California Water and Environmental Modeling Forum

2022 ANNUAL MEETING PROGRAM

Groundwater Modeling for Lake Perris Seepage Recovery Project Design

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Woodard & Curran

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Questions to Answer Using a Groundwater Model

▸ Volume of Recoverable Seepage

▸ Recovery Wells
- Locations
- Extraction Rates

▸ Drawdown at the Project Area

▸ EIR Project Impact Evaluation
- Regional Groundwater Levels
- Regional Water Quality Impacts

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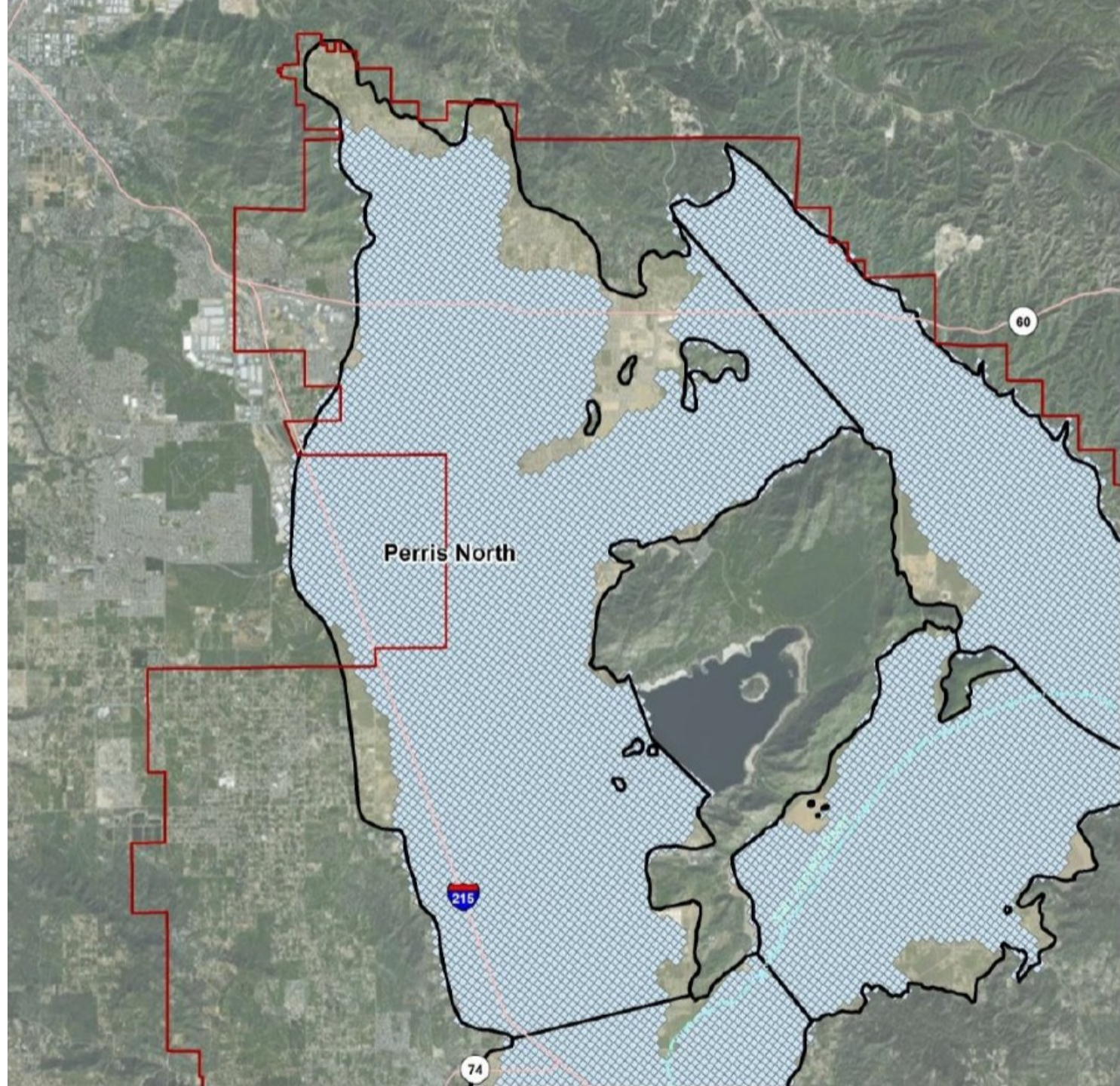# Existing Groundwater Model

▸ <u>S</u>an <u>J</u>acinto Basin
  Groundwater <u>F</u>low
  <u>M</u>odel (SJFM-2014)

▸ Uniform Grid

  ▪ 500 ft x 500 ft
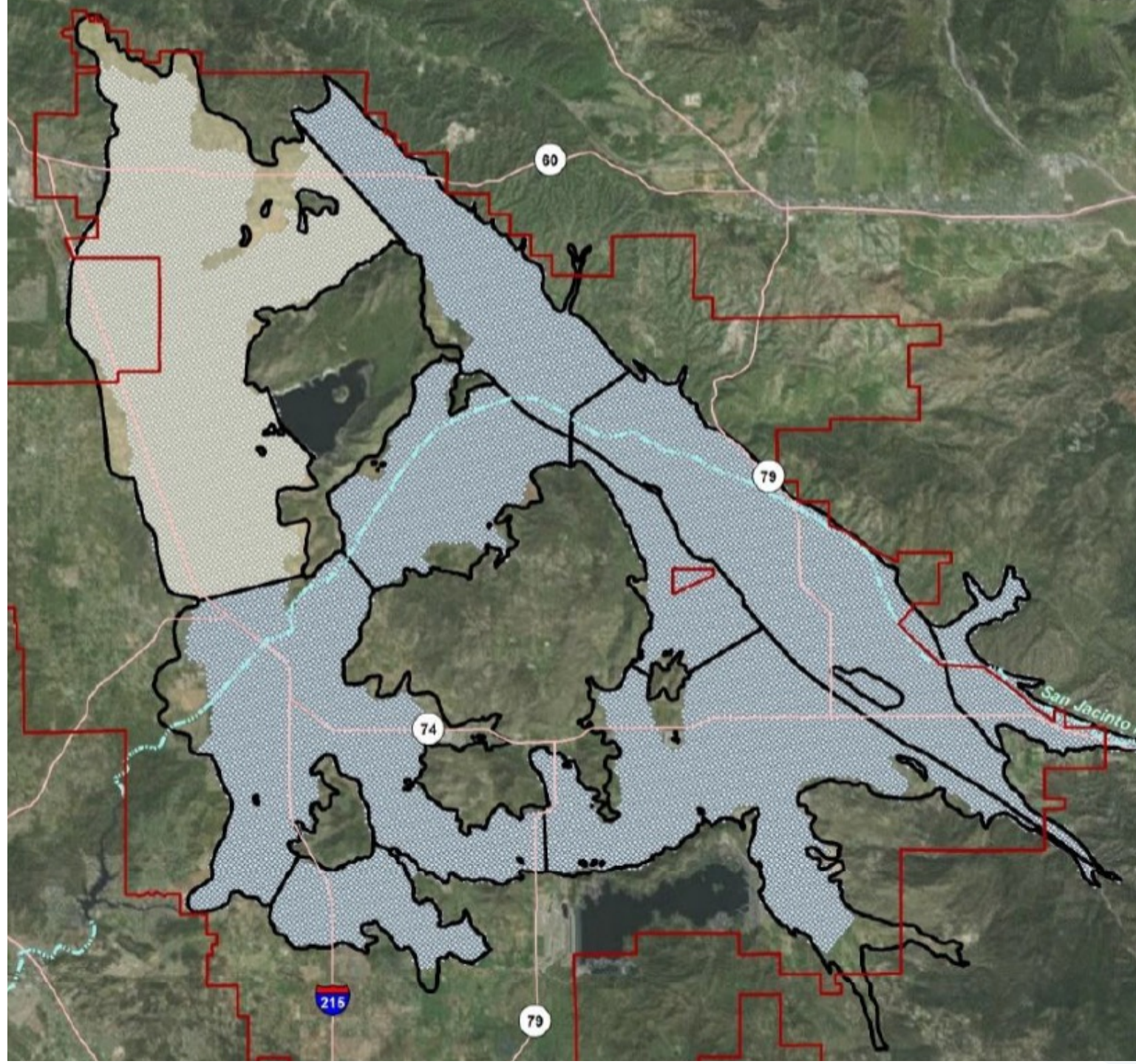
Existing Groundwater Model

▸ Simple Constant Flux Boundary for Lake Perris Seepage

Model Refinement

▸ Model Grid Refinement:
  ▪ Lake Perris Area – 62.5'x62.5'

