SAFER Aquifer Risk Map
Informational Board Item #5

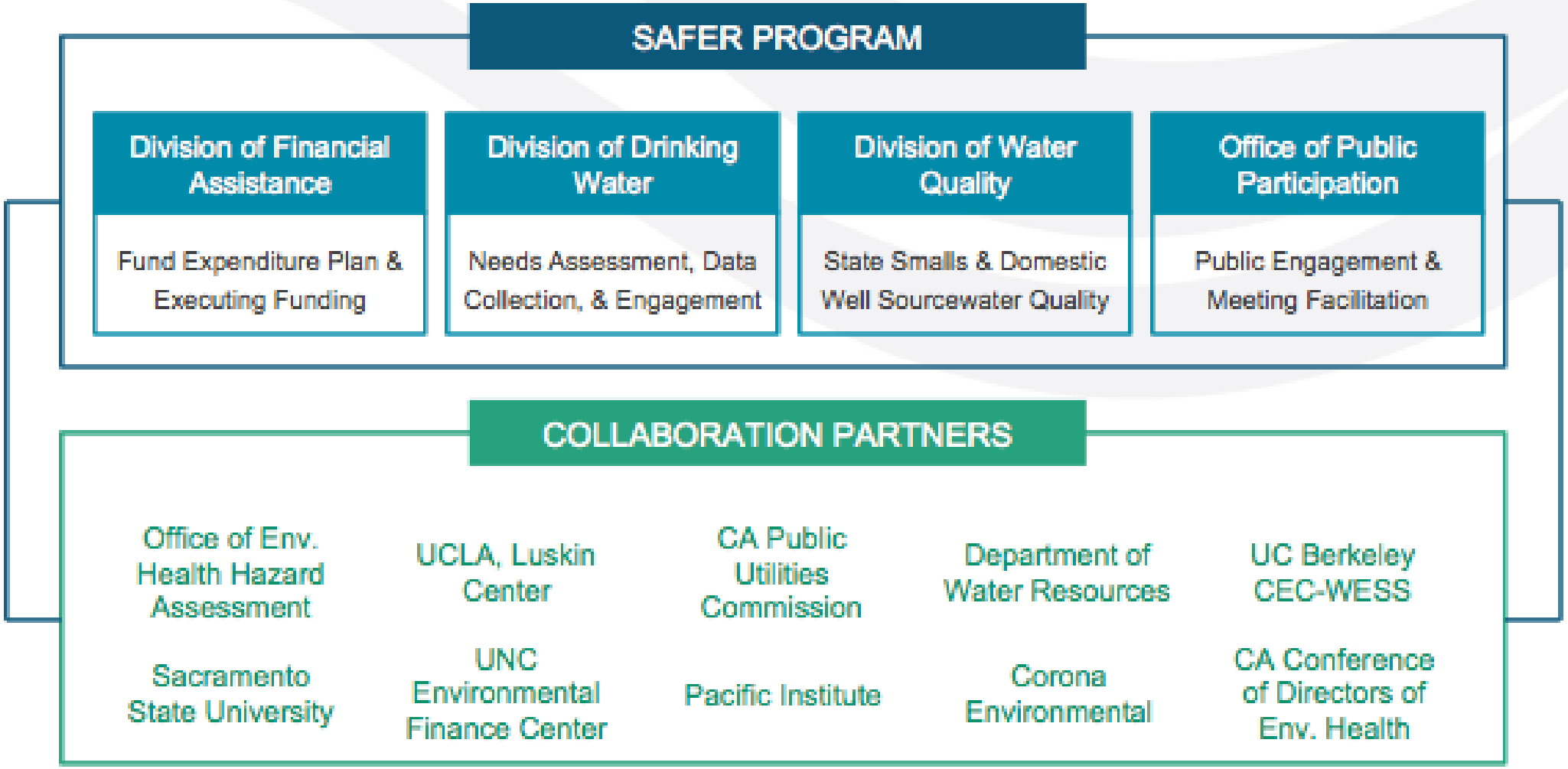
Division of Water Quality
Groundwater Ambient Monitoring & Assessment Program

November 4, 2020

Presenters: Scott Seyfried
and Emily Houlihan

CALIFORNIA
Water Boards

SAFER Program Team



SB-200 Requirements

"116772. (a) (1) By January 1, 2021, the board, in consultation with local health officers and other relevant stakeholders, shall use available data to make available a **map of aquifers that are at high risk of containing contaminants that exceed safe drinking water standards** that are used or likely to be **used as a source of drinking water for a state small water system or a domestic well**. The board shall **update the map annually** based on new and relevant data."

SB-200 Requirements (cont.)

> (2) The board shall make the map of high-risk areas, as well as the data used to make the map, **publicly accessible on its internet website** in a manner that complies with the Information Practices Act of 1977 (Chapter 1 (commencing with Section 1798) of Title 1.8 of Part 4 of Division 3 of the Civil Code). The board shall notify local health officers and county planning agencies of high-risk areas within their jurisdictions.

Aquifer Risk Map - Timeline

April 1, 2020 Webinar 1	July 22 Webinar 2	October 9 Webinar 3	November 4 Board Meeting	January 1, 2021
Project Kick Off – Staff Receives Initial Feedback	Follow up Workshop- Staff presents proposed approaches	Draft map presented for comment and review	Informational item on draft map	Map is made available to the public

Outreach – develop approach → Stakeholder input – feedback on approaches → Implement approach – focused stakeholder input → Finalize and post *(Update Annually)*

Targeted Outreach

- Office of Environmental Health and Hazard Assessment (OEHHA)
- Water Equity Science Shop (WESS)
- Department of Water Resources
- Central Valley Regional Board Staff (CV-SALTS)
- Regional Water Boards
- Sustainable Groundwater Management Act (SGMA) roundtable members
- California Conference of Directors of Environmental Health (CCDEH)
- Coachella Valley Water District (CVWD)
- Select parties in response to comments received during the webinars
- Divisions of Drinking Water, Financial Assistance, and Water Quality

Aquifer Risk Map – Main Goals

1. Prepare a map depicting relative risk of ambient source groundwater containing chemical constituents at concentrations above regulatory levels

2. Focus on shallow groundwater likely to be accessed by domestic wells and state small systems

3. Water quality risk to be combined with other factors: accessibility, affordability, water shortage risk, and demographic information - as part of the SAFER fund expenditure planning

