (continued)

Comment	GEOSCIENCE Response
5) Elsinore Valley – appendix b has 12 for 2020 max and table 1 has 8	Previous modeling assumptions reflected the 2020 and 2040 maximum discharges provided by EVMWD in Appendix B. However, as explained in the email that accompanied the scenario assumptions, these discharges have been recently modified at the recommendation of Risk Sciences to reflect EVMWD permitted discharge. Appendix B will be annotated to reflect this change.
6) Elsinore Valley – appendix b has 16.8 for 2040 max and table 1 has 8	See response above.

Comments from City of Corona (continued)

Comment	GEOSCIENCE Response
7) I did not see the Arlington Desalter or San Bernardino Geothermal plant submittal in appendix B, but I see the below text for Arlington Desalter. Should the design capacity for 2020 reflect the max discharge?	No data projections were received for San Bernardino Geothermal or Arlington Desalter Discharge. These have been added to this version of Table 1 to summarize the assumptions for TAC review since they were discussed in the previous BMP Task Force meeting. As explained in the email that accompanied the scenario assumptions, discharge assumptions for the Arlington Desalter were developed through conversations with Western. The geothermal discharge is assumed to be the average of the last 5 years for all scenario runs (see Footnote D on Table 1).

Updated Scenario Assumptions – San Bernardino Geothermal Plant

Agency	Facility / Discharge Point	Current Design Capacity [MGD]	2020 Design Capacity [MGD]	2040 Design Capacity [MGD]	Permit TDS [mg/L]	Permit TIN [mg/L]	Scen A 2020 Max Discharge [MGD]	Scen B 2020 Avg Discharge [MGD]	Scen C 2020 Min Discharge [MGD]	Scen D 2040 Max Discharge [MGD]	Scen E 2040 Avg Discharge [MGD]	Scen F 2040 Min Discharge [MGD]
City of San Bernardino	San Bernardino Geothermal Plant	-	-	-	264[D]	0.7[D]	1.0	1.0	1.0	1.0	1.0	1.0

D. No discharge projection form (Appendix B) was provided. Discharge assumptions are based on average of last 5 years (WY 2012-2016)

Updated Scenario Assumptions – Arlington Desalter

Agency	Facility / Discharge Point	Current Design Capacity [MGD]	2020 Design Capacity [MGD]	2040 Design Capacity [MGD]	Permit TDS [mg/L]	Permit TIN [mg/L]	Scen A 2020 Max Discharge [MGD]	Scen B 2020 Avg Discharge [MGD]	Scen C 2020 Min Discharge [MGD]	Scen D 2040 Max Discharge [MGD]	Scen E 2040 Avg Discharge [MGD]	Scen F 2040 Min Discharge [MGD]
Western Municipal Water District	Arlington Desalter[N]	6.9	7.25	-	260[D]	4.4[D]	7.25	6.3[O]	0	7.25	6.3[O]	0

D. No discharge projection form (Appendix B) was provided. Discharge assumptions are based on average of last 5 years (WY 2012-2016)

N. No discharge projection form (Appendix B) was provided. Discharge assumptions were developed through conversations with Western. Currently, there are no planned discharges from the Arlington Desalter to the SAR. Discharge is included here based on permitted discharge and possible future operations.

O. Discharge of 6.3 MGD will only be applied from November through April.

Comments from City of Corona (continued)

Comment	GEOSCIENCE Response
8) IEUA and Colton/San Bernardino appendix B submittals, it is unclear if these are accurately reflected in table 1	We developed the IEUA discharge assumptions through conversations with IEUA. These assumptions are discussed in Section 2.3.1.2.2 of TM-3. The minimum and maximum discharges for RIX were developed using SNRC design capacity (minimum RIX discharge) and RIX design capacity (maximum RIX discharge), which were plugged into the excel spreadsheet provided by the City of San Bernardino. Additional explanation for the development of these minimum and maximum discharges will be included in the Draft Final Report.

Comments from Orange County Water District

Comment	GEOSCIENCE Response
1) Regarding the last bullet in the email below, 'Streambed Percolation in Orange County Groundwater Management Zone', please clarify what TDS concentration will be used in the WLAM generated results for the section of the SAR from the Imperial gage through the intersection with the RFM outlet – we assume the TDS concentration used for this section would be the TDS concentration estimated at the Imperial gage, but please clarify. We assume the TDS concentration used for this section would be the TDS concentration estimated at the Imperial gage since this location is where the most extensive historical data set was available for model calibration in this section of the river in Orange County, and also the amount of water entering the river below the Imperial gage is small compared to the amount of water flowing in the SAR past the Imperial gage.	Clarification will be provided indicating that recharge in the Orange County Management Zone will be based on model-calculated streambed percolation from the Imperial Gage to the outlet of the RFM. Water quality will reflect that calculated at the Imperial Gage, since the model was calibrated to observed data at this location.