▸ Other Features:
  • Lake Perris boundary conditions (linked to reservoir levels)
  • Bedrock elevation (incorporate recent drilling and pump test data)
  • Passive recovery system
  • Additional calibration wells (3 wells located within the dam embankment)
  • New observation wells (42 wells)
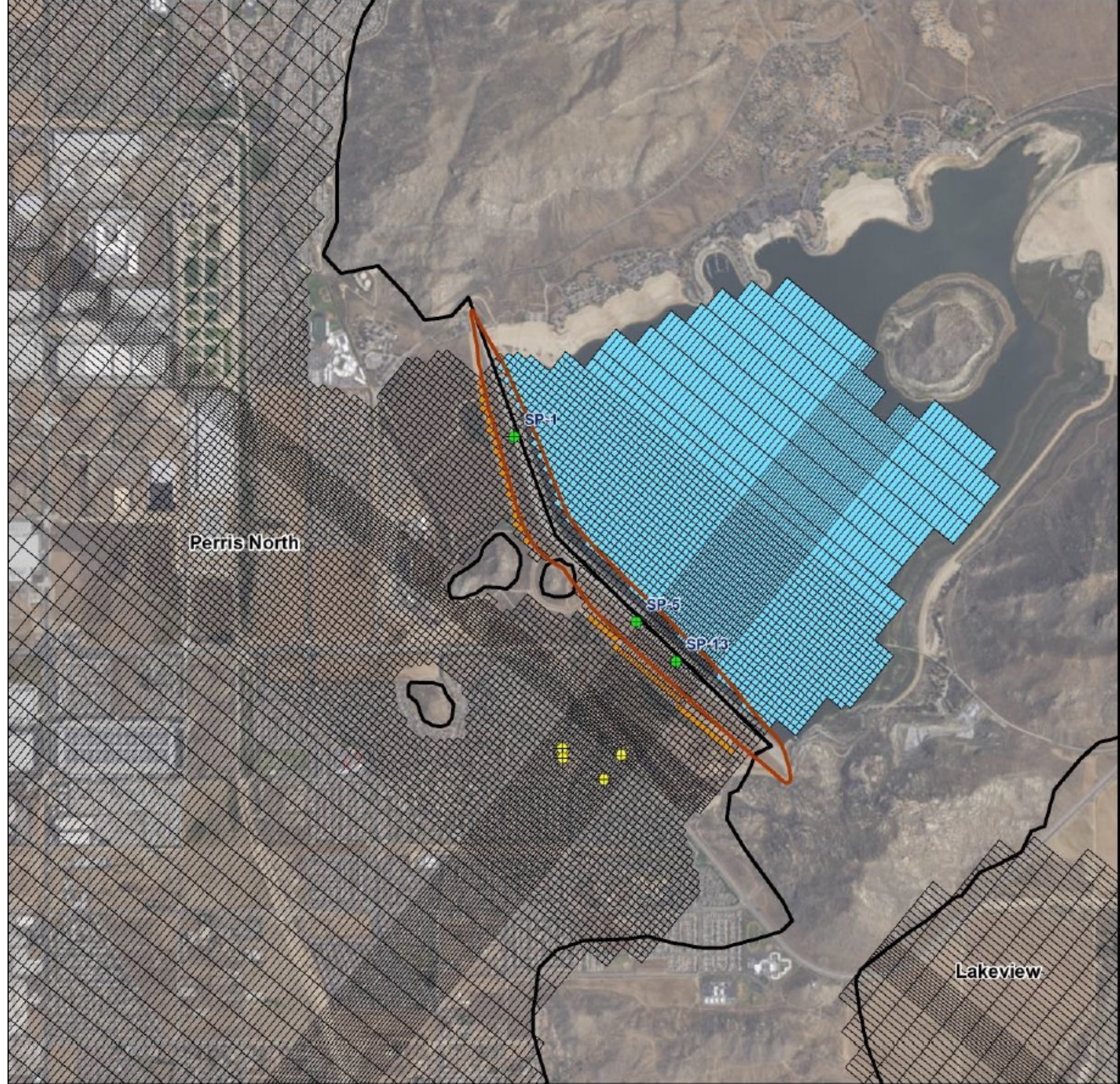 • Cement Deep Soil Mixing (CDSM) cells (72 cells)
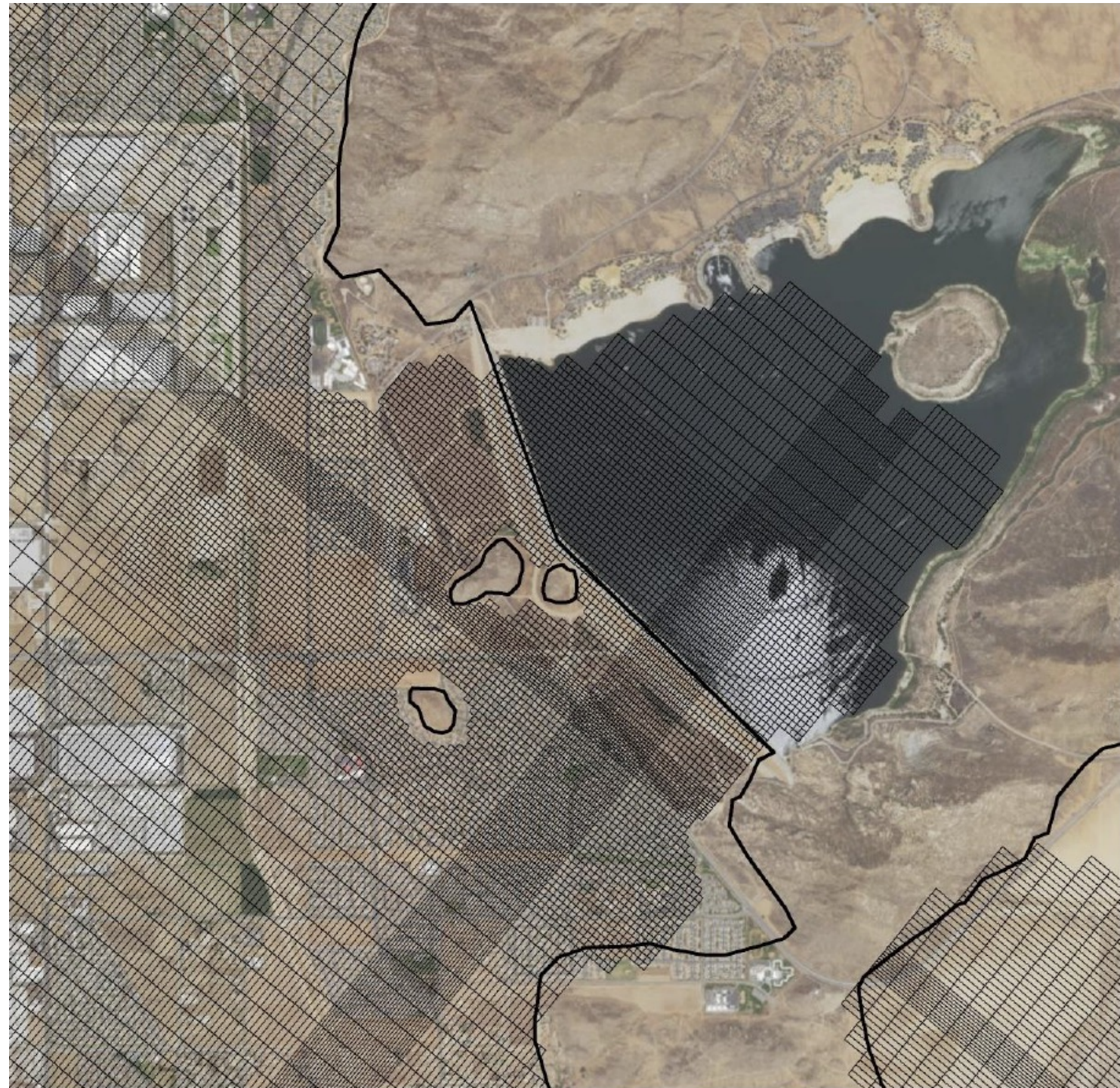
Updated Bedrock Elevation
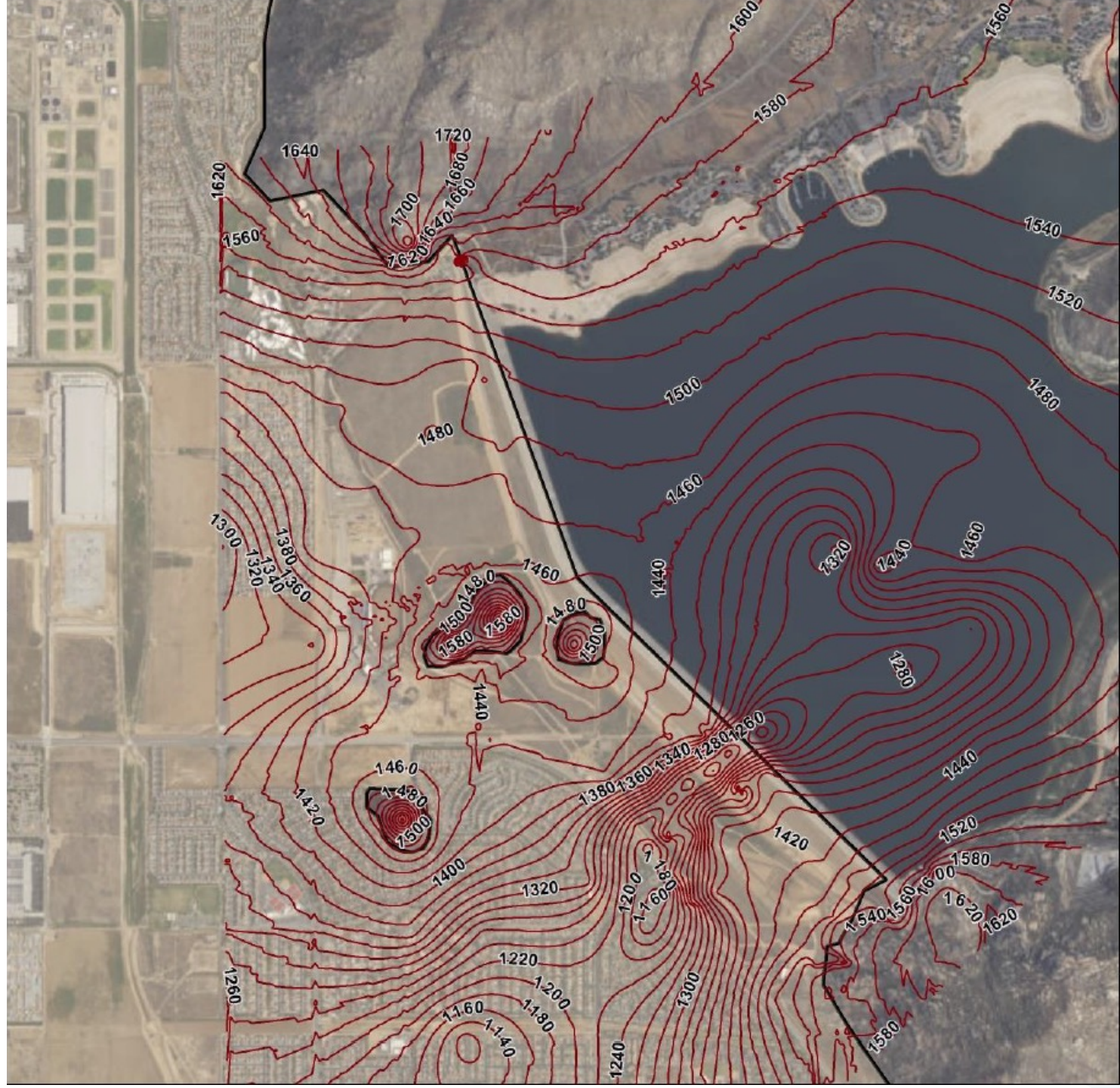
Lake Perris Boundary

