# San Jacinto Groundwater Basin Water Quality Management Projects

## (Perris North & Perris South Subbasins)

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Principal Engineering Geologist
April 6, 2022

# Overview of EMWD

ESTABLISHED IN

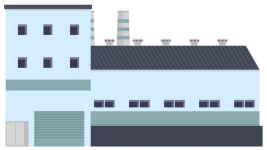
# 1950

SERVES:

WATER / WASTEWATER / RECYCLED

# 558

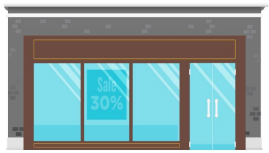
SQUARE MILE SERVICE AREA



WHOLESALE

&

RETAIL



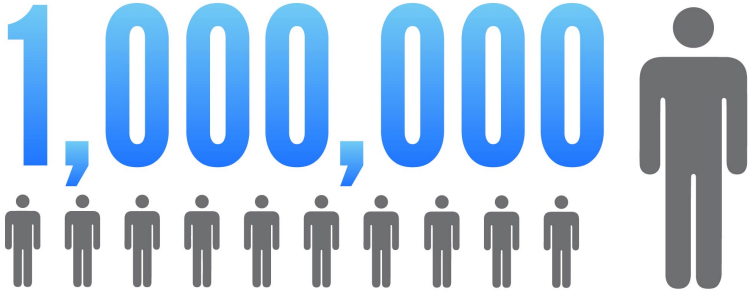

APPROXIMATELY

# 38%

CURRENTLY BUILT OUT

## POPULATION NEARLY:

# 1,000,000



# 26

member agencies of The Metropolitan Water District of Southern California

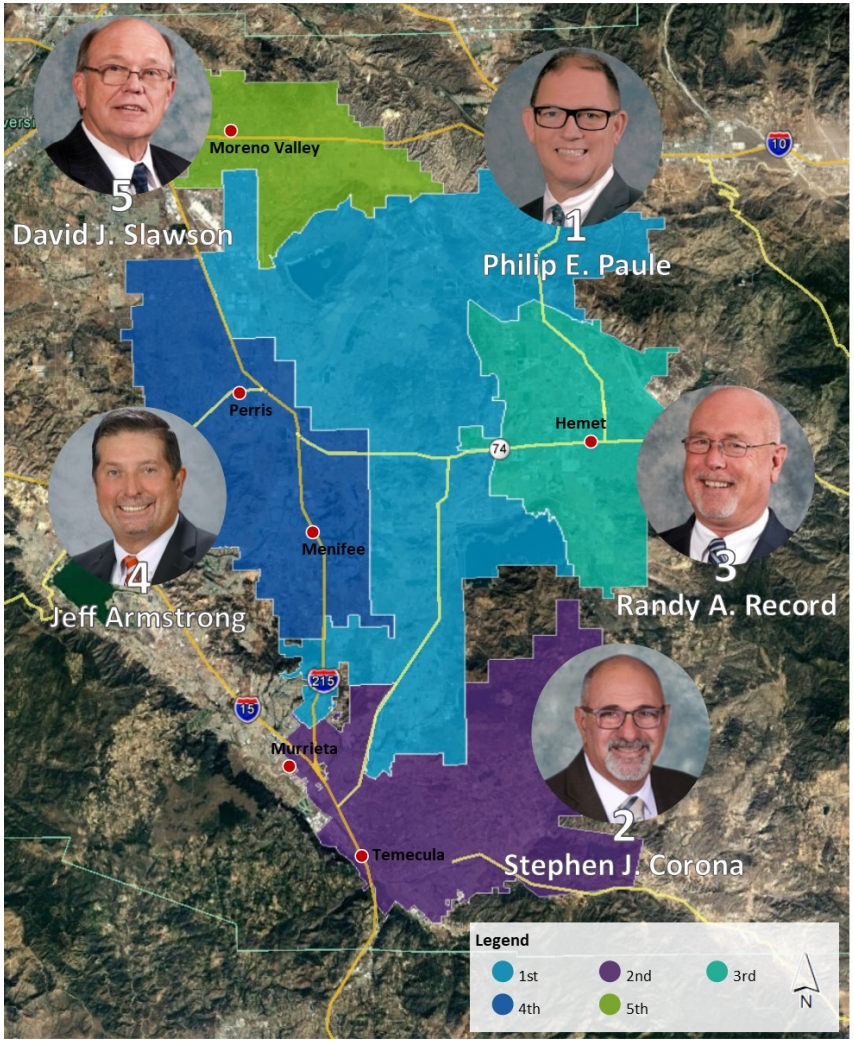
ONE OF THE



emwd

# About EMWD

- Five division publicly-elected Board of Directors
- More than 600 employees
- Annual budget of $441 million for FY 2021-22
- Five-year capital program of $534.5 million for FY 2021-22 to FY 2025-26
  - More than 180 active capital projects
- Sixth largest public water utility in California



# EMWD Compared to Other Retail Water Agencies in California

## California's Largest Retail Water Agencies


1. Los Angeles Dept. of Water and Power
2. East Bay Municipal Utilities District
3. City of San Diego
4. San Jose Water Company
5. San Francisco Public Utilities Commission
6. **EMWD**
7. City of Fresno
8. Irvine Ranch Water District
9. City of Anaheim
10. Alameda County Water District

## Western Riverside County Water Agencies Statewide Population Rankings


- 6 **EMWD**
- 12 Riverside Public Utilities
- 36 Rancho California Water District
- 40 Elsinore Valley Municipal Water District
- 70 Western Municipal Water District
- 142 Lake Hemet Municipal Water District
- 205 City of Hemet
- 255 City of San Jacinto

# EMWD's Service Area

- Moreno Valley to Temecula
- Seven cities and the unincorporated areas
- One of 26 member agencies of The Metropolitan Water District of Southern California (MWD)
- EMWD Representative to MWD:
  - Randy Record

# Core Services

## DRINKING WATER

- Approximately 159,000 accounts
  - 82,395 acre feet sold in FYE 2021
  - Imported water from State Water Project and Colorado River Aqueduct
  - Groundwater wells (adjudicated basin)
  - Menifee and Perris brackish desalters

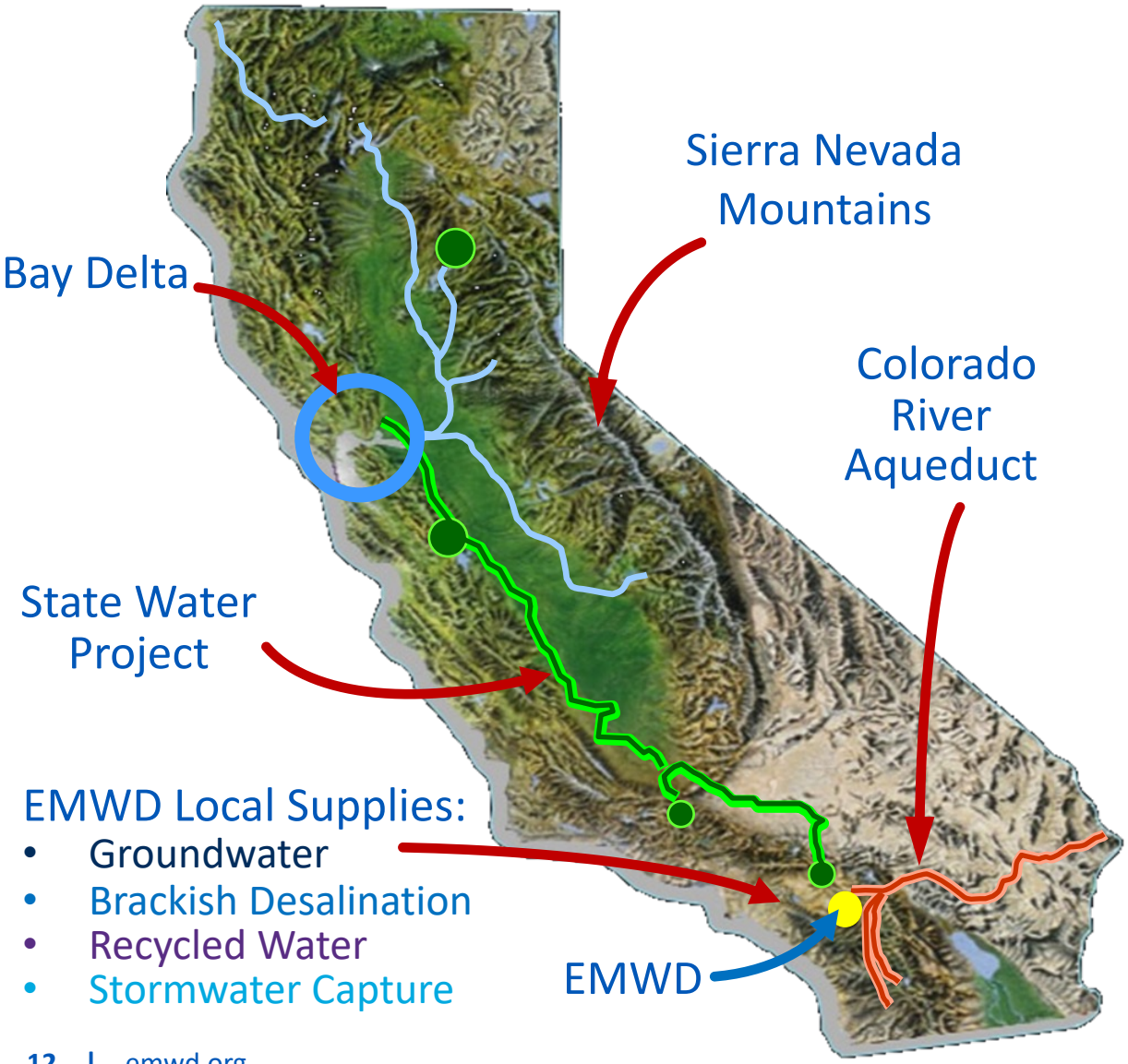
## WASTEWATER

- Approximately 263,000 accounts
  - Four operating regional water reclamation facilities
  - 74 million gallons per day capacity
  - 47 millions gallons per day average


## RECYCLED WATER

- Approximately 686 accounts
  - 33,745 acre feet sold in FYE 2021
  - Extensive agricultural irrigation, municipal irrigation, and environmental use

# Sources of Water

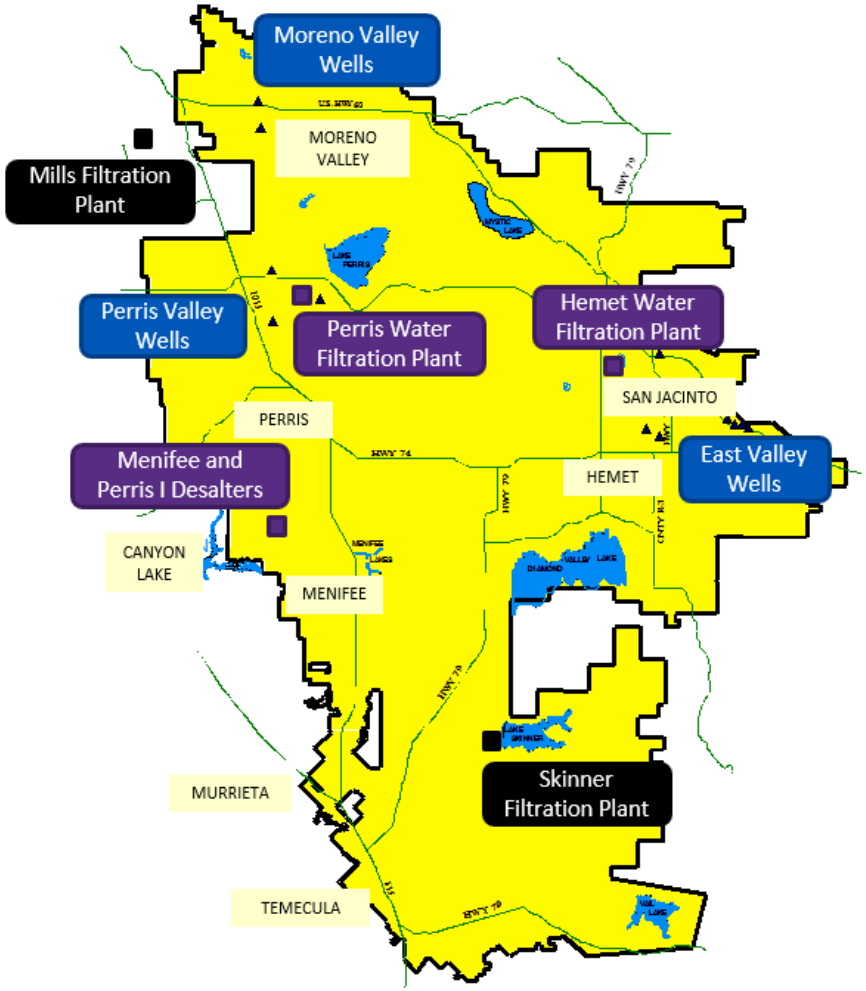



- 26 member agencies
- Owns Colorado River Aqueduct
- State Water Project Contractor
- Imports water to meet half of Southern California retail demands
- Typical demands: 2.1 MAF
- Demand forecast in FY 21/22: 1.77 MAF

Best Practices in Water Use Efficiency (Conservation)

# Location of Water Supplies Entering EMWD's System

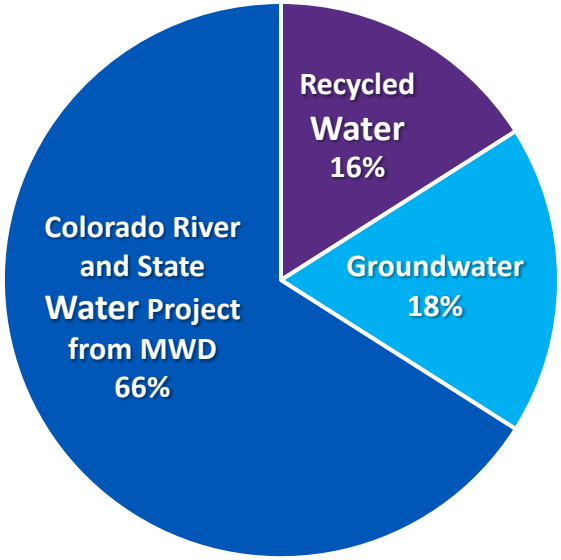
- Imported Treated Water from MWD
  - Henry J. Mills Water Filtration Plant (up to 155 cfs)
  - Robert A. Skinner Water Filtration Plant (up to 85 cfs)
- Imported Raw Water from MWD
  - Hemet Water Filtration Plant
  - Perris Water Filtration Plant
- Groundwater Wells in Moreno Valley and the San Jacinto Valley
- Brackish Groundwater Wells in Menifee and Perris Valley