Previous Work

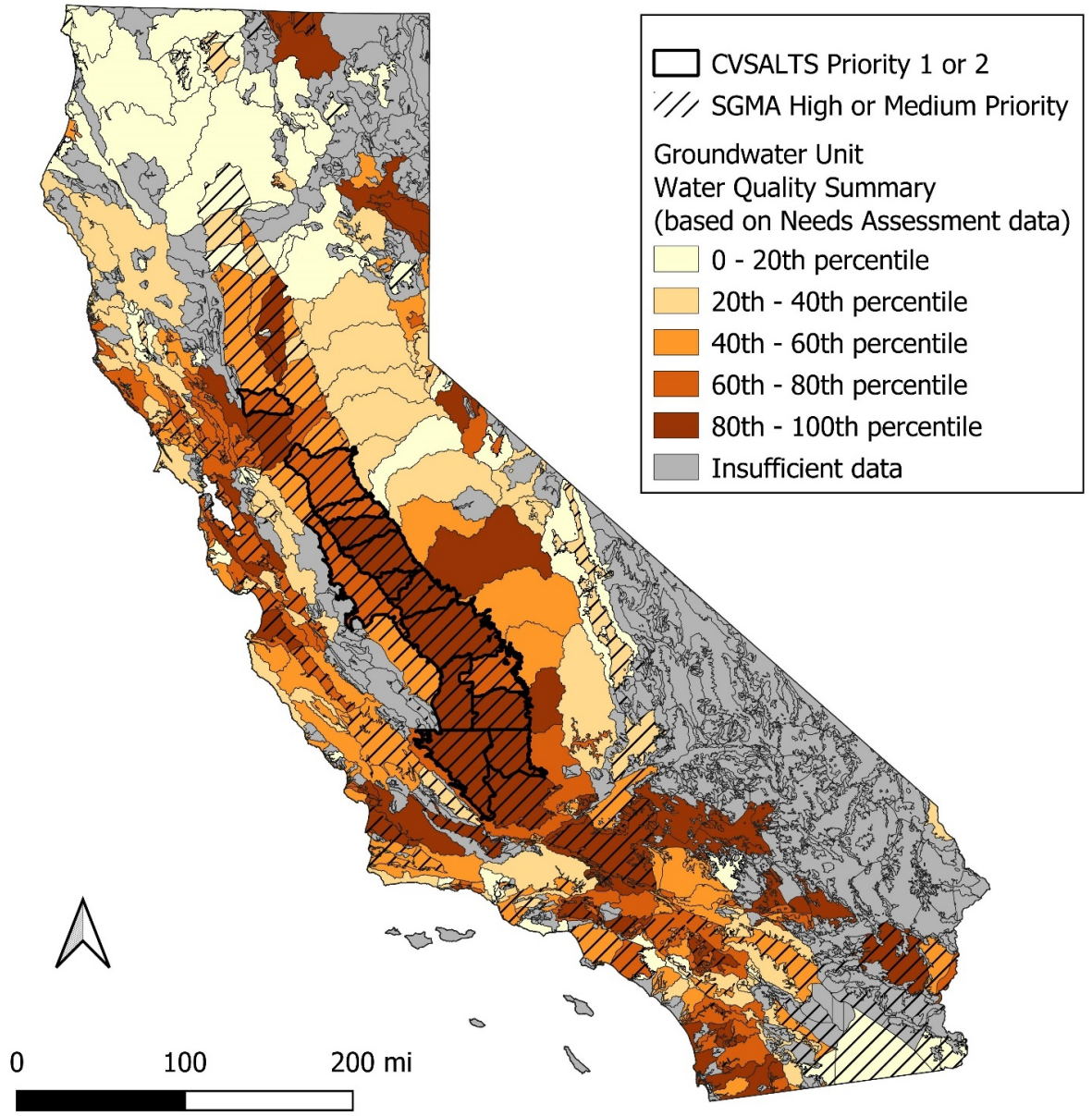
Domestic Well Water Quality Tool (Needs Assessment)

- Depth-filtered water quality results from public and domestic wells to estimate domestic well depth groundwater quality on a square mile basis for all chemicals with a maximum contaminant level (MCL).
- Department of Water Resources (DWR) well completion report database domestic well counts to estimate density of domestic wells per square mile

Previous Work

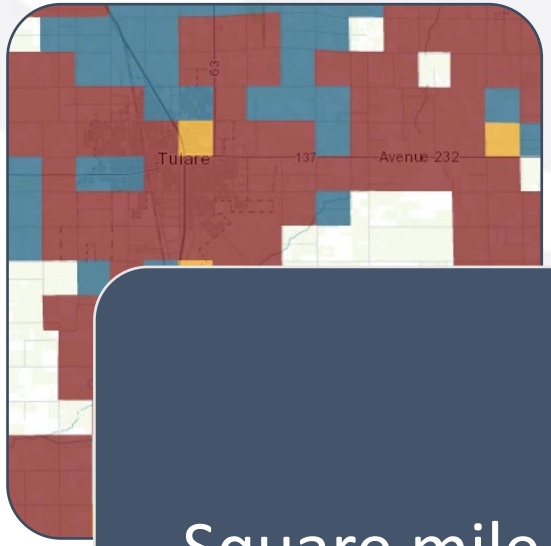
Fund Expenditure Plan

- Aggregates Needs Assessment data by Groundwater Units; units are ranked by the percent of sections “at-risk” for any constituent (“at-risk” = long-term OR recent estimations over MCL)
- Groundwater Units ranked by percentile

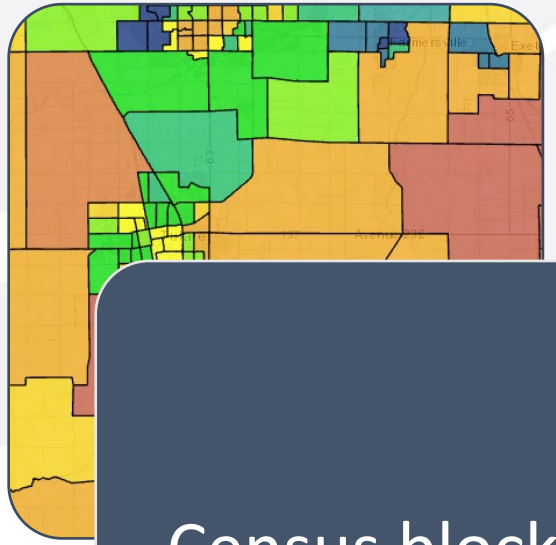


Methodology Overview – Water Quality

Point data (wells)