- ▸ Lake Perris Simulated Using RIV Module
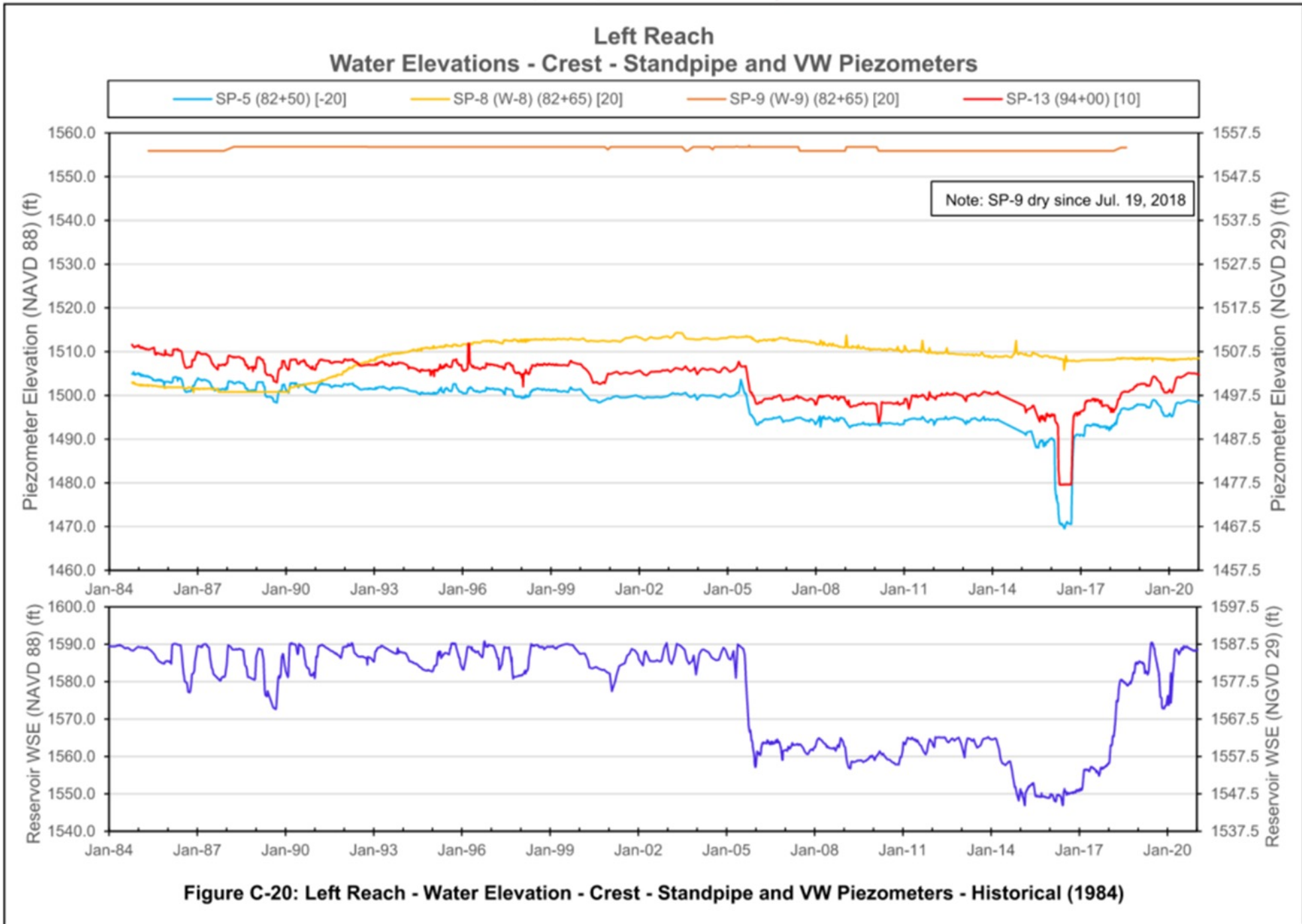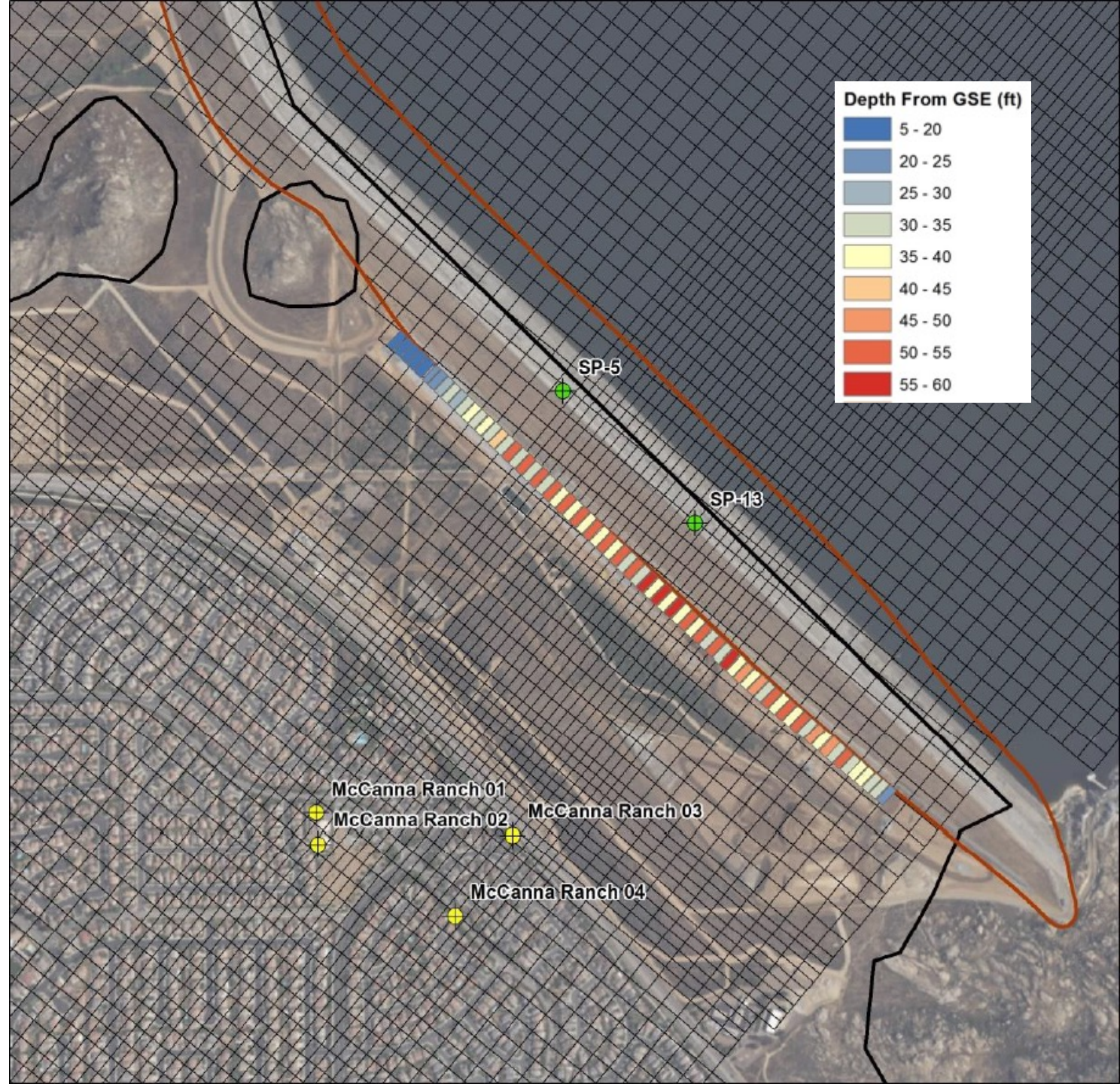- ▸ Passive Seepage Recovery System