# Water Supply Portfolio

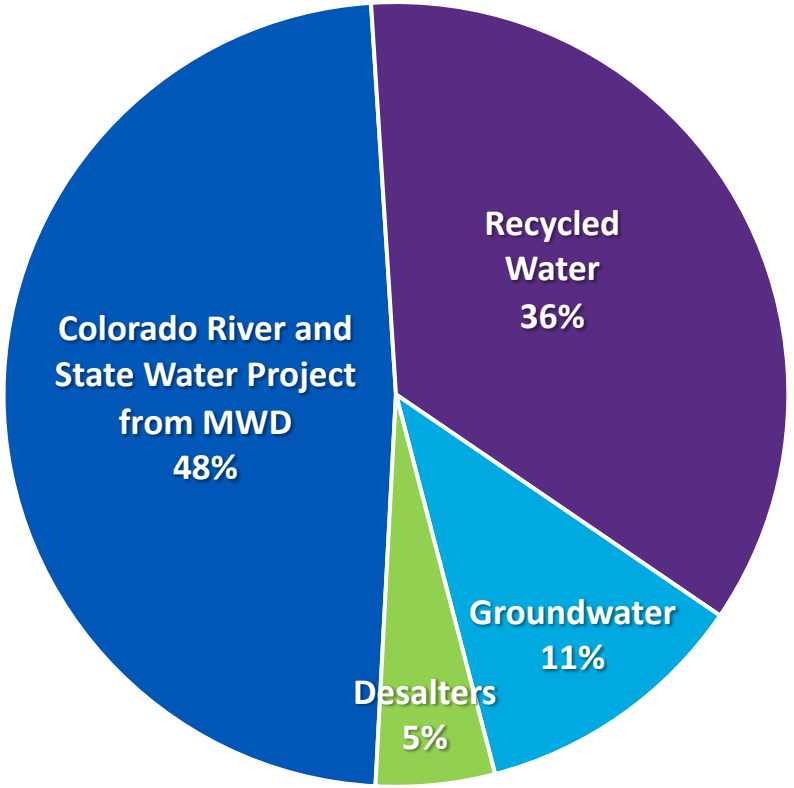
## 1990

Population served: 358,000




## 2021*

Population served: 870,500




**Total Water Supply: 147,734 AF per EMWD Annual Comprehensive Financial Report, FYE 2021*

# Progress Since the Year 2000

*Service Area*
**Population**

Up
93%

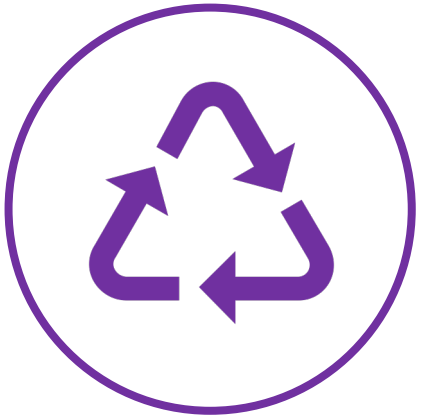
*Per Capita*
**Water Use**

Down
42%

**Imported Water**
*Consumption*

Down
3%

**Recycled Water**
*Consumption*



Up
8%

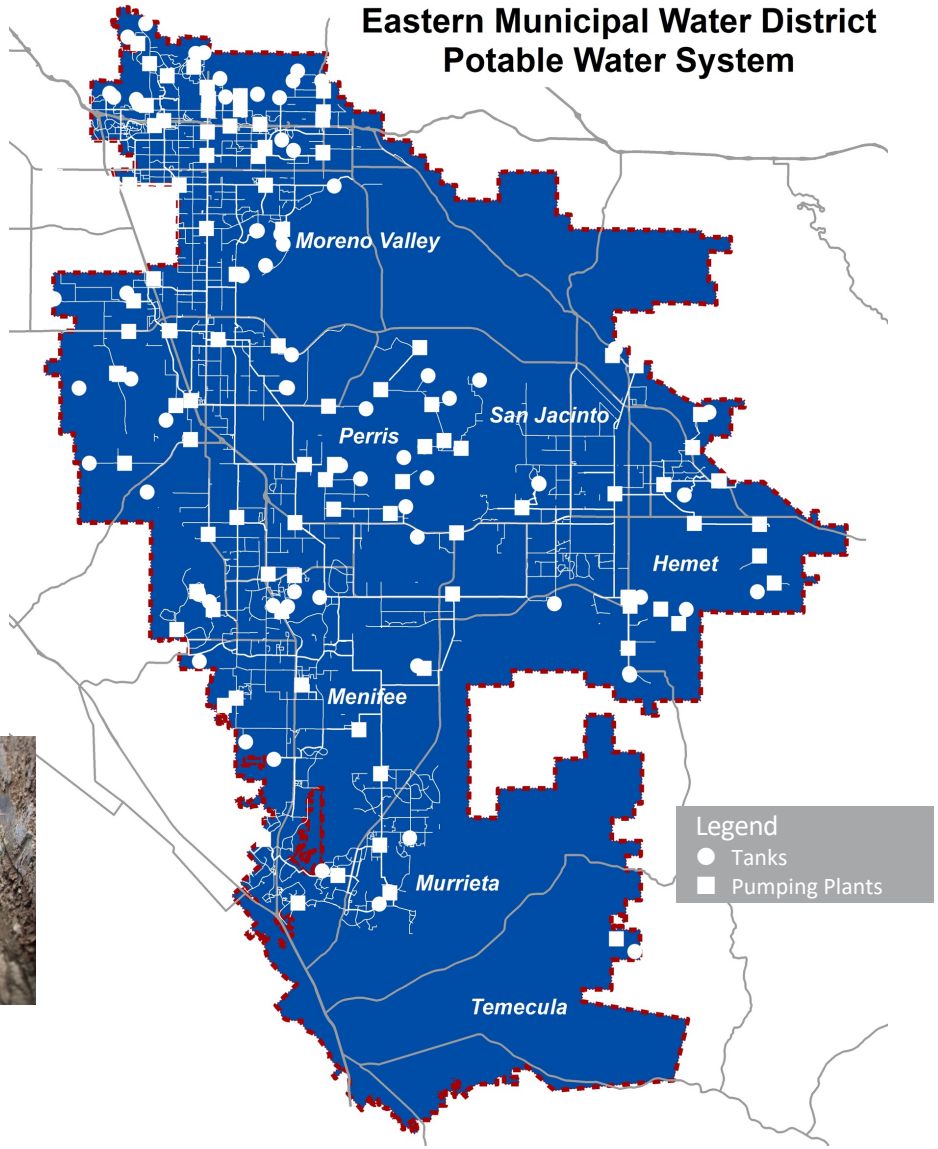


emwd

# Infrastructure

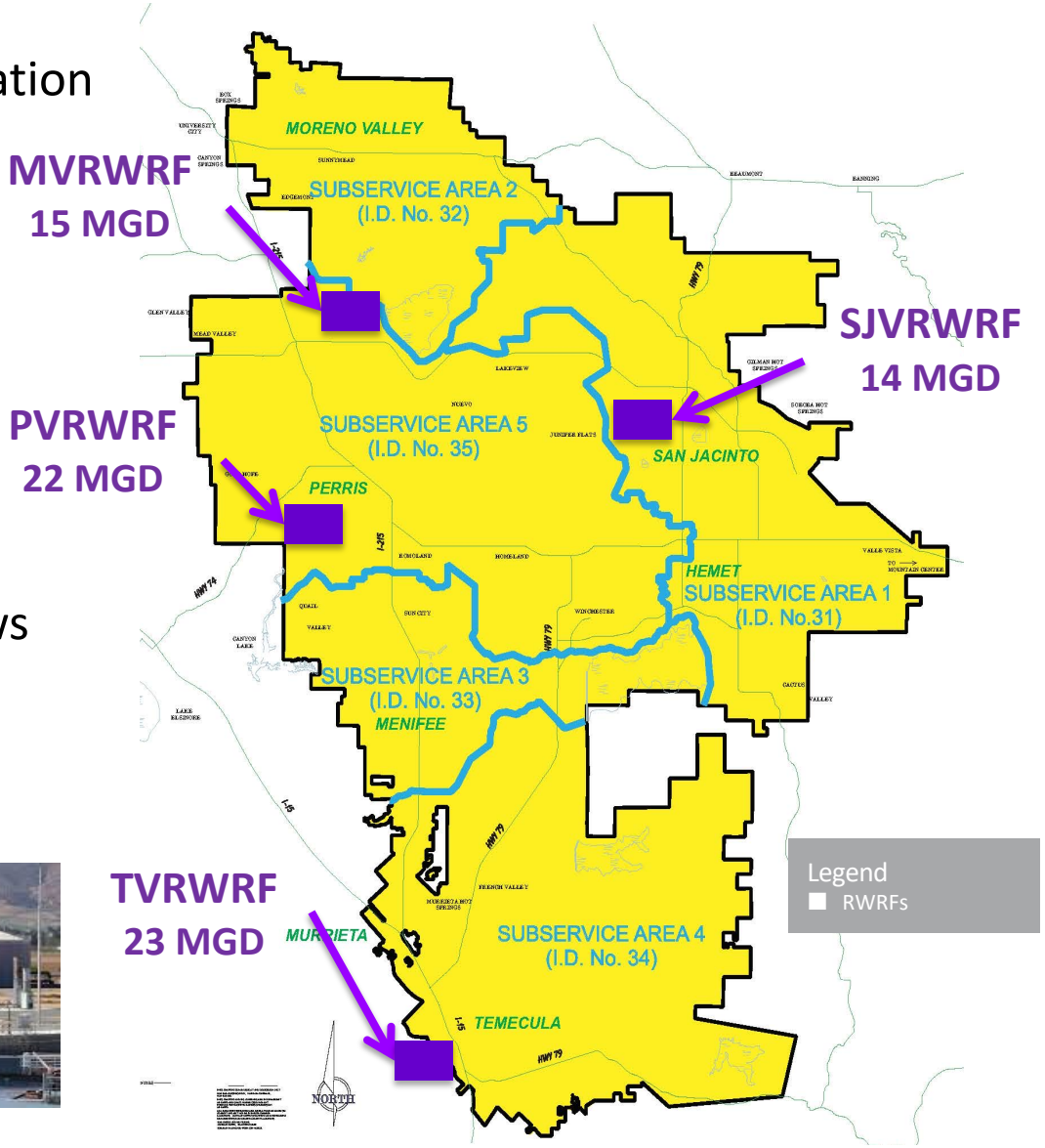
# Drinking Water System

- 2 water filtration plants
- 3 desalination plants
- 2,534 miles of pipelines
- 86 pump stations
- 79 storage tanks
- 14 potable wells
- 13 brackish wells



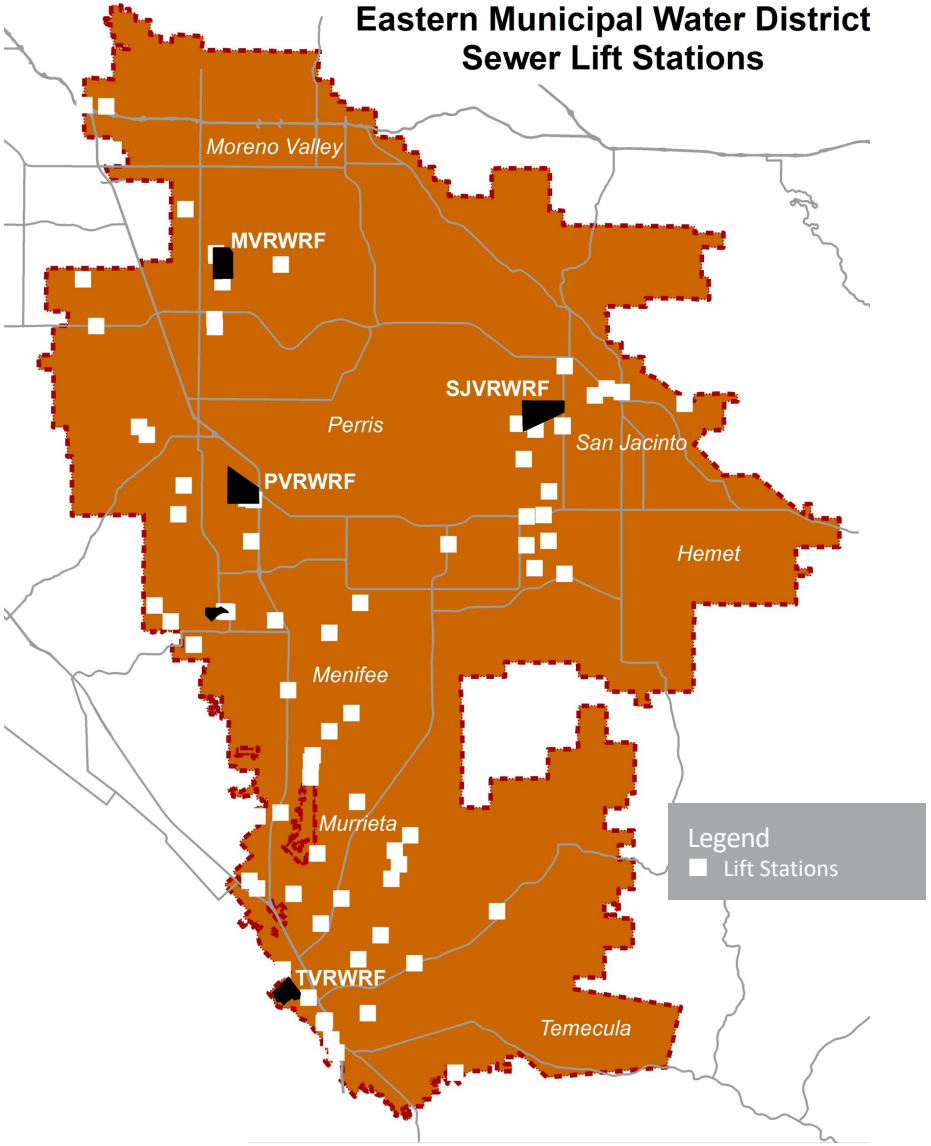
# Wastewater Collection and Treatment

- Four Regional Water Reclamation Facilities (RWRFs)
  - San Jacinto Valley
  - Moreno Valley
  - Temecula Valley
  - Perris Valley
- 74 MGD current permitted operating capacity
- 47 MGD current average flows



# Wastewater Collection and Reclamation

- 1,913 miles of sewer pipelines
- 51 active sewage lift stations



# Recycled Water Program

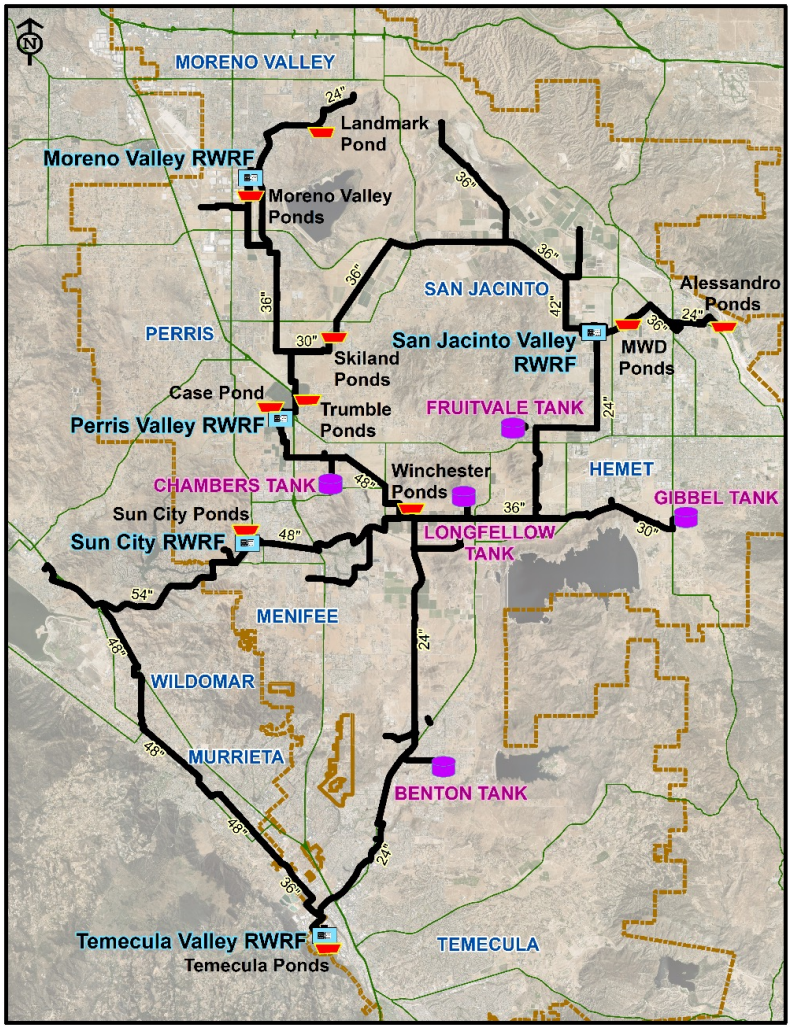
- Program started in 1960s
- Four treatment plants treating approximately 47 MGD to produce tertiary recycled water to Title 22 standards
  - Agricultural irrigation (~10,000 acres)
  - Sport fields, golf courses, parks, schools, medians, recreational
  - Wetlands and habitat
    - San Jacinto Wildlife Area – California Department of Fish and Wildlife

Strategic Goal: 100 Percent Beneficial Reuse

Succession Plan: Potable Reuse

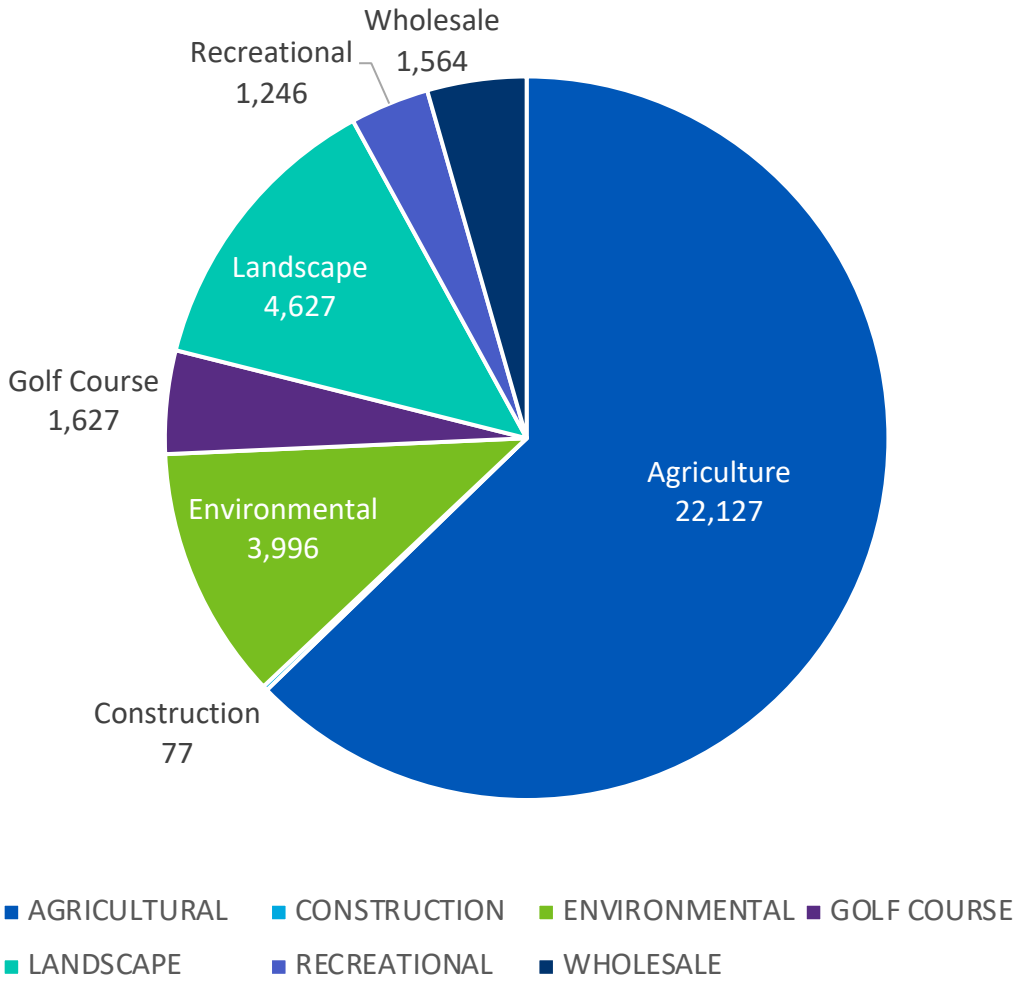
33,745 AF sold in FYE 2021

# EMWD's Recycled Water Program




- $200 million in capital investments
- 252 miles of recycled water pipeline
- Nearly 7,700 AF of seasonal storage
- Four pressure zones consisting of:
  - 19.5 MG of elevated storage
  - 24 active pump facilities

