Livermore Valley Groundwater Source and PFAS Transport Study

Comprehensive Monitoring for Recharge and Diversion Decision Planning

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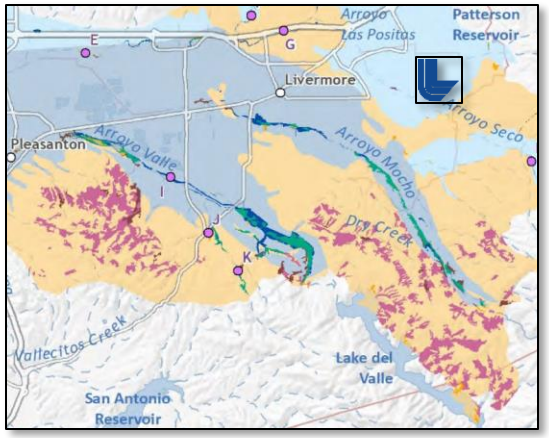
Previous Laboratory Directed Research with Zone 7

- LLNL: Unique expertise in isotope tracing of water flows in the environment
  - 3-year study with Zone 7 (2022-2025)
    - presented Jan 2026 to Zone 7 Water Agency Committee
  - Funded entirely by LLNL
  - Demonstrate and develop novel isotopic tracer techniques
  - Focus on Arroyos: dynamic groundwater recharge systems



Results of previous Laboratory Directed Research

1. Identified 6 wells with rapid recharge
   - Application of unique isotope tracer suite
   - Recommendations for MAR efficiency
2. Quantified recharge rates
   - Reduced uncertainty for model integration
3. Demonstrated that imported MAR water is used by Groundwater Dependent Ecosystems
   - Novel technique for SGMA compliance

Hydrological Processes

RESEARCH ARTICLE

How Rains and Floods Become Groundwater: Understanding Recharge Pathways With Stable and Cosmogenic Isotopes

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In review 2026 at Water Resources Research

Quantifying groundwater recharge rates with cosmogenic isotopes and an age-ranked storage selection model.
Submitted to Water Resources Research.
Lerback, Visser, Harm, Grande, Moran, Minn, and Danielsen.

Ecohydrology

RESEARCH ARTICLE | Full Access

California Trees Seasonally Use Augmented Water Sources: Water Isotope Tracking in a Groundwater-Dependent Ecosystem

Jory Chapin Lerback, Erik Oerter, Ate Visser, A. Jake Harm

First published: 08 January 2026 | https://doi.org/10.1002/eco.70166 |

LLNL collaboration with Zone 7

- Zone 7 provides water management in the Livermore Valley Groundwater Basin (DWR Basin No. 2-10). Align with mission:
  - "Deliver safe, reliable, efficient, and sustainable water and flood protection services."
- Strategic Plan Initiative:

 # 11 Manage the Groundwater Sustainability Agency and implement the Groundwater Sustainability Plan

- Study and refine knowledge of the groundwater basin
- Update groundwater models