Figure C-20: Left Reach - Water Elevation - Crest - Standpipe and VW Piezometers - Historical (1984)

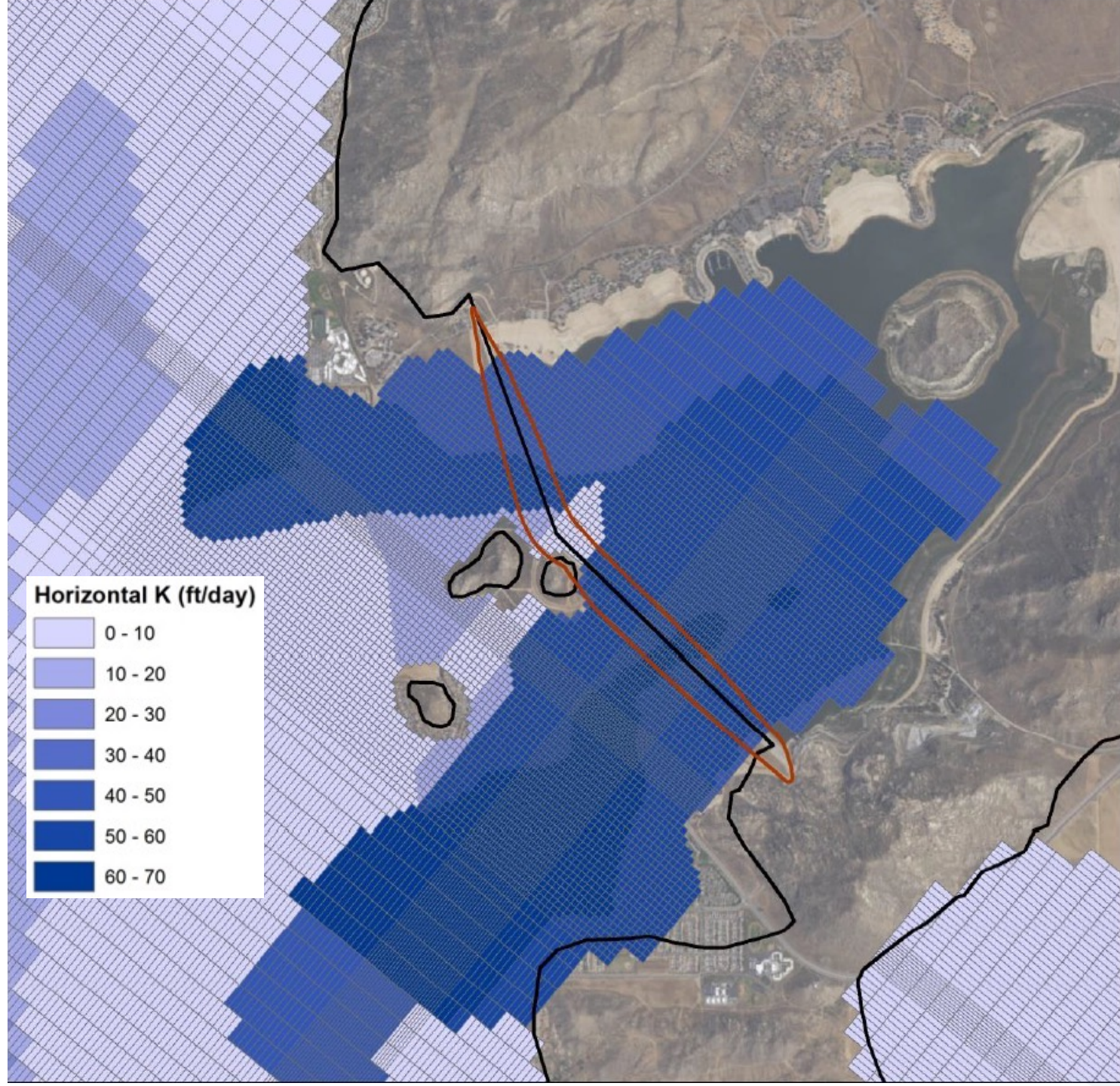# Cement Deep Soil Mixing (CDSM) Cells

Pump Tests

▸ Transmissivity: 11,000 – 19,000 ft²/day
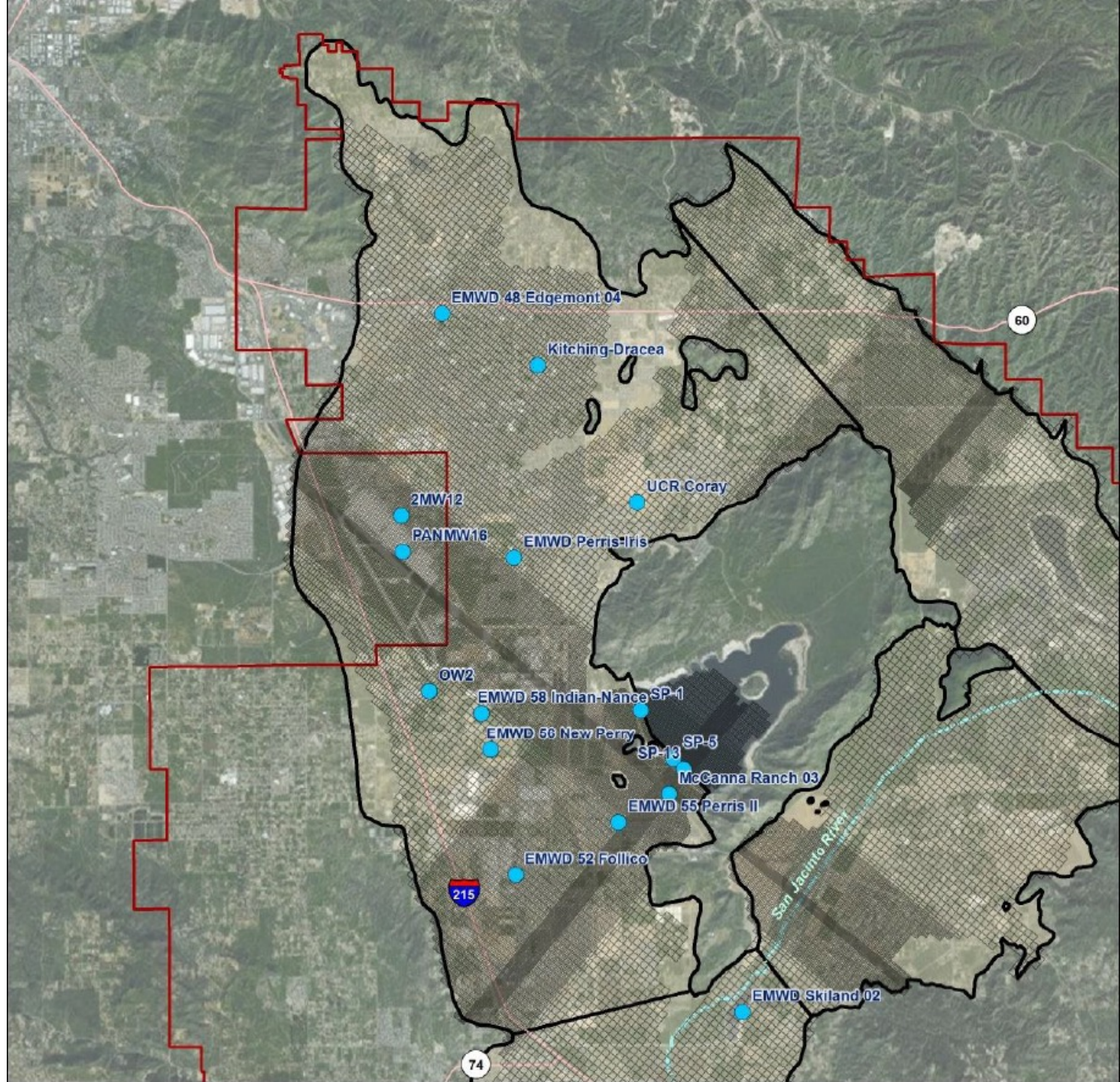
▸ Hydraulic Conductivity: 50 – 100 ft/day

Updated Hydraulic Conductivity

Horizontal K (ft/day)

