Santa Ana River Wasteload Allocation Model Update

BASIN MONITORING PROGRAM TASK FORCE

October 18, 2017

SAWPA

GEOSCIENCE

Overview

- Comments on TM 1 - Data Collection
- Comments on TM 2 - WLAM Update and Recalibration
- Assumptions for Waste Load Allocation Scenarios
- Evaluation of Recharge in Percolation Basins – Pilot Program

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Comments from OCWD

Item	Section	Pg.	Comment	GEOSCIENCE Response
1	Figures	Figure 6	Figure 6 includes 'underground pipe' – some of these features are not part of the channel system but are imported water pipelines – it does not seem relevant to include them in Figure 6	

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Comments from SAWPA

Item	Section	Pg.	Comment	GEOSCIENCE Response
1	2	2	Please change acronym for Riverside County Flood Control and Water Conservation District to (RCFCWCD) as is their normal protocol.	
2	General	-	Overall, the report appears to be very brief and summarized citing the sources of data collection that are largely reflected in the original proposal and scope. We recommend additional information be added to this TM about the "process of data collection" particularly for data from the public owned treatment works. The data collection form should be included as an appendix with explanation as to why and how data will be used in the model. Concerns had been raised about some data collection associated with the recharge basins and how this will be incorporated into the new WLAM update.	
3	General	-	Some discussion of how data collected will be entered into the HSPF platform for later would be helpful	

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Comments from RWQCB

Item	Section	Pg.	Comment	GEOSCIENCE Response
1	2.3.10.2	11	Add reference for TIN in effluent from OCWD wetlands.	
2	3.1	12	Add the degree of accuracy for streamflow data for each gaging station used for model calibration.	
3	3.1	12	Provide explanation on why only three gaging stations were used for the TDS/TIN calibration.	
4	3.3	15	Provide an explanation for the reduction in model performance between the 2008 WLAM (R4) and the WLAM Update (HSPF) seen at the San Timoteo Creek near Loma Linda and Temescal Creek at Main Street gaging stations.	
5	3.3	15	Provide an explanation for the poor model performance at the Santa Ana River at Santa Ana gaging station.	
6	General	-	Revisit areas where the model is over/underestimating streamflow and may need improvement (e.g., Figures 20, 21, 24, and 28).	
7	Figures	Figure 48	According to the scatter plot shown on Figure 48, the model appears to consistently overestimate streamflow. Please address.	

Comments from OCWD

Item	Section	Pg.	Comment	GEOSCIENCE Response
1	2.2	4	Section 2.2, Watershed Model Development – it is not clear if the stormwater runoff in the green shaded area in Figure 5 is accounted for in the model. The green shaded area includes flow that would be conveyed to the SAR through the Carbon Diversion Channel, Fletcher Channel, and some other small tributaries to the SAR that are located between OCWD's Imperial Highway inflatable dam and Santiago Creek. OCWD's Recharge Facilities Model does not simulate runoff in the green shaded area. Please provide more discussion of the modeling of stormwater runoff in the green shaded area in Figure 5.	
2	Figures	Figure 2	For Figure 5, please add a legend for the symbols	
3	2.3.8	9	Section 2.3.8, Wastewater Discharge – add a table showing the wastewater discharge for each facility per year	
4	2.3.8	9	Section 2.3.8, Wastewater Discharge – is there no discharge by Eastern MWD at their discharge point to Temescal Creek?	

Comments from OCWD (Cont.)

Item	Section	Pg.	Comment	GEOSCIENCE Response
5	General	-	A water budget summary table should be included – among other items, the table should list total runoff, total wastewater discharge, total unmanaged streambed infiltration, total managed infiltration (such as OCWD managed infiltration, and other agencies if it can be accounted for), total evapotranspiration, rising groundwater at Riverside Narrows, rising groundwater in Prado Basin, and total outflow at the downstream model boundary; the table should list the above terms by year; the table should be used to demonstrate that all the water in the system is accounted for from a mass balance perspective on an annual basis.	
6	2.3.9	10	Section 2.3.9, Rising Groundwater – text should be added to describing how the rising groundwater rate was estimated at the two locations; reference is made in the text to Figure 10, but it is not clear from Figure 10 where the rising groundwater is specified; please include additional features on Figure 10 to specify where rising groundwater is defined in the model;	

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Comments from OCWD (Cont.)

Item	Section	Pg.	Comment	GEOSCIENCE Response
7	2.3.10.2	10	Section 2.3.10.2, OCWD Wetlands – the TIN of effluent from the OCWD Prado Wetlands should be varied seasonally – the winter time nitrate removal rate is lower than the summer time removal rate. For May-October, a TIN effluent of 1 mg/L is appropriate; for November-April, 4 mg/L is appropriate.	
8	3.3	15	Section 3.3, Streamflow Calibration Results – the R2 values should be included in the table on page 15.	
9	3.3	15	Section 3.3, Streamflow Calibration Results – in the table on page 15, the monthly streamflow calibration is listed as 'very good' for both the 2008 WLAM and the WLAM Update for the Prado Inflow – in looking at Figure 31, the 2008 WLAM calibration result is noticeably better than the WLAM Update – since (1) Prado Dam is where runoff in the upper Santa Ana Watershed collects before flowing to the lower Santa Ana Watershed, (2) Water Quality Objectives are identified for Reach 2 and 3 in the Regional Board's Basin Plan, and (3) Reaches 2 and 3 are demarcated at Prado Dam, additional attention should be given to the WLAM Update calibration results at Prado Dam. OCWD is not yet ready to use the WLAM Update for assessing future conditions until more evaluation is given to the calibration shown in Figure 31.	

Comments from OCWD (Cont.)