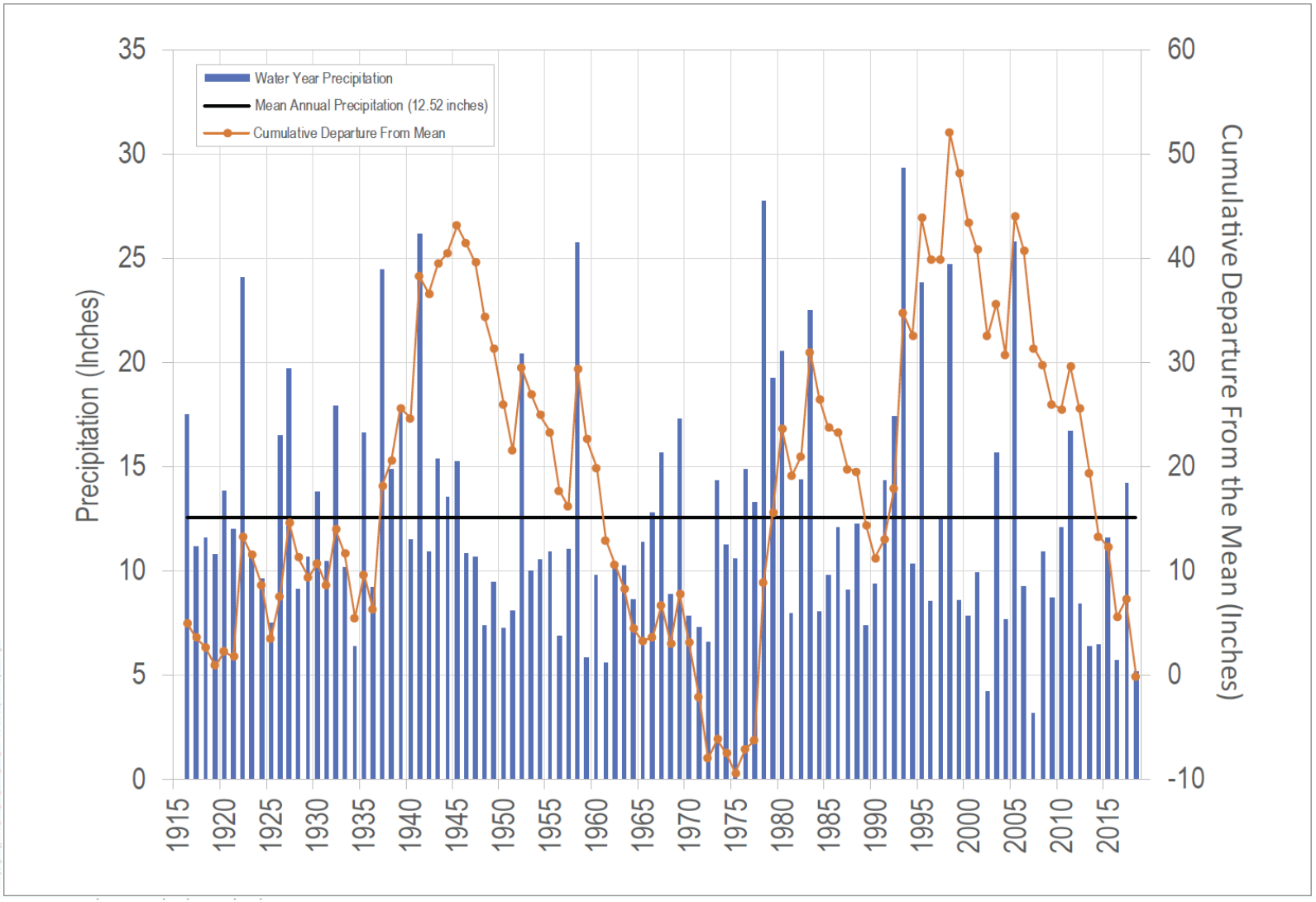
# Recycled Water Usage Type FY 2020-21



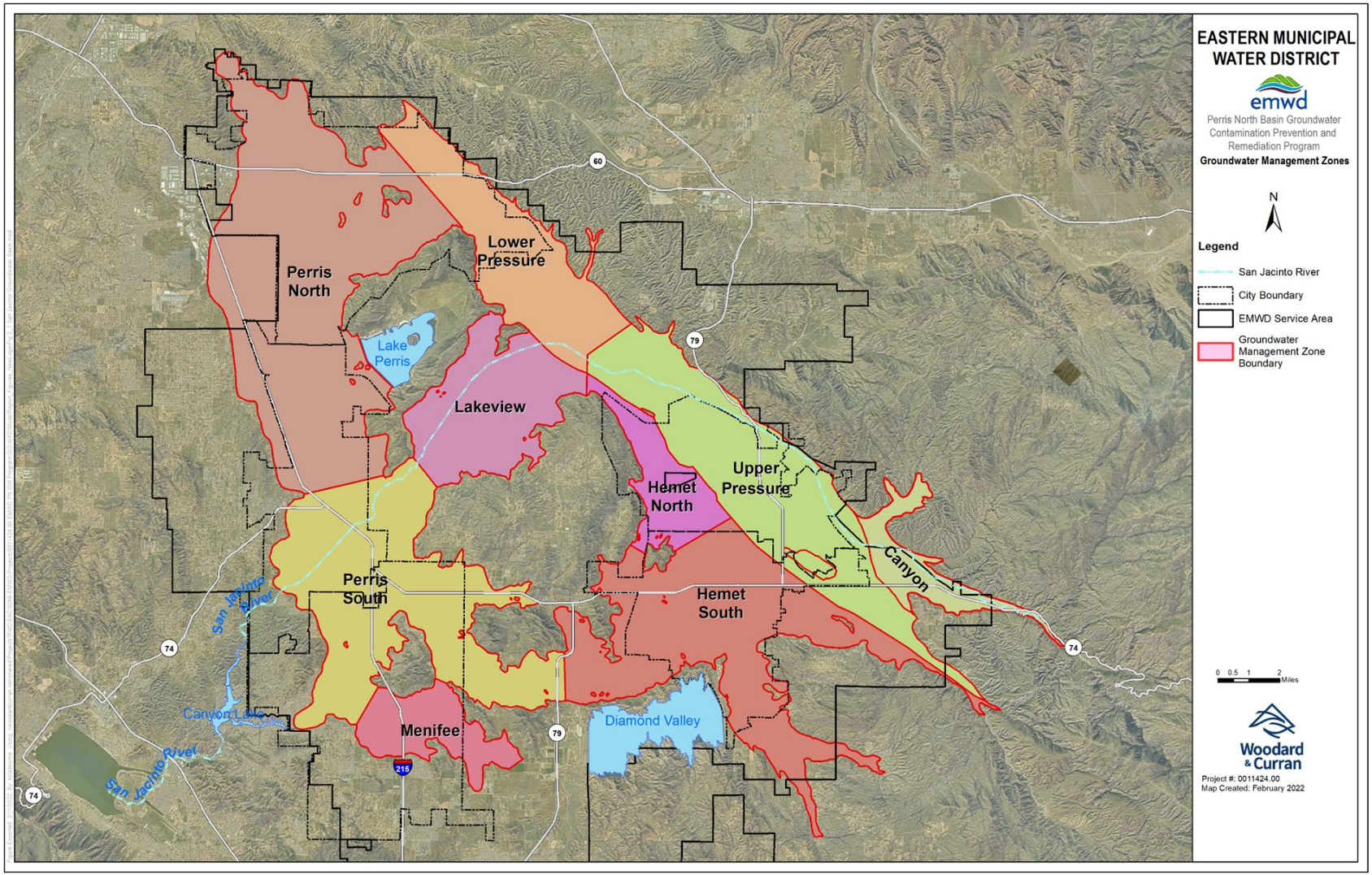

*Per *EMWD Customer Billing Data, FYE 2021*

# Groundwater Management

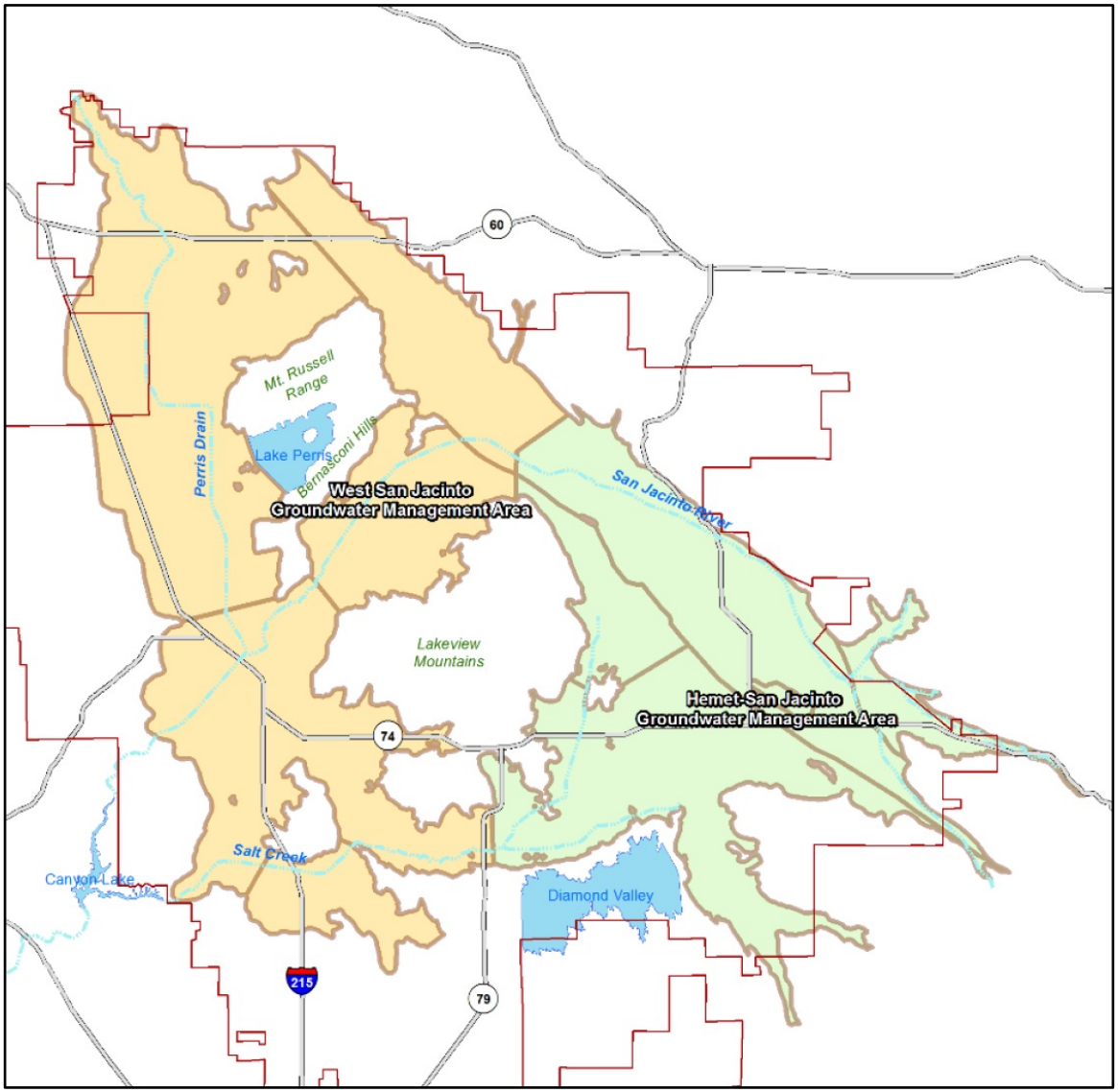
# Basin Hydrology



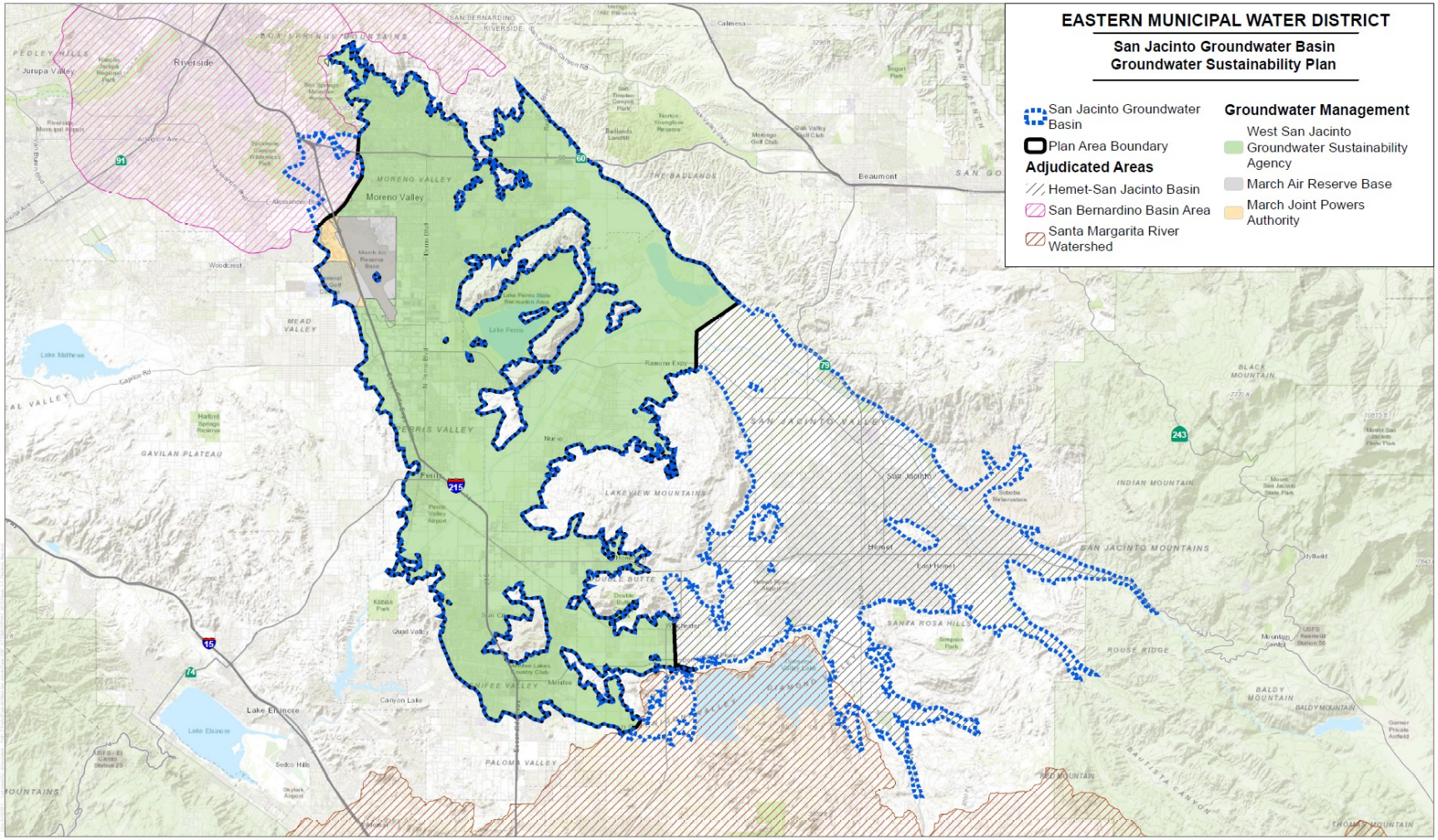
# Groundwater Management Zones



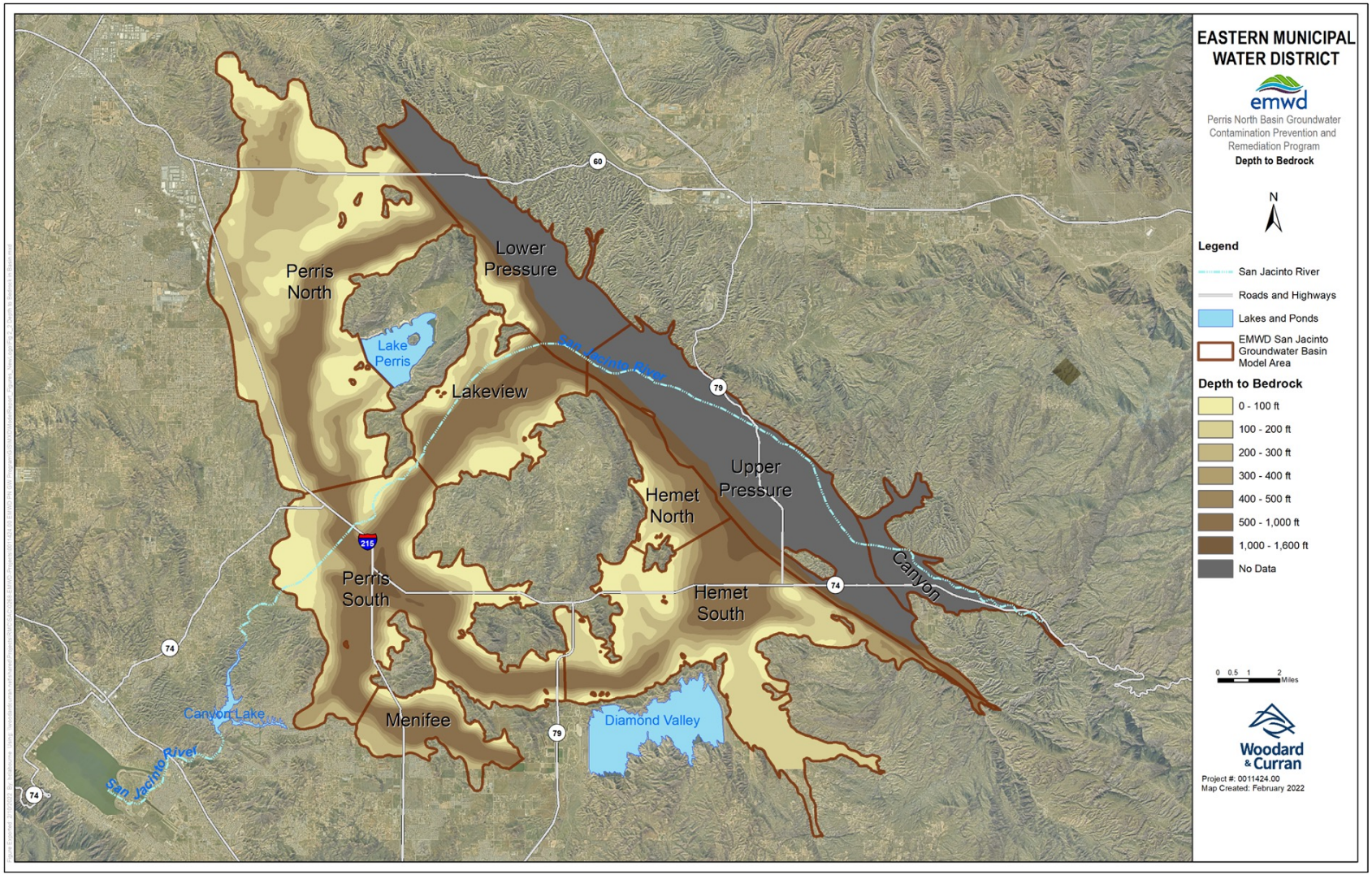
# Groundwater Management Areas



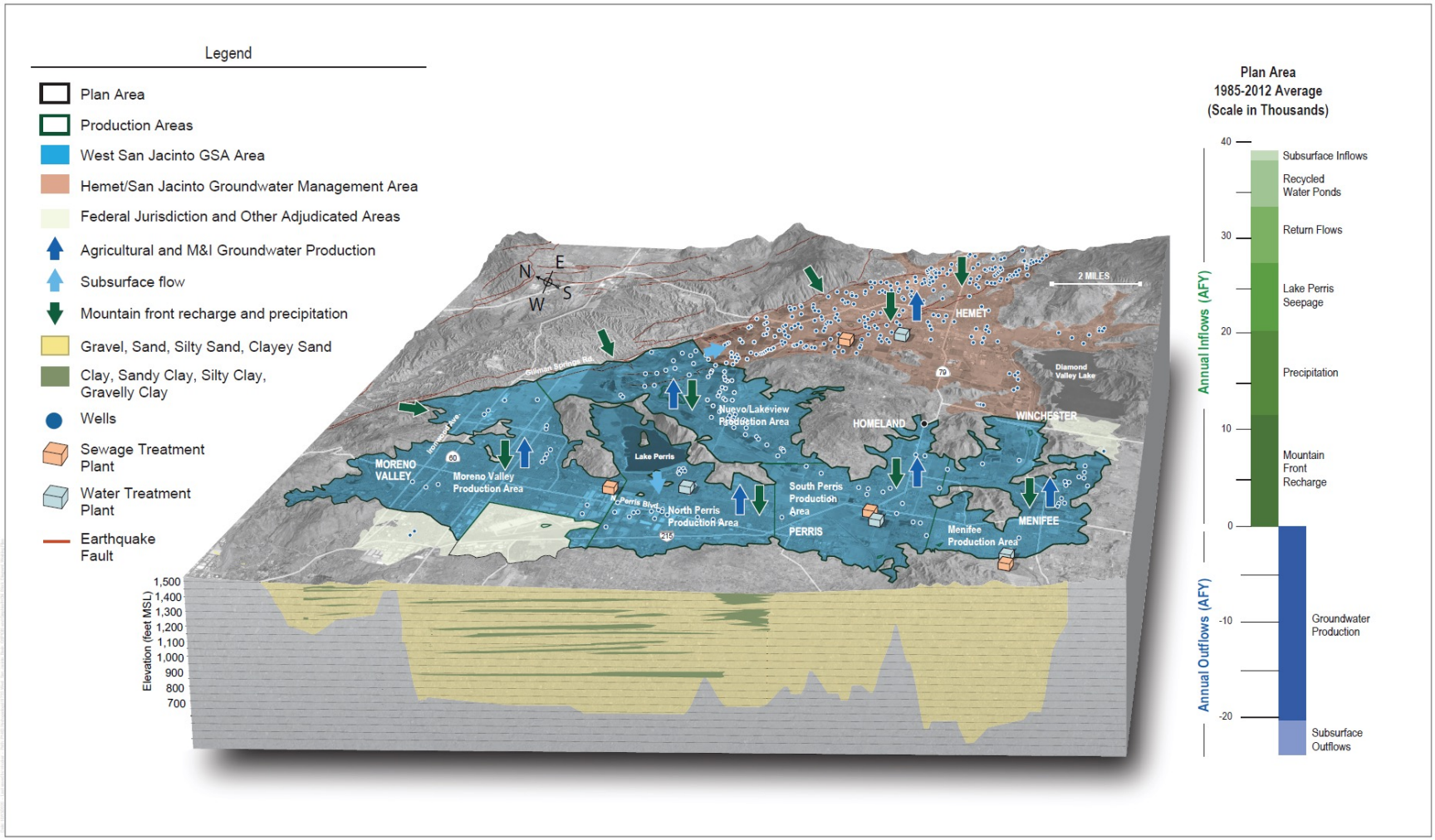
# EMWD is a Groundwater Sustainability Agency



