Basin Planning Priorities Task 1 Workshop Surface Water Monitoring Requirements and Goals for the Santa Ana River Watershed Part 2 and Analysis of Modeling Tools

February 22, 2022

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#### **Reach 4**

Surface Water Objectives: TDS = 550 mgl TIN = 10 mgl

#### **Basin Plan Metric/Data:**

<u>No description</u> in the Basin Plan of the data required for sampling and assessment for the Reach 4 objectives.

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### Reach 4

Surface Water Objectives: TDS = 550 mgl TIN = 10 mgl What are the Surface Water Objectives in Reach 4 Protecting ? Recharge to Riverside-A GMZ

Question to be answered by the surface water monitoring data to compare to the objective: What is the quality of the flow in Reach 4?

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#### Reach 4 – Questions on the Monitoring for Compliance of Surface Water Objectives

# Is the data collected enough to assess the quality of flow in Reach 4 and compliance with Reach 4 objectives?

- Should sampling be representative of baseflow or total flow?
- Should sampling be done more than the month of August?
- Should there be more than one sample per year at each site?
- Should sampling be done at different locations than the three used currently?



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#### Reach 5

Surface Water Objectives: TDS = 300 mgl TIN = 5 mgl

#### **Basin Plan Metric/Data:**

<u>No description</u> in the Basin Plan of the data required for sampling and assessment for the Reach 5 objectives.

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#### Reach 5

Surface Water Objectives: TDS = 300 mgl TIN = 5 mgl

What are the Surface Water Objectives in Reach 5 Protecting? Recharge in the Bunker Hill-B and Colton GMZs.

Question to be answered by the surface water monitoring data to compare to the objective: What is the quality of the discharge in Reach 5

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#### Reach 5 – Questions on the Monitoring for Compliance of Surface Water Objectives

#### Is the data collected enough to assess the quality of flow in Reach 5 and compliance with Reach 5 objectives?

- Should sampling be representative of baseflow or total flow?
- Should sampling be done more than the month of August?
- Should there be more than one sample per year?
- Should sampling be done at different locations than the one used currently?



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# Analysis of Modeling Tools

# **Relationship of the WLAM to the Basin Plan**

- Simulates fate of TDS/TIN in watershed to determine wasteload allocations (i.e., maximum TDS/TIN loads that can be discharged to achieve and maintain compliance with water quality objectives)
- Why is monitoring data important?
  - Evaluate current compliance
  - Used for model to predict future compliance and wasteload allocations

# **Question for model analysis**

- What gaps in our understanding of the Santa Ana River become apparent from reviewing the models?
  - To answer this question, we will:
    - Examine assumptions in WLAM
    - Review WLAM results What is the uncertainty in how the model represents the flow components and dynamics of the Santa Ana River?
    - Compare WLAM assumptions to ISARM and CVM
    - Compare model results Do the model results differ?

# Once we understand the model uncertainties...

• How could the monitoring be improved to reduce these uncertainties?

## WLAM – Assumptions



https://sawpa.org/

- HSPF does not directly simulate surface water/groundwater interaction
- Losing reaches:
  - Specified infiltration rate
- Gaining reaches:
  - Point inflow

## WLAM – Sensitivity Analysis for Reaches 3 and 4



- Purpose: determine effect of changes
  in rising water on model-calculated
  streambed recharge
- WLAM is calibrated to flow/quality at Riverside Narrows (RN)
  - Different parameters can yield similar results
  - Uncertainty in the quantity/quality of rising water

## WLAM – Sensitivity Analysis for Reaches 3 and 4



- Two scenarios:
  - 1. Final Calibration Run
  - Sensitivity Run Calibration run with rising water at Riverside Narrows (RN) reduced by 50%
- Calibrated Sensitivity Run to match flow/quality at RN (MWD Xing)
- What is the water/salt budget of different segments?