Item	Section	Pg.	Comment	GEOSCIENCE Response
10	3.3	13	Section 3.3, Streamflow Calibration Results – it would be helpful to have more discussion of the parameters that were changed for calibration – for example, discussion could be added to explain the degree to which each parameter was changed, and whether it was changed throughout the model or in certain areas; this should be added to Section 3.3, or an earlier section.	
11	3.3	15	Section 3.3, Streamflow Calibration Results – the daily streamflow calibration for the WLAM Update is listed as 'poor' for the SAR at Santa Ana – the reason for the poor calibration should be described in greater detail.	
12	3.4	16	Section 3.4, TDS and TIN Calibration – the table showing the residuals on page 16 should also include the residuals calculated on a percentage basis.	
13	3.4	16	Section 3.4, TDS and TIN Calibration – the evaluation of the flow calibration uses the methodology of Donigian (2002) to categorize the calibration performance; is there a similar methodology for the calibration of TDS and TIN that can be used to categorize the residuals?	

Comments from OCWD (Cont.)

Item	Section	Pg.	Comment	GEOSCIENCE Response
14	3.4	16	Section 3.4, TDS and TIN Calibration – it would be helpful to have more discussion of the parameters that were changed for calibration – for example, discussion could be added to explain the degree to which each parameter was changed, and whether it was changed throughout the model or in certain areas; a brief amount of text is already included for the nitrogen reaction rate coefficients, but discussion should be added for the other parameters that were changed.	
15	General	-	General document formatting comment – the tables that are imbedded in the text are not numbered (for example, there is no table number for the table on page 16); these tables are some of the most important tables in the document and will be referred to frequently; these tables should be numbered for ease of reference.	

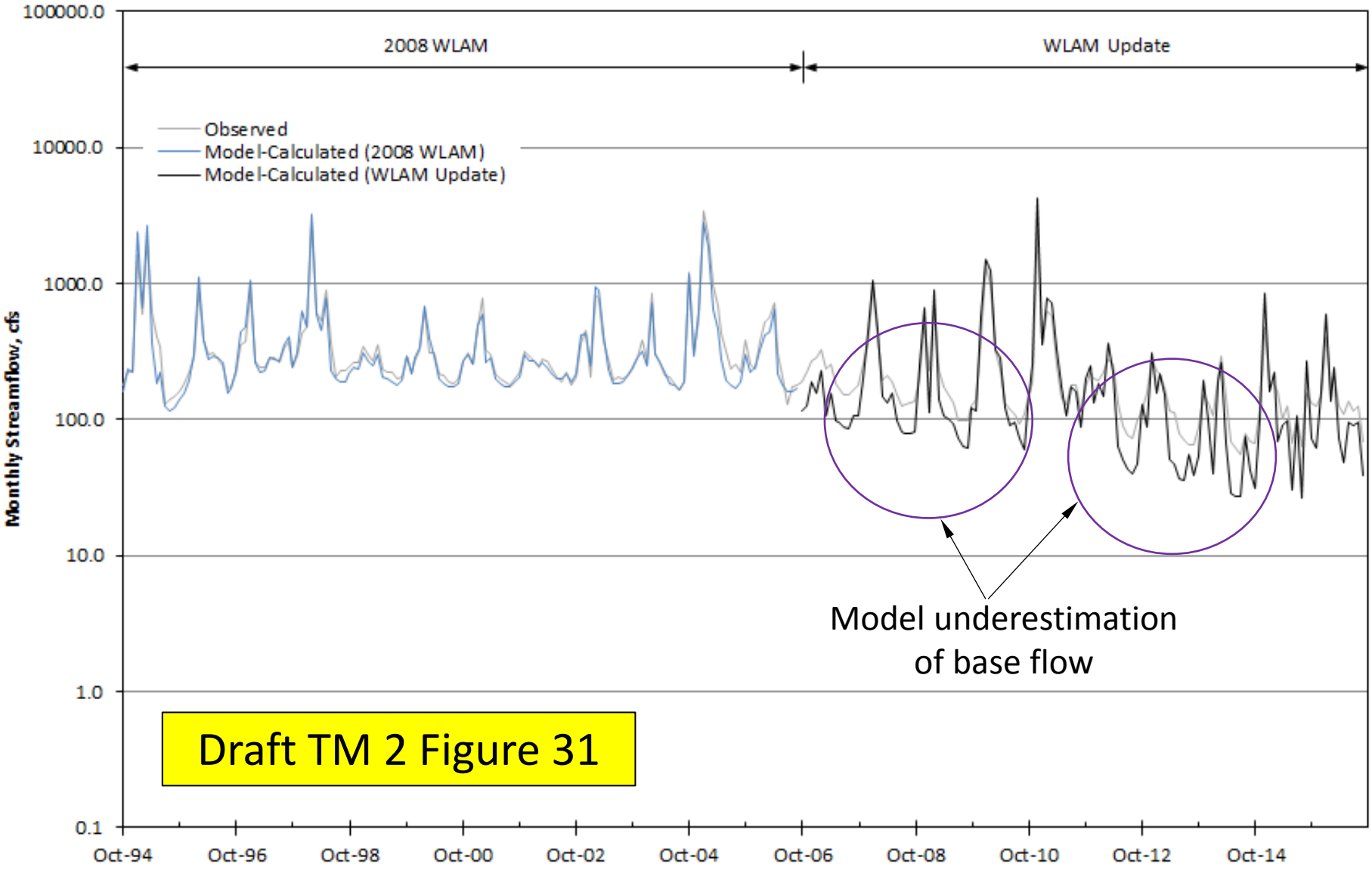
Comments from SAWPA

Item	Section	Pg.	Comment	GEOSCIENCE Response
1	1.1	1	Page 1. This TM has a significant number of acronyms associated with model components, see page 10, so it is recommended to have a list of acronyms and abbreviations. I may have missed them but many do not appear to be defined at all.	
2	1.2	2	Page 2. The last paragraph on this page needs further explanation. It is unclear from these sentences whether reference to "the model update" is referring to just the 2008 WLAM model or/and the new model using HSPF.	
3	2.1.1	3	Page 3. Last line. Change "compressive" to "comprehensive".	
4	2.3.5	8	Page 8. 1st paragraph. It seems very odd to be using an ET station labeled "Los Angeles County Public Works (LACPW) station at Puddingstone Dam" which is outside the Santa Ana River Watershed should be used. There are multiple ET sites in the Santa Ana River Watershed that have been established by water agencies to support the development of water budgets. Please confirm accuracy of ET and whether use of more local ET stations is warranted.	