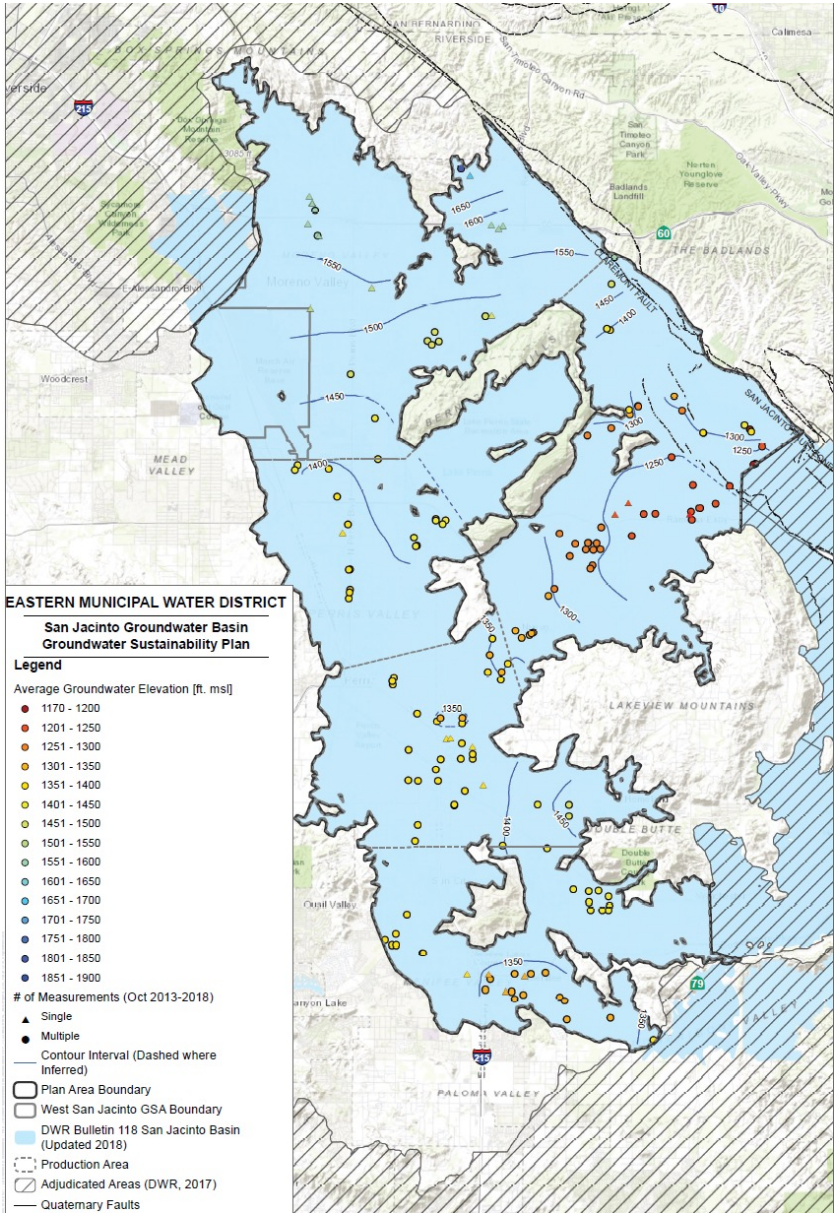
# Depth to Bedrock



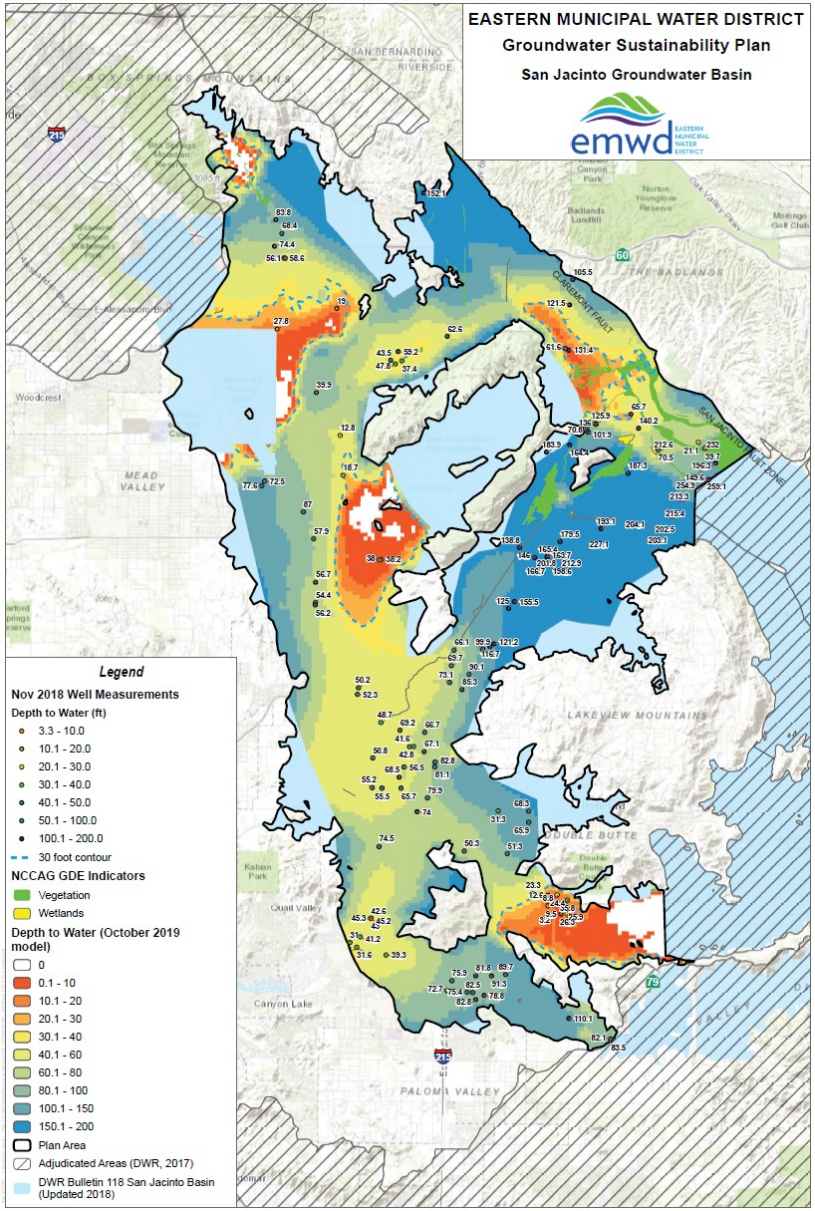
# Hydrogeological Conceptual Model



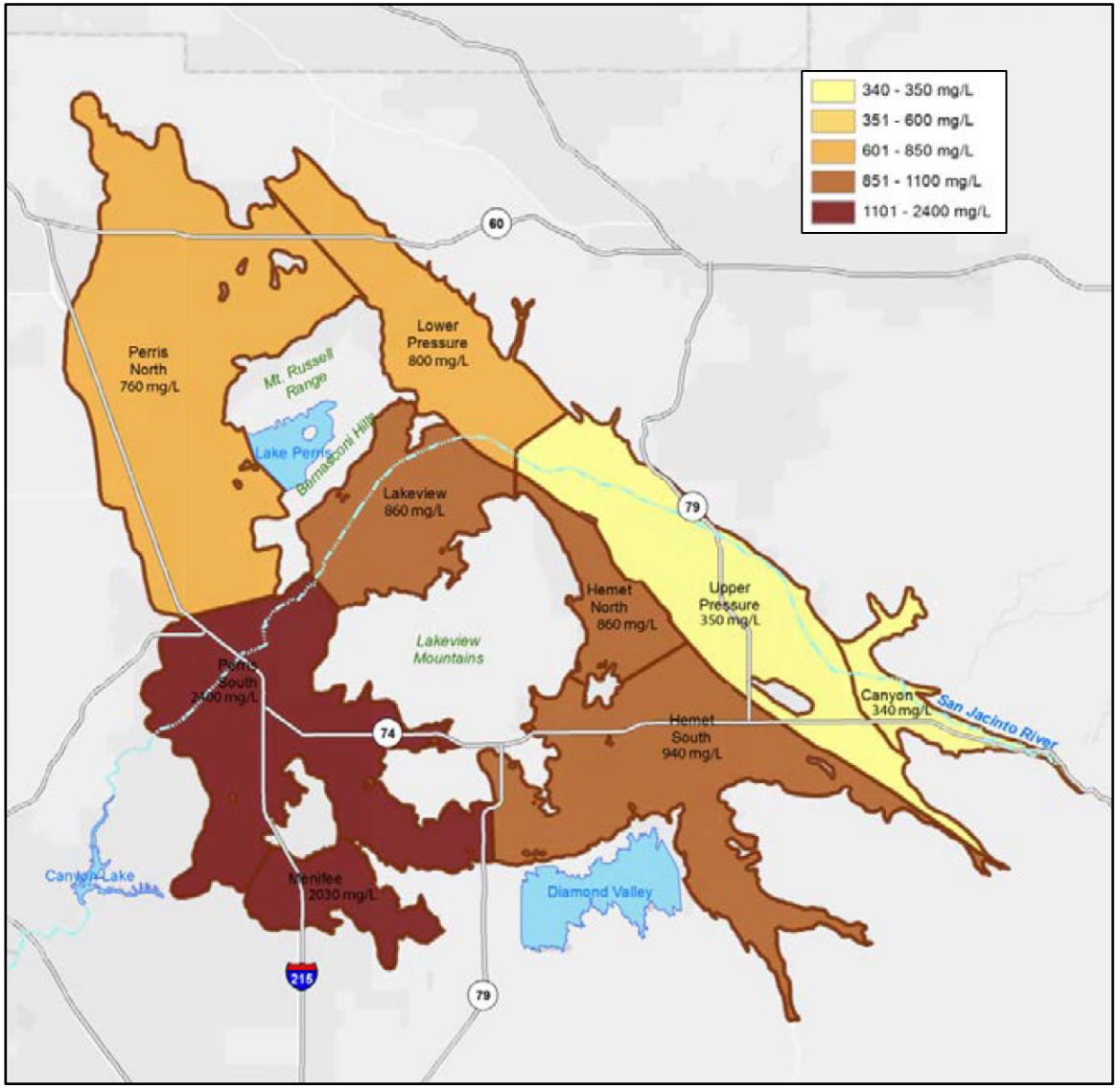
# Fall 2013-2018 Average Groundwater Elevation



# Depth to Water November 2018



# Ambient Average TDS by GMZ



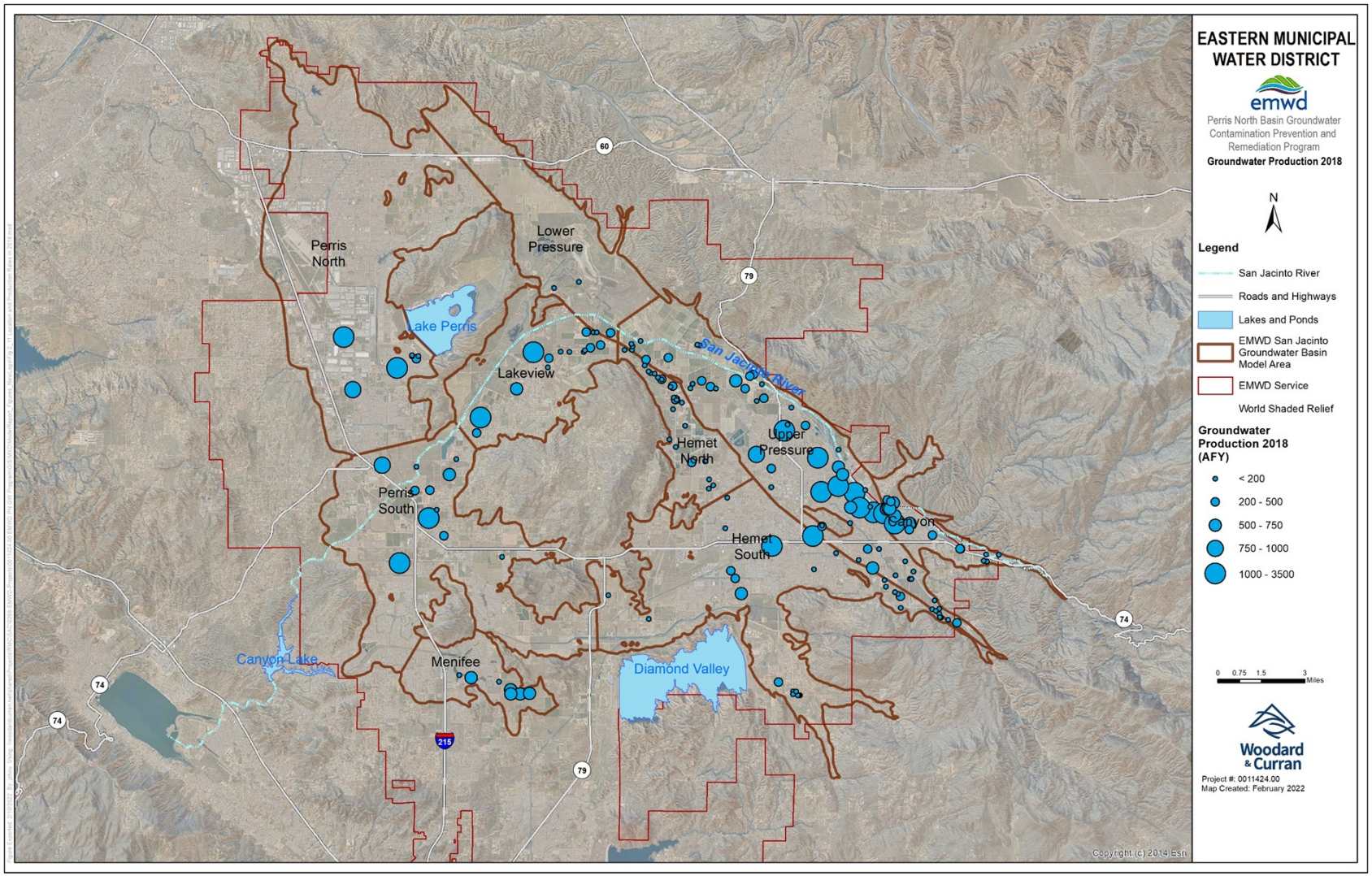
# Groundwater Quality Monitoring Results (2013-2018)