	0 - 10
	10 - 20
	20 - 30
	30 - 40
	40 - 50
	50 - 60
	60 - 70

Calibration Wells for Model Update

Seepage Water Budget – Historical Conditions

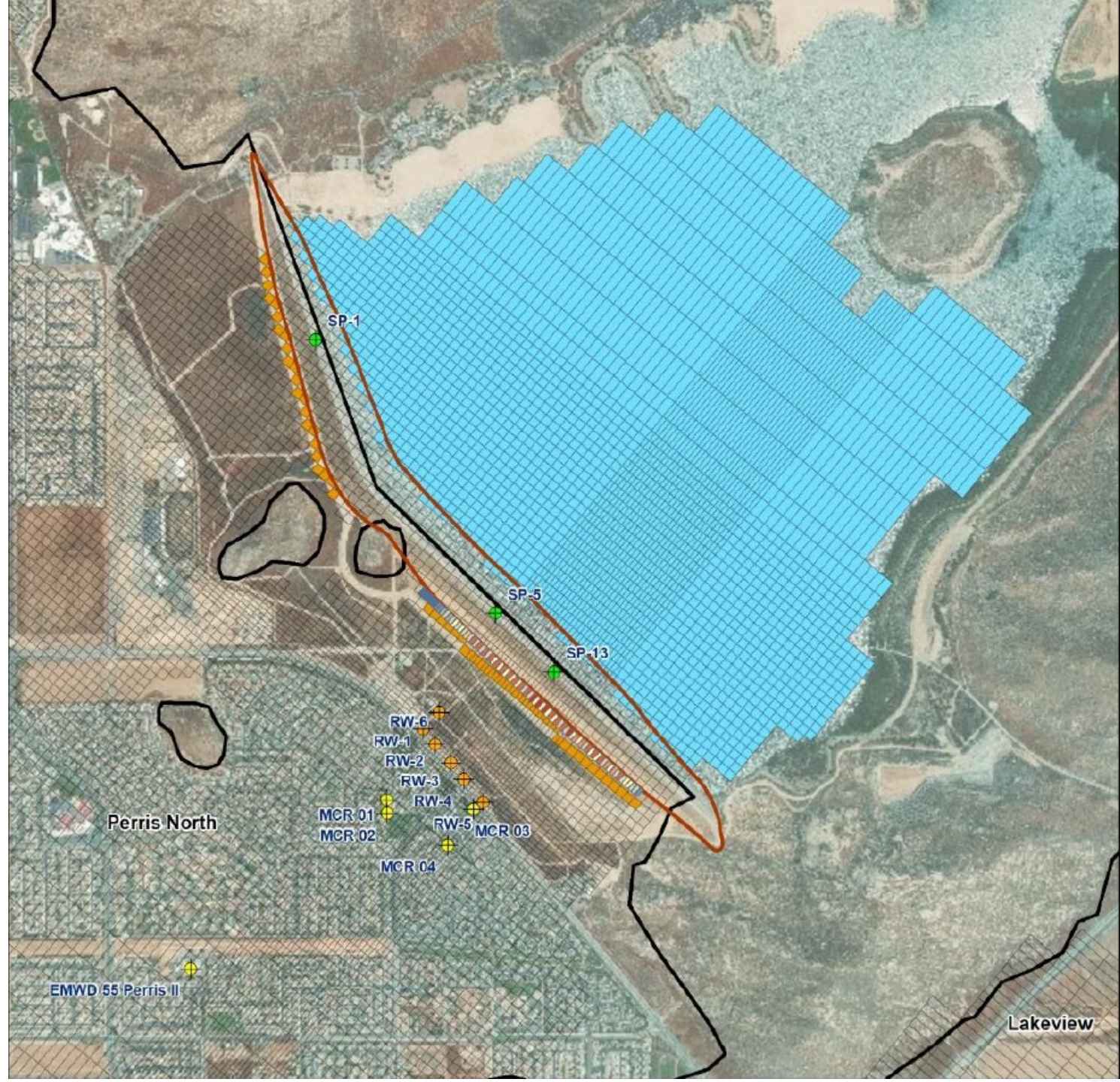| 1984 – 2005 (Unit: AFY)		Refined Model
Right Side	Seepage Recovery	549
	Seepage Bypass	412
	Total Right	961
Left Side	Seepage Recovery	3,366
	Seepage Bypass	3,264
	Total Left	6,630
Total Seepage		7,592

Distribution of Seepage Under Perris Dam – Left Dam
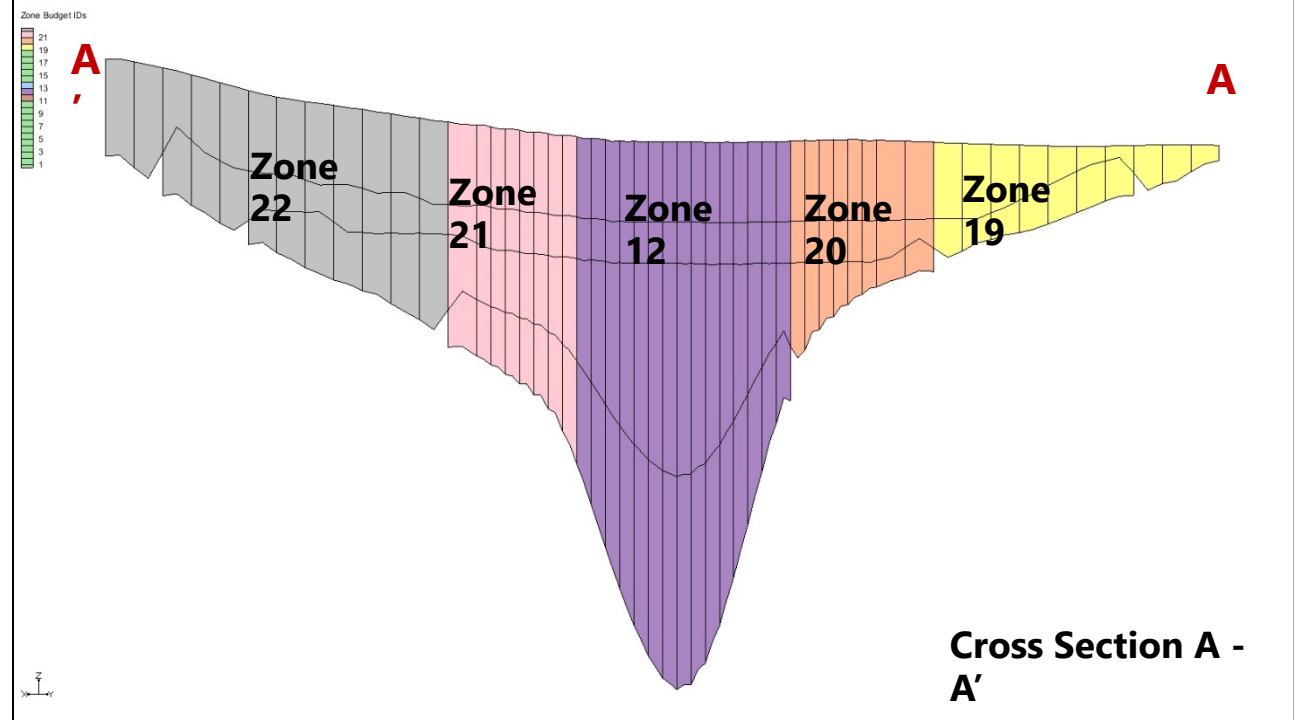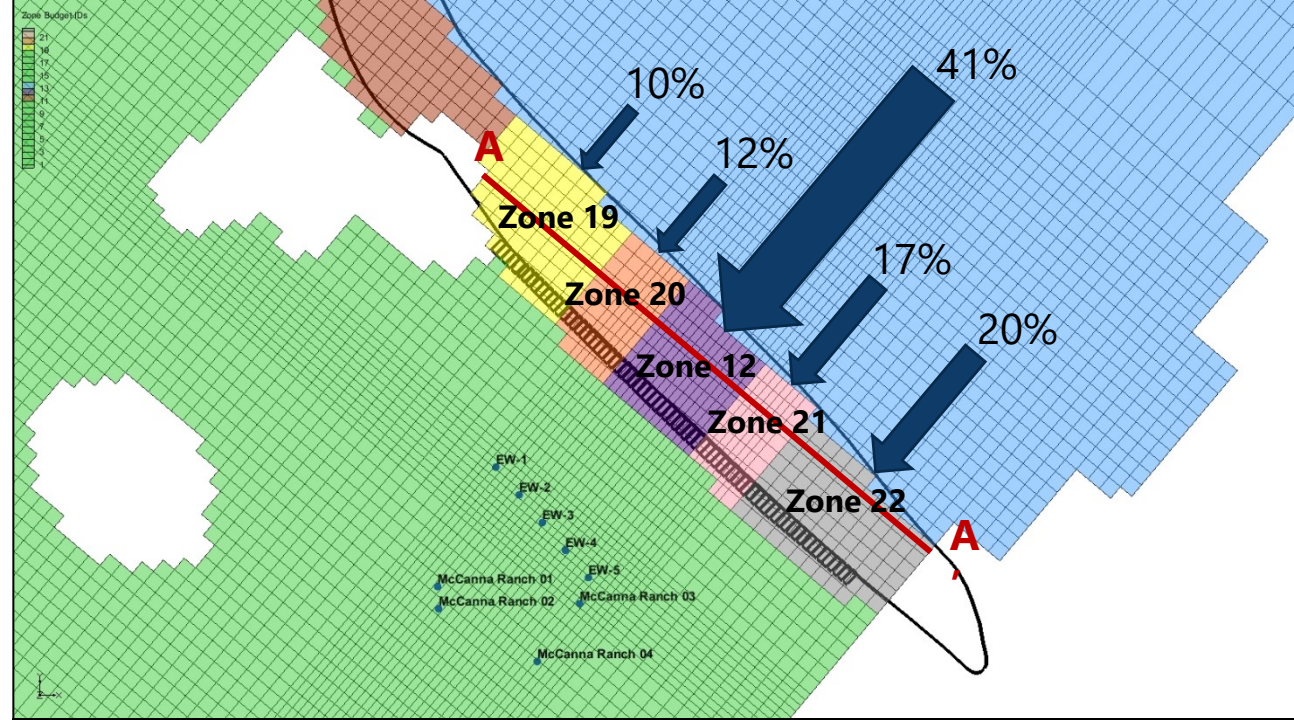
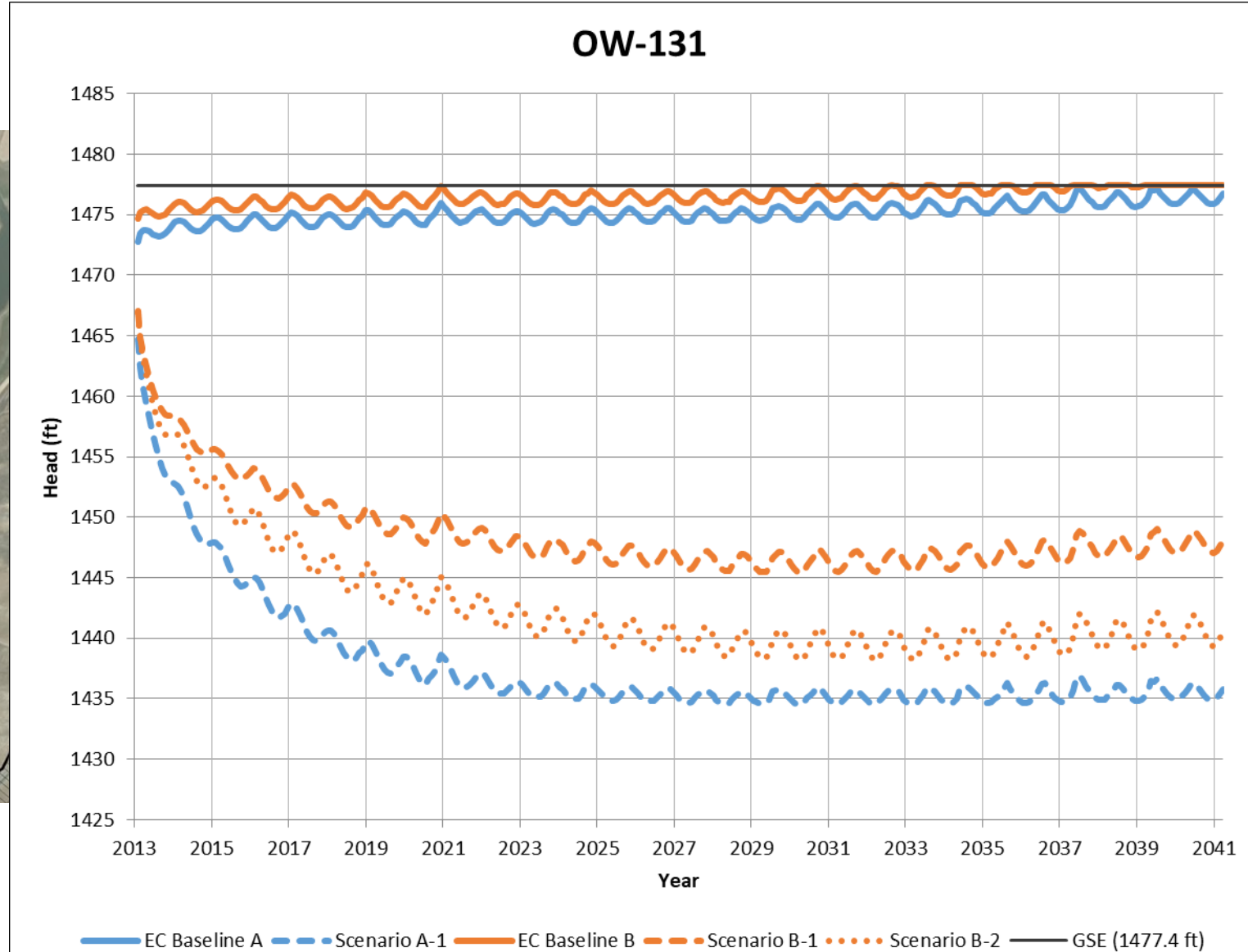Cross Section A - A′