Comments from SAWPA

Item	Section	Pg.	Comment	GEOSCIENCE Response
5	2.3.10.1	10	Page 10. Please explain what "nitrogen reaction rate coefficients" are. Are these the same thing as nitrogen loss coefficients?	
6	2.3.10.2	11	Page 11. The statement that the OCWD wetlands were used to treat all the effluent of WRCWRA plant seems too simplistic and not entirely accurate. Please expound. Devoting just three sentences about the OCWD wetlands and how impacts the WLAM seems overly brief and summarized. More detail is warranted. For example, though the wetlands is effective in nitrogen removal, evaporation through the wetlands would increase the TDS concentrations. Is this negligible? Please discuss why this particular nitrogen loss mechanism is addressed by the model why other nitrogen loss uptakes such as vegetation are not.	
7	3	12, 15	Page 12 & 15. The first sentence states that the calibration is a trial and error process until a "reasonable" match is met between model simulation and actual flows. However, some calibration results indicate a rating of Poor with the new WLAM model. Please explain why a "Poor" R2 level is considered a "reasonable" or "satisfactory" match. Please explain.	

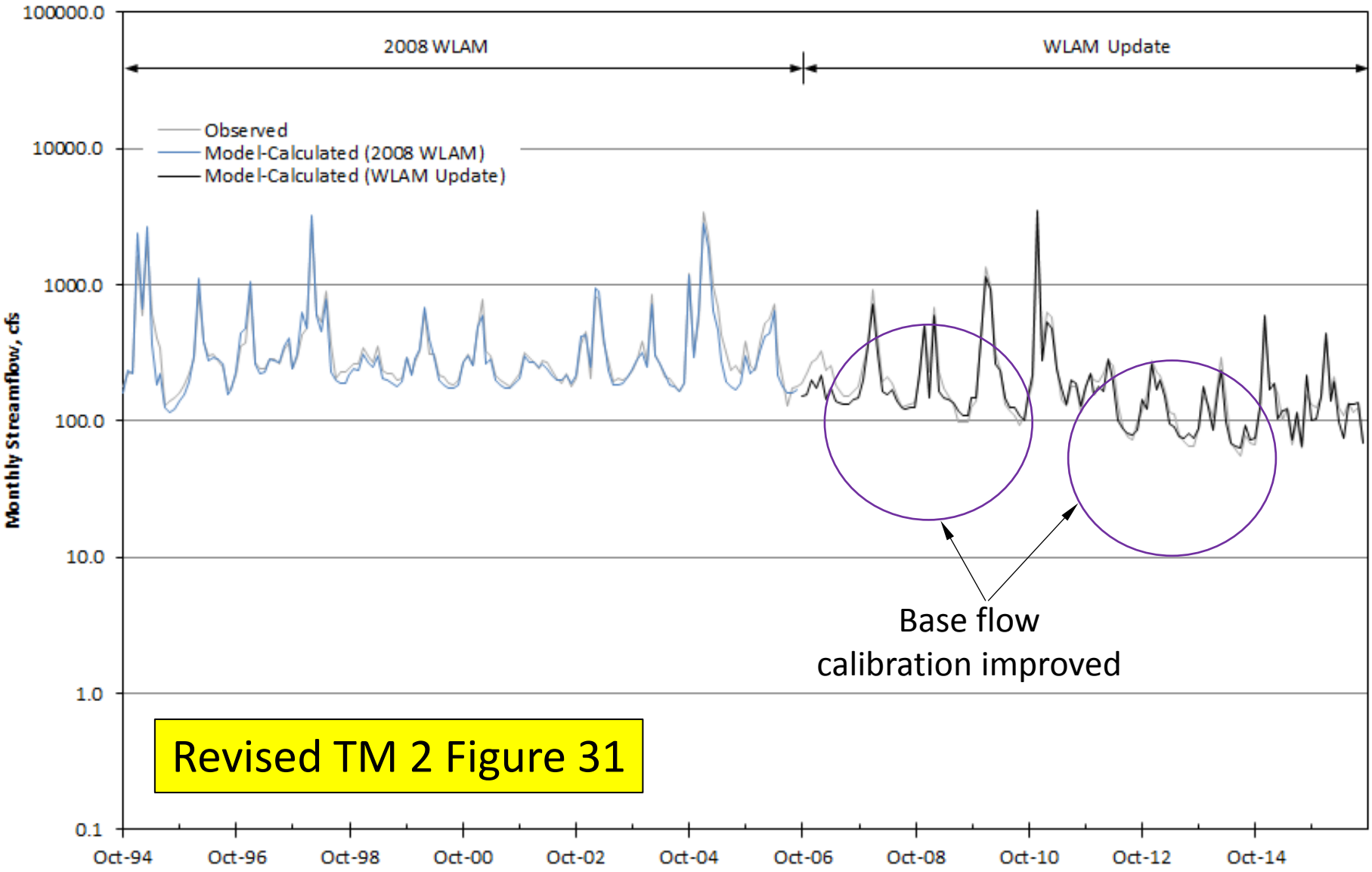
Hydrographs of Measured and Model-Simulated Monthly Streamflow at the Santa Ana River Inflow to Prado – Water Years 1995 to 2006 (2008 WLAM) and Water Years 2007 to 2016 (WLAM Update)



Draft TM 2 Figure 31

Figure 31

Hydrographs of Measured and Model-Simulated Monthly Streamflow at the Santa Ana River Inflow to Prado – Water Years 1995 to 2006 (2008 WLAM) and Water Years 2007 to 2016 (WLAM Update)



