



2025 Safe Yield Reevaluation

Workshop #1 – Hydrogeologic Conceptual Model

August 30, 2023

Meeting Objectives



Develop understanding of scope and schedule of 2025 Safe Yield Reevaluation (SYR), updates to hydrogeologic conceptual model (HCM) and numerical models, and expectations of future engagement by peer review committee



Gather feedback on updates to HCM and numerical models

Agenda

- **Welcome and Introductions**
- **Background and Objectives**
- **Scope of Chino Valley Model Update**
- **Updates to Hydrogeologic Conceptual Model**
- **Other Model Updates**
- **Next Steps and Schedule**

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Background – April 28, 2017 Court Order



Enabled update of the Safe Yield Reset methodology



Required 2025 Safe Yield Reevaluation



Required annual data collection, evaluation, and reporting

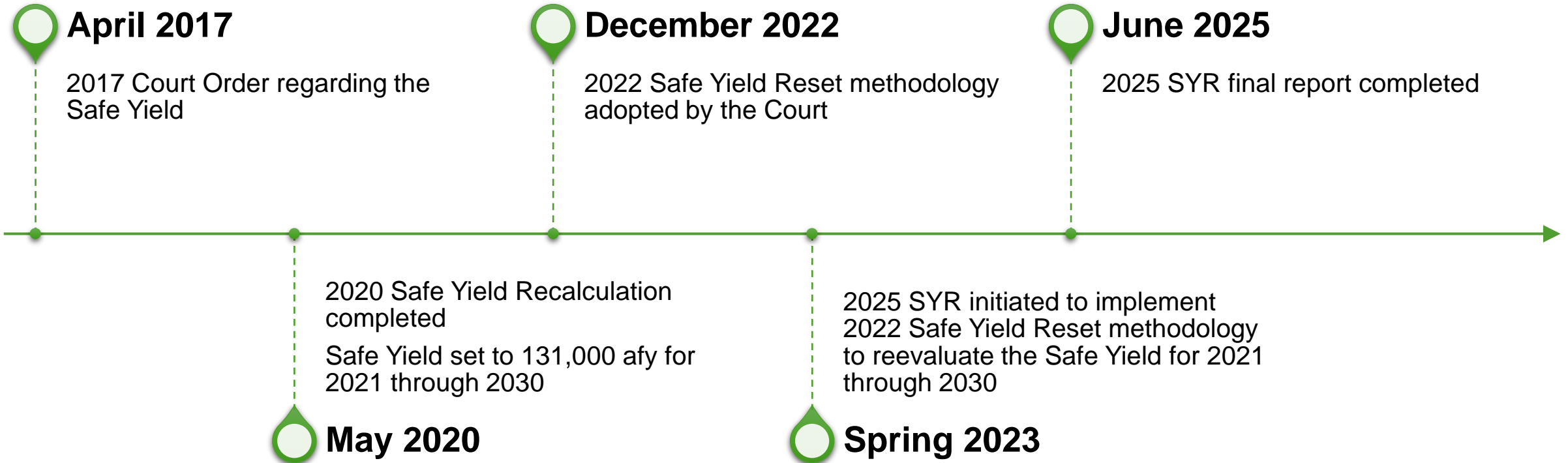


Allowed for an interim correction of Safe Yield (+/- 2.5%)




Required a peer review process

How Did We Get Here?



2025 SYR Process

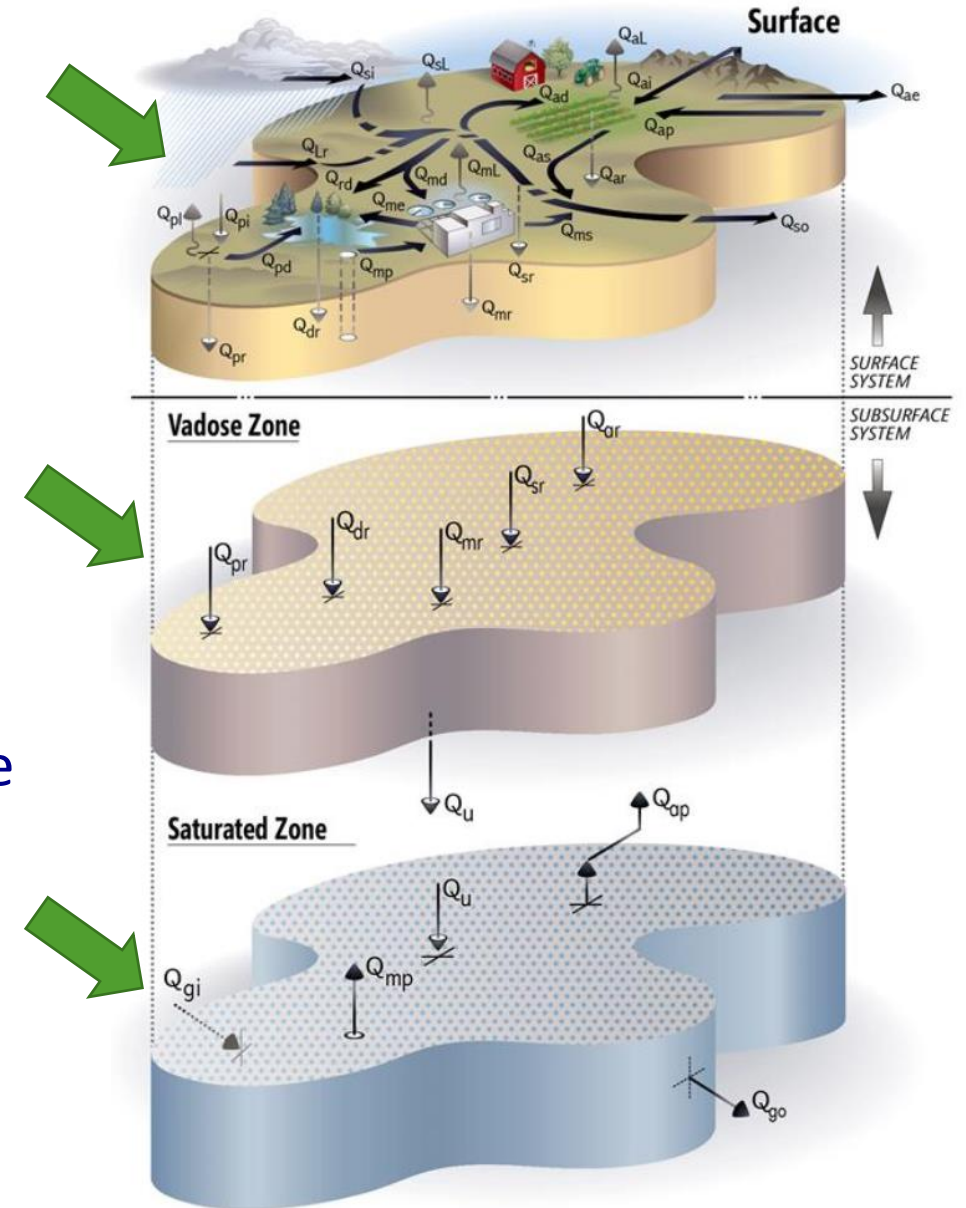
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- Update hydrogeologic conceptual model
 - Generate calibrated realizations (2025 CVM)
 - Develop projection realizations
 - Simulate projection realizations
 - Evaluate simulation results and calculate Safe Yield
 - Develop 2025 SYR report
 - Reset Safe Yield (if necessary)

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CVM Overview

- CVM comprises five codes:
 1. HSPF: San Gabriel Mountain Hydrology
 2. R4: Runoff, surface water flow, stormwater recharge, some agricultural pumping, applied water, soil zone processes
 3. HYDRUS-2D: Vertical flow through vadose zone
 4. MODFLOW-NWT: Groundwater flow
 5. PESTPP-IES: Parameter estimation and uncertainty/sensitivity analysis



Scope of CVM Update

- Update the 2020 CVM to incorporate new data/information as appropriate and refine where necessary
- Updates include:
 - Cross-sections and layering
 - Spadra/Chino Barrier
 - Delineation of Santa Ana River and its tributaries
 - Calibration period
 - Lag time calculation
 - R4 model update and validation

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Scope to Update the Hydrogeologic Conceptual Model (HCM)



Review new data/information to update understanding of the structure and dynamics of the groundwater system



Use updated HCM to update the numerical groundwater-flow model (e.g., layer discretization, aquifer properties, boundary flows, stream properties)

Overview of the HCM used in the 2020 CVM

- Boundary inflows from:
 - Adjacent mountains and hills
 - Adjacent groundwater basins
 - Bloomington Divide
- Five-layer aquifer system:
 - Aquifers (Layers 1, 3, 5)
 - Aquitards (Layers 2, 4)
- Bottom of aquifer defined consolidated bedrock
- Internal barriers to groundwater flow