Seepage Recovery Wells

Seepage Recovery Wells – Design Extraction Rates

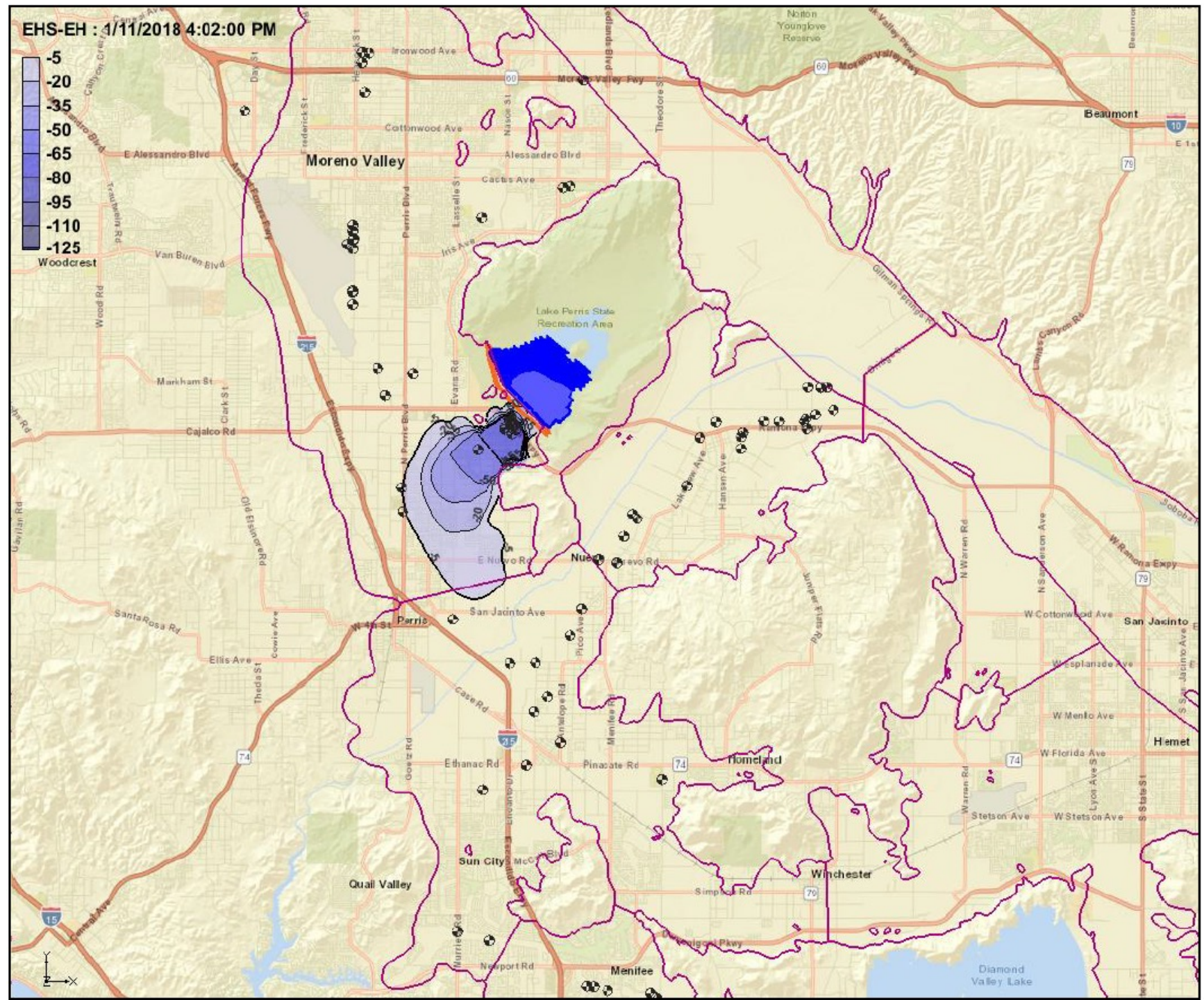| Recovery Wells	Extraction Rate (AFY)
RW-1	1,406
RW-2	1,563
RW-3	1,563
RW-4	1,563
RW-5	1,406
RW-6	0
Total	7,500