| Groundwater Management Zone | Year | No. of Samples | TDS (mg/L) | | Nitrate as N (mg/L) | | Perchlorate (µg/L) | | | Iron (µg/L) | | | Manganese (µg/L) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Max | Min | Max | Min | No. of Samples | Max | Min | No. of Samples | Max | Min | No. of Samples | Max | Min |
| Lakeview | 2013 | 21 | 3,100 | 270 | 12.0 | <0.2 | 1 | <4 | <4 | 22 | 36,900 | <5 | 22 | 1,040 | <1 |
| | 2014 | 21 | 3,300 | 280 | 19.0 | <0.2 | | | | 21 | 2,540 | <5 | 21 | 360 | <1 |
| | 2015 | 13 | 3,200 | 360 | 11.0 | <0.1 | 1 | <4 | <4 | 13 | 126,000 | <5.9 | 13 | 820 | <2.5 |
| | 2016 | 27 | 3,300 | 310 | 18.0 | <0.1 | | | | 27 | 3,280 | <5 | 27 | 180 | <5 |
| | 2017 | 24 | 3,000 | 270 | 14.0 | <0.1 | 10 | <4 | <1 | 128 | 5,340 | <5 | 128 | 400 | <1.4 |
| | 2018 | 28 | 2,730 | 268 | 20.3 | <0.4 | 12 | <4 | 0.13 | 171 | 66,800 | <10 | 174 | 925 | <0.4 |
| Perris North | 2013 | 18 | 1,800 | 220 | 21.0 | <0.2 | 1 | 4.5 | 4.5 | 18 | 16,600 | 6 | 18 | 150 | <1 |
| | 2014 | 18 | 1,800 | 240 | 22.0 | <0.2 | | | | 18 | 11,700 | <5 | 18 | 230 | <1 |
| | 2015 | 14 | 1,800 | 310 | 17.0 | <0.1 | 2 | 7.5 | <4 | 14 | 6,290 | <5 | 14 | 440 | <2.5 |
| | 2016 | 15 | 2,100 | 230 | 53.0 | <0.1 | | | | 15 | 2,800 | <5 | 15 | 180 | <2.5 |
| | 2017 | 12 | 1,900 | 330 | 20.0 | <0.1 | 3 | <4 | <1 | 11 | 580 | <5 | 11 | 240 | <1 |
| | 2018 | 17 | 2,160 | 352 | 42.6 | <0.4 | 3 | 3.9 | 1.9 | 18 | 1,180 | <10 | 18 | 220 | <0.4 |
| Perris South | 2013 | 47 | 9,600 | 230 | 22.0 | <0.2 | 10 | 6.9 | <4 | 48 | 64,000 | <5 | 48 | 5,900 | <1 |
| | 2014 | 47 | 15,000 | 290 | 13.0 | <0.2 | | | | 47 | 110,000 | <5 | 47 | 4,530 | <1 |
| | 2015 | 45 | 15,000 | 410 | 16.0 | <0.1 | 10 | <4 | <4 | 45 | 93,900 | <5 | 45 | 4,700 | <2.5 |
| | 2016 | 37 | 13,000 | 390 | 35.0 | <0.1 | | | | 36 | 44,200 | 11 | 36 | 5,450 | <5 |
| | 2017 | 45 | 12,000 | 420 | 27.0 | <0.1 | 35 | 7.8 | <1 | 366 | 30,100 | <5 | 366 | 5,980 | <1 |
| | 2018 | 45 | 11,700 | 446 | 12.0 | <0.4 | 29 | 43 | <1 | 385 | 51,700 | <10 | 394 | 6,120 | 0.4 |
| San Jacinto Lower Pressure | 2013 | 6 | 1,100 | 360 | 8.1 | <0.2 | | | | 6 | 10,600 | 460.0 | 6 | 1,430 | 29 |
| | 2014 | 5 | 1,100 | 290 | 8.3 | <0.2 | | | | 5 | 6,760 | 51.0 | 5 | 1,610 | 10 |
| | 2015 | 4 | 2,000 | 360 | 8.5 | <0.1 | | | | 4 | 59,800 | 660.0 | 4 | 610 | 54 |
| | 2016 | 6 | 3,100 | 350 | 8.0 | <0.1 | | | | 6 | 22,500 | 28.0 | 6 | 1,580 | 11 |
| | 2017 | 4 | 1,600 | 350 | 8.1 | <0.1 | | | | 4 | 111,000 | 48.0 | 4 | 1,620 | 33 |
| | 2018 | 6 | 920 | 384 | 9.4 | <0.4 | | | | 6 | 31,800 | 20.0 | 6 | 1,470 | 46 |
| Menifee | 2013 | 10 | 2,900 | 830 | 9.8 | <0.2 | | | | 10 | 12,800 | 10.0 | 10 | 1,350 | <2 |
| | 2014 | 10 | 2,800 | 970 | 14.0 | 3.7 | | | | 10 | 3,400 | 8.5 | 10 | 1,580 | <2 |
| | 2015 | 4 | 2,800 | 1,100 | 9.7 | <0.1 | | | | 4 | 21,000 | 5.0 | 4 | 1,300 | <5 |
| | 2016 | 6 | 2,300 | 890 | 9.8 | 2.0 | | | | 6 | 3,510 | 12.0 | 6 | 790 | <5 |
| | 2017 | 2 | 1,200 | 150 | 4.0 | <0.1 | | | | 2 | 6,190 | 5.6 | 2 | 170 | 9 |
| | 2018 | 5 | 2,950 | 900 | 8.5 | 0.7 | | | | 5 | 4,300 | 10.0 | 5 | 1,360 | <5 |

# Ambient TDS & Nitrate (as N) Concentrations and Assimilative Capacity

| Groundwater Management Zone | Water Quality Objective | Historical Ambient | 1997 Ambient | 2003 Ambient | 2006 Ambient | 2009 Ambient | 2012 Ambient | 2015 Ambient | Difference from 2012 to 2015 | Assimilative Capacity |
|---|---|---|---|---|---|---|---|---|---|---|
| *Total Dissolved Solids Concentration (mg/L)* | | | | | | | | | | |
| Perris North | 570 | 568 | 750 | 780 | 730 | 770 | 760 | 720 | –40 | –150 |
| Perris South | 1,260 | 1,258 | 3,190 | 2,200 | 2,600 | 2,470 | 2,400 | 2,340 | –60 | –1,080 |
| Lakeview/Hemet-North* | 520 | 519 | 830 | 840 | 880 | 890 | 860 | 850 | –10 | –330 |
| Menifee | 1,020 | 1,021 | 3,360 | 2,220 | 2,140 | 2,050 | 2,030 | 1,970 | –60 | –950 |
| San Jacinto-Lower Pressure | 520 | 520 | 730 | 950 | 810 | 800 | 800 | 780 | –20 | –260 |
| *Nitrate as Nitrogen Concentration (mg/L)* | | | | | | | | | | |
| Perris North | 5.2 | 5.2 | 4.7 | 6.7 | 6.5 | 7.4 | 7.3 | 7.4 | 0.1 | –2.2 |
| Perris South | 2.5 | 2.5 | 4.9 | 5.9 | 5.5 | 5.8 | 5.8 | 6.0 | 0.2 | –3.5 |
| Lakeview/Hemet-North* | 1.8 | 1.8 | 2.7 | 3.4 | 2.7 | 2.6 | 2.5 | 2.6 | 0.1 | –0.8 |
| Menifee | 2.8 | 2.8 | 5.4 | 6.0 | 4.7 | 4.4 | 4.6 | 4.5 | –0.1 | –1.7 |
| San Jacinto-Lower | 1.0 | 1.0 | 1.9 | 1.8 | 1.2 | 1.1 | 1.1 | 1.5 | 0.4 | –0.5 |

# Groundwater Production Wells in 2018



# Groundwater Monitoring Network

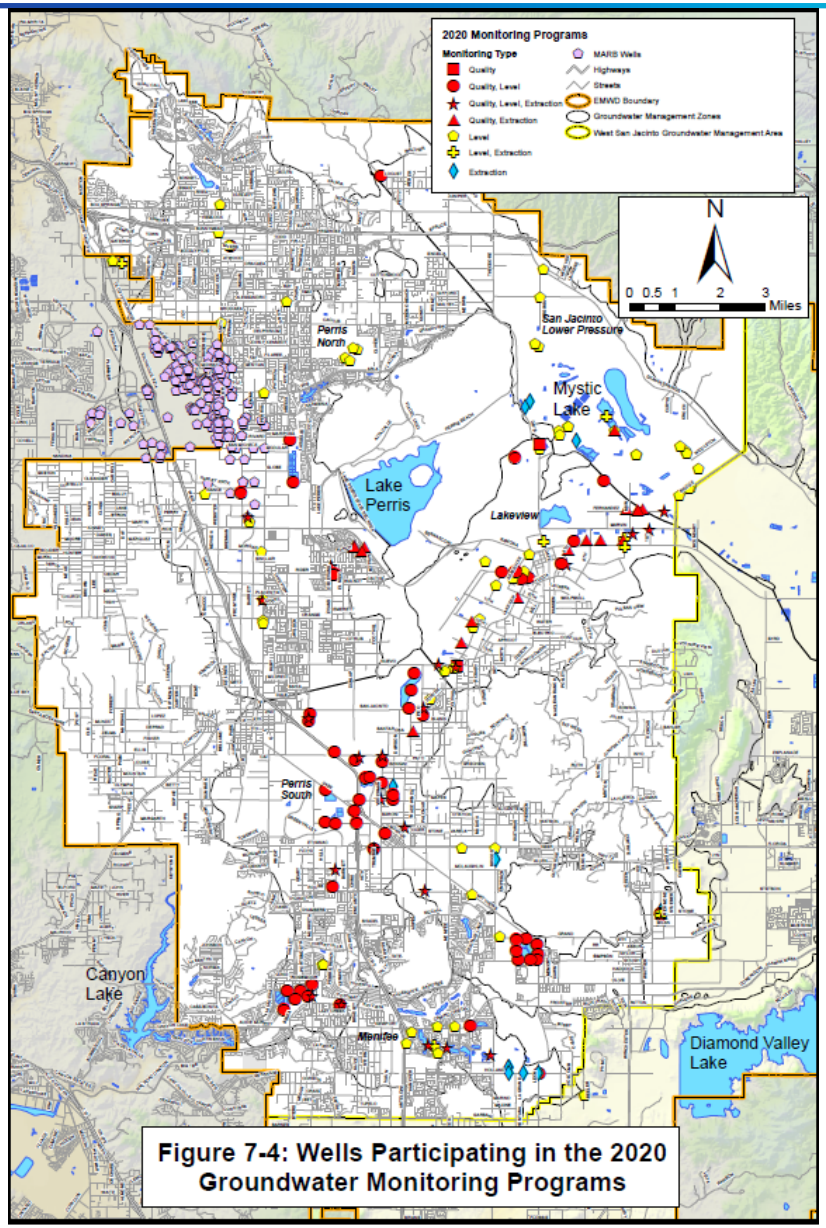


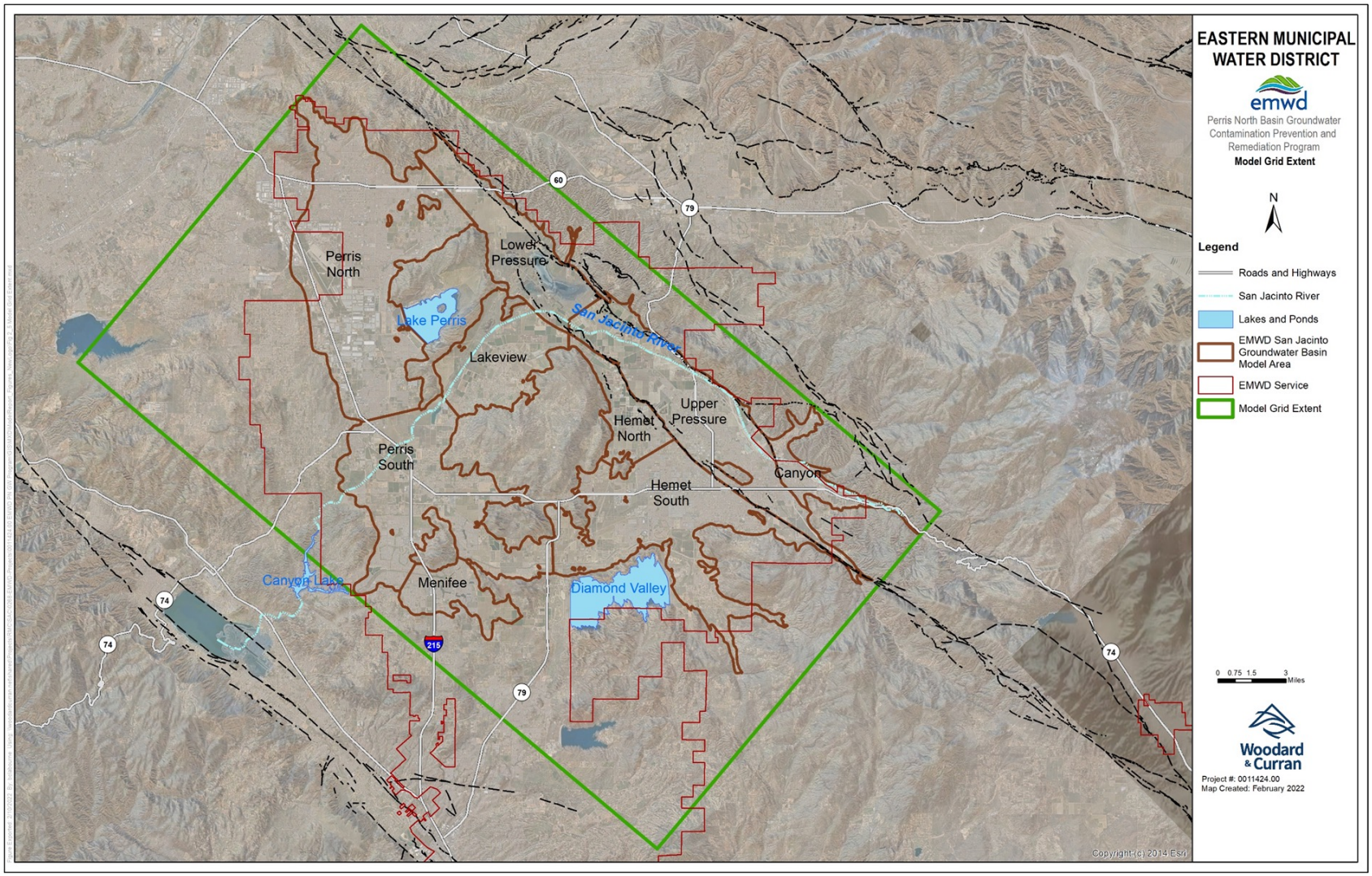

**Figure 7-4: Wells Participating in the 2020 Groundwater Monitoring Programs**

# Use of Groundwater Models

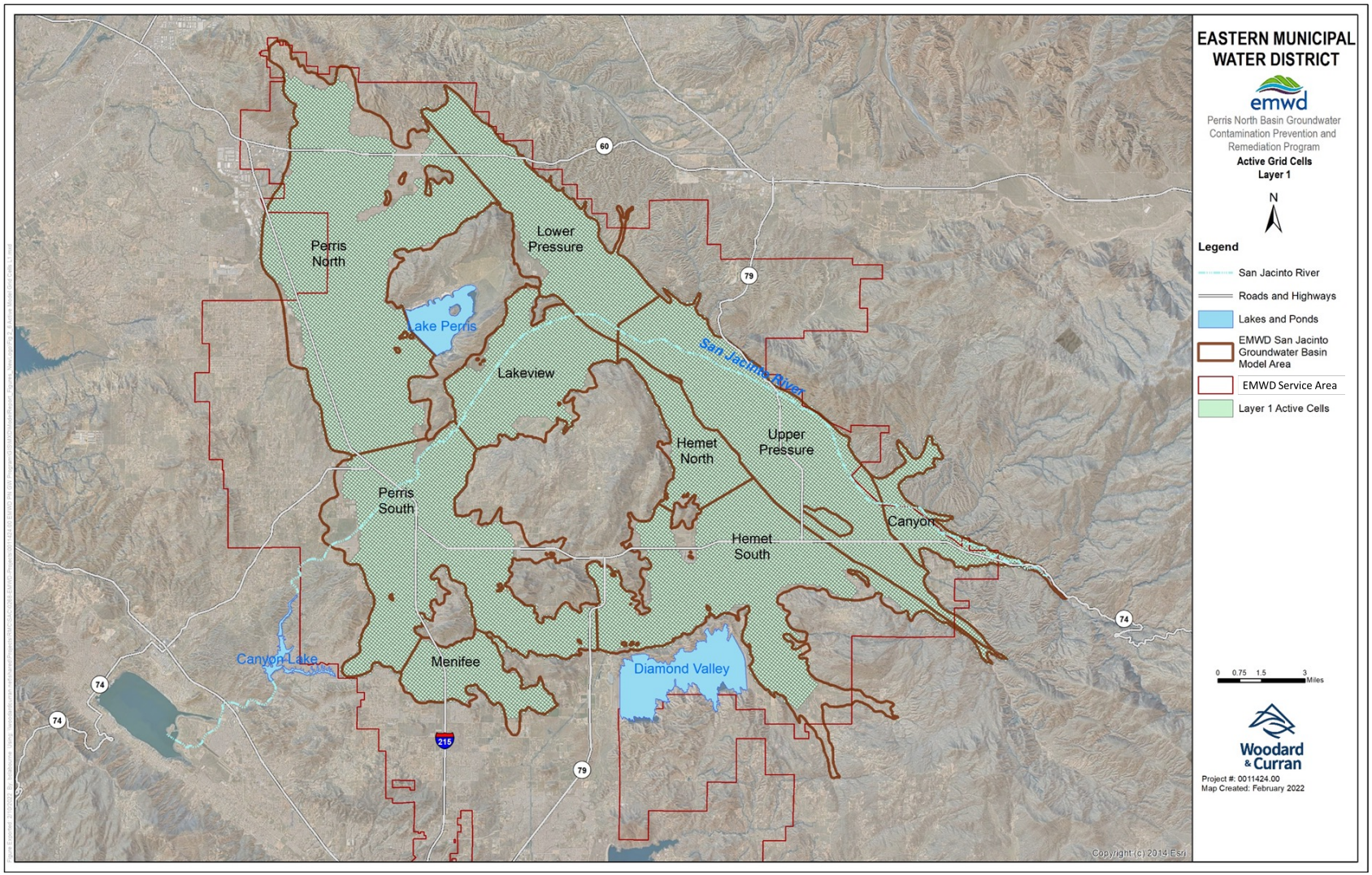
# History

- SJFTM-2002 Model
  - Flow & Transport Model of Entire San Jacinto Groundwater Basin
  - Peer Reviewed Regional Planning Tool
  - Simulation Period (1984-1999)
  - Numerous Model Applications
  - Used to Evaluate Phase 1 of Desalination Project
- SJFM-2014 Model
  - Flow Model Update
  - Peer Reviewed Regional Planning Tool
  - Simulation Period (1984-2012)
  - Numerous Model Applications
- SJFM-2020 Update
  - Updated Peer Reviewed Regional Planning Tool
  - Simulation Period (1984-2018)