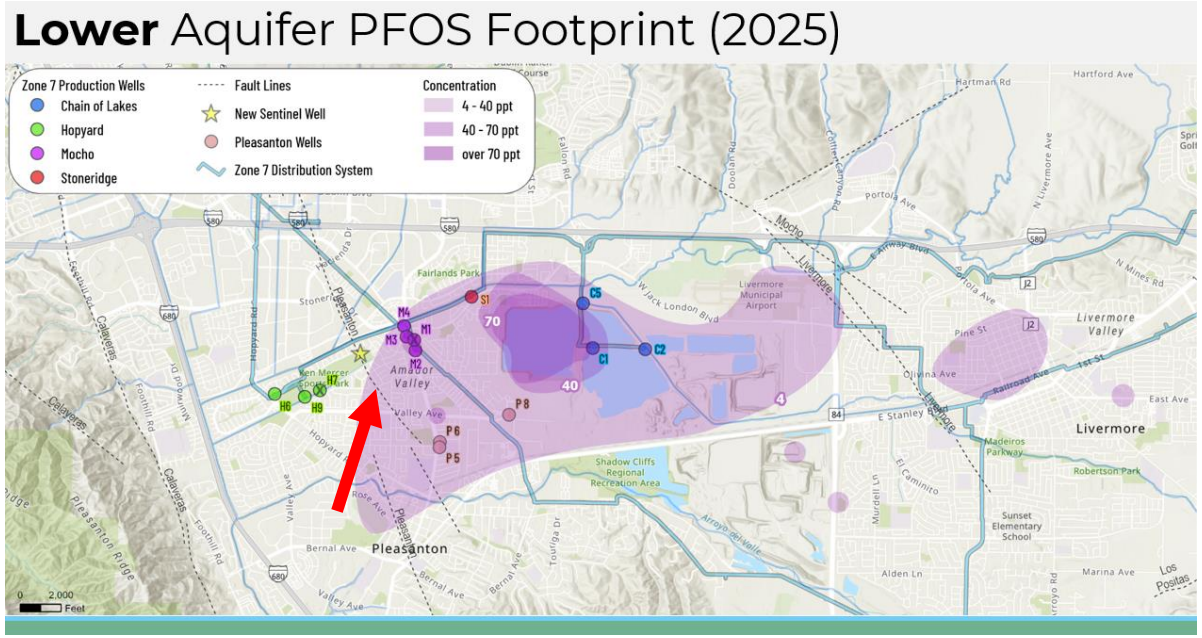
ZONE 7 WATER AGENCY
Delivering Quality, Reliability and Safety

GOAL D
Groundwater Management

Manage and protect the groundwater basin as the State designated Groundwater Sustainability Agency.

Zone 7's applied science needs

- Assess constituents of concern and protect water supply
  - PFAS (focus)
  - Transferrable methods e.g. Cr(VI)
  - Evaluate aquifer connectivity
- Evaluate future water supply reliability
  - Climate change
    - Decreased Sierra Nevada snowpack
    - Increased local storms (floods)
  - Increased demand



Funding Opportunity

WaterSMART Applied Science Grant

- Objectives
  - Apply research science for management decisions
  - Enable strategic water management
- Requirements
  - Both Cat A (Water Manager) and B (Researcher) applicants
  - Clearly defined management need
  - Does not support operational budgets
  - 55% matching funds
- Scoring priority
  - Apply data science techniques (*Task 2)

BUREAU OF RECLAMATION

Scope for Funding Opportunity

Questions:

1. What are the effects of pumping and recharge on the distribution of PFAS in the basin?
2. What is the fate of recharge water in the groundwater basin?

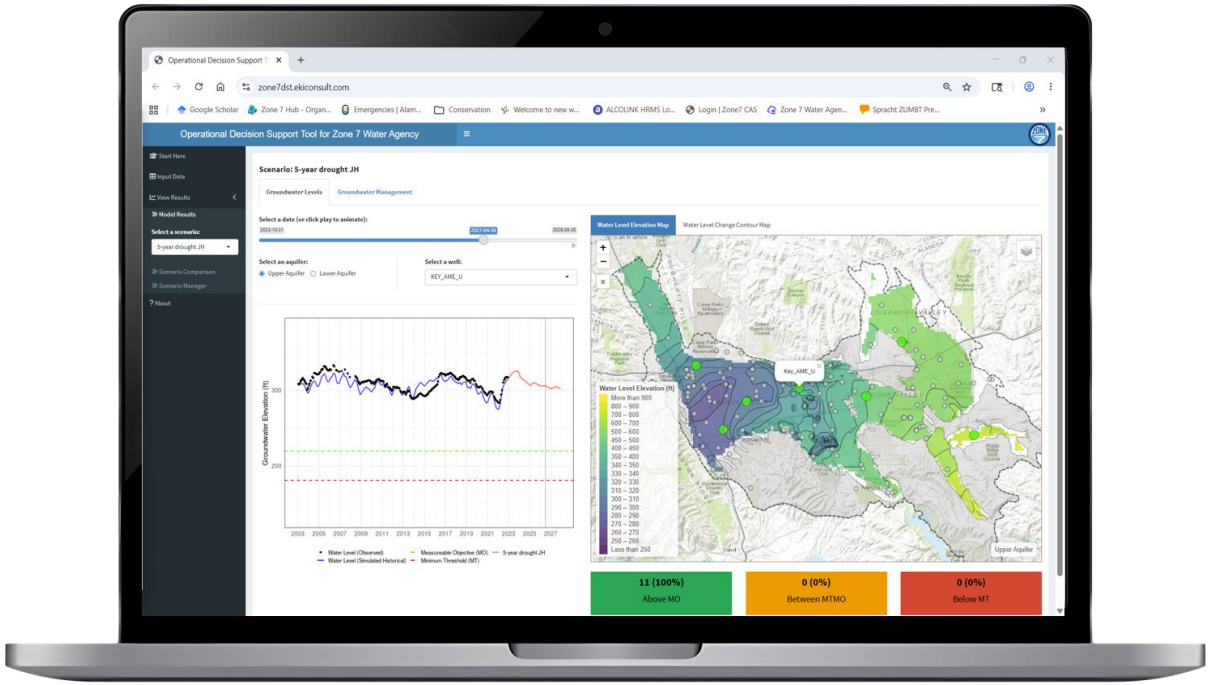
Objectives:

1. Evaluating Transport of PFAS
2. Improve Estimates of Basin Recharge and Flow Velocity
3. Enhance Decision Support Tool (DST) with PFAS Groundwater Transport Functionality

Project Tasks

Objective 1: Evaluate Transport of PFAS

- Task 1.1: Characterizing Recharge Origin at Monitoring Wells (LLNL)
- Task 1.2: Update PFAS Concentrations in Groundwater Model (Zone 7)
- **Task 1.3: Evaluate Potential Flow Barrier (LLNL, FY27 budget request)**

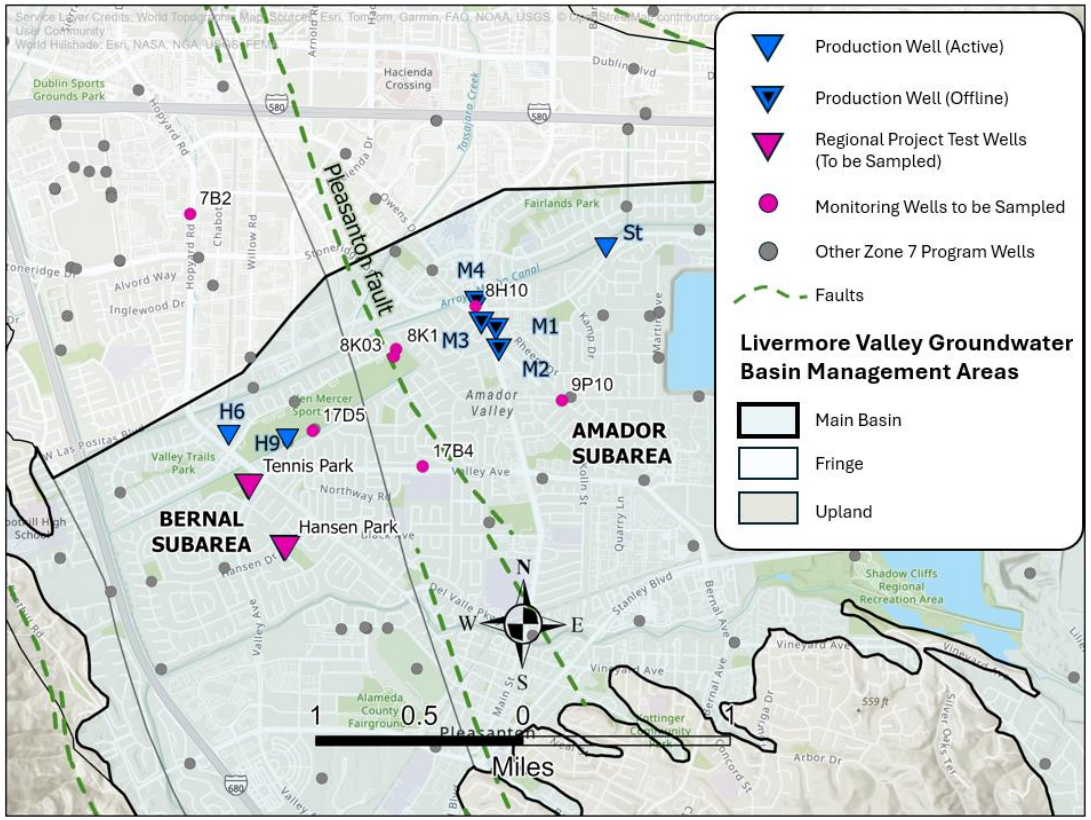


Potential Flow Barrier

- Fault described in previous work
  - DWR Bulletin 118-2 (1966)
    - Water levels
    - 1940 aerial photograph (not available)
  - USGS (1980)
    - Pleasanton fault “active”
  - Other Studies:
    - Feature may be stratigraphic variations (Norfleet 2004)
  - Zone 7 Mocho well pump test (2023)
    - Water levels unchanged on west side of fault
- LLNL value: water chemistry to track water movement