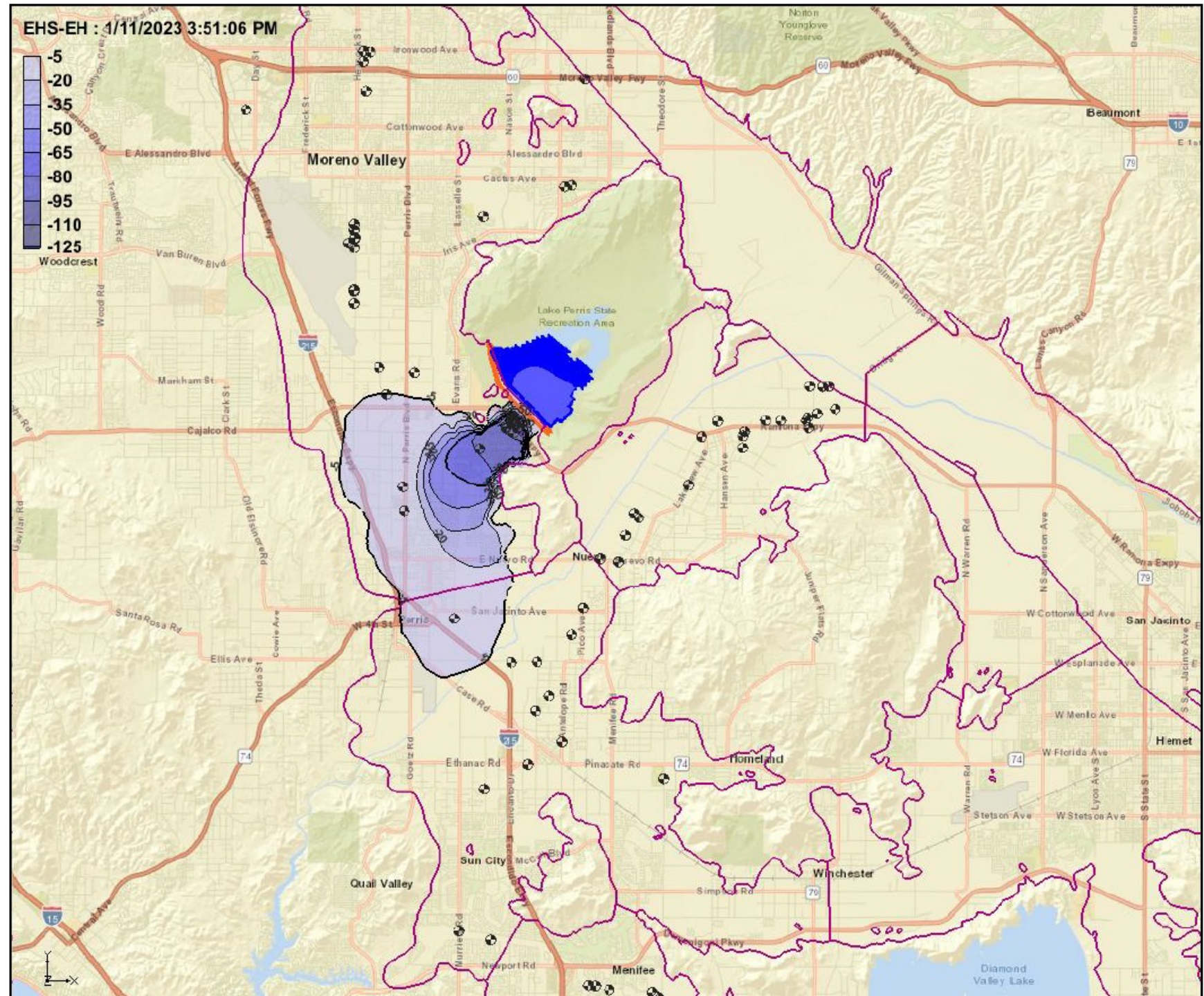Woodard & Curran

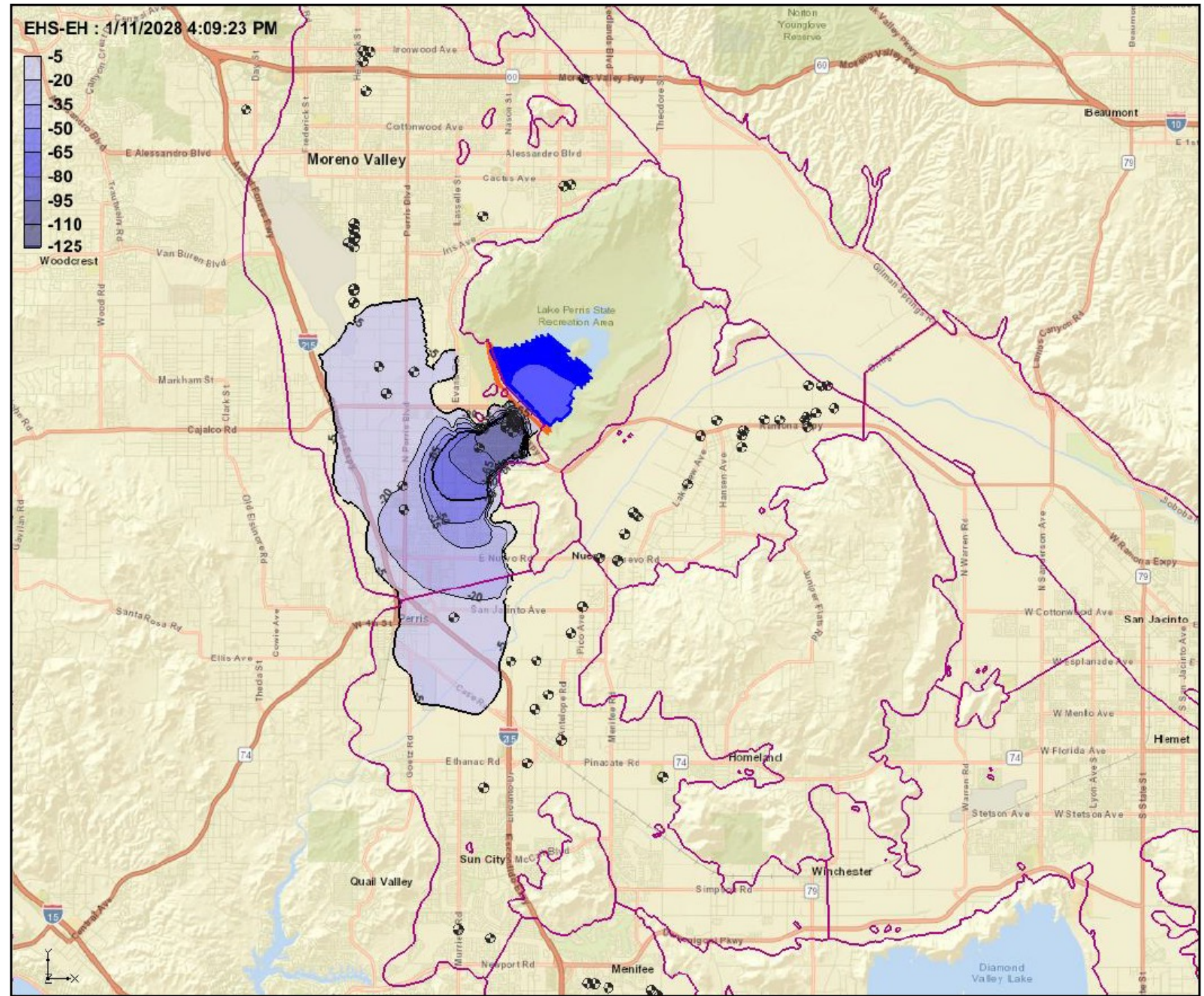# Project Impact - Riparian Area (OW-131)
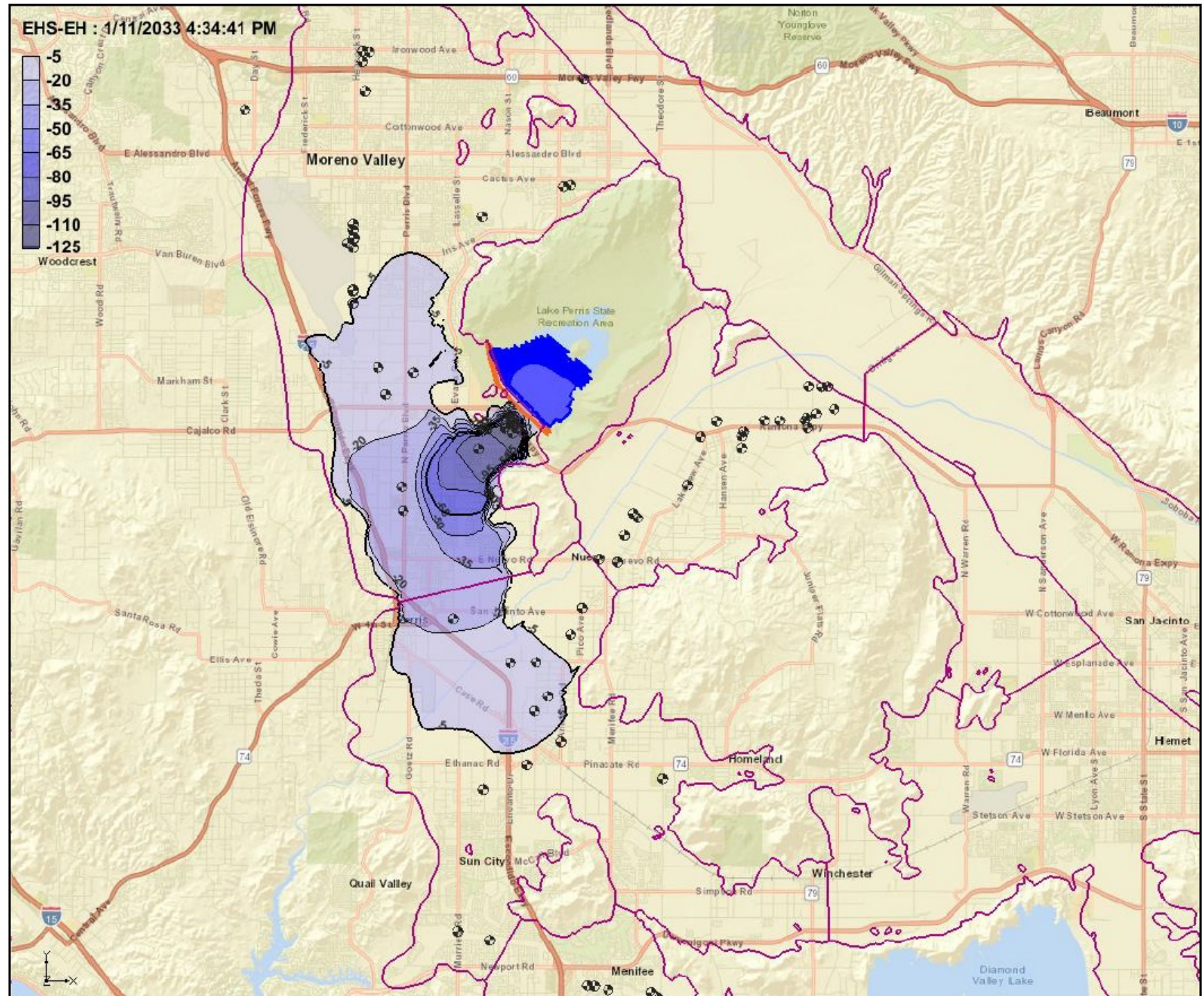
EHS-EH
(year 5)