Square mile sections



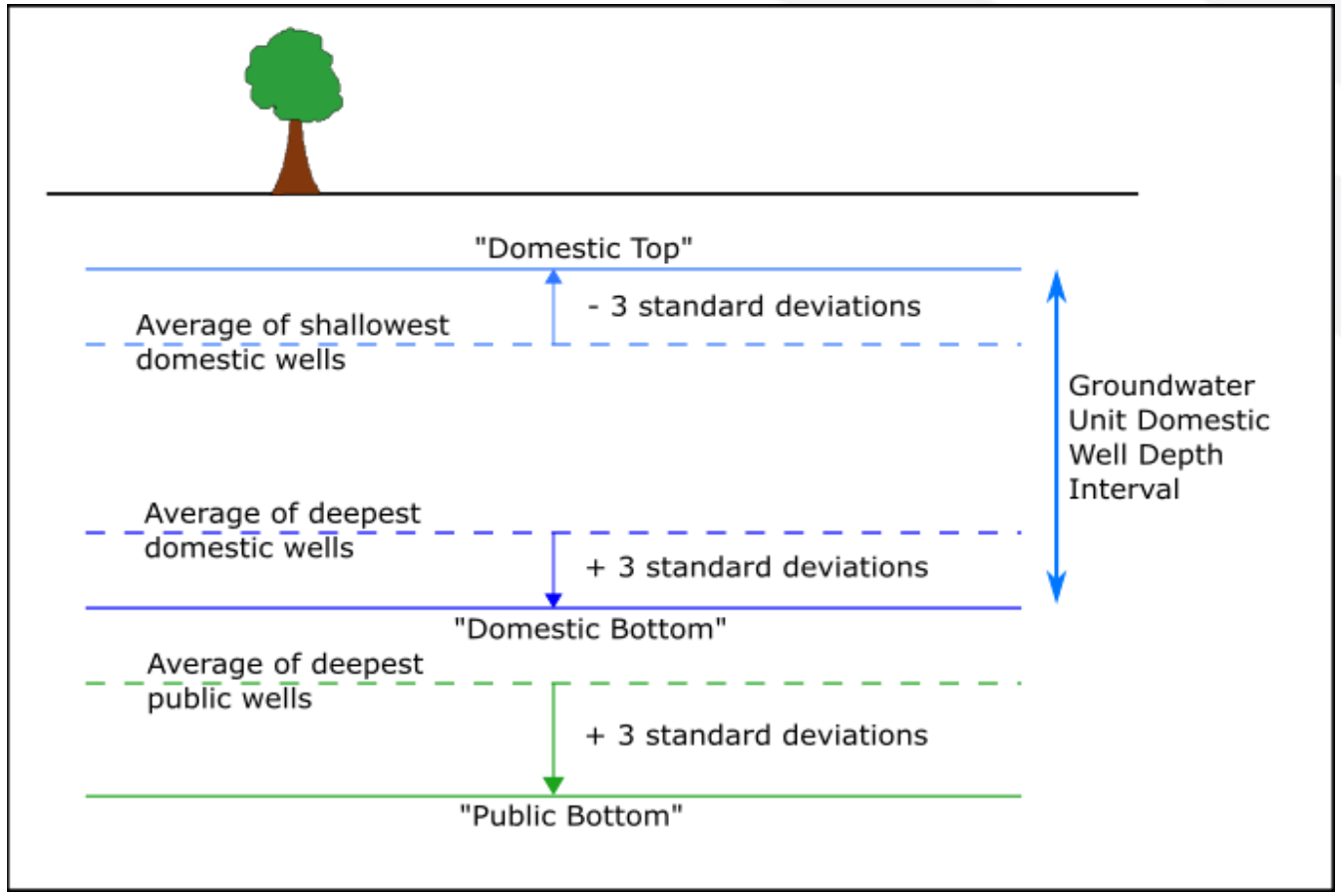
Census block groups

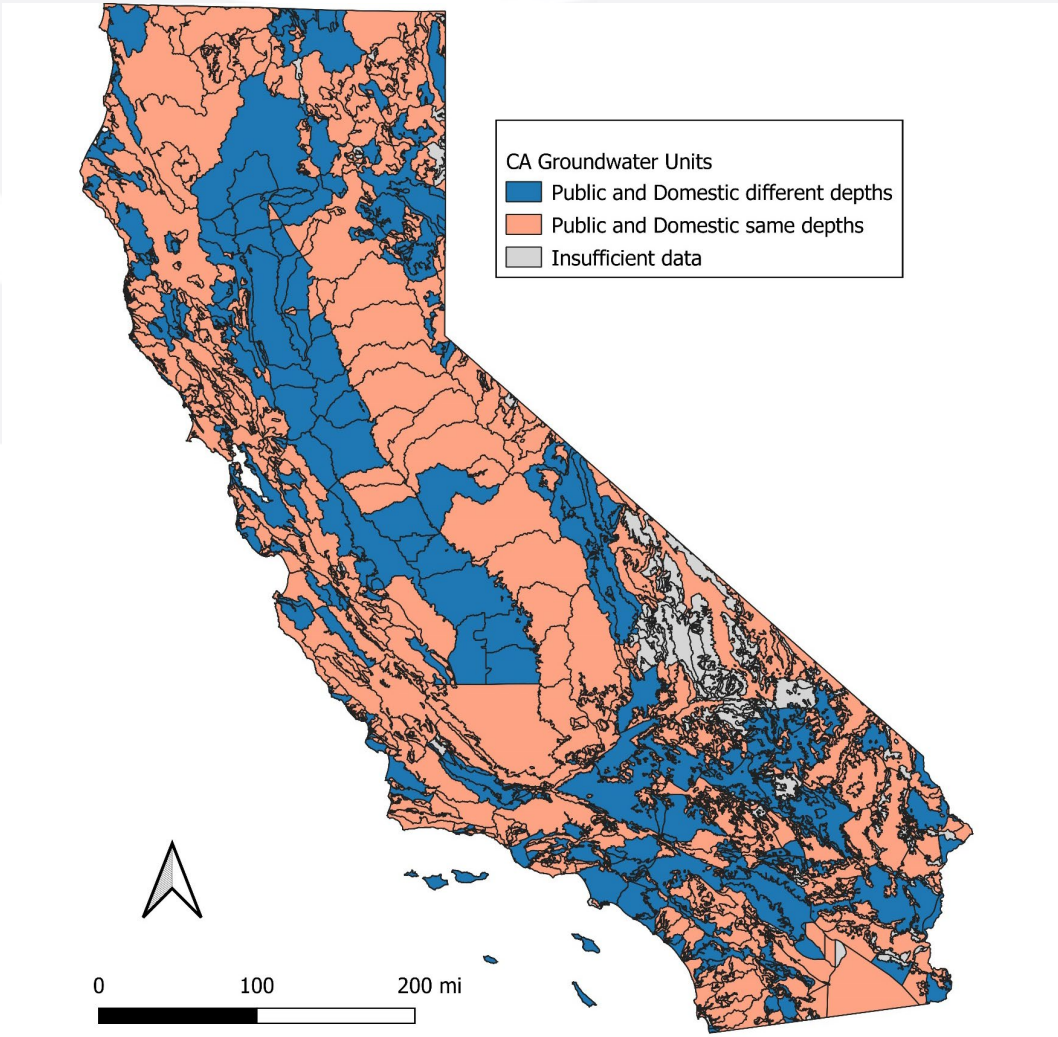
Data Processing

Data collection, filtering, and de-clustering methodology follows the Domestic Well Water Quality Tool procedure