Revised TM 2 Figure 31

Figure 31

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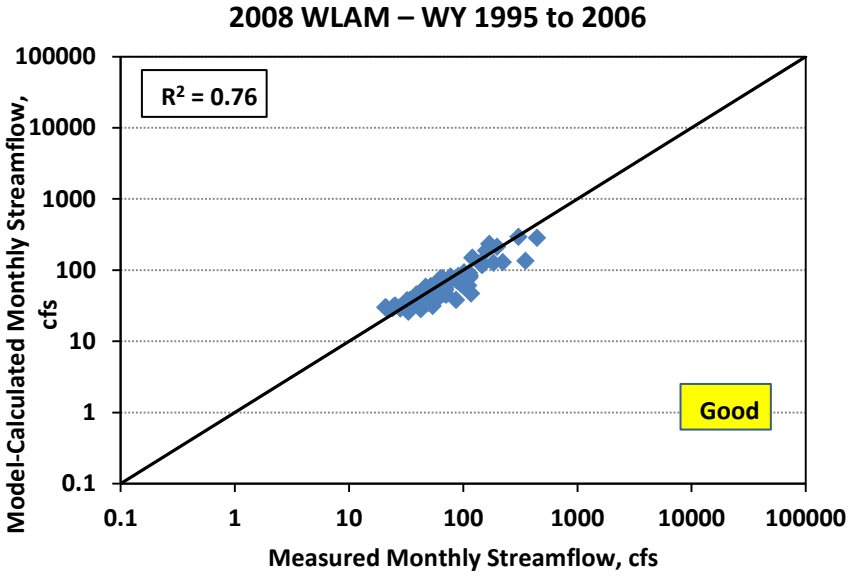
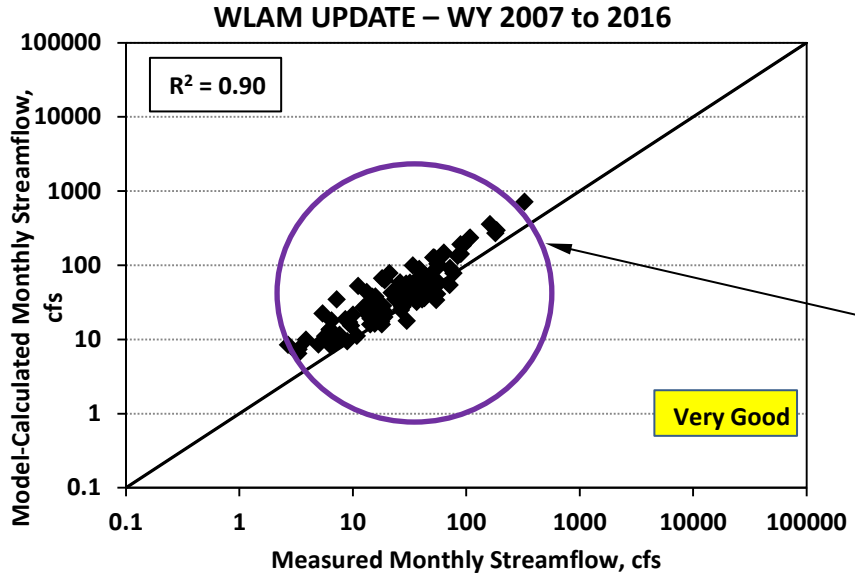
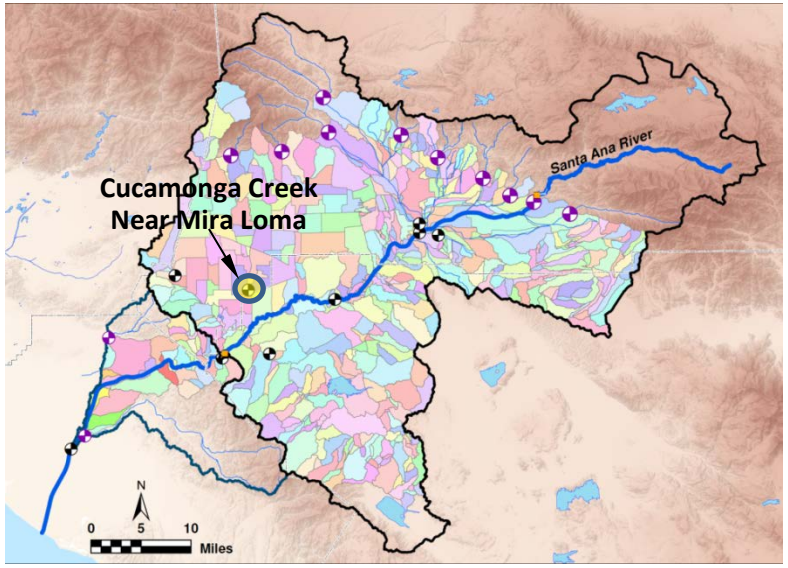
Draft TM 2 Figure 48







Model overestimates streamflow consistently

SCATTERPLOTS OF MEASURED AND MODEL-SIMULATED MONTHLY STREAMFLOW AT THE CUCAMONGA CREEK NEAR MIRA LOMA WATER YEARS 1995 TO 2006 (2008 WLAM) AND WATER YEARS 2007 TO 2016 (WLAM UPDATE)