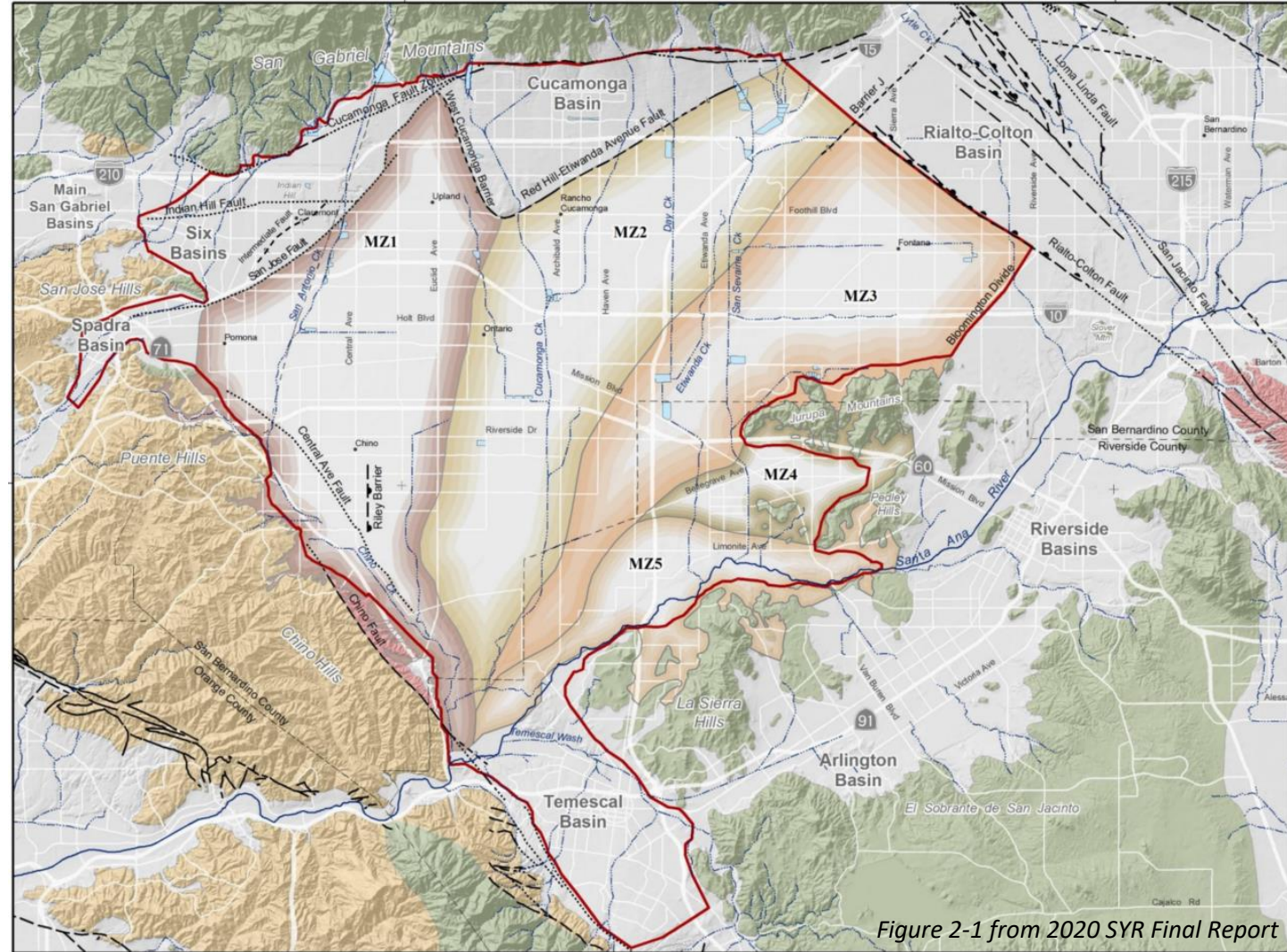


Figure 2-1 from 2020 SYR Final Report

HCM Update

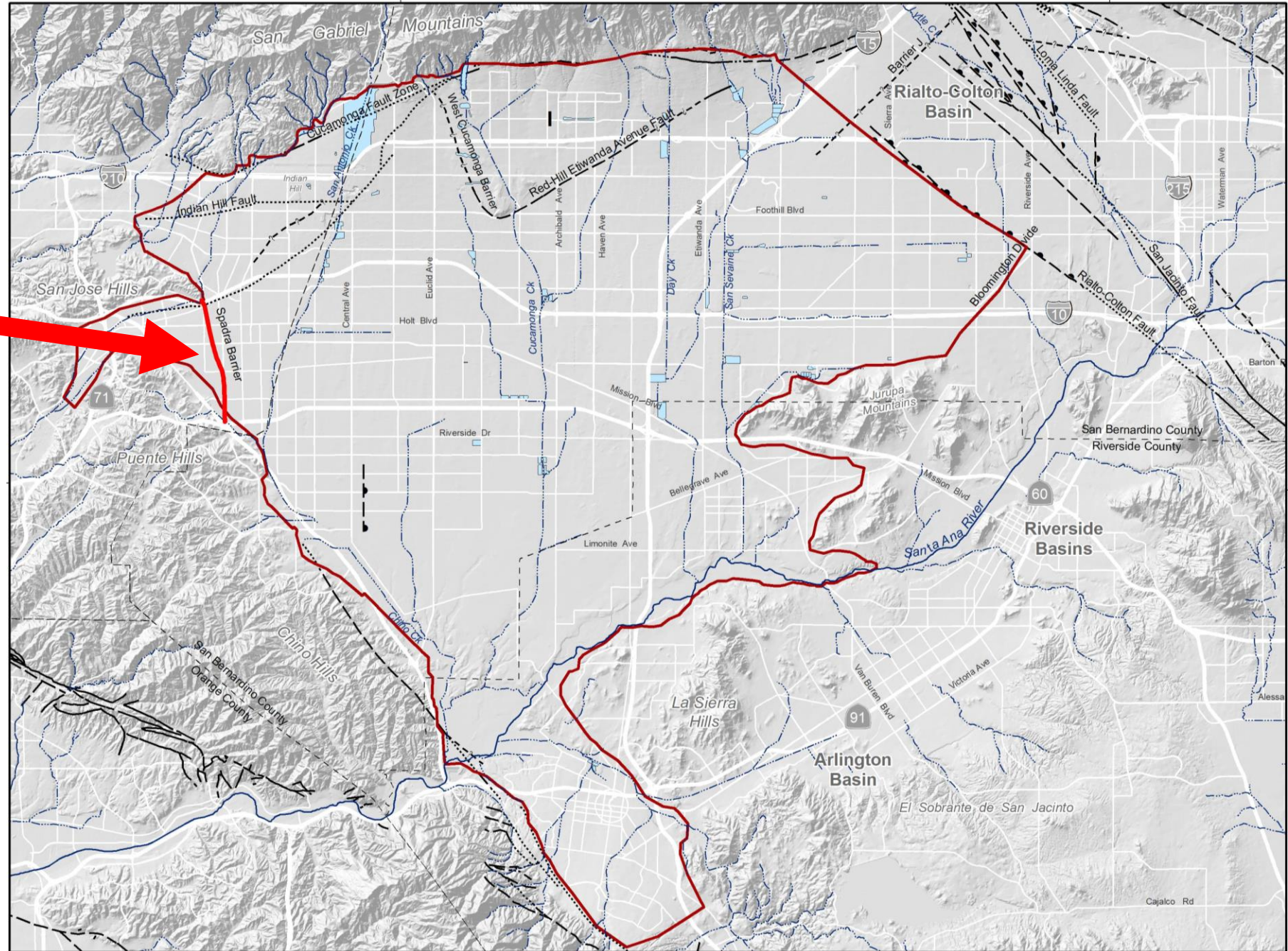
- Lithology and geophysical data from:
 - New wells constructed since January 2018
 - Older wells with data on DWR's WCR and/or available via data requests
- USGS Reports and geologic maps
- Groundwater flow across internal and external barriers
- Subsidence data
- Extent of riparian vegetation and/or ET in the Prado Basin
- One-meter digital elevation model (DEM)



Most new data did not result in updates to the HCM

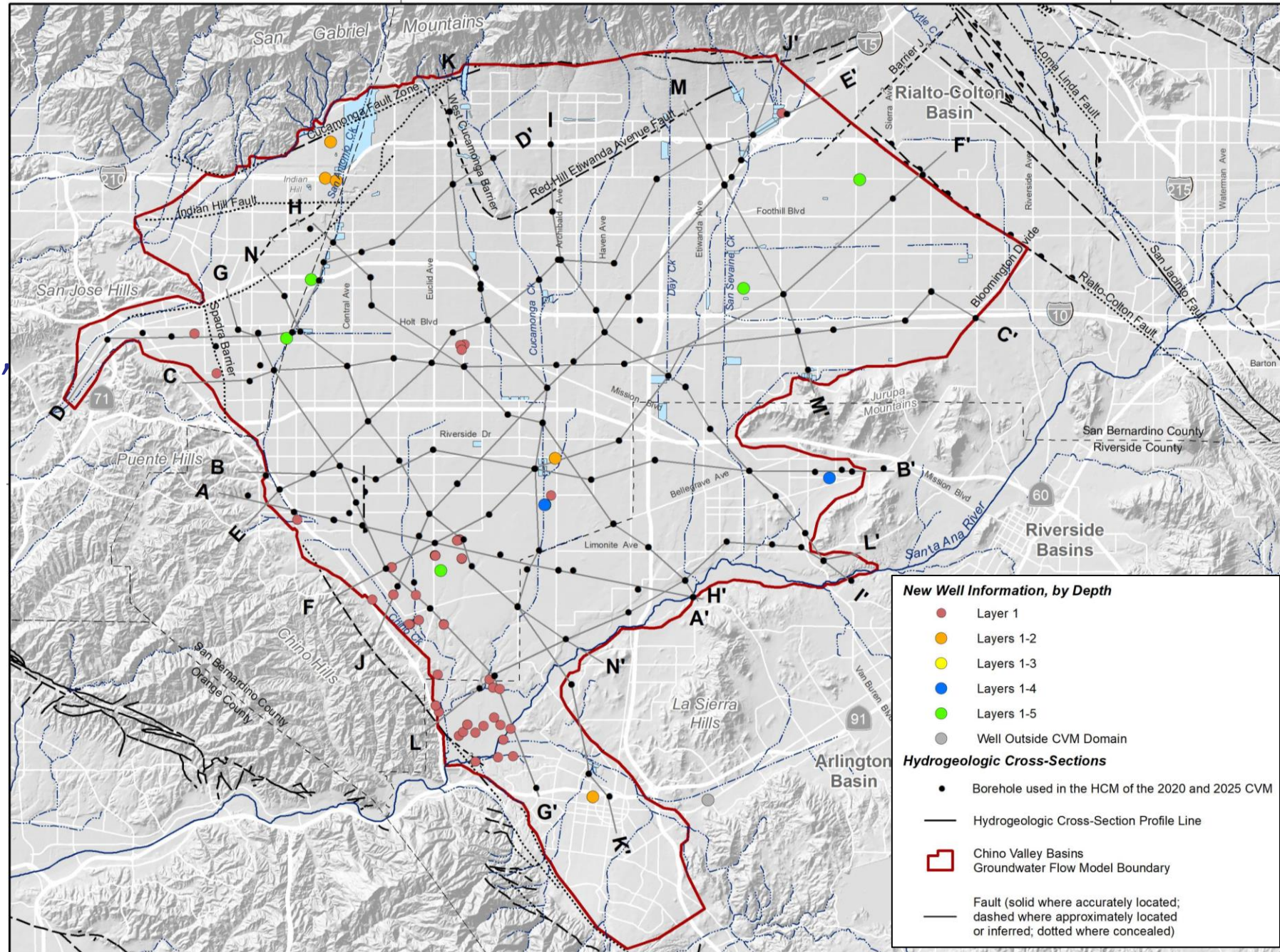
HCM Update: Barriers

- Added Spadra Barrier
- Evidence of barrier:
 - Abrupt change in depth to bedrock
 - Difference in groundwater levels
 - USGS-mapped fault



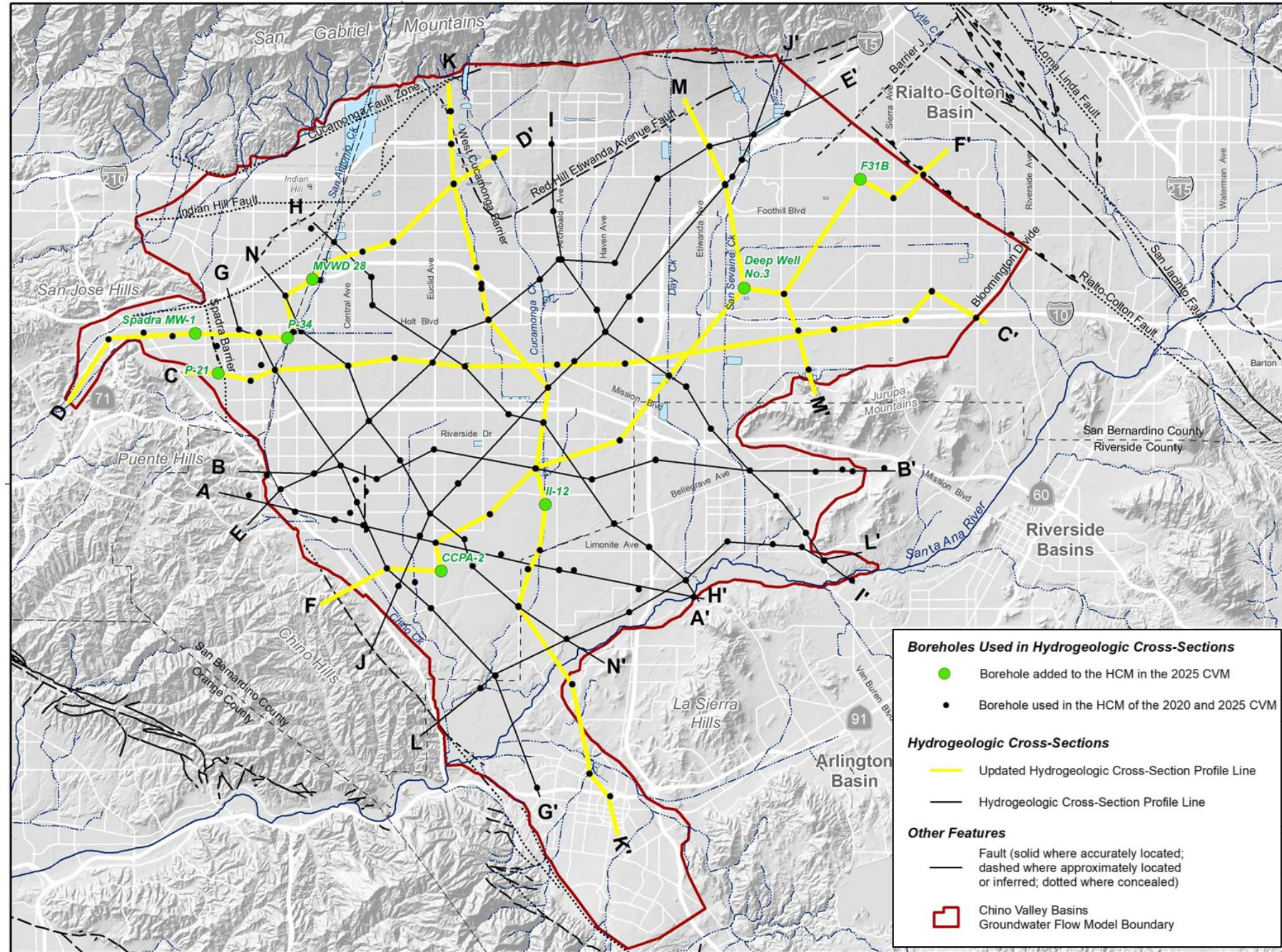
HCM Update: Geology and Layering

- Revised extent and thickness of aquifer layers, mainly:
 - Layer 1
 - Depth to bedrock
- Changes to aquifer layers based on:
 - Lithology and geophysical data from deeper wells