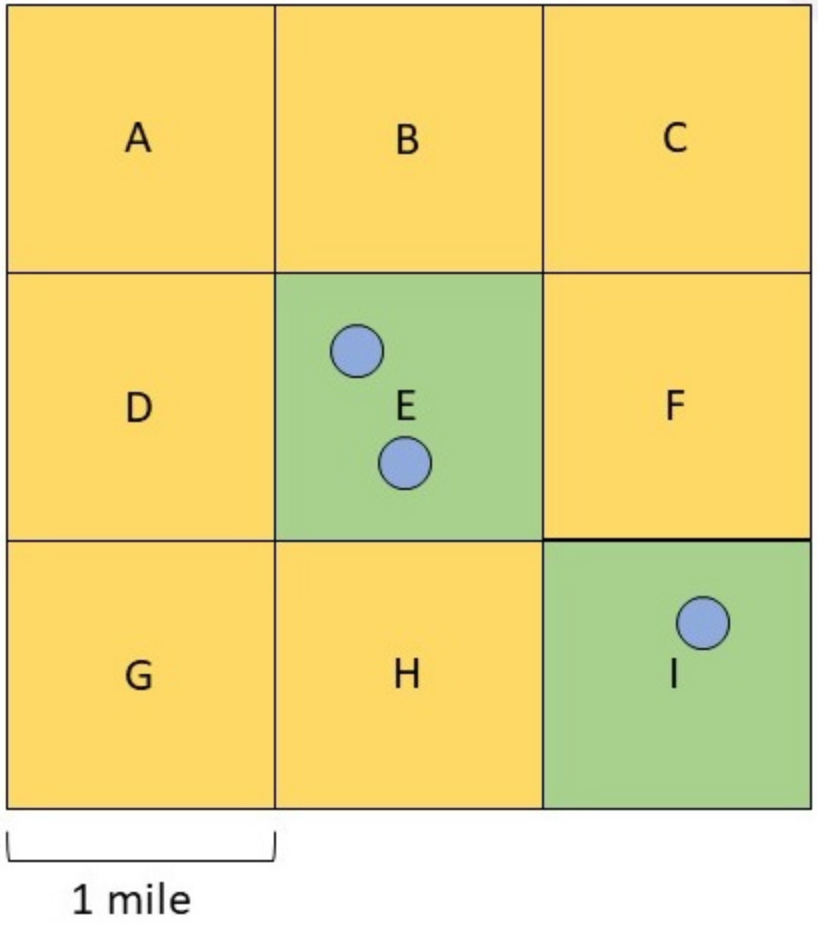
- Use publicly-available data from both public and domestic wells
- Filter wells by depth
- Average by year, well, and square mile section
- Assess both long-term averages (20 year) and recent results
- Assess all constituents with an MCL, including Hexavalent Chromium

Depth Filter





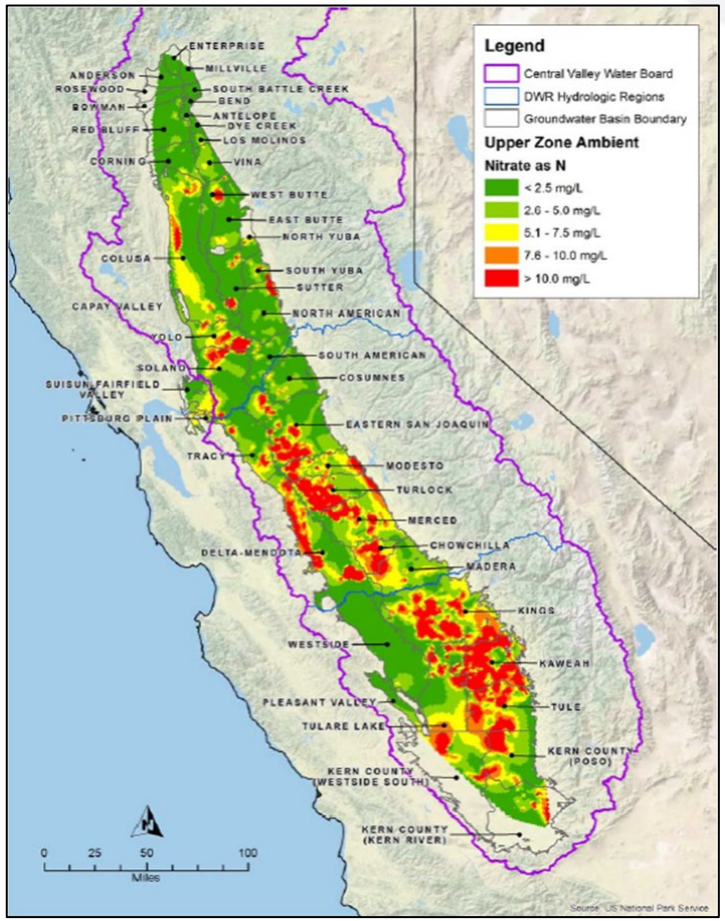
De-clustering



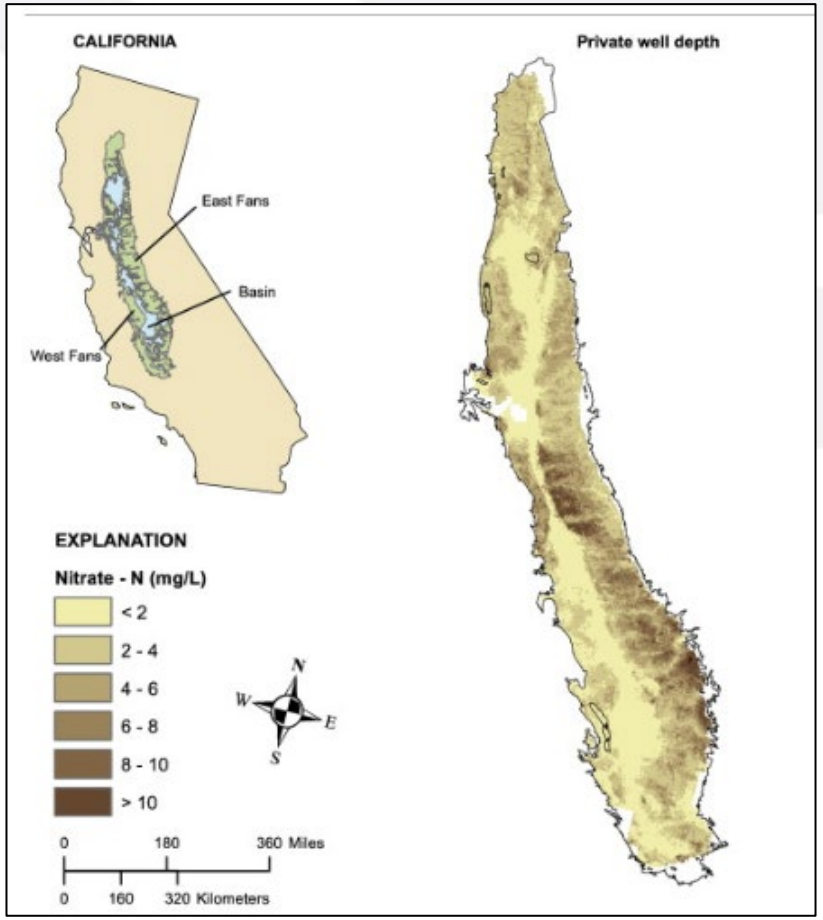
	Long-term average	Recent results
Sections with a water quality well	Average of wells in section	All recent results from wells in section
Sections adjacent to a water quality well	Average of adjacent sections with water quality wells	Averaged recent results from adjacent sections with water quality data

Section	Long-term average (MCL index)	Count of recent results above the MCL
E	3	1
I	2	0
F, H	2.5	0.5
A, B, C, D, G	3	1