Task 1.3 Evaluate Potential Flow Barrier

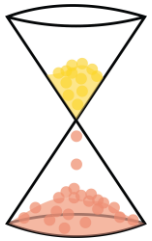
- Management Impact Study design:
  - Increased Hopyard Well Pumping
    - Pump while Mocho is offline
  - Monitor for 3 months
- Sampling plan: pink wells (tentative)
  - 2 Hopyard Wells
  - 7 monitoring wells
- Evaluate whether flow barrier will protect western production wells

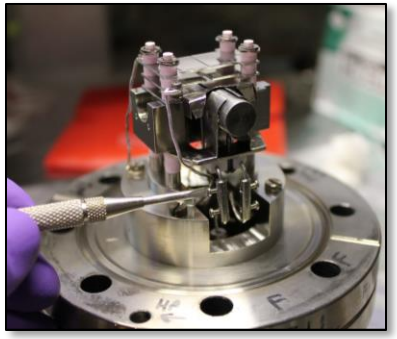


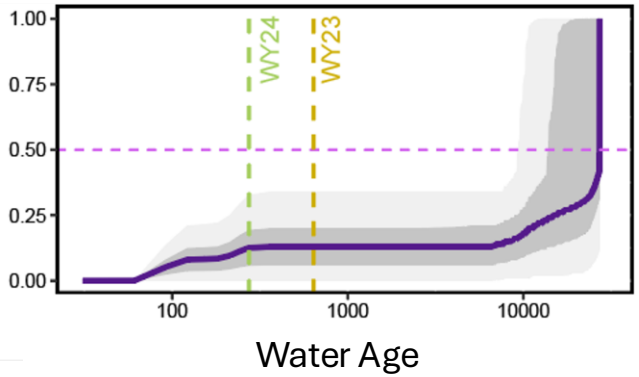
Type	Number of wells	Number of times	Number of samples
Production Wells	2	6	12
Sentinel Well	1	6	6
Monitoring Wells	6	3	18
Total			36