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19-Sep-17

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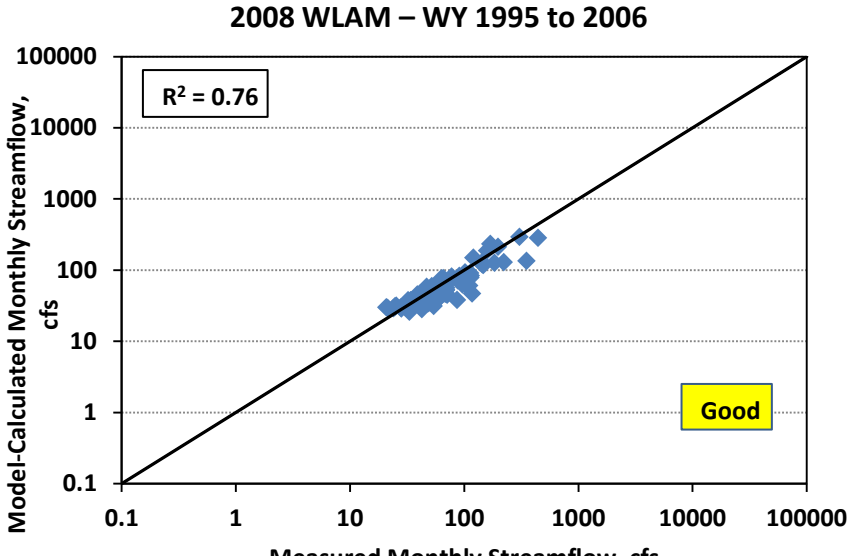
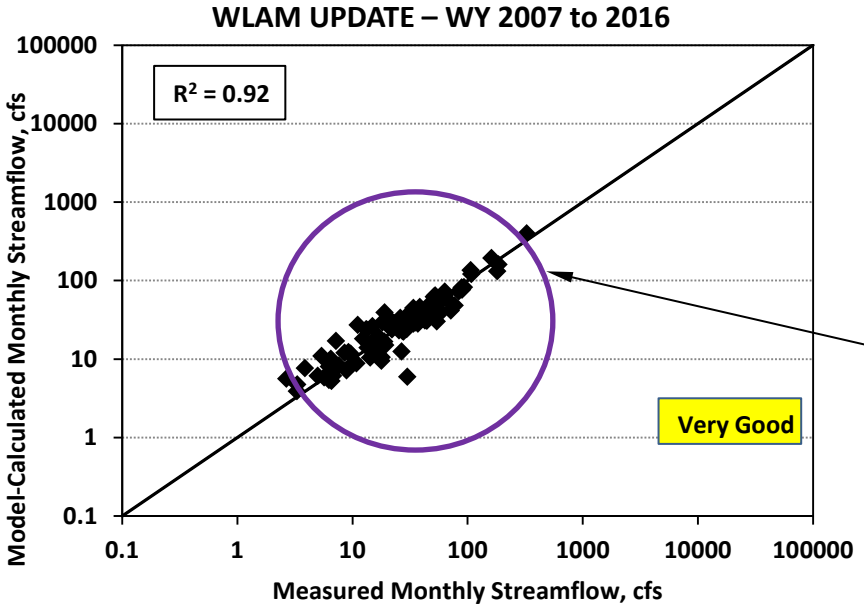
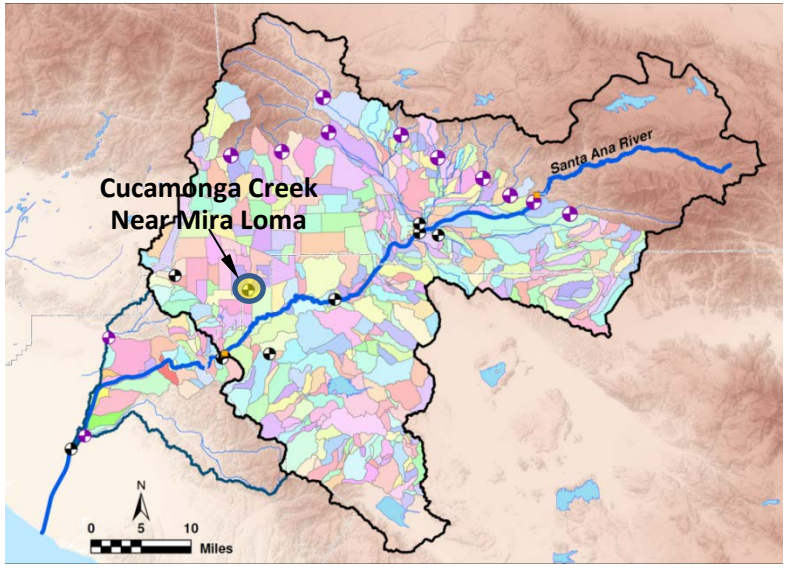
Revised TM 2 Figure 48







Overestimation of streamflow improved

SCATTERPLOTS OF MEASURED AND MODEL-SIMULATED MONTHLY STREAMFLOW AT THE CUCAMONGA CREEK NEAR MIRA LOMA WATER YEARS 1995 TO 2006 (2008 WLAM) AND WATER YEARS 2007 TO 2016 (WLAM UPDATE)

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19-Sep-17

Hydrographs of Measured and Model-Simulated Monthly Streamflow at the Temescal Creek at Main Street
Water Years 1995 to 2006 (2008 WLAM) and Water Years 2007 to 2016 (WLAM Update)