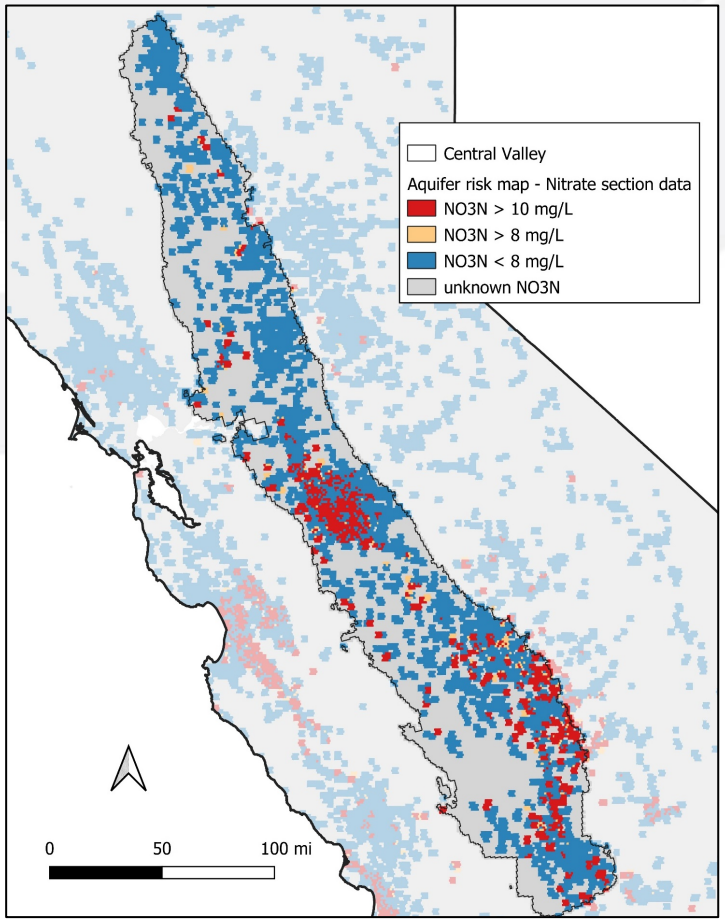
Comparison with other studies



CV-SALTS Upper Zone Ambient nitrate

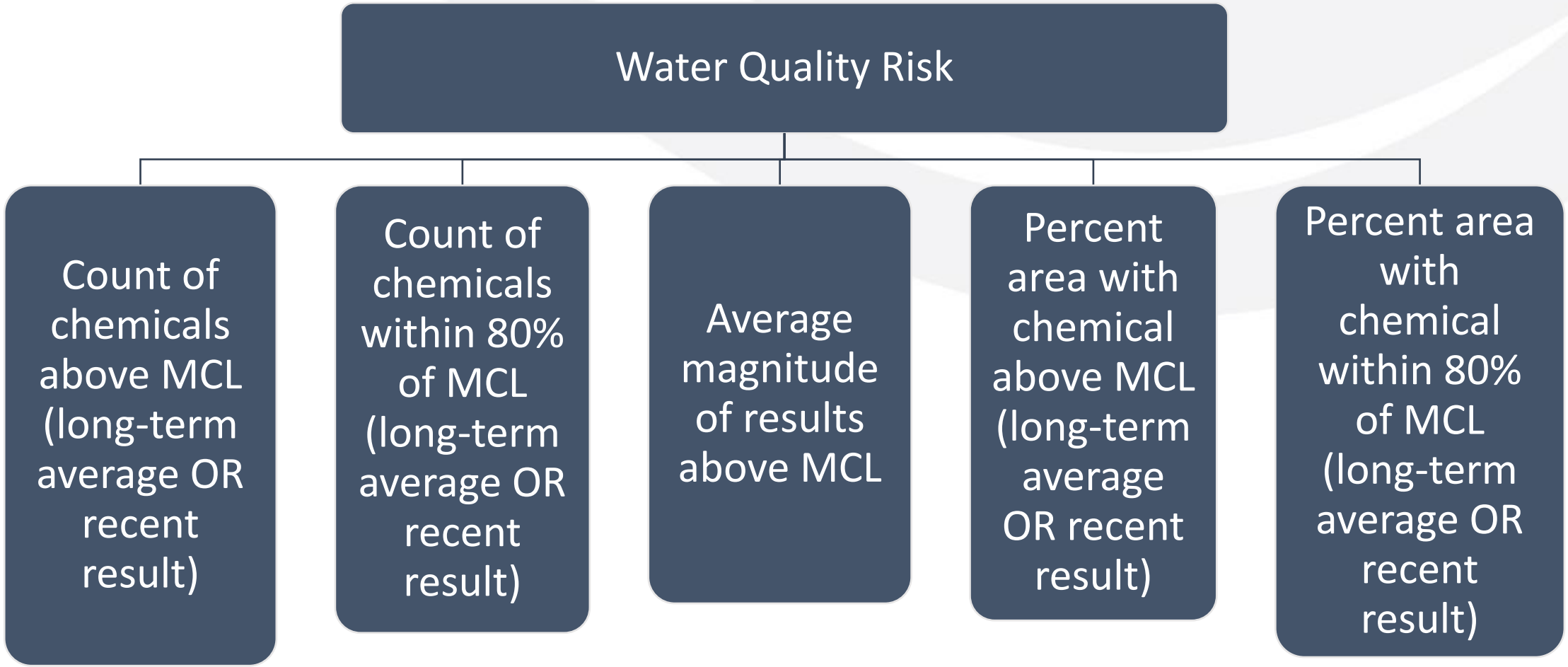


Ransom et al. (2018) Private well depth nitrate



Aquifer risk map nitrate section data

Water Quality Metrics



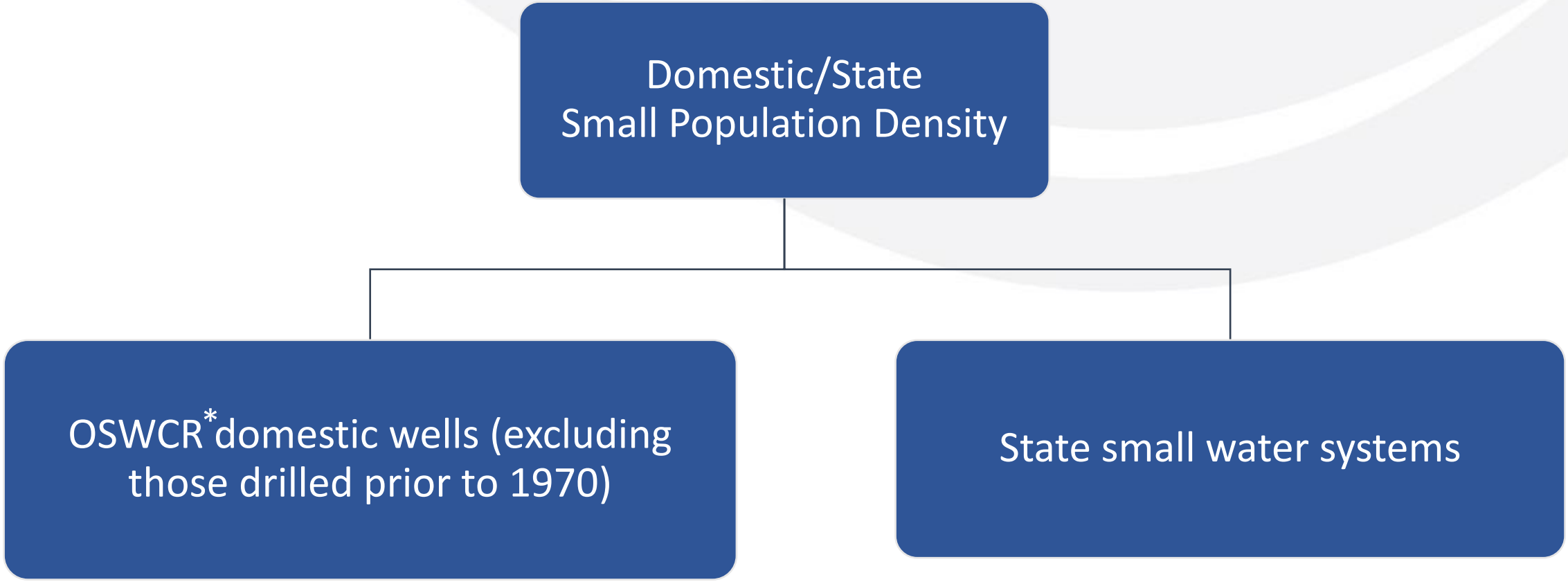
Water Quality Score

A water quality score is calculated for each census block group

$$\text{Water quality score} = \left(\text{Count of chemical constituents above MCL} + \frac{\text{Count of chemical constituents within 80\% of MCL}}{2} + \frac{\text{Average magnitude of results above MCL}}{10} \right) \times \left(\text{Percent area with results above MCL} + \frac{\text{Percent area with results within 80\% of MCL}}{2} \right)$$

Final scores are converted to percentiles.

Domestic Well and State Small System Density