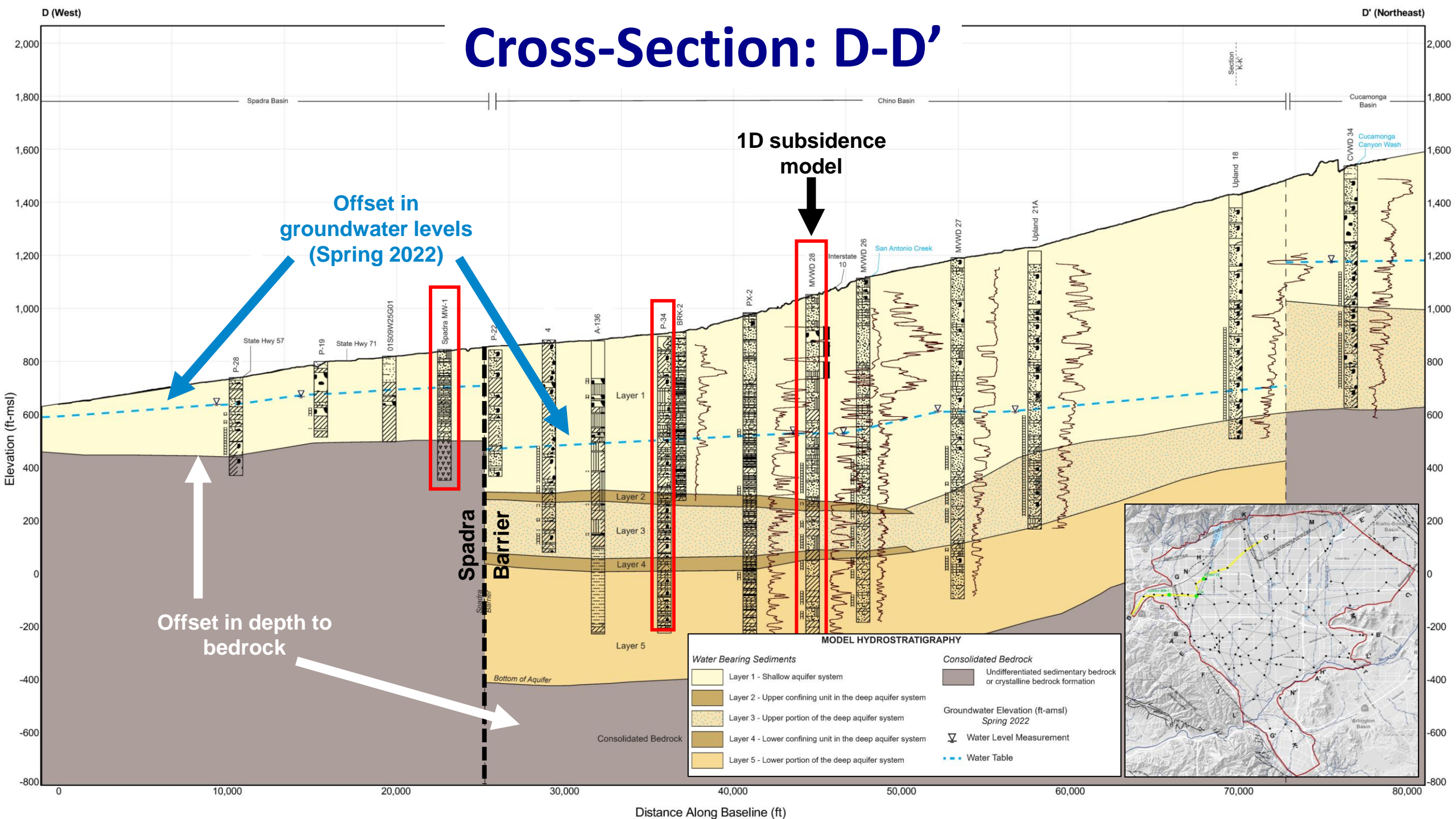


HCM Update: Cross-Sections

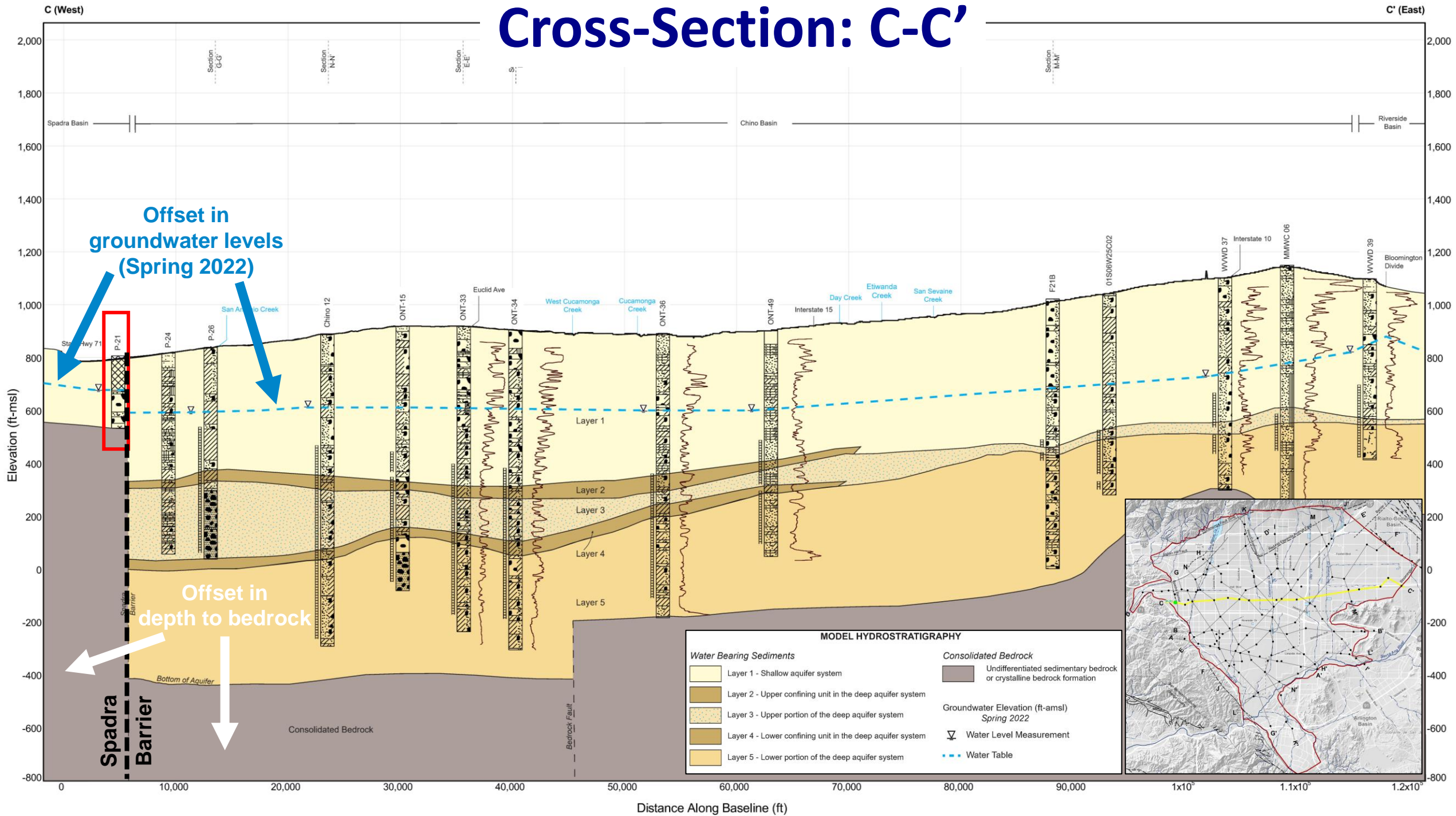
- Added new wells:
 - Wells with new lithology or geophysical data
 - Wells with 1D subsidence models
- Revised thickness and extent of aquifer layers
- Added Spadra Barrier



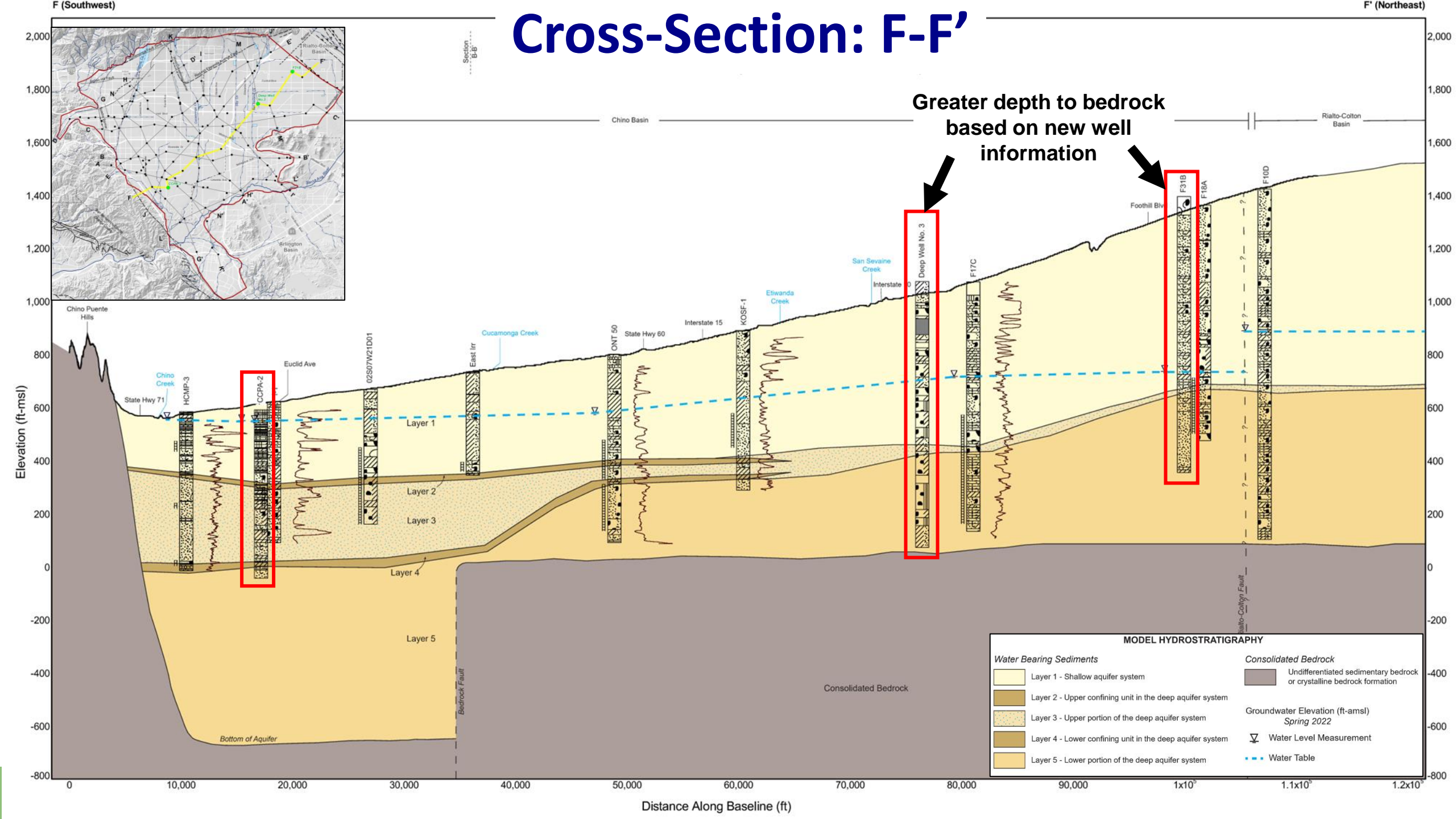
Cross-Section: D-D'