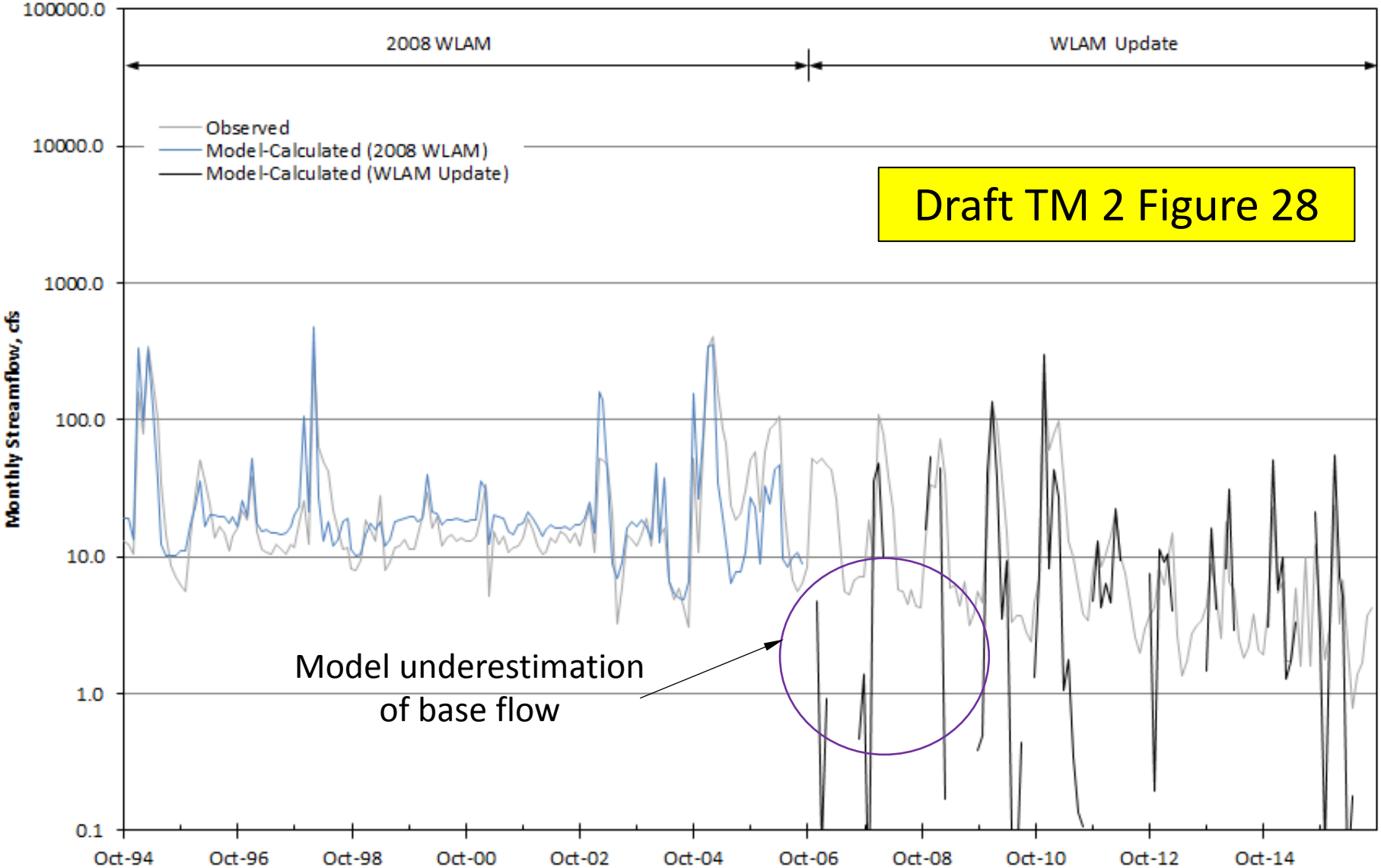

Figure 28

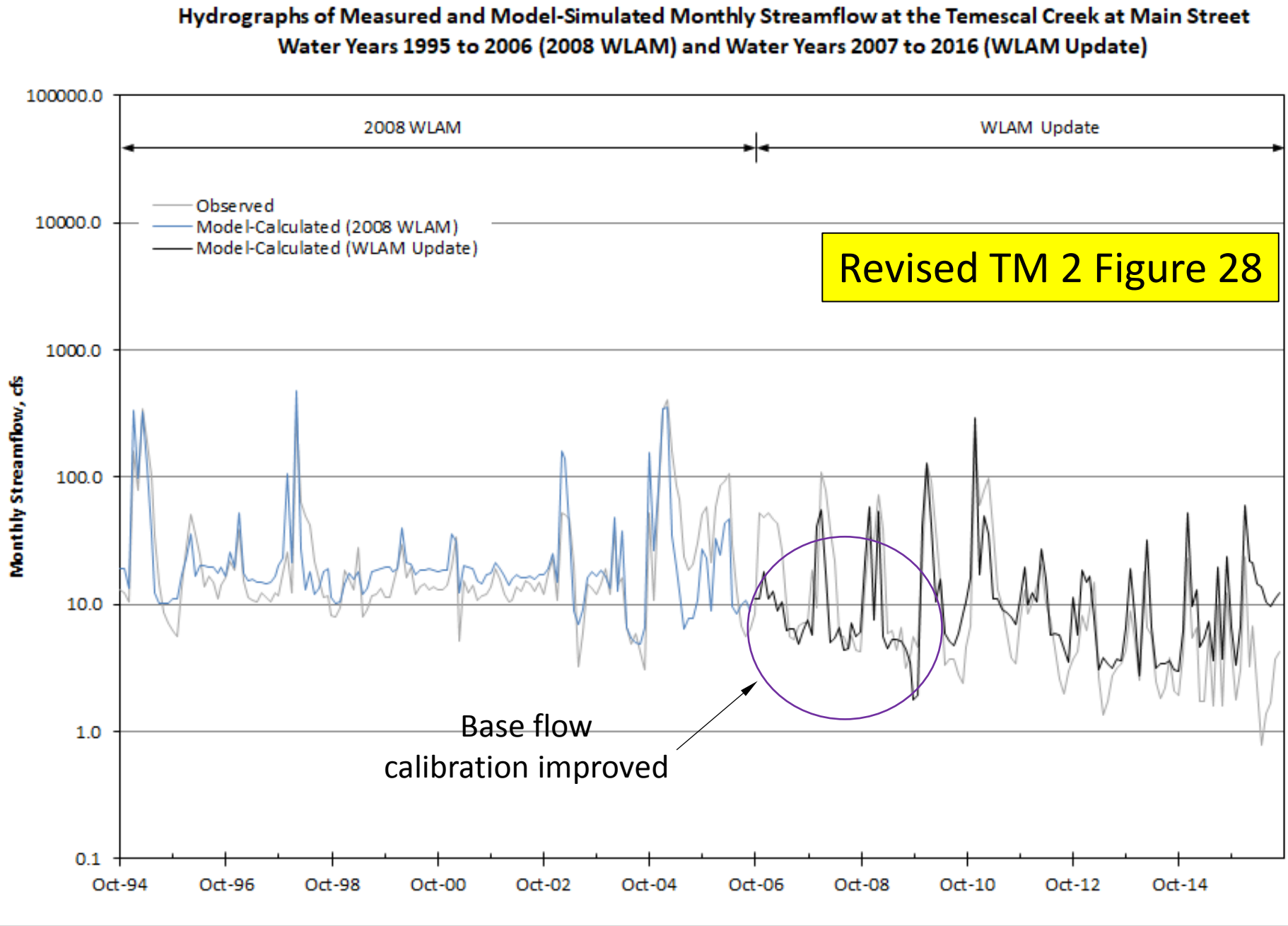
Hydrographs of Measured and Model-Simulated Monthly Streamflow at the Temescal Creek at Main Street
Water Years 1995 to 2006 (2008 WLAM) and Water Years 2007 to 2016 (WLAM Update)
2008 WLAM
WLAM Update
Observed
Model-Calculated (2008 WLAM)
Model-Calculated (WLAM Update)
Revised TM 2 Figure 28
Monthly Streamflow, cfs
100000.0
10000.0
1000.0
100.0
10.0
1.0
0.1
Oct-94
Oct-96
Oct-98
Oct-00
Oct-02
Oct-04
Oct-06
Oct-08
Oct-10
Oct-12
Oct-14
Base flow
calibration improved