*California Department of Water Resources Online System of Well Construction Records

Domestic Well and State Small System Density

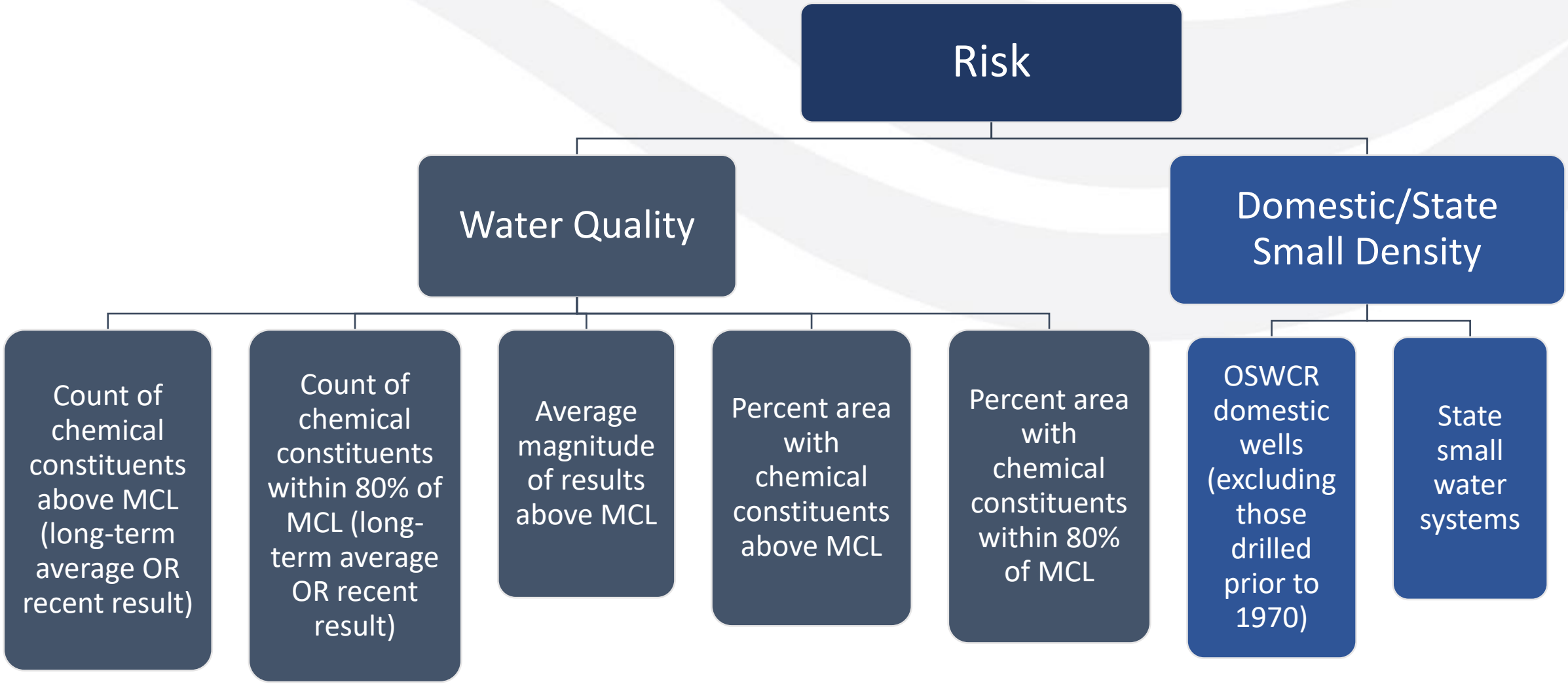
System density is calculated for each census block group:

$$\text{System Density} = \frac{\text{Domestic well count*} + \text{Count of State small systems}}{\text{Area of census block group}}$$

Final values converted to percentiles.

*excludes records with installation date prior to 1970

Risk


Risk
Water Quality
Domestic/State Small Density
Count of chemical constituents above MCL (long-term average OR recent result)
Count of chemical constituents within 80% of MCL (long-term average OR recent result)
Average magnitude of results above MCL
Percent area with chemical constituents above MCL
Percent area with chemical constituents within 80% of MCL
OSWCR domestic wells (excluding those drilled prior to 1970)
State small water systems