Cross-Section: C-C'

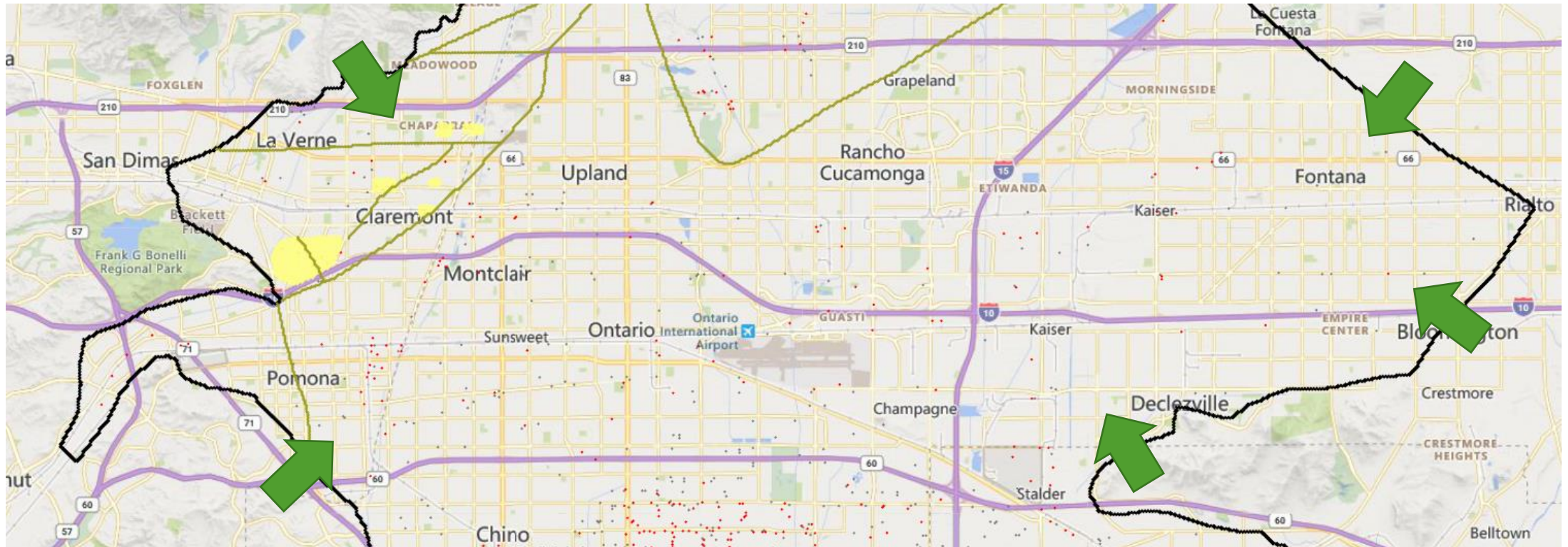


Cross-Section: F-F'



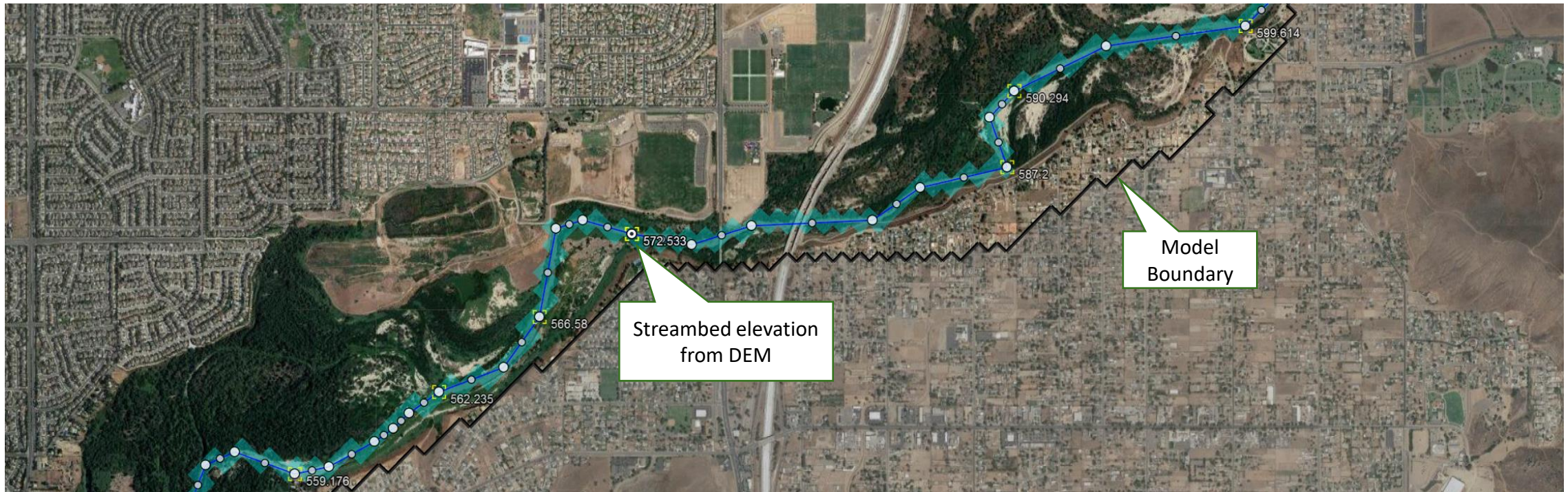
Boundary Flows

- Reviewed other models (USGS, GSSI, Todd) and water level data
- No changes to boundary conditions, but may calibrate subsurface and mountain front inflow values



Santa Ana River Delineation

- Updated stream courses in the SFR package based on aerials and the 2018 one-meter DEM from USGS
- Updated streambed elevation, stream slope, and 8-point stream cross-sections based on the DEM



Change of Santa Ana River Course Over Time



Change of Santa Ana River Course Over Time



Summary of Updates

- Revised layering and geology
 - Reduced depth to bedrock and thickness of aquifer west of Spadra Barrier
 - Increased depth to bedrock across eastern side of Basin
- Added Spadra Barrier
 - Barrier simulated using HFB package
 - Barrier hydraulic properties will be calibrated
- May calibrate subsurface and mountain front inflow
- Updated the stream properties in SFR package

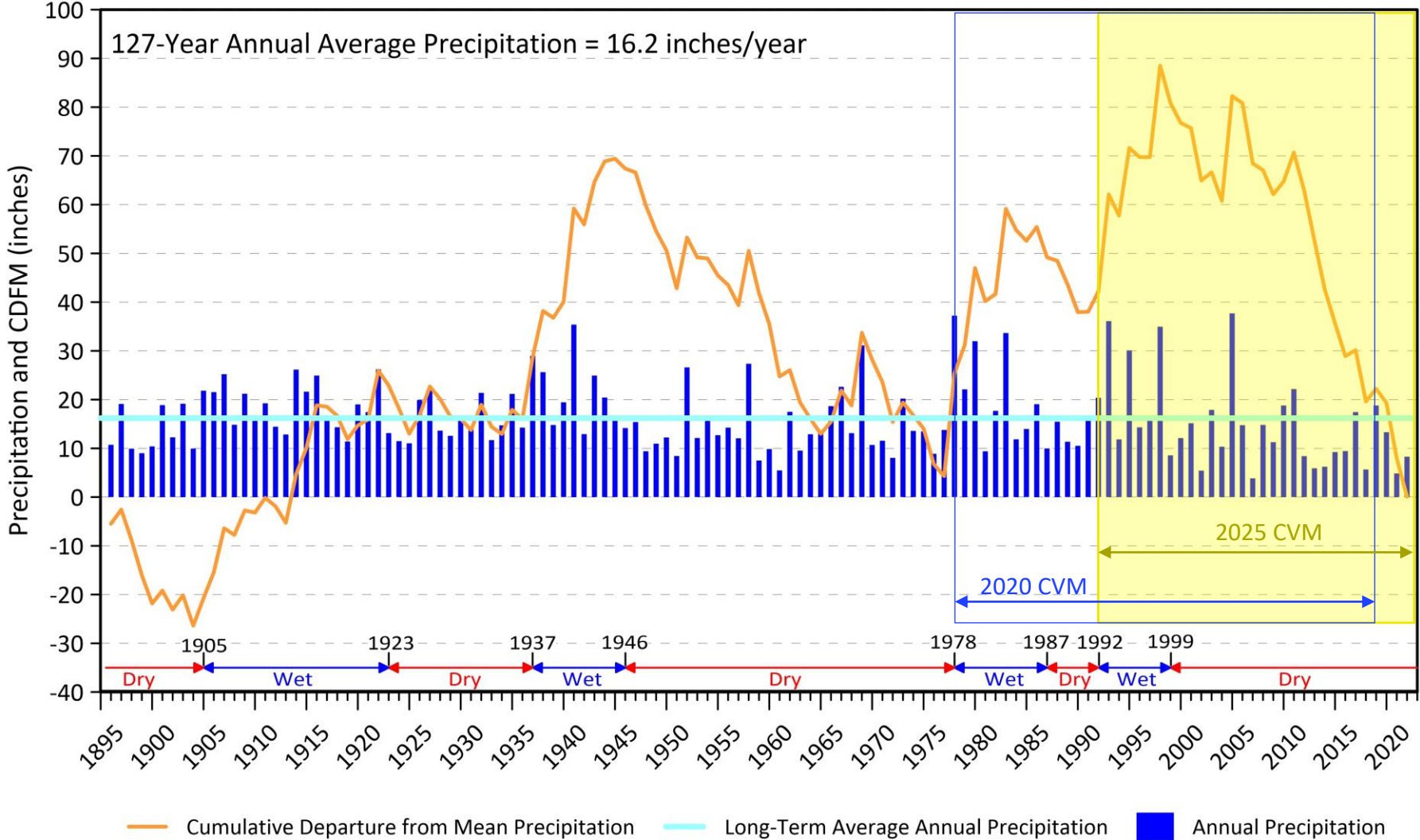
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Calibration Period