LLNL Isotope Hydrology Methods

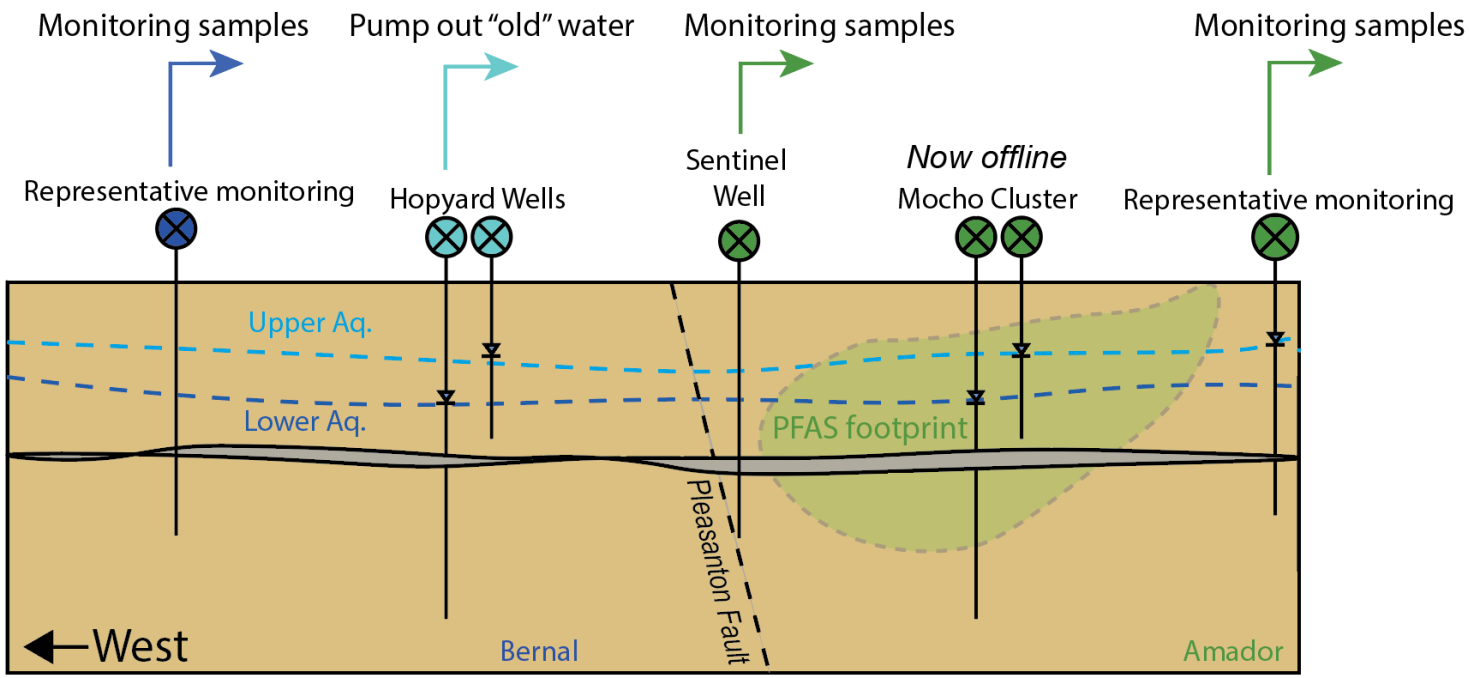
- Like fingerprints, stable isotopes track water source
  - Storms, light rains, evaporated ponds, imported water
- Radioactive isotopes act as a timer from source (rain) to receptor (groundwater well)
  - naturally occurring isotopes
- Unique expertise for measurements and interpretation







Management Impact Study Design Schematic



Cross-section view

Flow barrier?

⚠ Risk mitigation: monitor Sentinel Well
If PFAS detection, stop pumping

Timeline (2 years; tentative)

Type	Title	Oct-26	Nov-26	Dec-26	Jan-27	Feb-27	Mar-27	Apr-27	May-27	Jun-27	Jul-27	Aug-27	Sep-27	Oct-27	Nov-27	Dec-27	Jan-28	Feb-28	Mar-28	Apr-28	May-28	Jun-28	Jul-28	Aug-28	Sep-28
Task	**1. Contaminant evaluation**	*Pump test*											*Preliminary data*												*Final data*
Milestone	1. Report: Flow Barrier Evaluation																								*
Task	**2. Refine Water Balance**											*WaterSMART Basin Recharge*													
Milestone	2. Report: Flow Velocity Calculations																						*		
Task	**3. Enhance Decision Support Tool Suite**											*PFAS transport functionality*													
Milestone	3. Updated Decision Support Tool																								*

Budget

- The total project costs (WaterSMART + matching): $835k
- The proposal will request $375k from WaterSMART (= 45%)
- Zone 7 matching funds $460k (= 55%)
  - Existing contracts with EKI: $75k
  - In-kind from Zone 7: $260k
    - $140k PFAS sampling
    - $120k Hopyard pumping
  - LLNL Management Impact Study: $125k FY27 budget request
  - Depending on WaterSMART: remaining ($260k) may be requested in the mid-cycle budget amendment (FY27-28)

Anticipated deliverables to improve management

- Data products
  - Characterization of recharge water sources for 30 wells (Objectives 1 and 2)
  - Updated conditions of PFAS potential flow barrier (Objective 1)
  - Refined water budget inputs (Objective 2)
- Management tools
  - Enhanced Decision Support Tool – PFAS transport functionality (Objective 3)
- Dissemination
  - Public technical report (DOE's OSTI.gov)
  - Presentations
    - Zone 7 Water Agency Committee
    - Bureau of Reclamation-sponsored webinar
    - Association of California Water Agencies (ACWA)
    - Groundwater Resources Association of California (GRAC)

Thank you

- Protecting our water supply
- Enhanced water management strategy
- Building regional leadership

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