Risk

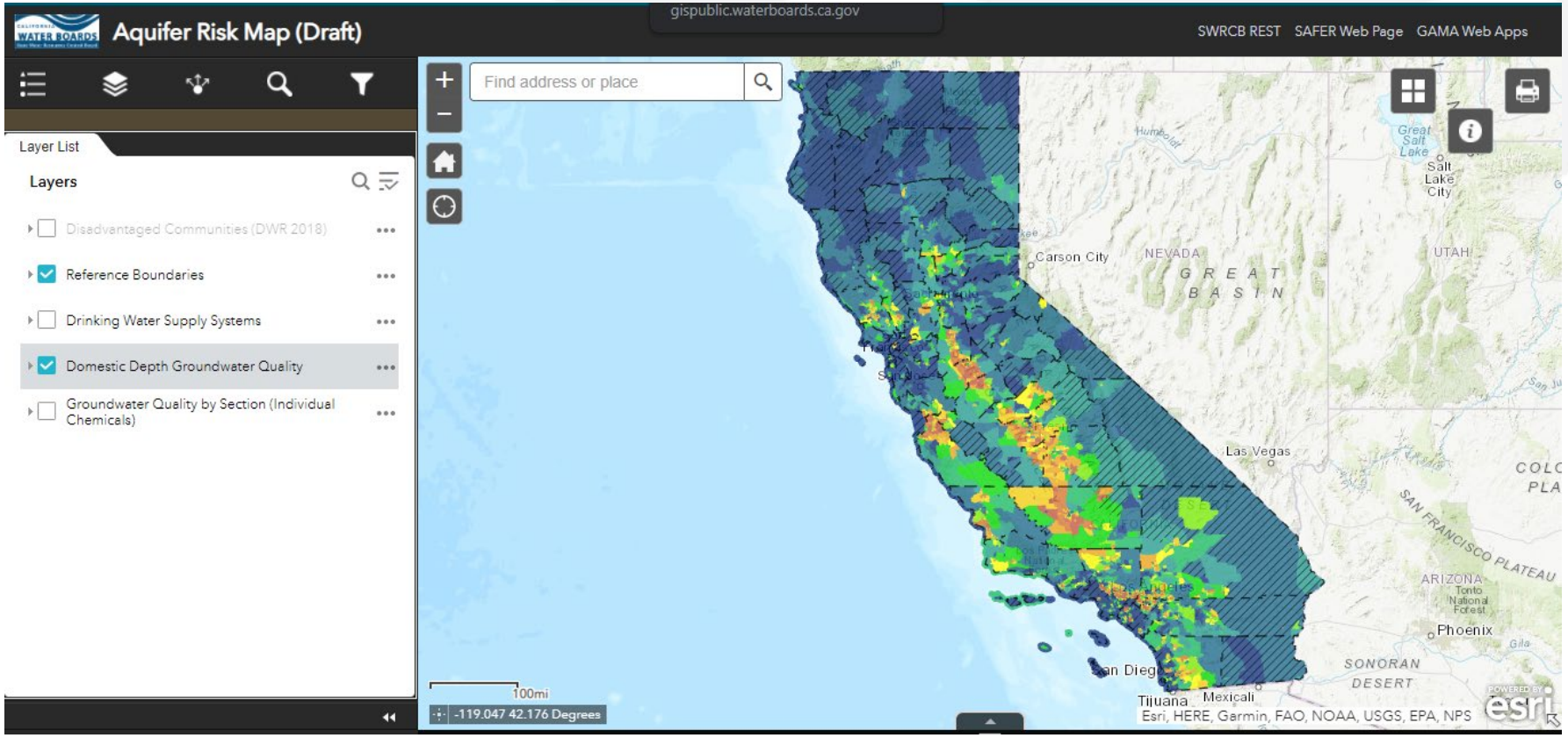
The water quality percentile is added to the domestic well/state small system density percentile to determine to overall risk.

$$\text{Risk} = \text{Water Quality Percentile} + \text{Domestic Well/State Small Water System Density Percentile}$$

The final values converted to percentiles .

Demonstration

[Link to map]



Contact Information and Links

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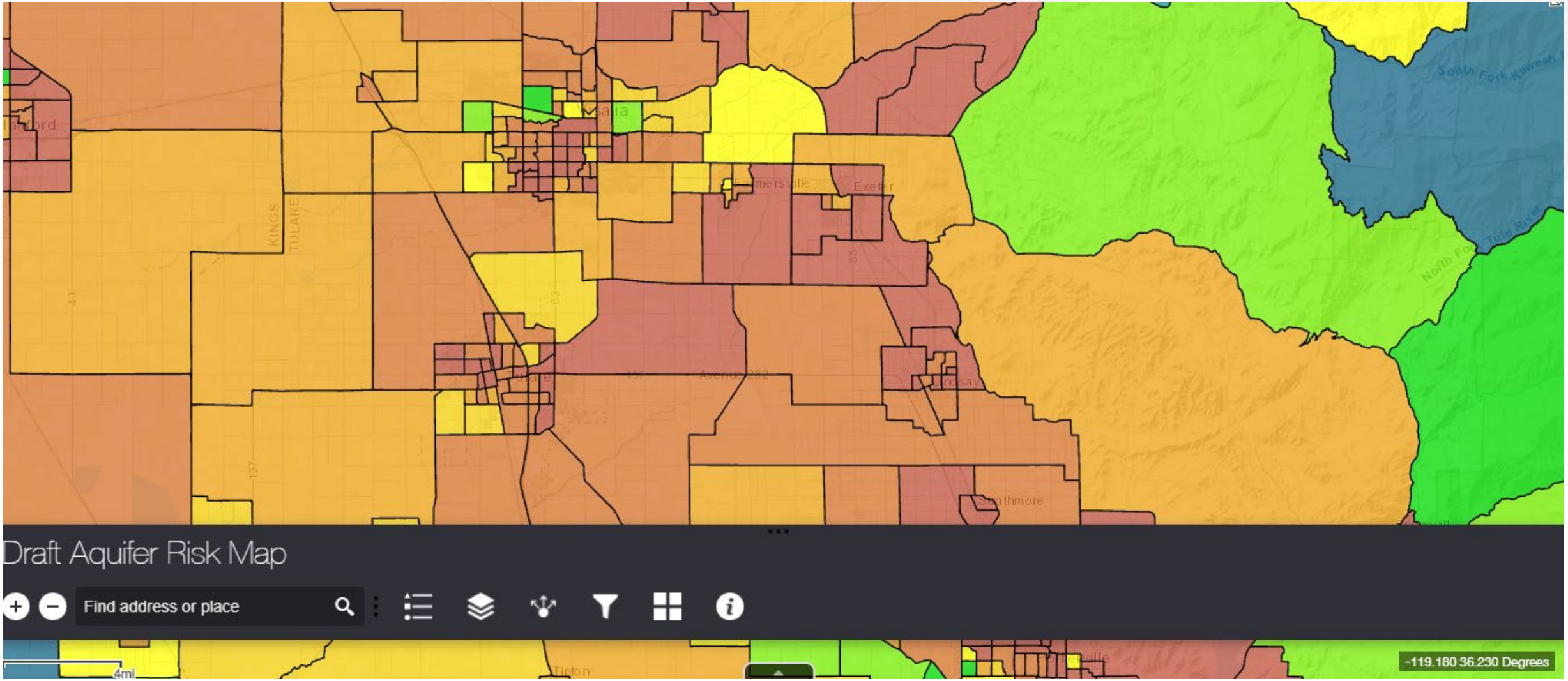
Web Tool Screenshots