Comments from Orange County Water District (continued)

Comment	GEOSCIENCE Response
2) Please clarify for Table 2 if the Water Year listed represents the ending the year listed (is ‘2016’ = 2015/16?)	“Water Year” will be clarified in Table 2 to indicate what time period each entry represents (e.g., WY 2016 = Oct 2015 – Sep 2016)
3) Please clarify for Table 3 if the Fiscal Year listed represents the ending the year listed (is ‘2017’ = 2016/17?)	“Fiscal Year” will be clarified in Table 3 to indicate what time period each entry represents (e.g., FY 2016 = Jul 2015 – Jun 2016)

Comments from Orange County Water District (continued)

<table>
<tr><th>Comment</th><th>GEOSCIENCE Response</th></tr>
<tr><td>4) In comparing the magnitude of the values in table 2 vs table 3, some of the values in table 3 seem odd – for example, in table 3, years 2015 and 2016 and 2017 all have more stormwater recharge than year 1993 – and 1993 was a wetter year than 2015, 2016, and 2017 (assuming ‘1993’ was July 1 1992 to June 30 1993)</td><td rowspan="2">Since the scope of work to develop an accounting of recharge in off channel basins (Task 4) was cancelled, Table 3 consists of a collection of assumptions made with available data. Monthly stormwater projections provided by Watermaster/WEI for the Integrated SAR Model were used for the period from 1966 through 1990, as discussed at the October Task Force meeting. A correlation between the projected stormwater recharge and historical stormwater recharge was applied on either side of this simulation period (i.e., 1950-1965 and 1991-2016). Therefore, the interpolated values reflect the historical monthly stormwater recharge data provided by Watermaster and IEUA, which were the same for the period from 1978 through 2000. A written explanation of these assumptions will be provided in the final report.</td></tr>
<tr><td>5) It also seems odd that years 1991 through 2000 all have the same value in Table 3, given that there were significant variations in precipitation in those years.</td></tr>
</table>

Comments from Risk Sciences

Comment	GEOSCIENCE Response
1) Table 2 shows the "Undiverted Stormwater Released from Seven Oaks Dam." I was not clear on whether this table reflects the water that will be held behind the dam and then released later in the year so that it can be captured in SBVWCD's recharge basins or whether this table was just the water that SBVWCD was unable to capture in its recharge basins. I thought it odd that, in the wet winter of 2010 and 2011, the table shows zero flow. I think the problem here is that I don't understand what the values in this table represent and how they affect the rest of the WLAM.	Table 2 represents annual values of undiverted flow that passes the Valley District diversion structure. We have completed some additional analysis and updated the values from 2002 through 2016.

Annual Volume of Diverted and Undiverted Storm Water Released from Seven Oaks Dam with a Diversion Capacity of 500 cfs

Water Year[1]	Diverted Flow that Enters the Valley District Diversion Structure (acre-ft/yr)	Undiverted Flow that Passes the Valley District Diversion Structure (acre-ft/yr)
1950	6,098	0
1951	2,399	0
1952	54,135	28,973
1953	14,940	0
1954	31,358	0
1955	799	0
1956	238	0
1957	2,918	0
1958	59,463	8,926
1959	4,149	0
1960	14,951	0
1961	28,903	0
1962	7,833	0
1963	799	0
1964	238	0
1965	1,664	0
1966	30,122	0
1967	59,463	8,926
1968	5,234	0
1969	98,000	106,614
1970	28,903	0
1971	18,227	0
1972	10,782	0
1973	31,358	0
1974	5,698	0
1975	4,487	0
1976	5,970	319
1977	2,399	0
1978	43,000	28,432
1979	43,000	16,871
1980	43,000	136,260
1981	7,608	0
1982	15,069	0
1983	54,000	57,621
1984	14,951	0
1985	5,083	0
1986	12,227	0
1987	1,329	0
1988	1,409	0
1989	2,918	0
1990	239	0
1991	5,117	0
1992	8,300	0
1993	65,000	62,401
1994	6,098	0
1995	54,000	28,973
1996	10,564	0
1997	11,001	0
1998	65,000	7,948
1999	4,710	0
2000	4,149	0
2001	12,881	0
2002	9,971	0
2003	23,754	0
2004	14,893	0
2005	89,483	28,799
2006	54,485	1,190
2007	19,982	0
2008	31,698	0
2009	22,517	0
2010	43,868	862
2011	73,477	13,176
2012	28,117	0
2013	17,806	0
2014	13,474	0
2015	13,458	0
2016	13,667	0
Average	**22,281**	**8,004**
Maximum	**98,000**	**136,260**
Minimum	**238**	**0**

[1] Water Year listed represents the year in which the water year ends (e.g., WY 1950 = October 1940 - September 1950)

Comments from Risk Sciences (continued)

Comment	GEOSCIENCE Response
2) The last bullet in the email describes how the additional recharge that occurs between the Imperial Gage and the RFM outlet will now be accounted for. But it does not describe how the TDS and TIN concentrations in the recharge water for that zone will be calculated. Will you be using the concentrations that were estimated based on the Imperial gage calibration point or some sort of average between that value and the concentrations that were calculated for the Santa Ana gage further downstream? Are we just trying to quantify the recharge that occurs in the stream channel bottom or are we also accounting for the recharge that occurs in OCWD's off-channel basins using water that was diverted out of the river? Just looking for a bit more detail and clarity so that we are confident we're asking and answering the right question.	Surface flow water quality will be calculated by the model at the Imperial Gage (model simulation was calibrated to observed data at this location). Recharge will only be quantified for that which occurs through the stream channel bottom. Recharge in off-channel basins is not included since the Task Force decided not to incorporate managed recharge in percolation basins.

Next Steps

Next Steps

- Final comments from IEUA by January 11, 2019
- Task Force approval of scenario assumptions by January 18, 2019

Updated Project Schedule

Updated Project Schedule

- **Submit Draft Study Report in Mid-February 2019**
- **Submit Final Study Report in Mid- to Late-March 2019**