Figure 28

TDS Calibration Performance

Gaging Station	2008 WLAM (R4) WY 1995-2006			WLAM Update (HSPF) WY 2007-2016		
	Mean Residuals	Average Observed TDS	Residual as % of Observed TDS	Mean Residuals	Average Observed TDS	Residual as % of Observed TDS
	mg/L	mg/L	%	mg/L	mg/L	%
Santa Ana River at MWD Crossing	16.4	591	2.8%	-0.4	587	-0.1%
Santa Ana River below Prado Dam	20.7	535	3.9%	-2.0	619	-0.3%
Santa Ana River at Imperial Highway near Anaheim	NA	NA	NA	7.8	640	1.2%

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TIN Calibration Performance

Gaging Station	2008 WLAM (R4) WY 1995-2006			WLAM Update (HSPF) WY 2007-2016		
	Mean Residuals	Average Observed TIN	Residual as % of Observed TIN	Mean Residuals	Average Observed TIN	Residual as % of Observed TIN
	mg/L	mg/L	%	mg/L	mg/L	%
Santa Ana River at MWD Crossing	-0.45	6.14	-7.4%	-0.40	8.45	-4.7%
Santa Ana River below Prado Dam	-0.07	5.13	-1.4%	-0.28	3.92	-7.1%
Santa Ana River at Imperial Highway near Anaheim	NA	NA	NA	-0.21	3.09	-6.8%

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Revised Data Request Form

Agency Name:	
POTW Plant Name	
Plant Design Capacity (MGD)	
NPDES Permit Discharge Location:	
Contact Person:	
Contact Phone Number:	
Contact E-mail Address:	
Current Discharge Permit No.:	
Reg. Bd. Res. No. & Date:	

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Revised Data Request Form (Cont.)

DISCHARGE to SURFACE WATER	Current	2020	2040
Maximum Expected Discharge (MGD)			
Average Expected Discharge (MGD)			
Minimum Expected Discharge (MGD)			

RECYLED WATER for IRRIGATION or REUSE	Current	2020	2040
Maximum Expected Reuse (MGD)			
Average Expected Reuse (MGD)			
Minimum Expected Reuse (MGD)			

RECYCLED WATER for AQUIFER RECHARGE	Current	2020	2040
Maximum Expected Recharge (MGD)			
Average Expected Recharge (MGD)			
Minimum Expected Recharge (MGD)			

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Revised Data Request Form (Cont.)

WATER QUALITY	TIN	TDS
Effluent Limit in Current Discharge Permit (mg/L)		
Recent 12-mos. Volume Weighted Average (mg/L)		
Est. 12 mos. Volume Weighted Average in 2040 (mg/L)		

1) Current or recent annual average can be calendar 2016 or FY 2016-17 or other 12 mo. rolling average.

2) "MGD" = million-gallons-per-day (annualized average).

3) Agencies with multiple treatment facilities and outfalls may need to complete separate forms for each facility and/or discharge location.

4) If water quality in the recycled water earmarked for reuse is different from the water quality of the wastewater that is discharged, such differences should be described in detail.

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Status Data Request

Agency	Data Request (25-Aug-17)	Revised Data Request (2-Oct-17)
City of Beaumont	✓	✓
City of Corona	✓	✓
City of Redlands		
City of Rialto		
City of Riverside	✓	
City of San Bernardino	✓	
Eastern Municipal Water District		✓
Elsinore Valley Municipal Water District	✓	✓
Inland Empire Utilities Agency		
San Bernardino Valley Municipal Water District (Sterling Natural Resource Center)	✓	
Temescal Valley Water District	✓	
Sterling Natural Resource Center	✓	
Western Municipal Water District	✓	✓
Yucaipa Valley Water District		

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Major Assumptions for Waste Load Allocation Scenarios

Scenario	Hydrology	Land Use	Maximum Discharge (Zero Recycled)	Planned Recycled / Discharge)	50% of Planned Recycled
A	WY 1950-2016	2012	X		
B				X	
C					X
D		General Plan (2040)	X		
E				X	
F					X