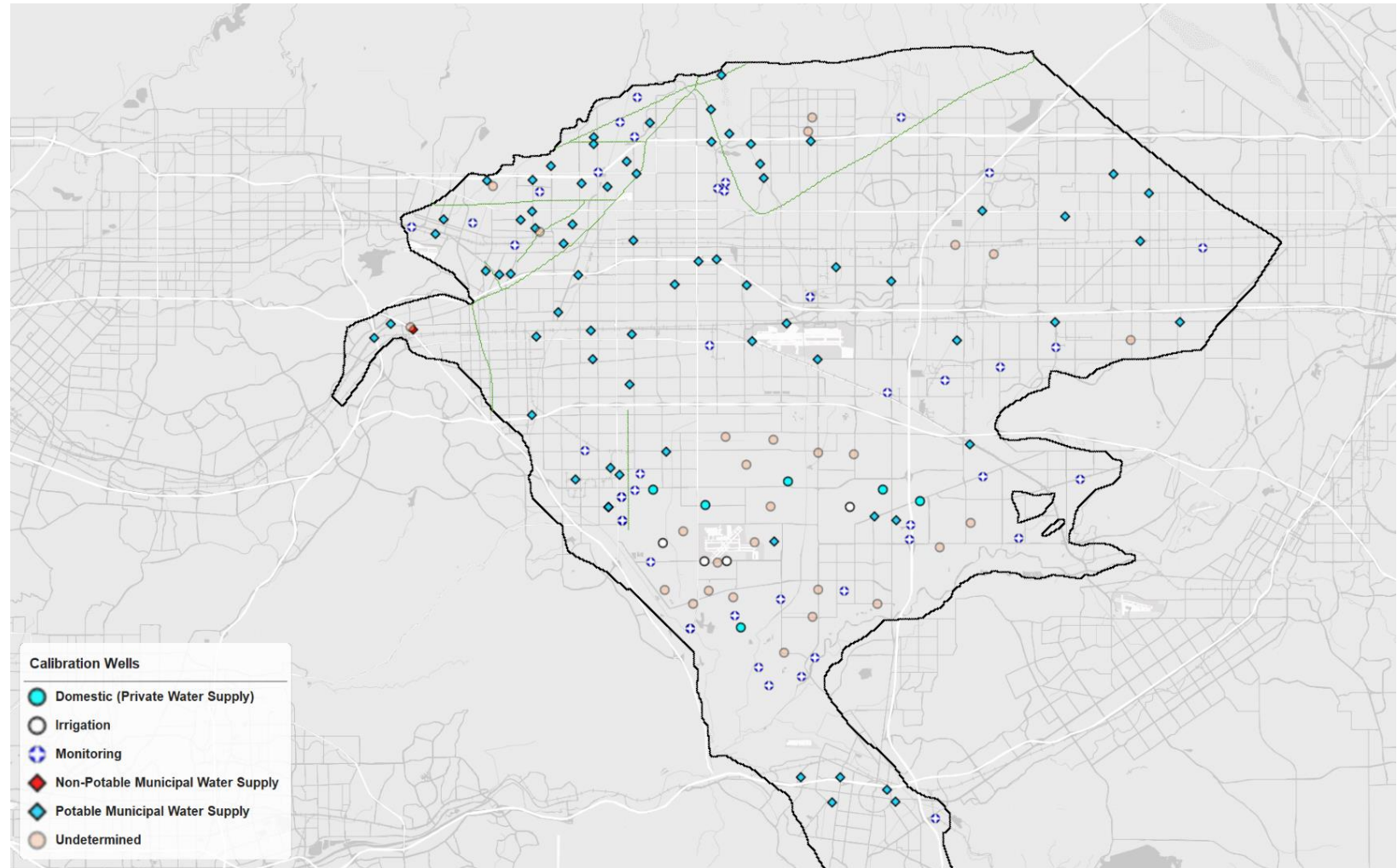
- 2020 CVM:
FY 1978 - 2018
- 2025 CVM:
FY 1992 – 2022
- 2025 SYR
(projection): FY
2023 – 2072

Annual Precipitation in Inches over the Chino Basin by Fiscal Year



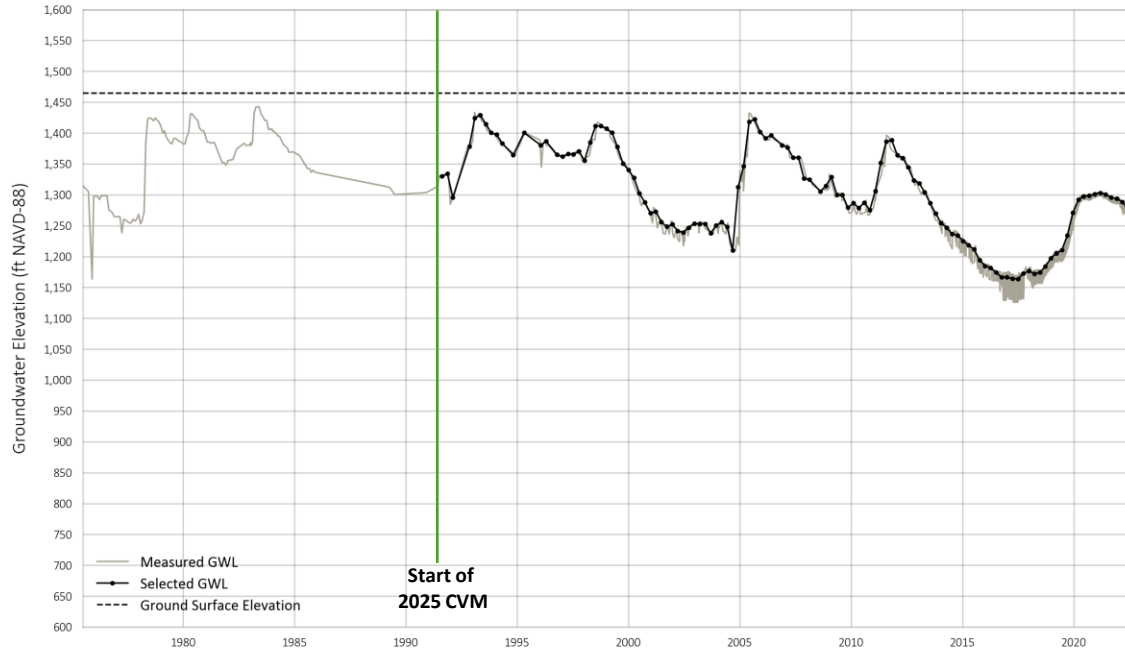
Calibration Wells

- Number of calibration wells: 152
- Number of groundwater elevation data at these wells:
 - FY 1978 to FY 1991: **5,414**
 - FY 1992 to FY 2022: **752,473**



Selection of Calibration Targets

at a uniform temporal distribution when possible



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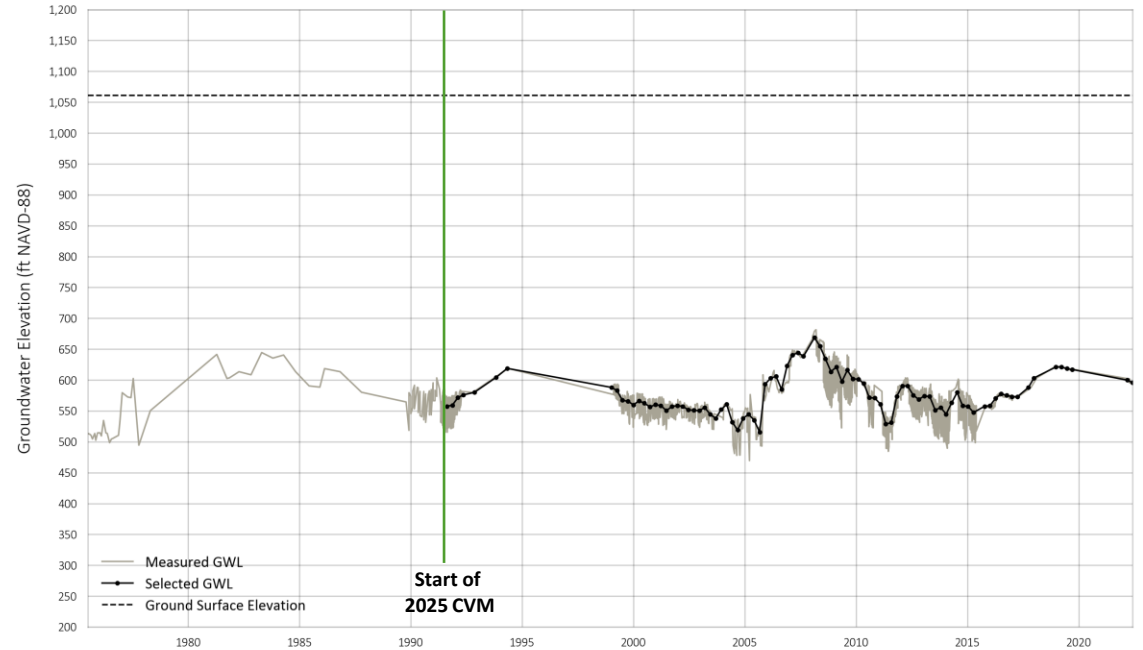


Well Location



Measured vs Selected
Groundwater Level (GWL)
HydroDaVE Well ID: 1002395
Well Name: Mountain View 4

Figure A-29



Prepared by:



Well Location

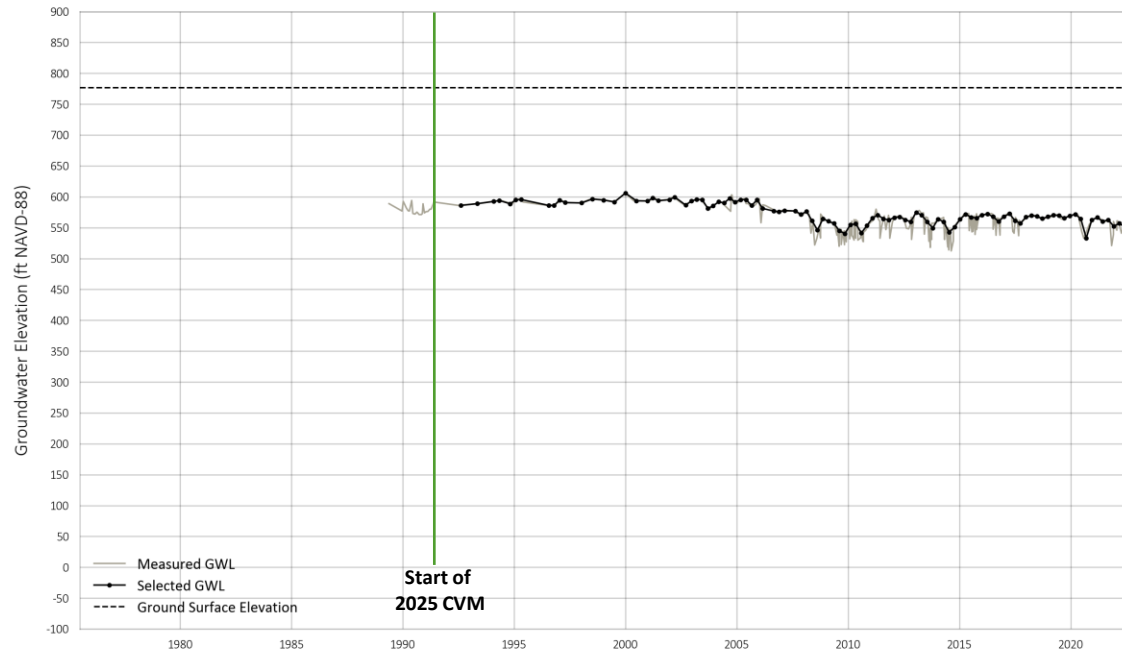


Measured vs Selected
Groundwater Level (GWL)
HydroDaVE Well ID: 1002554
Well Name: Margarita #1