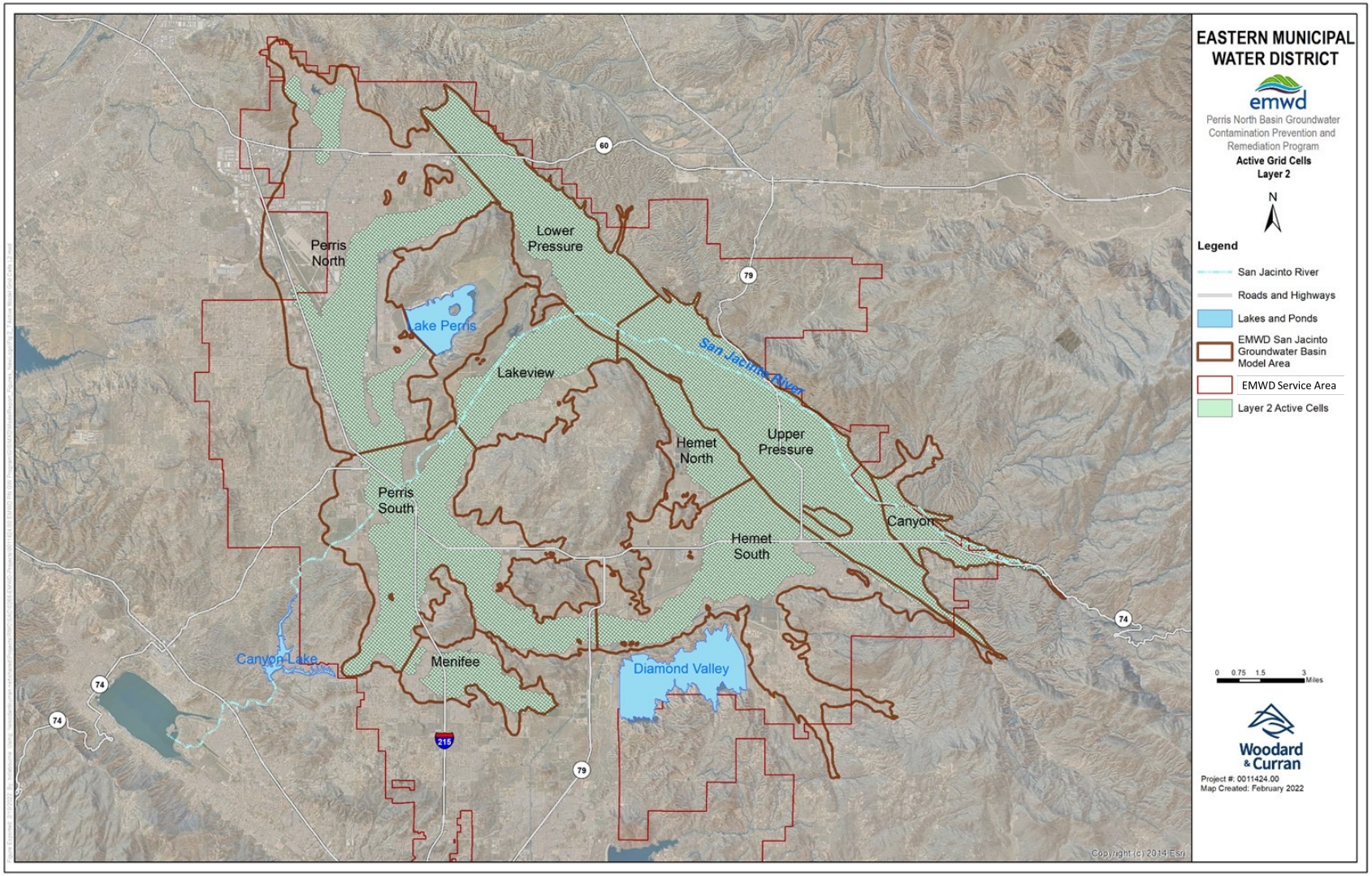
# San Jacinto Flow Model (SJFM) Grid



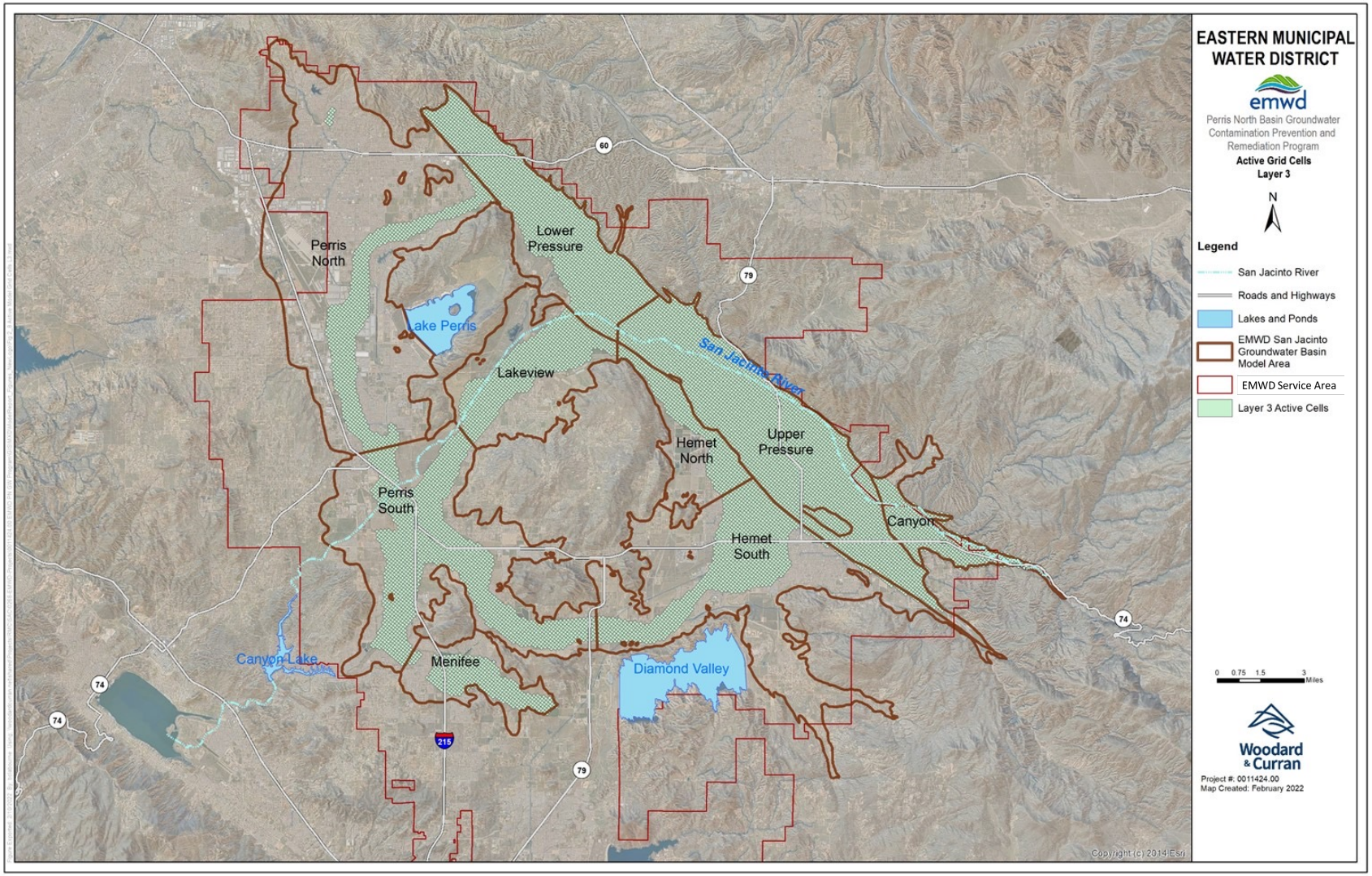
# SJFM Model Grid – Layer 1



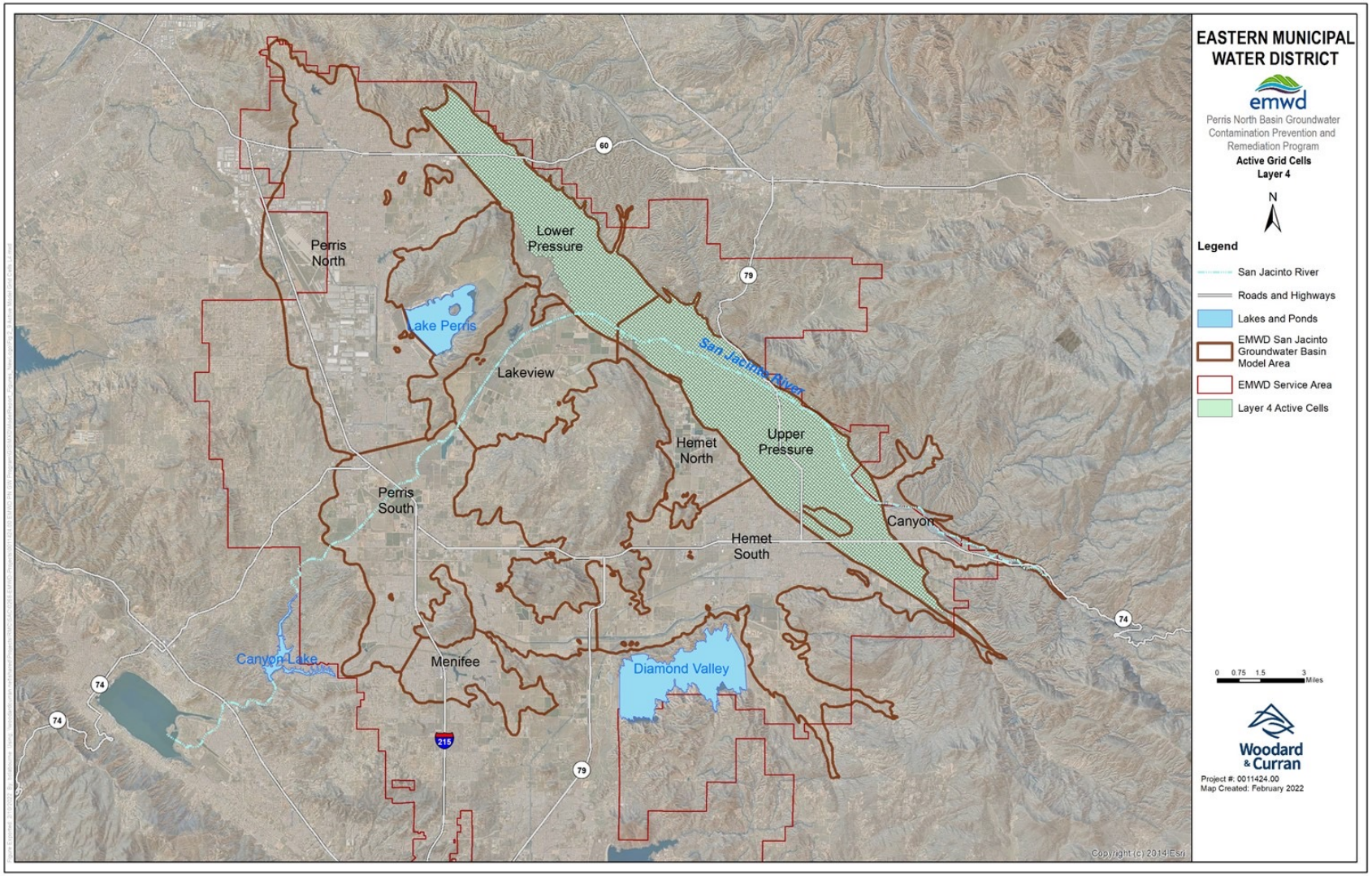
# SJFM Model Grid – Layer 2



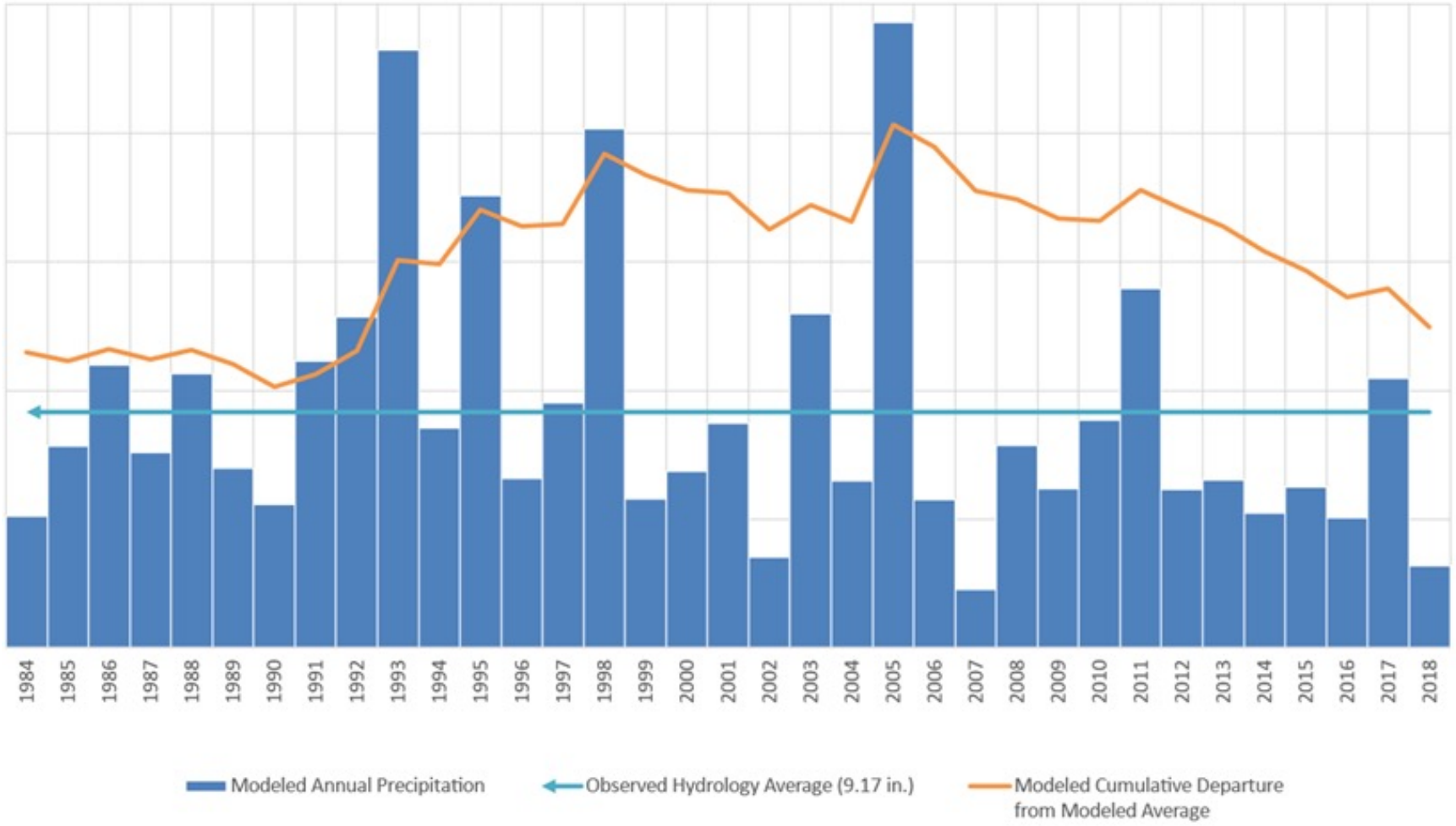
# SJFM Model Grid – Layer 3



# SJFM Model Grid – Layer 4

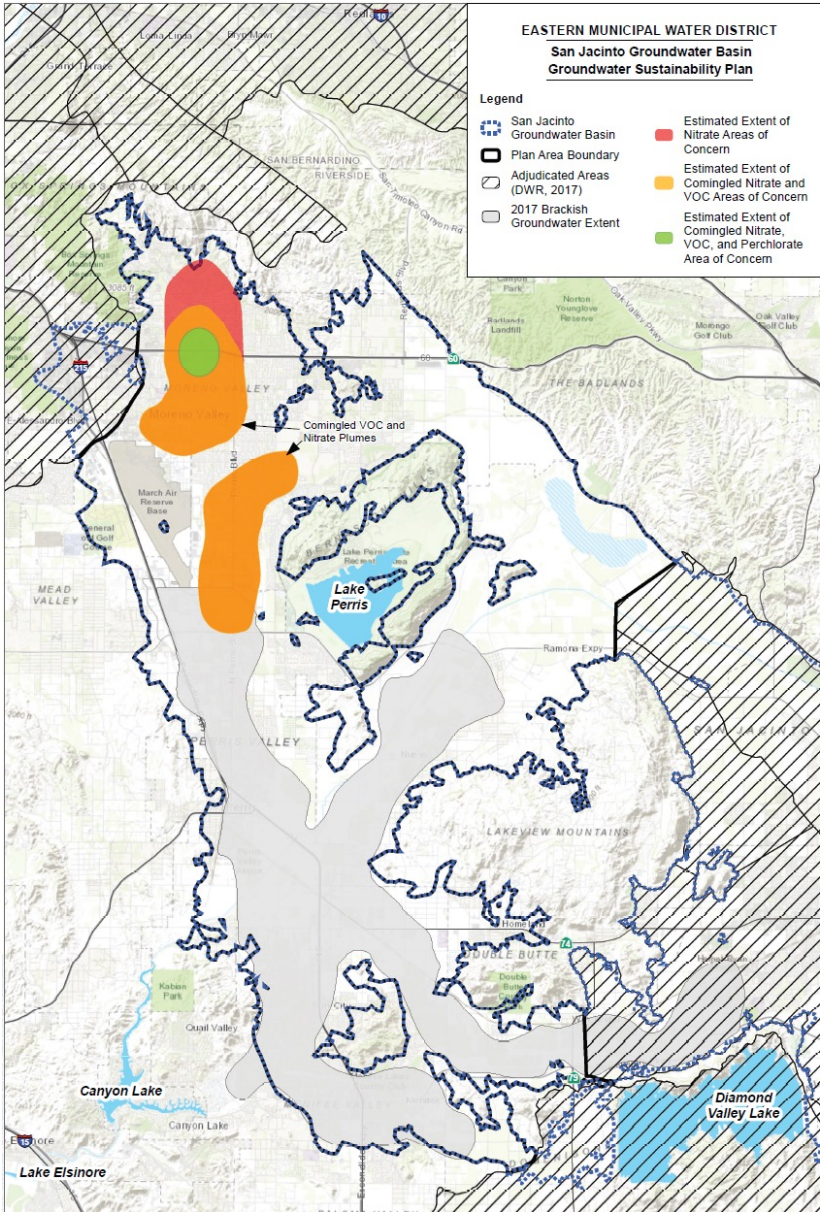


# SJFM Model Simulation Period
(1984-2018)



# Water Quality Projects Design and Implementation

# Non-point Source Contaminant Extent



# Developing Water Quality Management Projects

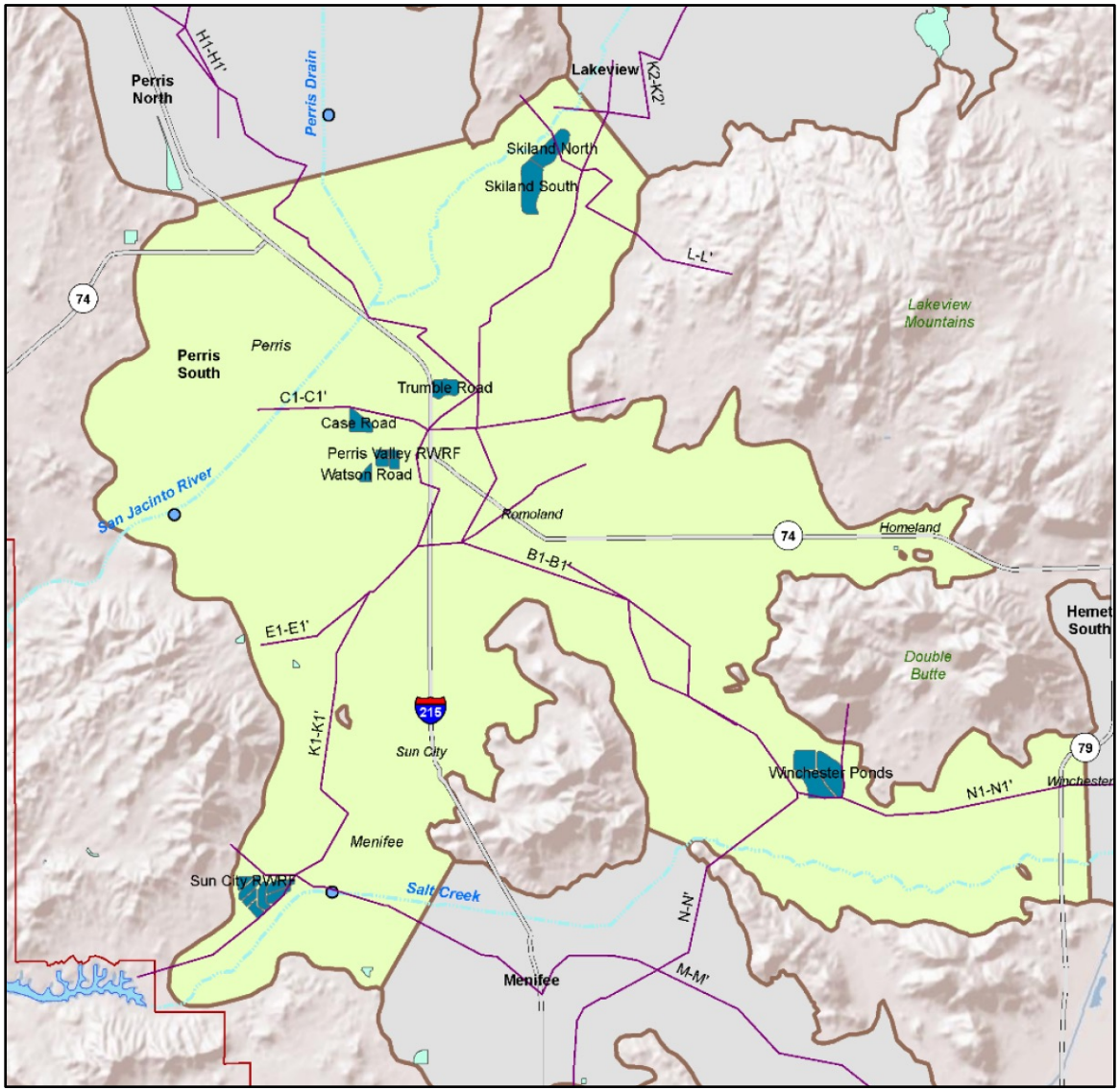
- Use previous slide and discuss how water quality management projects were developed to improve the water quality conditions of the basin