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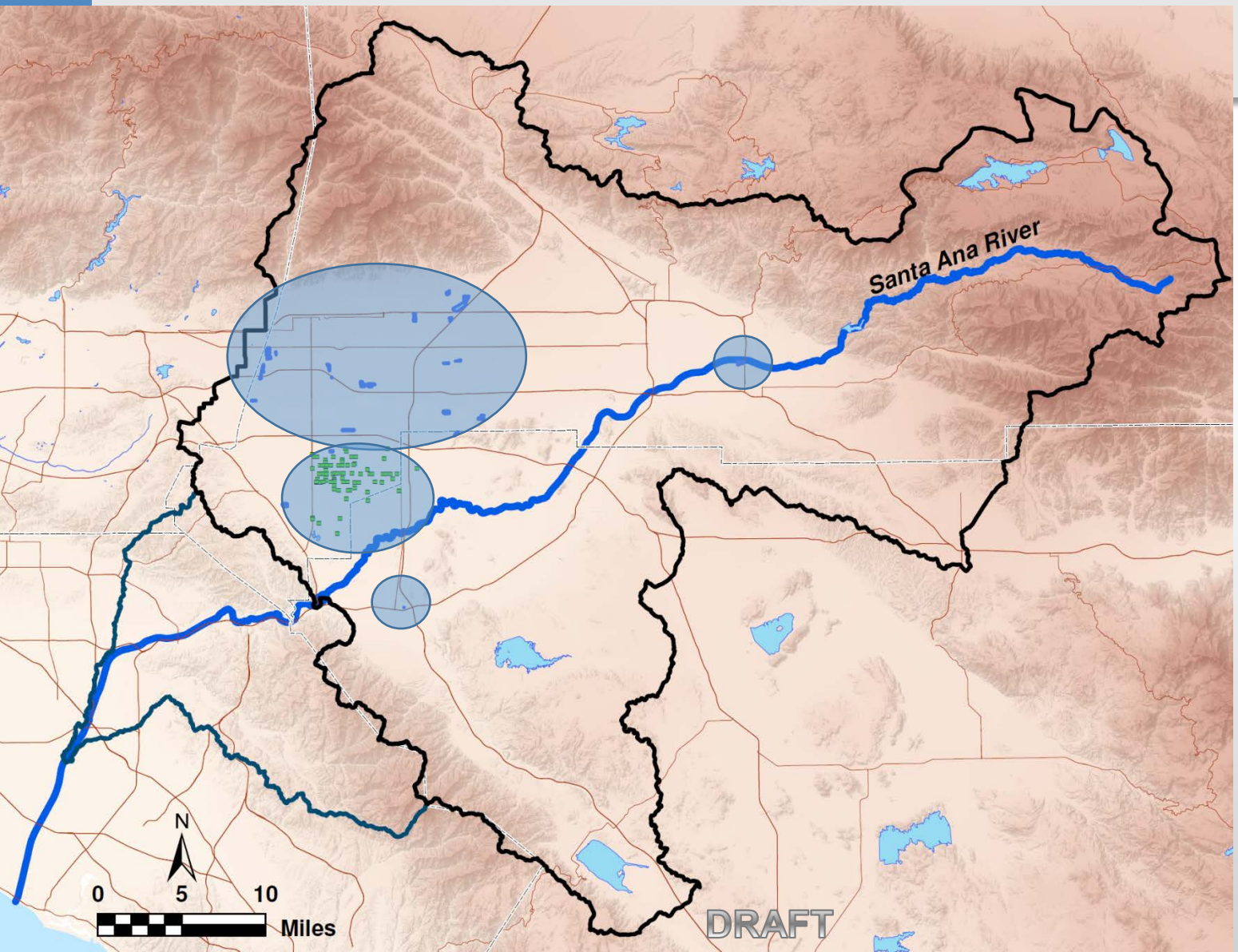
Evaluation of Recharge in Percolation Ponds – Pilot Program



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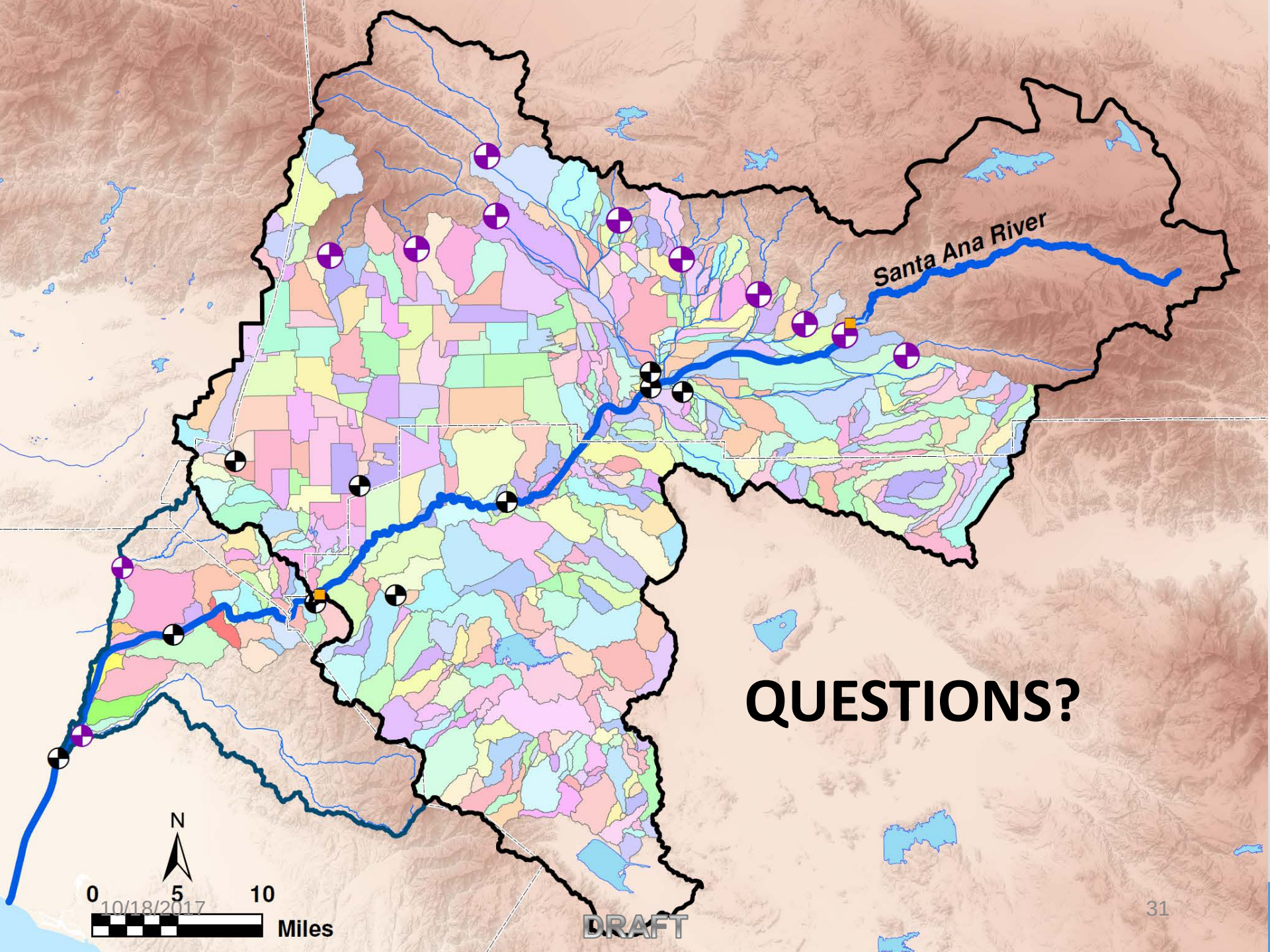
- City of Redlands,
- City of Corona,
- IEUA, and
- Dairy ponds in Chino-North GMZ



QUESTIONS?

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