Figure A-58

Selection of Calibration Targets

at a uniform temporal distribution when possible



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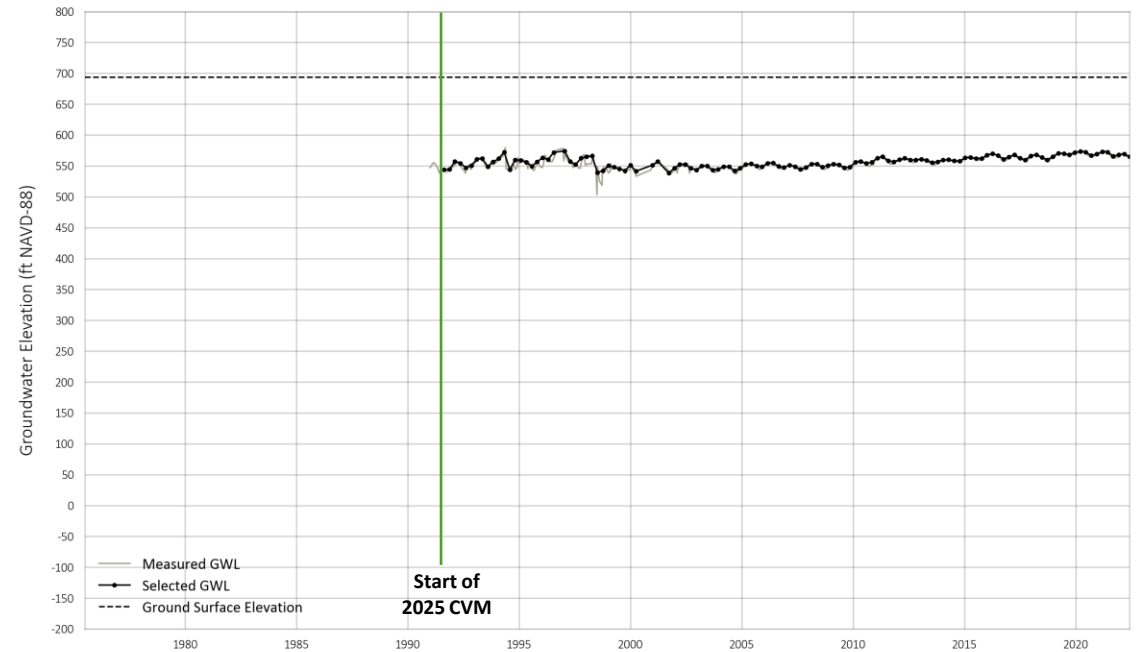


Well Location



Measured vs Selected
Groundwater Level (GWL)
HydroDaVE Well ID: 1003502
Well Name: JCSD 16

Figure A-88



Prepared by:



Well Location

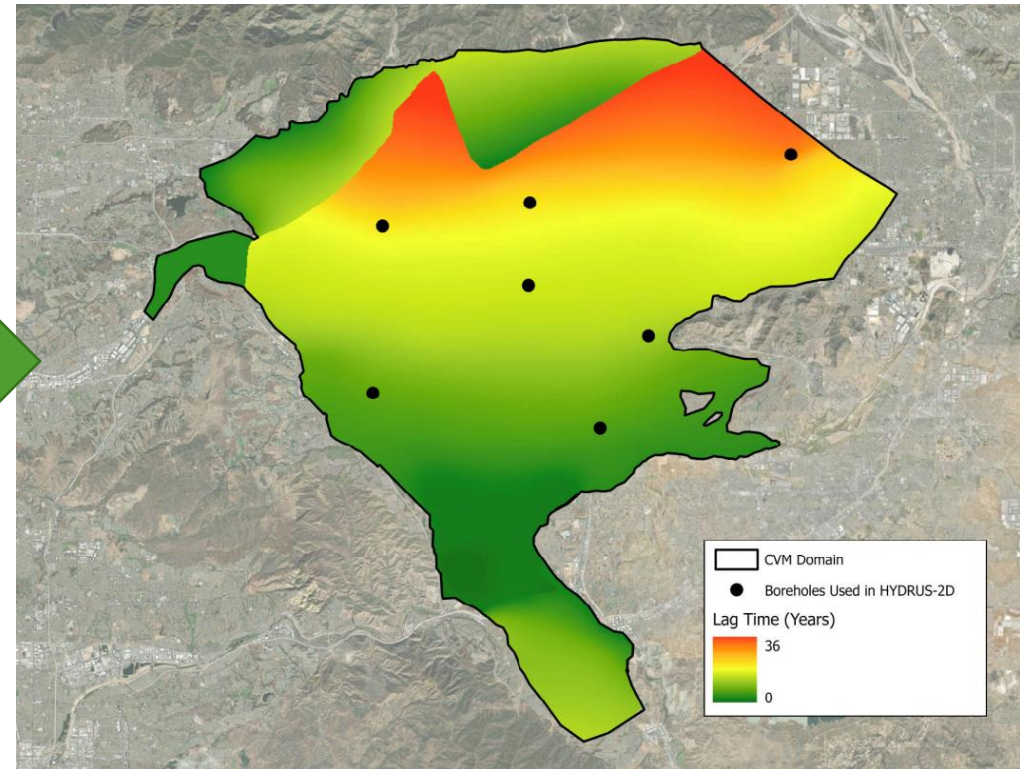
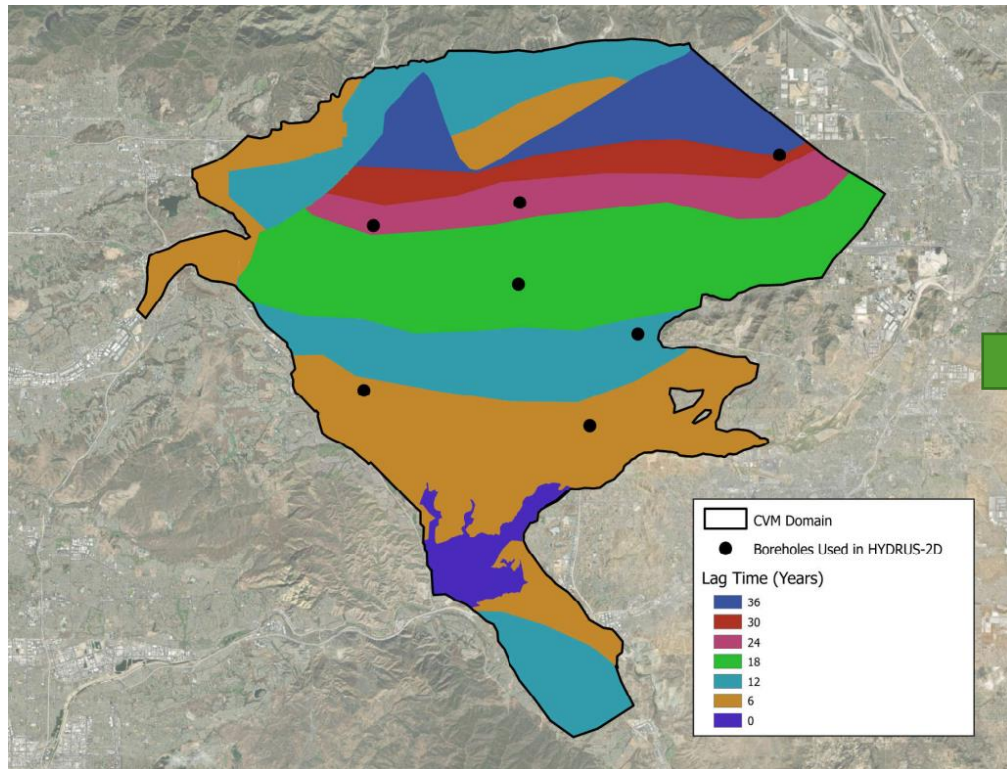


Measured vs Selected
Groundwater Level (GWL)
HydroDaVE Well ID: 1203149
Well Name: CH HILL 18A

Figure A-95

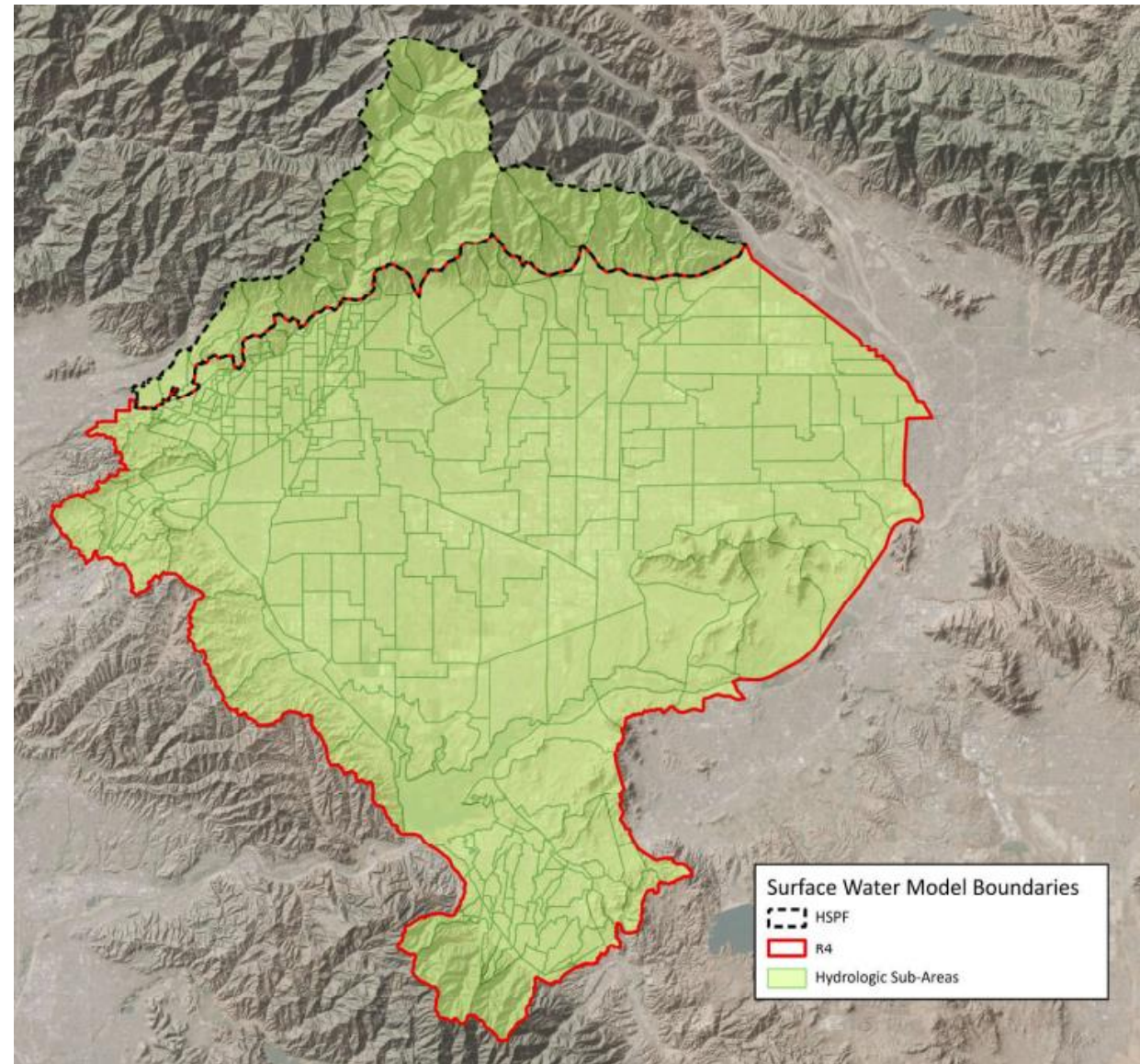
Lag Time Calculation

- Updated calculation of lag time of DIPAW through the vadose zone to reduce jumps in timing of recharge
- Lag time calculations are based on prior HYDRUS-2D results



R4/HSPF Model

- No recalibration
 - Determined unnecessary during 2022 SY Reset methodology scoping
- R4/HSPF outputs will be able to vary during calibration/uncertainty analysis



Summary of Updates to HSPF/R4 Models

Updates to HSPF/R4 Models

- Extended hydrology through FY 2022

Added 2022 land use to R4 Model

- Acquired from Land IQ for southern Chino Basin
- Refined crop field delineation
- Most of the remaining basin is built out