# Perris South Desalination Expansion Program

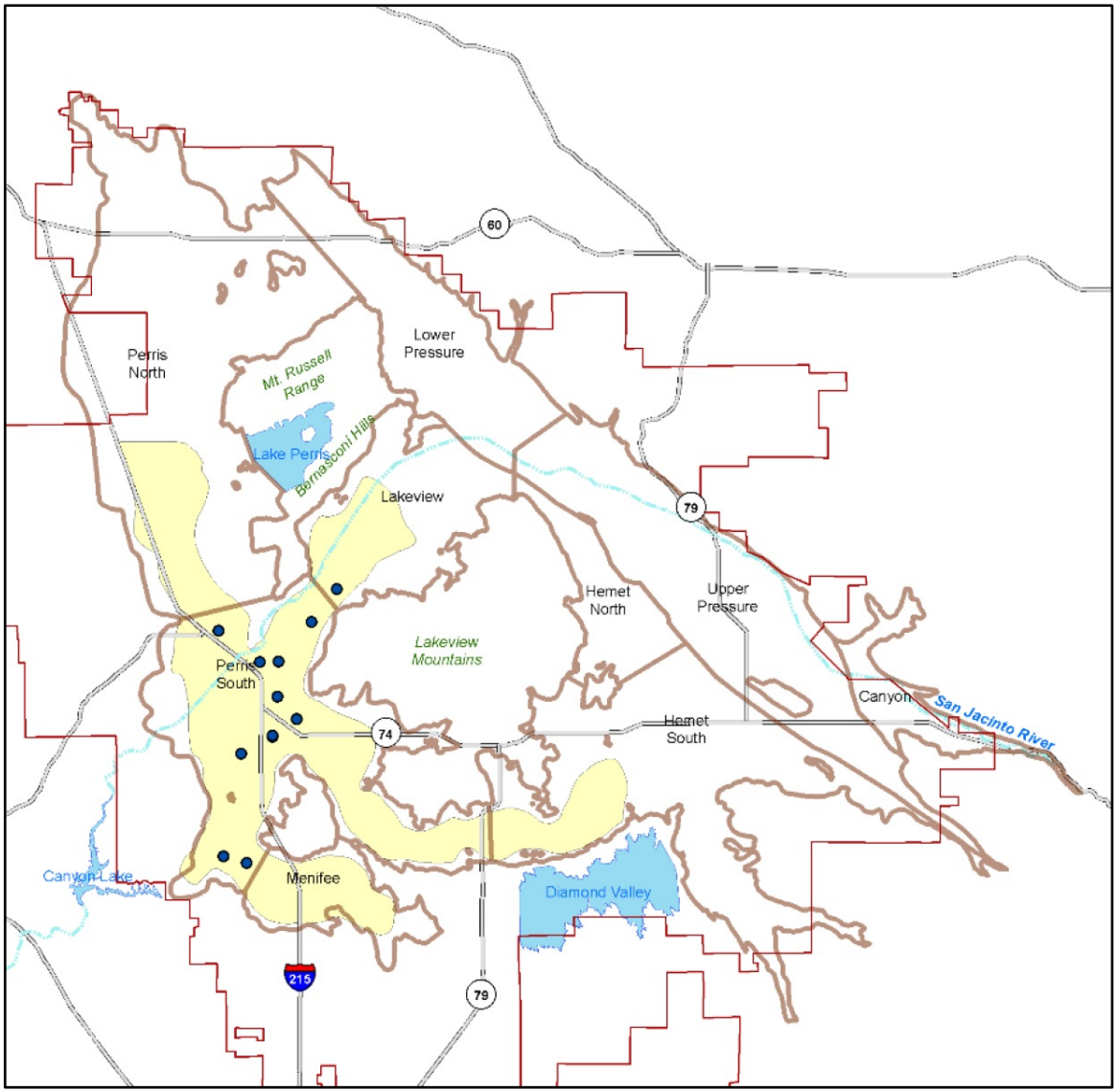
# Background & History

- EMWD Working with the US Army Corps of Engineers to put existing brackish water to beneficial use through desalination
- Several brackish water treatment plants
- Brine exported to the coast for disposal
- Ongoing expansion of existing desalter plant capacity
- Siting, drilling, construction and testing of desalter expansion wells
  - Numerical modeling to support increased production and to site exploratory borings
  - Exploratory borings to confirm existing hydrogeology and water quality and to support due diligence related to property acquisition
  - Current effort is to support 3 future high-capacity desalter wells to augment current brackish water supply

# Perris South GMZ

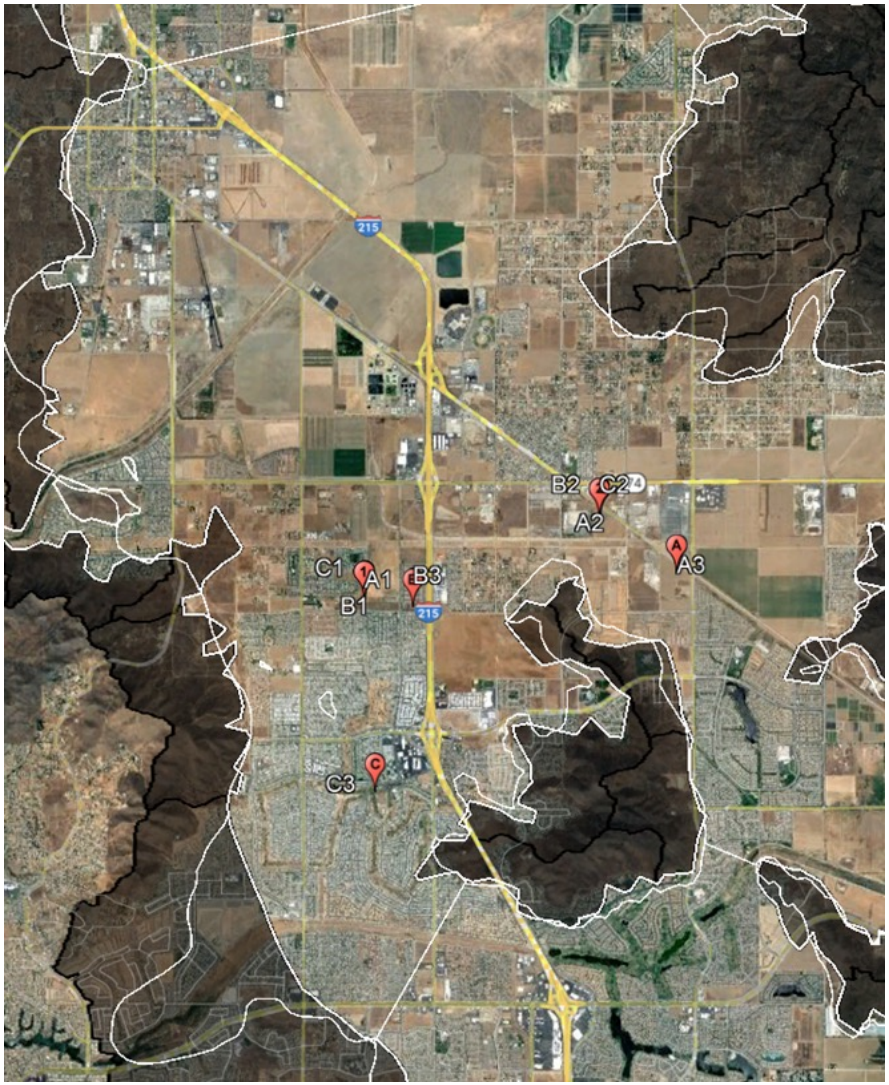


# Existing Brackish Water Wells



# Project Design

- Potential new desalter well location evaluation
- Based on water supply availability evaluation completed using numerical groundwater flow model
- Will further vet these locations with exploratory boreholes
- 3 high-capacity desalter wells planned for this area

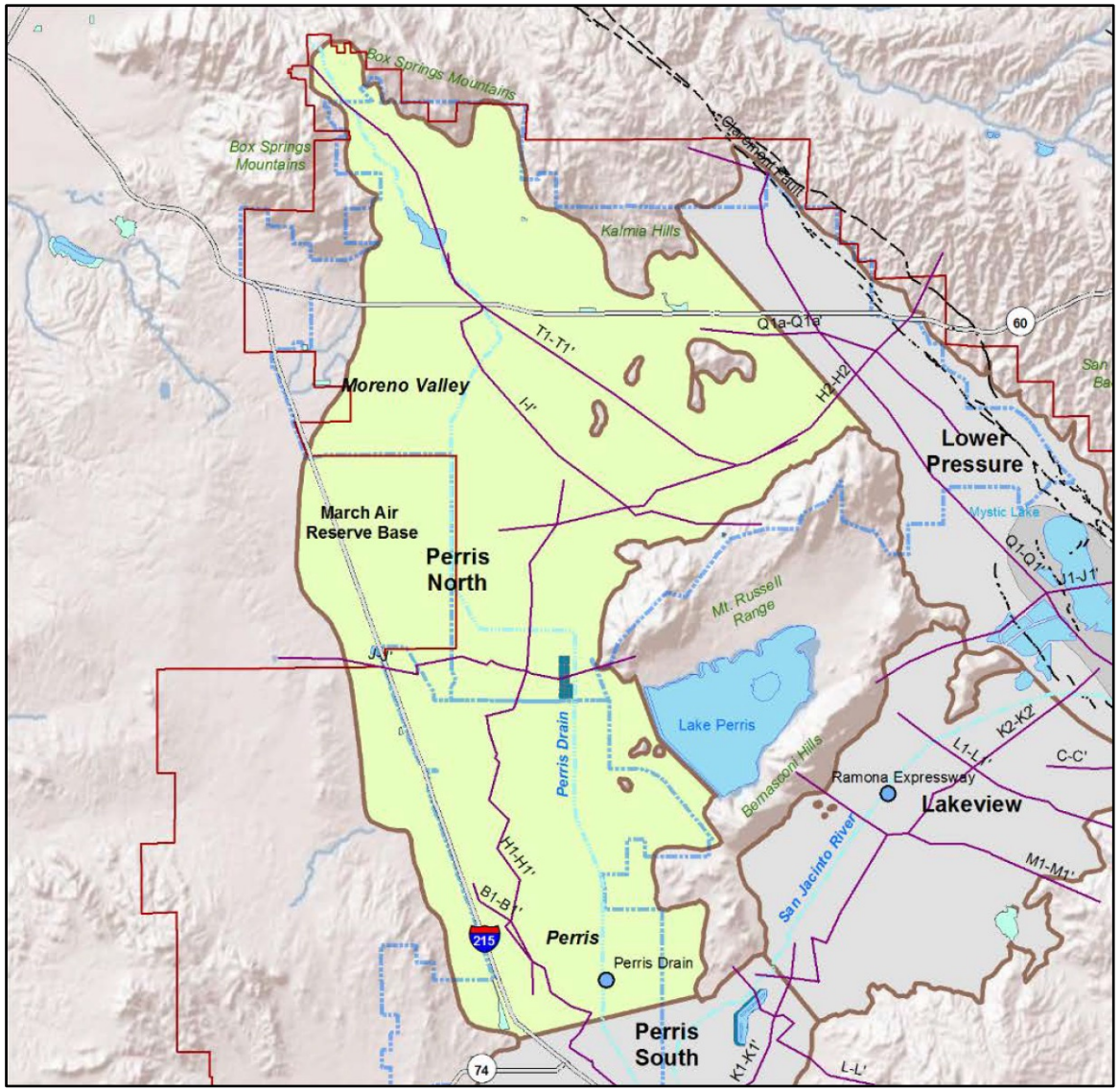


# Questions to be Answered Using the Groundwater Model

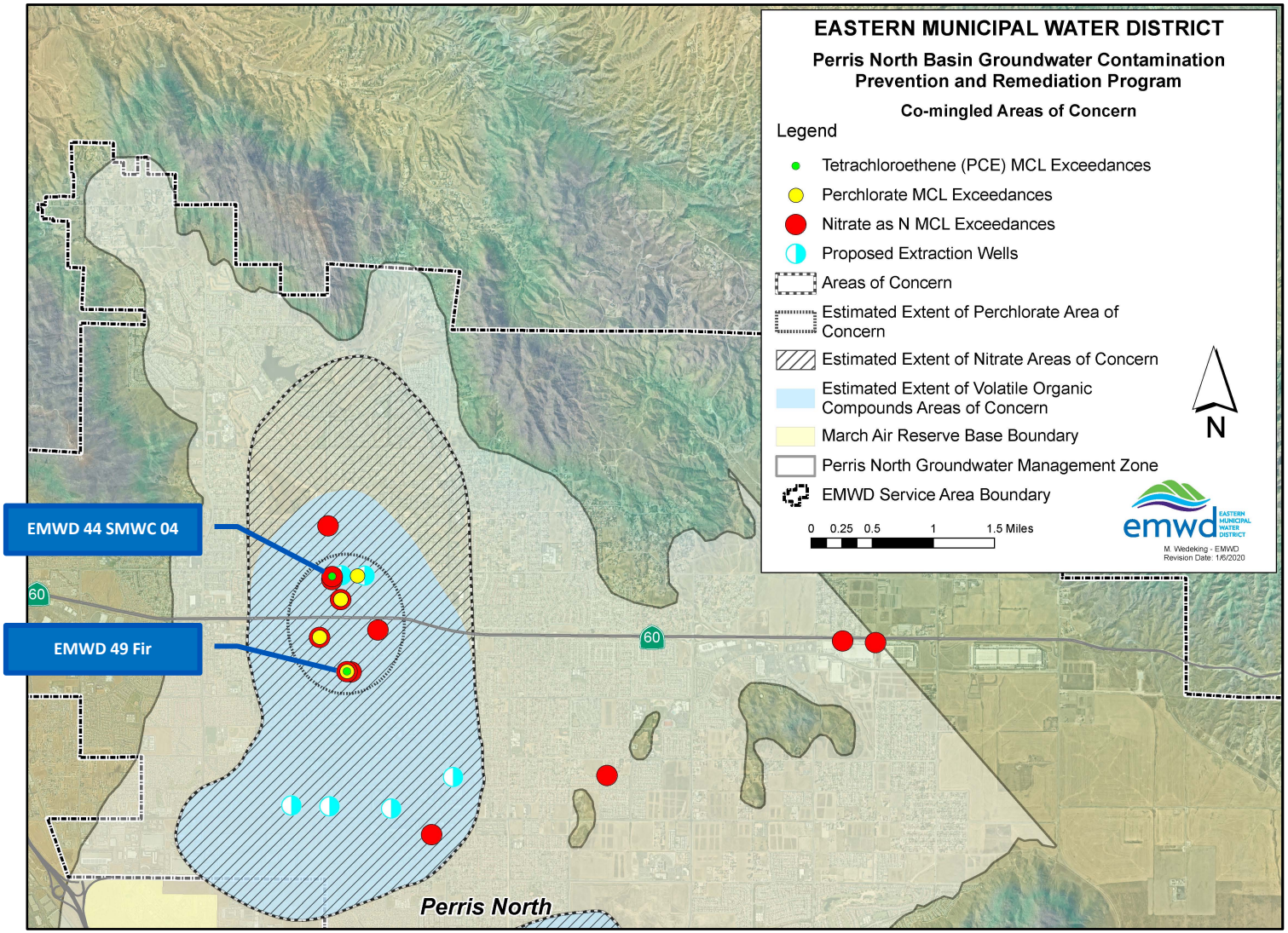
- Extraction Wells
  - Number
  - Locations
  - Extraction Rates
  - Effectiveness in Capturing High TDS Groundwater
- Monitoring Wells
  - Number
  - Locations
  - Effectiveness in Monitoring Effectiveness of Program Wells
  - Effectiveness in Monitoring Basin Conditions
- Project Impact on Groundwater Levels