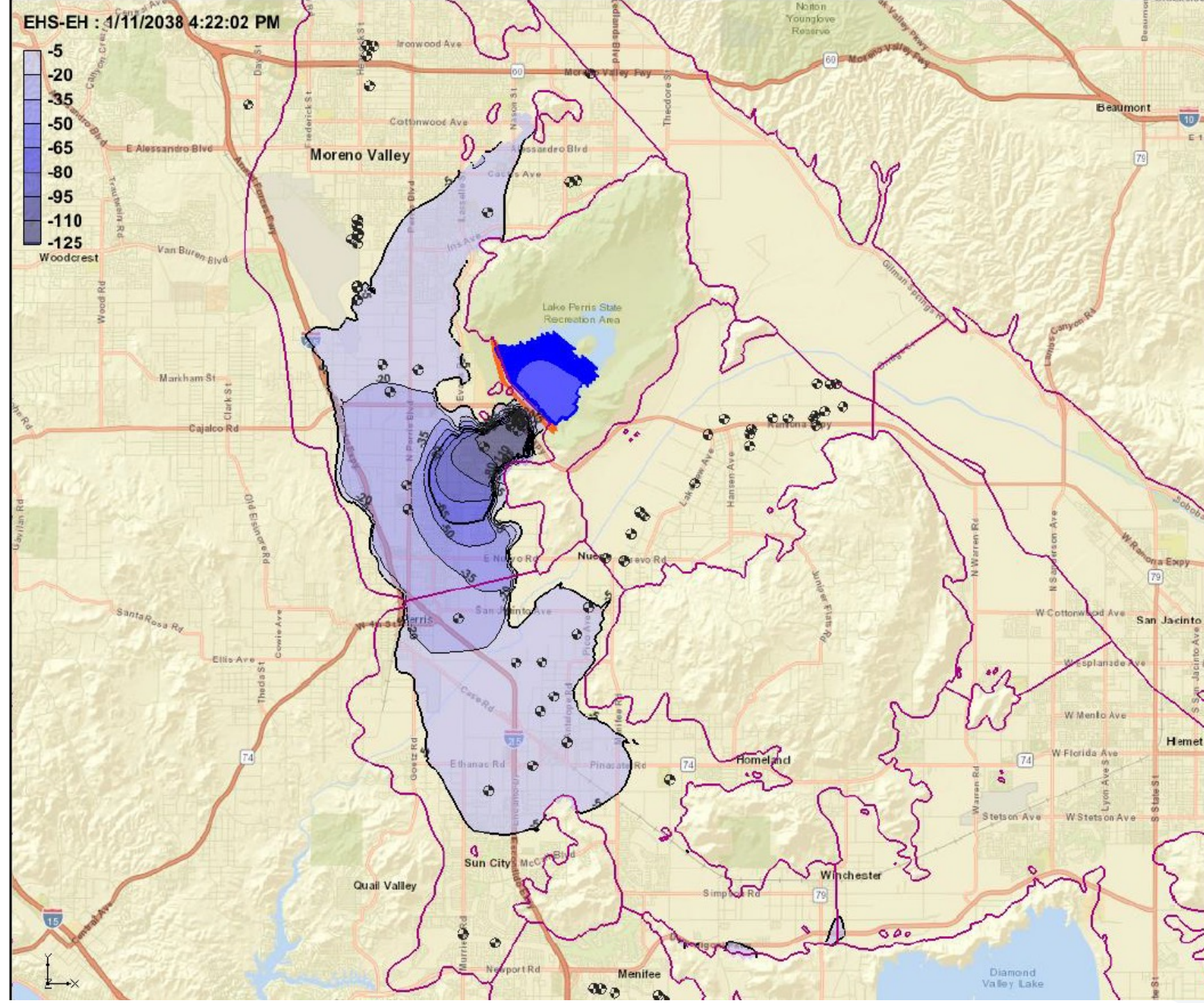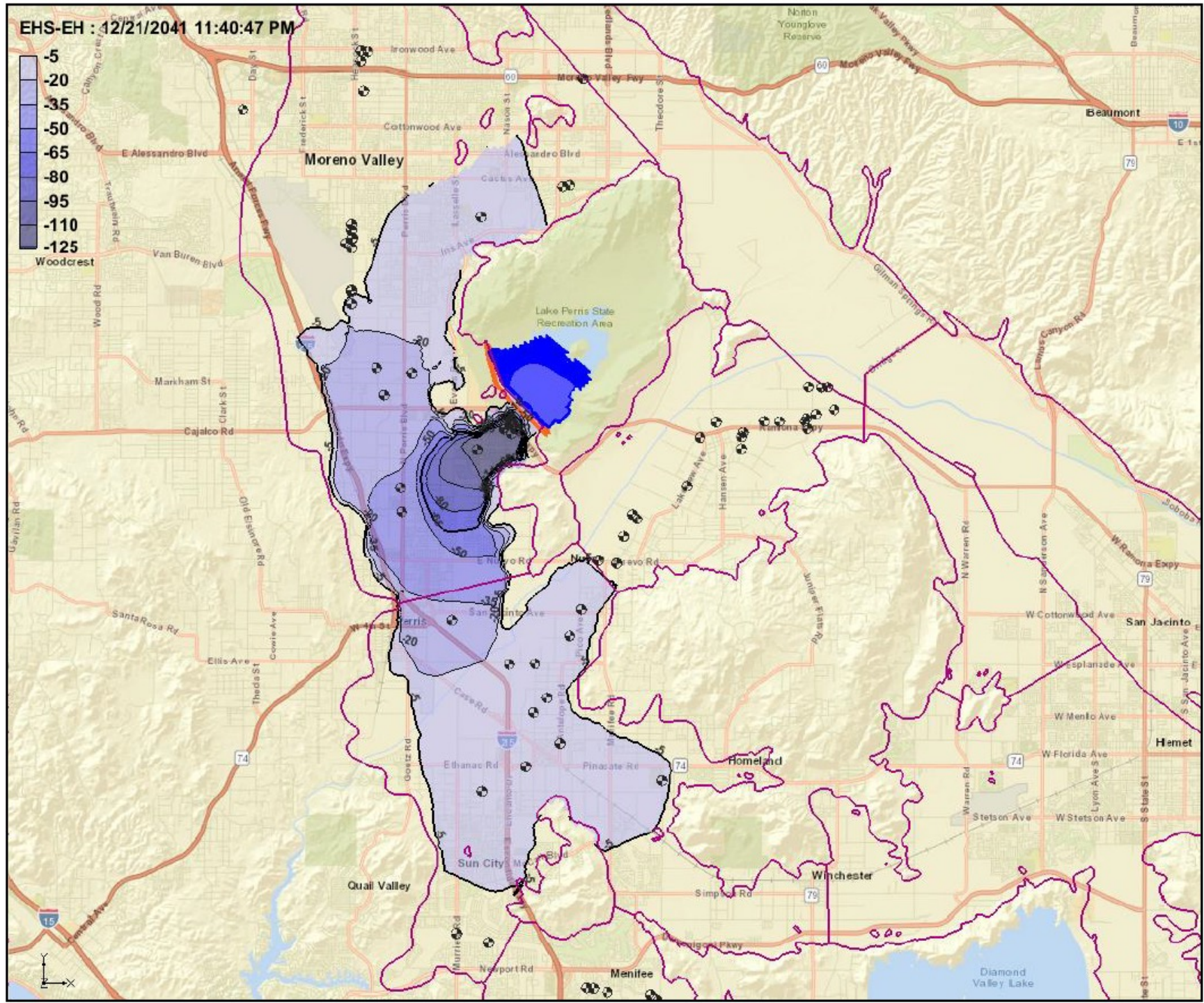# EHS-EH (year 10)

EHS-EH
(year 15)

EHS-EH (year 20)

EHS-EH
(year 25)

EHS-EH
(year 30)

Operational Constraints for Seepage Recovery Wells

▶ Wells will be screened from 110 ft bgs

▶ Wells will be equipped with variable frequency drives (VFD)

▶ Water levels do not drop below 100 ft bgs

▶ Five Seepage Recovery Wells
- Four wells operate continuously
- Fifth well is on standby
- Rotate pumping on a weekly basis
- No well will remain idle for more than 1 week

▶ Extraction Rates for each well:

	Gallons per minute (gpm)	Acre-feet per Year (AFY)	Cubic Feet per Day (cf/d)
Minimum Operational Extraction Rate	650	1,048	125,042
Maximum Operational Extraction Rate	1,200	1,936	230,847

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Operational Simulations Result

▸ Recovery wells can pump for 5 years at maximum capacity without drawing water levels below 100 ft bgs

▸ Heads fluctuate 7-10 feet as a result of rotating active wells

▸ Long-term seepage recovery rate will decrease by ~1,000 AFY

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