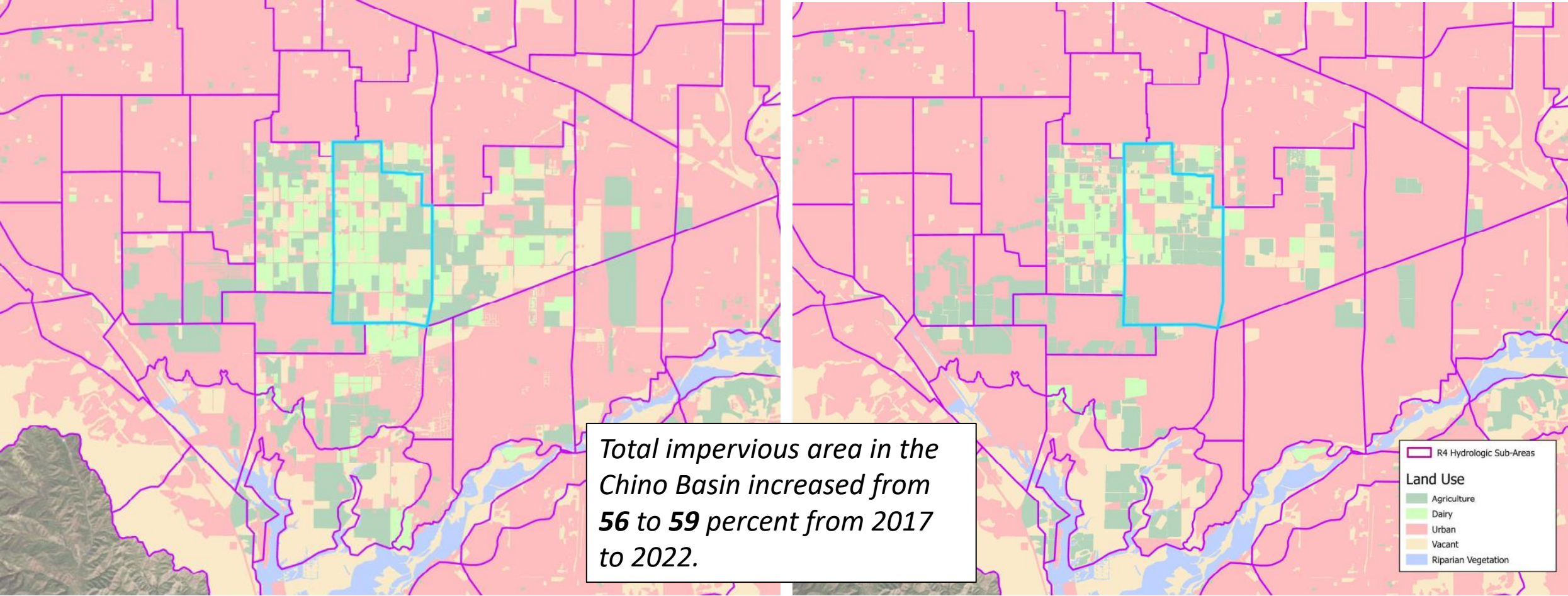
Validated R4 model through FY 2022

- Streamflow (Cucamonga and Chino Creek)
- Managed stormwater recharge
- Applied water estimates