# Perris North Groundwater Contamination Prevention & Remediation Program

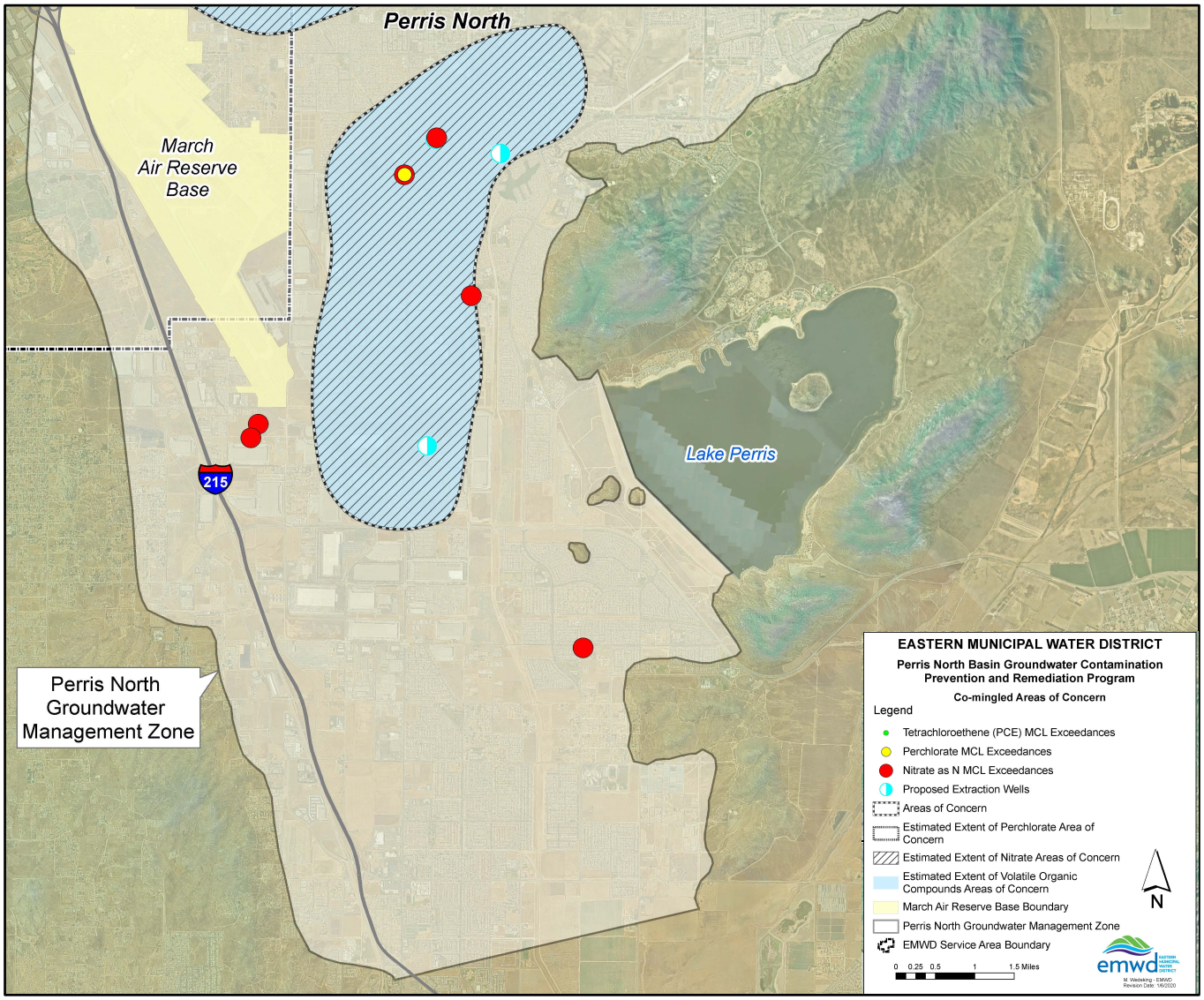
# Perris North GMZ



# Co-mingled Perchlorate, Nitrate, and VOC Area of Concern (Moreno Valley & Cactus Corridor North Areas)



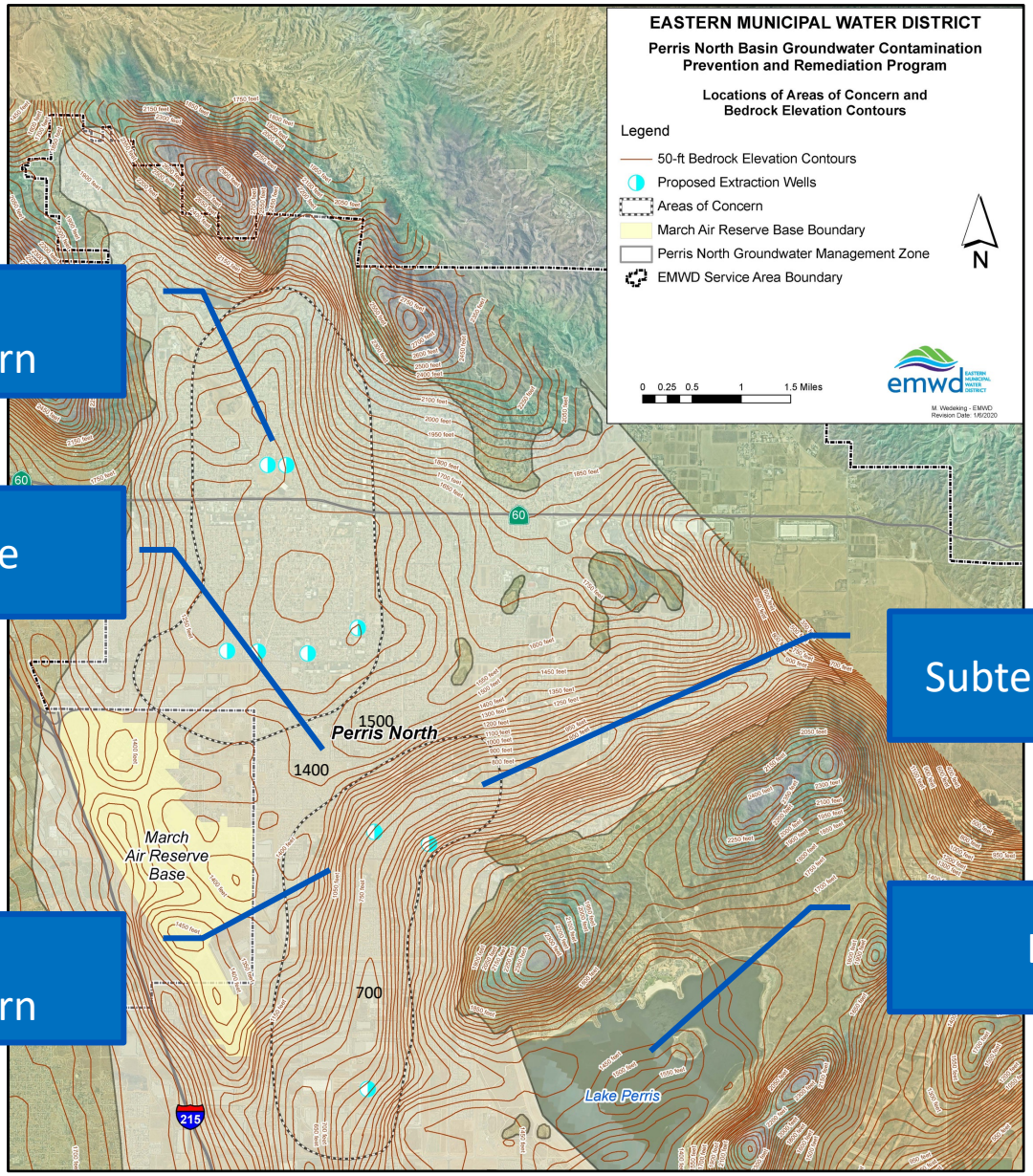
# Co-mingled Area of Concern
# (Cactus Corridor East and South Areas)






emwd

# Background – Depth to Bedrock in Perris North




Northern Area of Concern

Bedrock Ridge

Southern Area of Concern

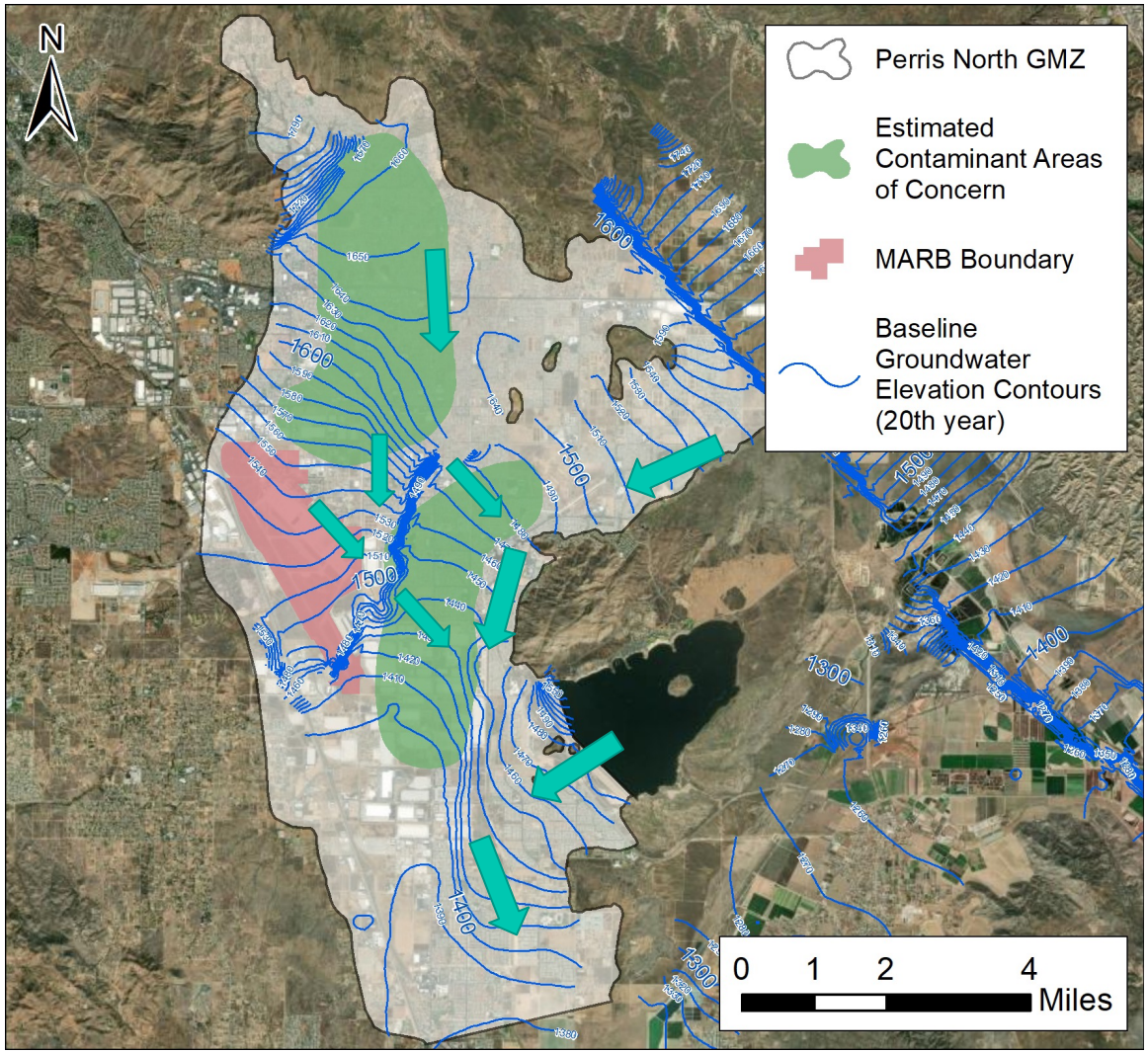
Subterranean Canyon

Lake Perris



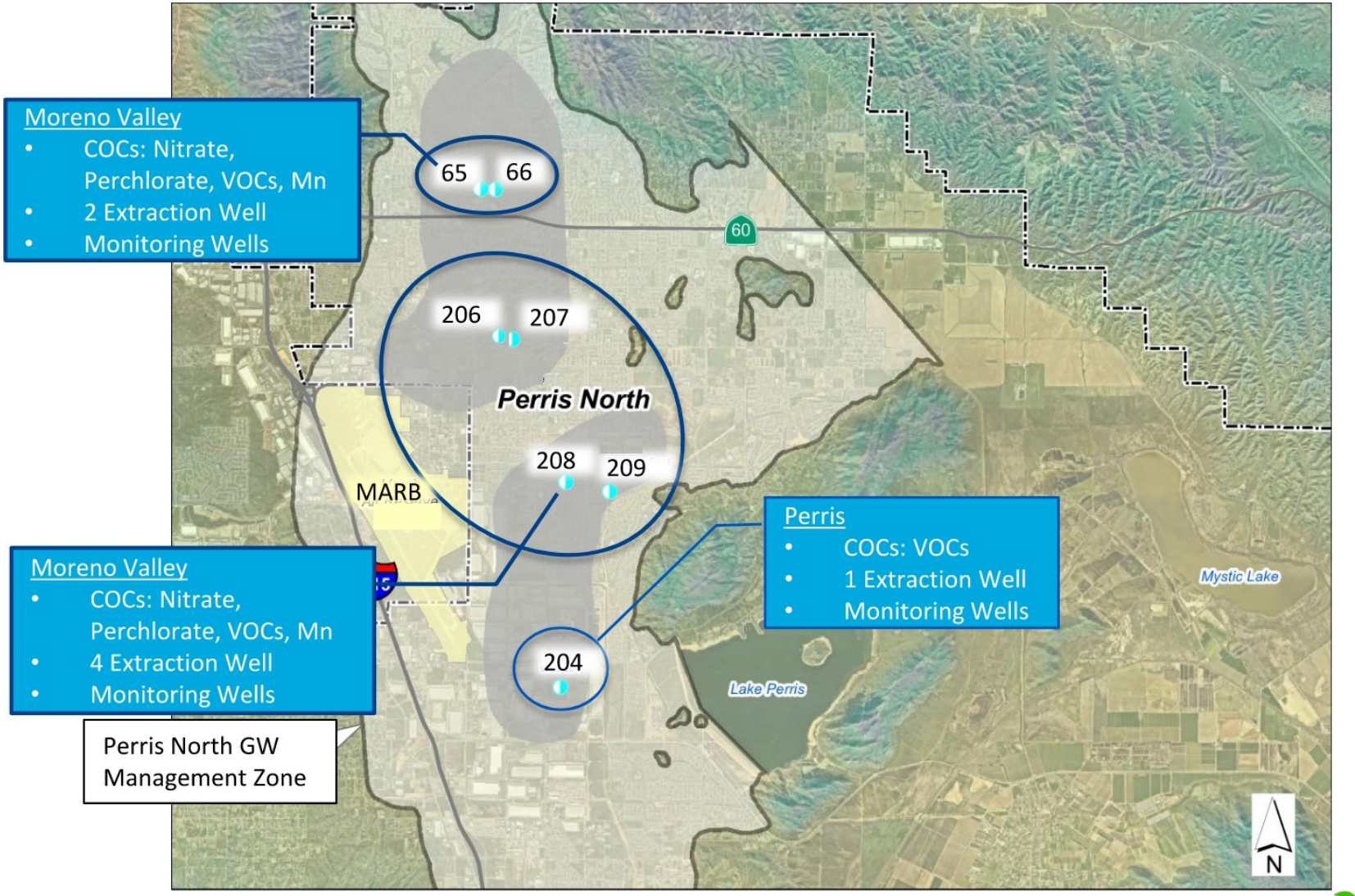
emwd

# Groundwater Flow Direction




Direction of Groundwater Flow is generally north to south

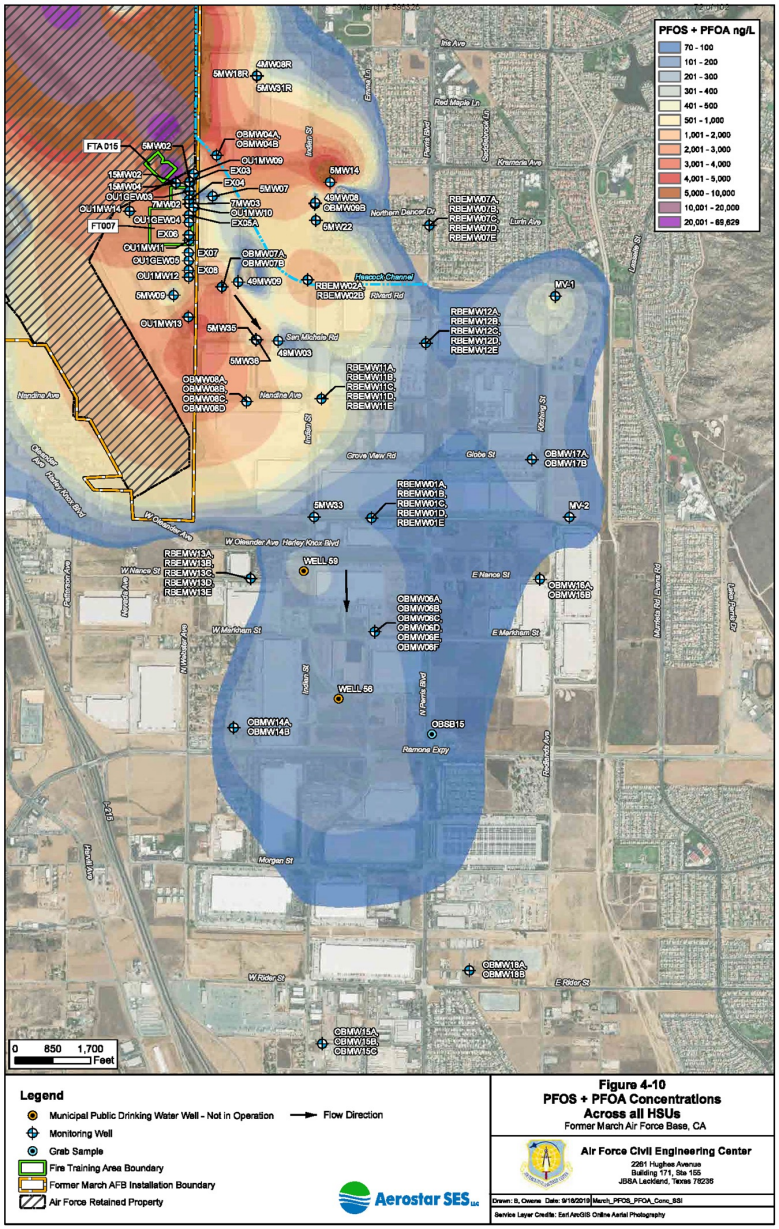
# Project Design



# Project Funding

- State of California Proposition 1 Funding
  - Matching funds, managed by SWRCB
  - Original Project Funding Total (50/50 split) ~ $90M
- Project is on-going and in construction phase
  - 6 Extraction Wells substantially complete
  - Design and specifications for 53 monitoring wells at 16 locations (clusters) underway
  - Conveyance, well equipping, and raw treatment facilities in various stages of design, bidding, or construction

# PFAS Plume in Perris North GMZ



# Questions to be Answered Using the Groundwater Model

- Extraction Wells
  - Number
  - Locations
  - Extraction Rates
  - Effectiveness in Capturing Comingled Plumes
- Monitoring Wells
  - Number
  - Locations
  - Effectiveness in Monitoring Effectiveness of Program Wells
  - Effectiveness in Monitoring Basin Conditions
- Project Impact on Groundwater Levels
- Project Impact on Local Plumes
  - M&M Cleaners
  - Shell Perris
  - MARB
    - Plumes
    - EGETS Remediation System
    - PFAS Plume

# Contact Information

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