140,000 TDS Flow 120,000 Load (tons) 100,000 Volume-weighted TDS (mgl) Flow (afy)/TDS Reach 4 80,000 Reach 3 60,000 Annual Average 795 795 40,000 Other Inflows **Rising Water** 305 20,000 305 0 Inflows Outflows Inflows Outflows Inflows Outflows Inflows Outflows (Sensitivity) (Sensitivity) (Calibration) (Calibration) (Sensitivity) (Calibration) (Calibration) (Sensitivity) DRAFT

as evaluated in the 2017 WLAM sensitivity analysis

Simulated components of Flow and TDS in the SAR overlying Riverside-A GMZ

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Simulated components of Flow and TDS in the SAR overlying Riverside-A GMZ as evaluated in the 2017 WLAM sensitivity analysis





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140,000 Flow TDS 120,000 Load (tons) 100,000 Flow (afy)/TDS Reach 4 80,000 Reach 3 60,000 Annual Average 795 413 795 **290** 40,000 Other Inflows **Rising Water** ET 305 20,000 305 Flow at Riverside Narrows

Streambed Infiltration to Riverside-A GMZ

Flow from Reach 4 into Reach 3

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Outflows

(Calibration)

Inflows

(Sensitivity)

Outflows

(Sensitivity)

Inflows

(Calibration)

0

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Simulated components of Flow and TDS in the SAR overlying Riverside-A GMZ as evaluated in the 2017 WLAM sensitivity analysis

352

Outflows

(Sensitivity)

DRAFT

203

Outflows

(Calibration)

Inflows

(Sensitivity)

Inflows

(Calibration)

# WLAM – Sensitivity Analysis

- Multiple combinations of streambed recharge and rising water can yield the same flow/quality at RN
- Monitoring data used for calibration leaves considerable uncertainty in the Santa Ana River dynamics



# **Groundwater Models - Assumptions**

- MODFLOW simulates surface Based on relationship water/groundwater between: interaction - Water table depth
  - Streambed characteristics
  - Water level in stream



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# Integrated SAR Model (Geoscience, 2020)

- MODFLOW (plus HSPF) model developed for support of the Upper SAR Habitat Conservation Plan
- Domain covers entire SAR watershed tributary to Prado Dam
- Calibrated to flow in SAR at Prado Dam
- Calibration period: 1966 through 2016

# Chino Valley Model (WEI, 2020)

- MODFLOW (plus HSPF and R4) model developed for recalculation of Chino Basin Safe Yield and other studies
- Domain covers watershed tributary to Chino Basin to Prado Dam
- Calibrated to flow in SAR at Prado Dam
- Calibration period: 1978 through 2018

# **Analysis of Groundwater Models**

- Objective is to understand how model-estimated surface water-groundwater interaction compares to WLAM assumptions
  - Compared the average net exchange of water over the common period of analysis (WY 2007 through 2016)



## Integrated Model



#### CVM



### Comparison





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# How do the models inform the gaps in our understanding of the SAR?

- Multiple representations of the Santa Ana River can yield the same flow/quality at monitoring (calibration) points.
- Unknown quantity and quality of streambed infiltration or rising water; insufficient to understand the quality/quantity of water infiltrating into the GMZs
- The models that simulate groundwater-surface water interaction have results that disagree with the WLAM assumptions/results.
- Field data to understand these dynamics and represent them in a model is lacking.

# How could the monitoring be improved to reduce these uncertainties?

- Monitoring objective is to better understand surface water-groundwater interactions as opposed to evaluating current compliance with objectives
- Special study to address these uncertainties can inform long-term monitoring program to support the calibration of modeling tools and assess annual compliance
- Potential improvements:
  - Expanding current surface water monitoring to include other locations and/or constituents (e.g., temperature)
  - Groundwater level/quality monitoring near the Santa Ana River to constrain groundwater-surface water interaction

# Proposed Surface Water Monitoring Program Work Product

- Two elements:
  - Description of monitoring program needed to assess current compliance with the surface water objectives
  - Commitment to develop workplan for special monitoring studies that will improve our modeling and understanding of the dynamics of the Santa Ana River



#### **Next Steps**

- Continue feedback on questions through March 2, 2022.
  - Send to Veva Weamer <u>weamer@westyost.com</u> or Garrett Rapp <u>grapp@westyost.com</u>
- Late March/Early April 2022 Prepared Draft Technical Memorandum Surface Water Monitoring Requirements and Goals for the Santa Ana River Watershed

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