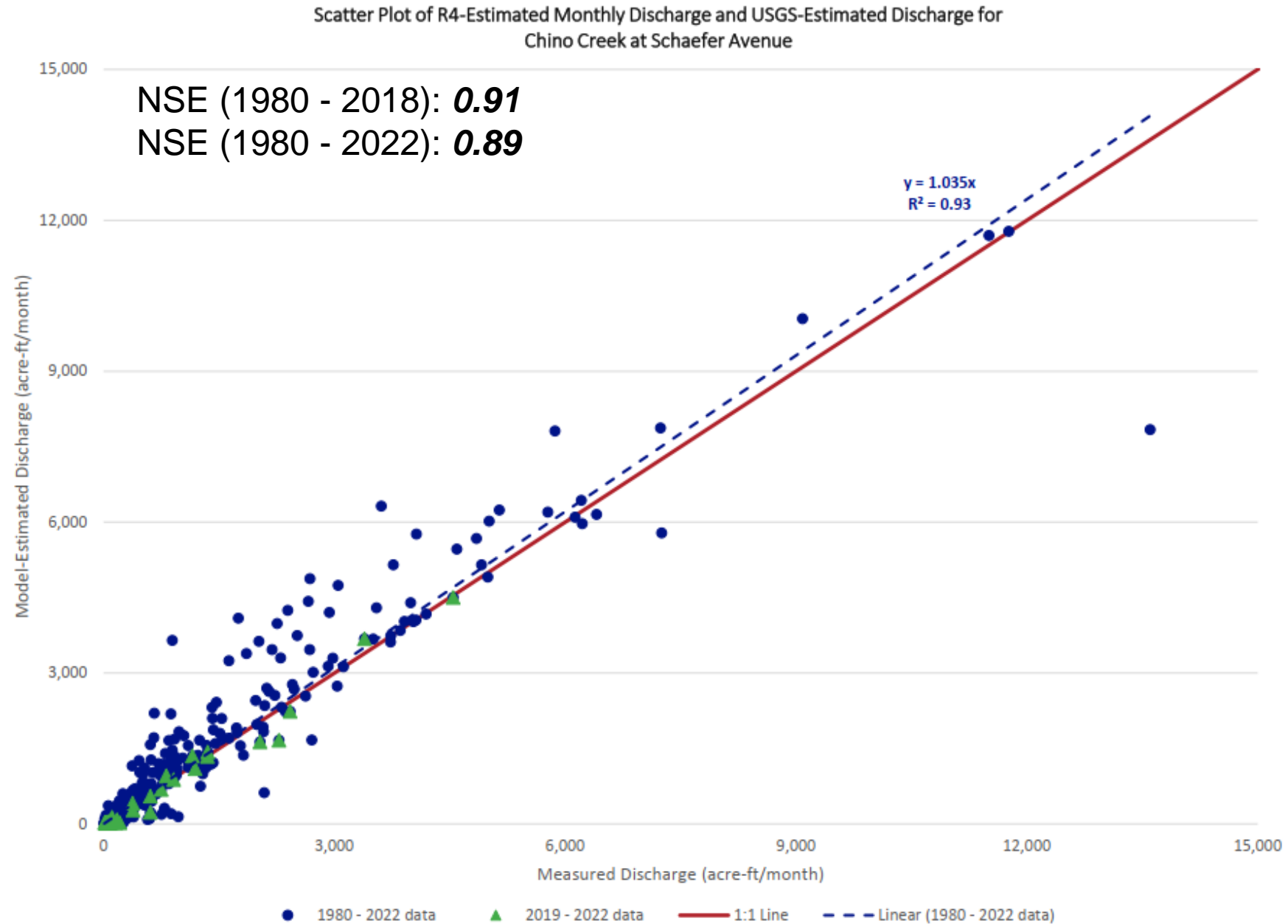
R4 Model – 2022 Land Use Update

2017

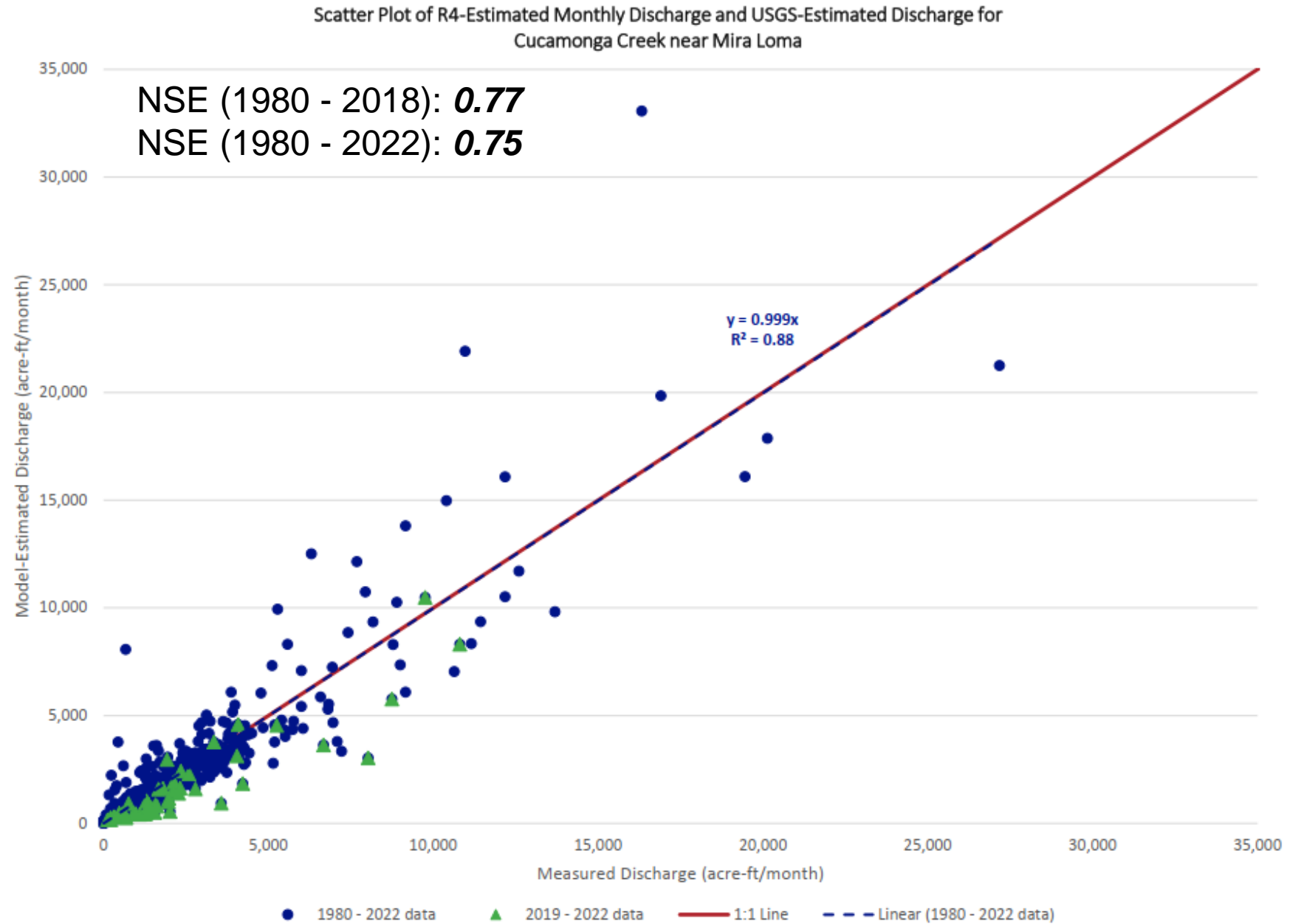
2022



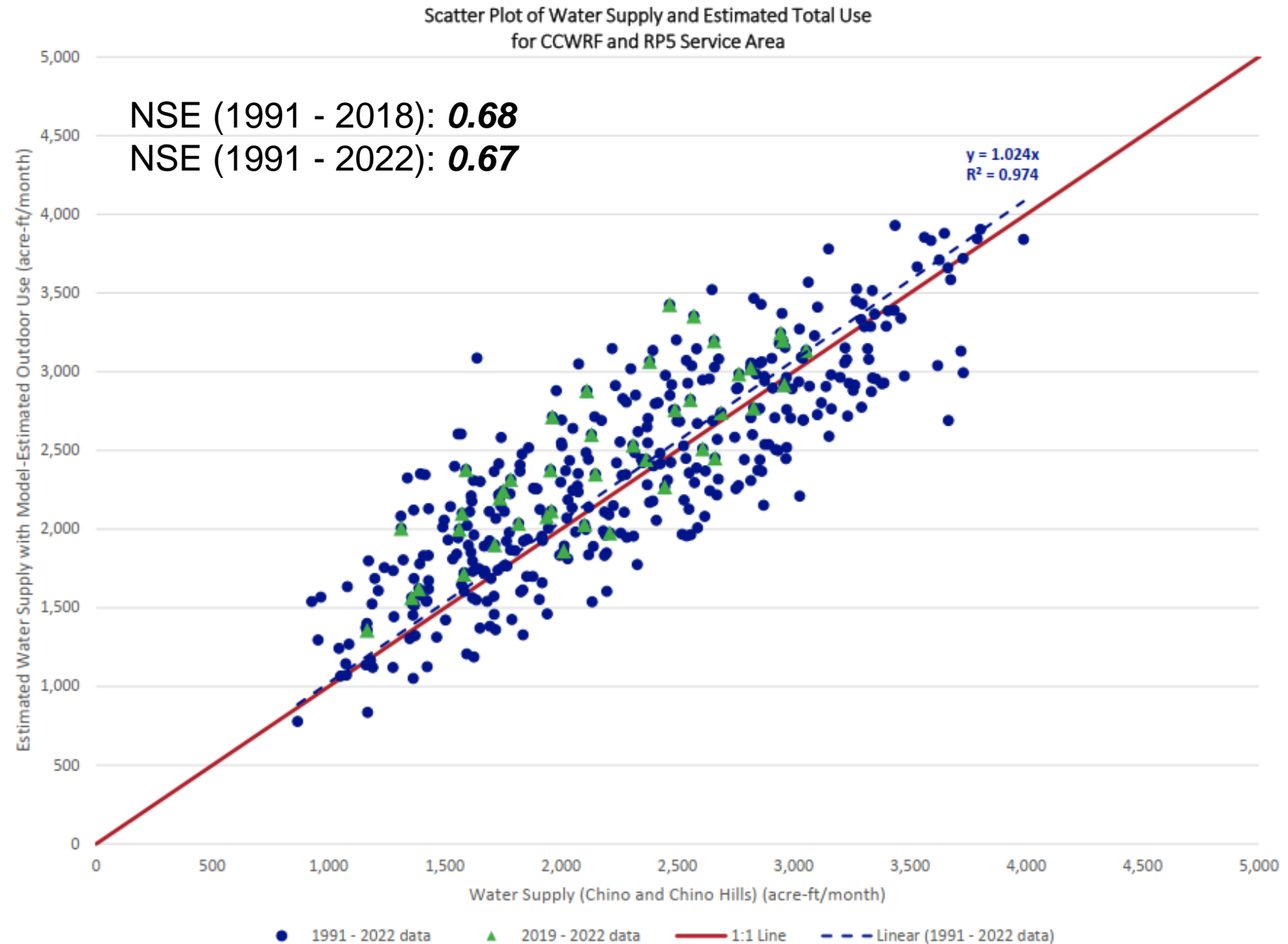
Validation of Streamflow – Chino Creek



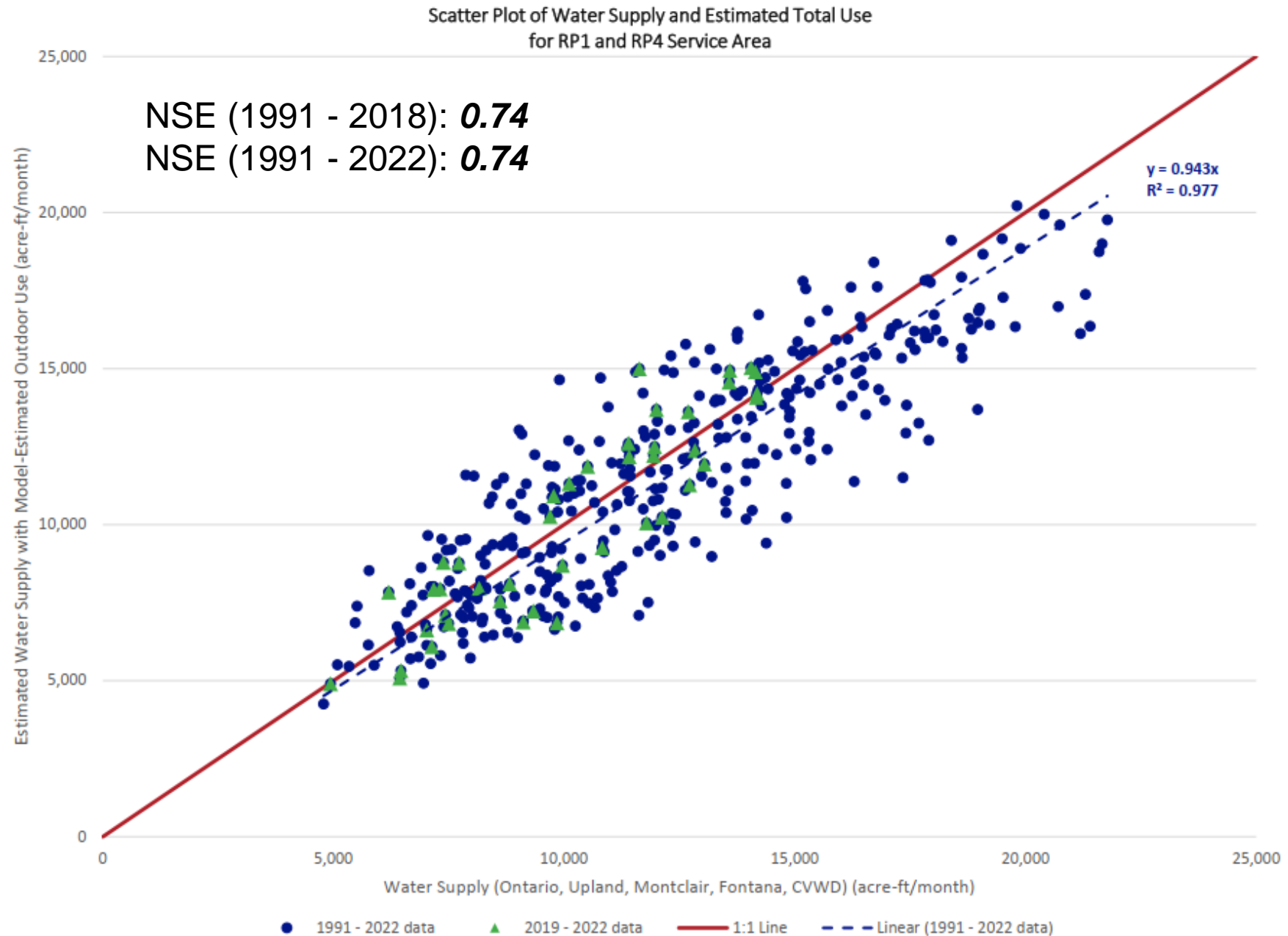
Validation of Streamflow – Cucamonga Creek



Validation of Applied Water – CCWRF/RP5



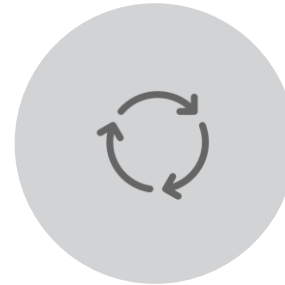
Validation of Applied Water – RP1/RP4



R4 Model Validation



Overall, additional four years of data and land use change did not significantly change calibration statistics or generate anomalous data



No changes necessary to use the R4 model for calculating MODFLOW inputs (RCH, SFR, FHB)

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Next Steps



Compile feedback from peer reviewers on HCM update



Complete HCM update, update the model, and begin calibration/uncertainty analysis

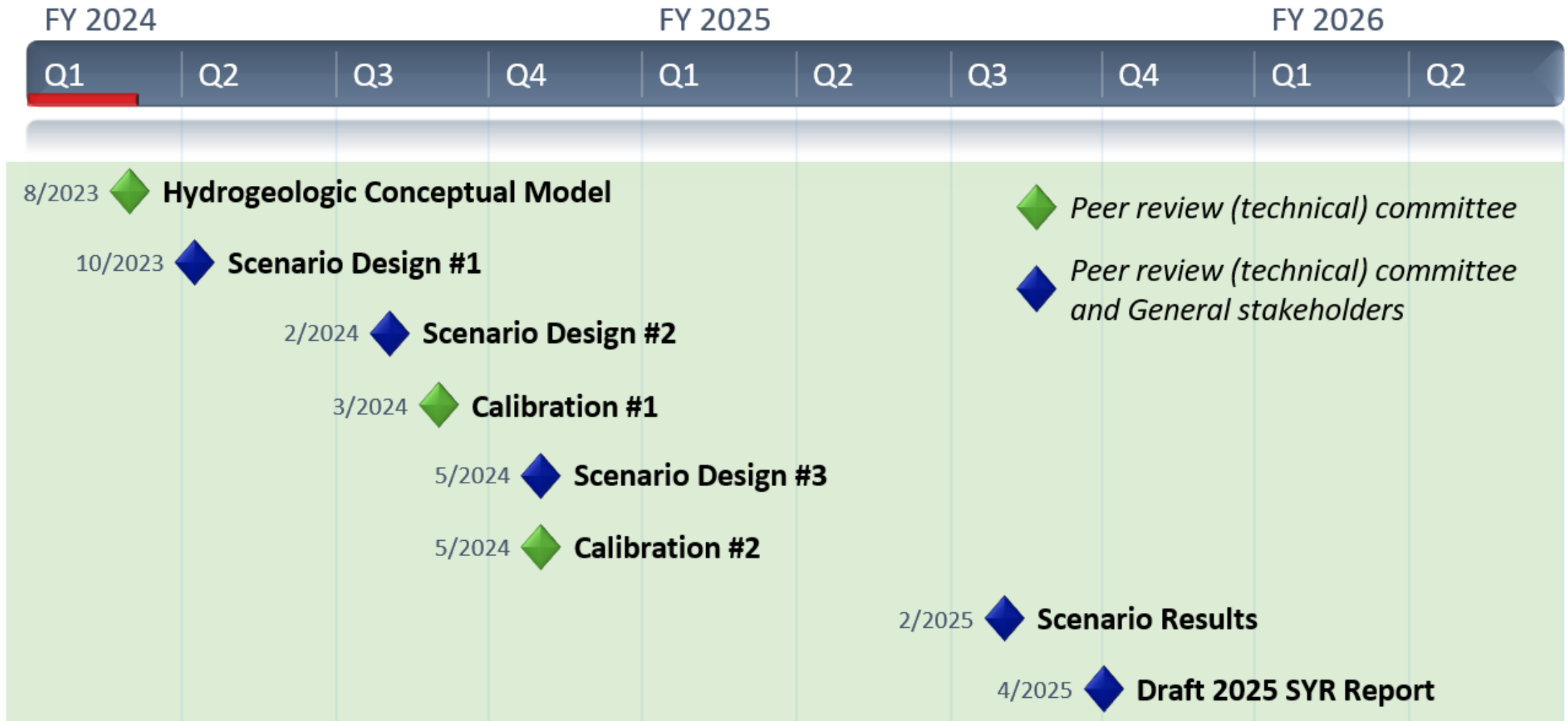


Upcoming workshops:


October 2023: Scenario design workshop #1 (peer reviewers/stakeholders)

March 2024: Calibration workshop #1 (peer reviewers)

2025 SYR Timeline



<https://www.cbwm.org/pages/syrm/>



Chino Basin Watermaster

How Do I...

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2017 Safe Yield Court Order Implementation

Background **2025 Safe Yield Reevaluation** Data Collection and Evaluation Safe Yield Reset Methodology Update

2025 SAFE YIELD REEVALUATION

Upcoming Meetings and Workshops
[Meeting and Workshop Schedule](#)

Past Stakeholder & Peer Review Workshops

Date	Event	Agenda	Presentation
2023-08-30	Hydrogeologic Conceptual Model - Technical Committee	View/Download	View/Download

Meeting Objectives



Develop understanding of scope and schedule of 2025 SYR, updates to HCM and numerical models, and expectations of future engagement by peer review committee



Gather feedback on updates to HCM and numerical models



THANK YOU