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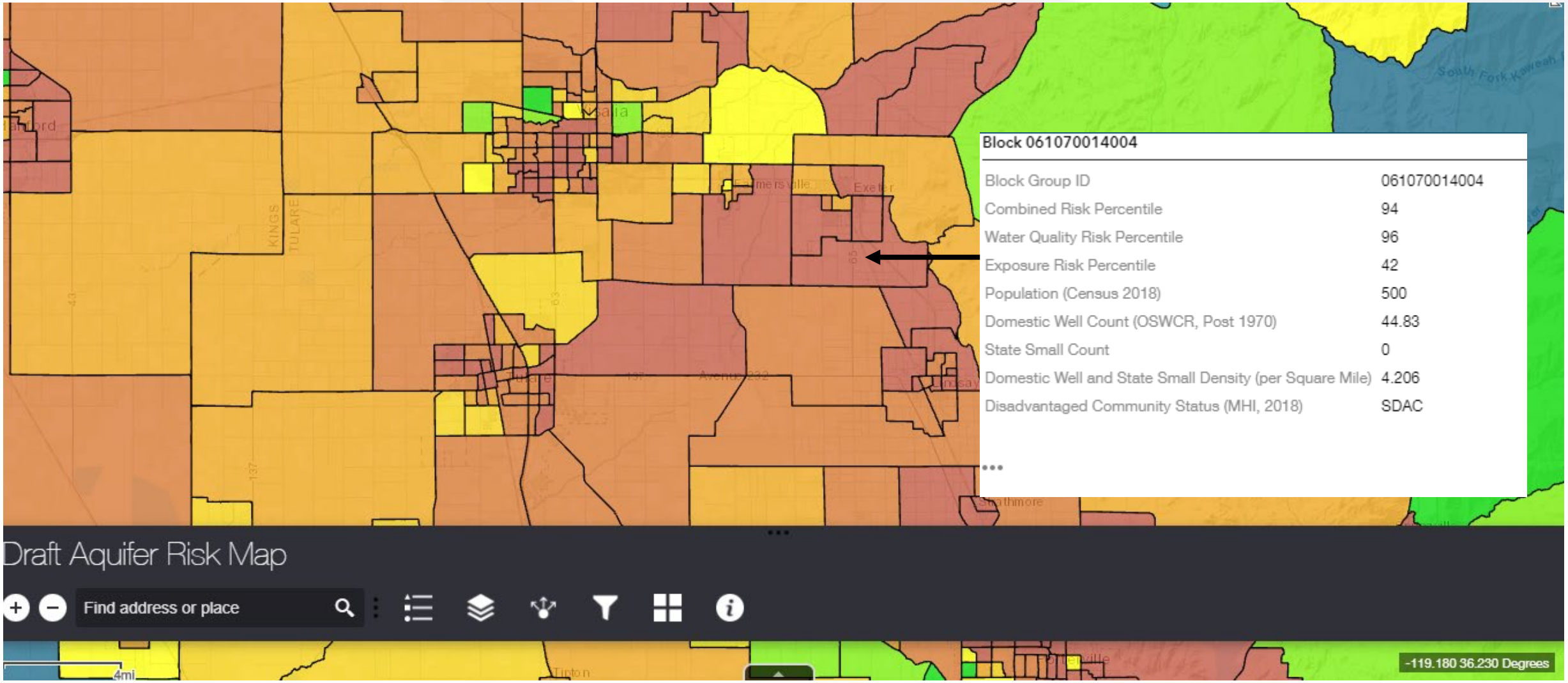

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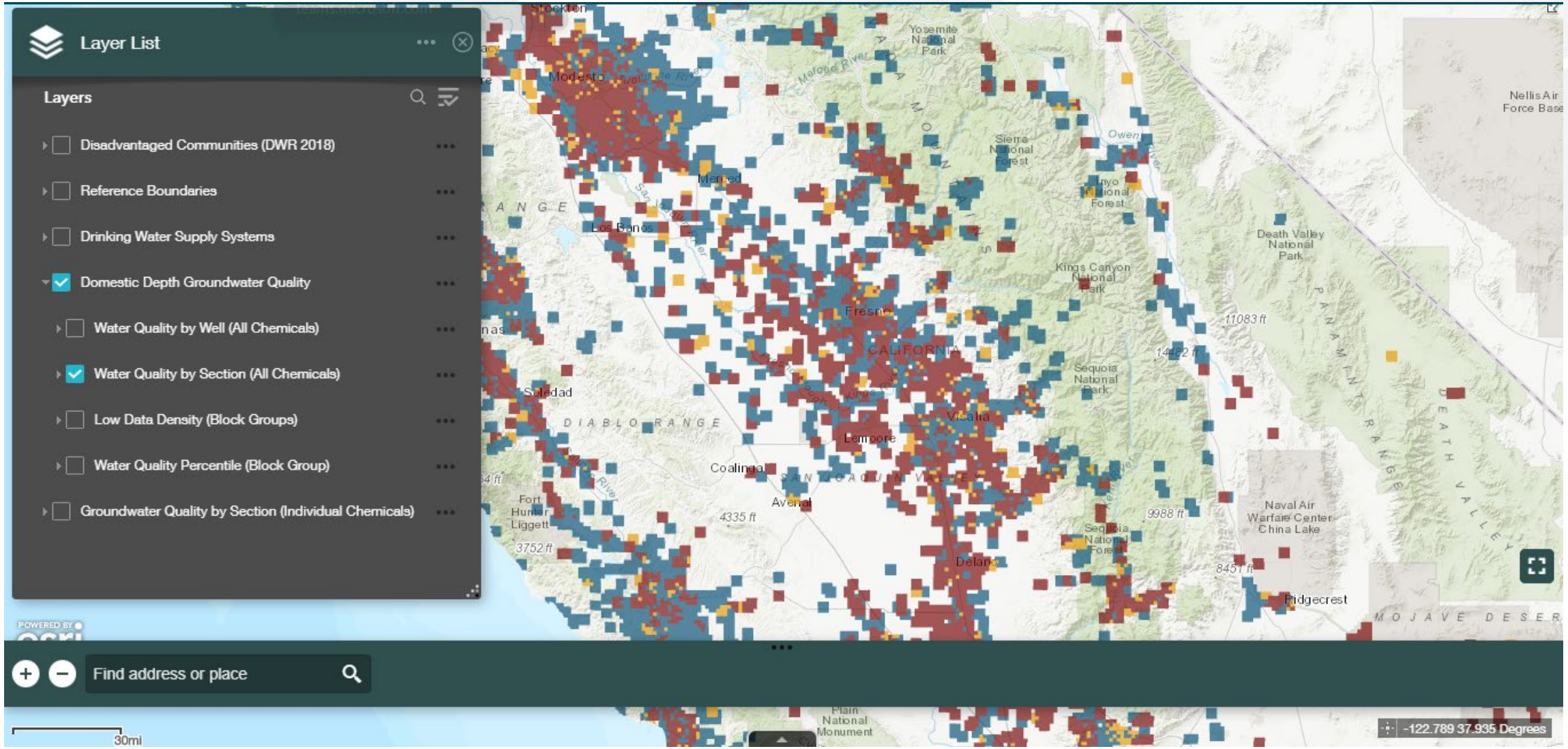

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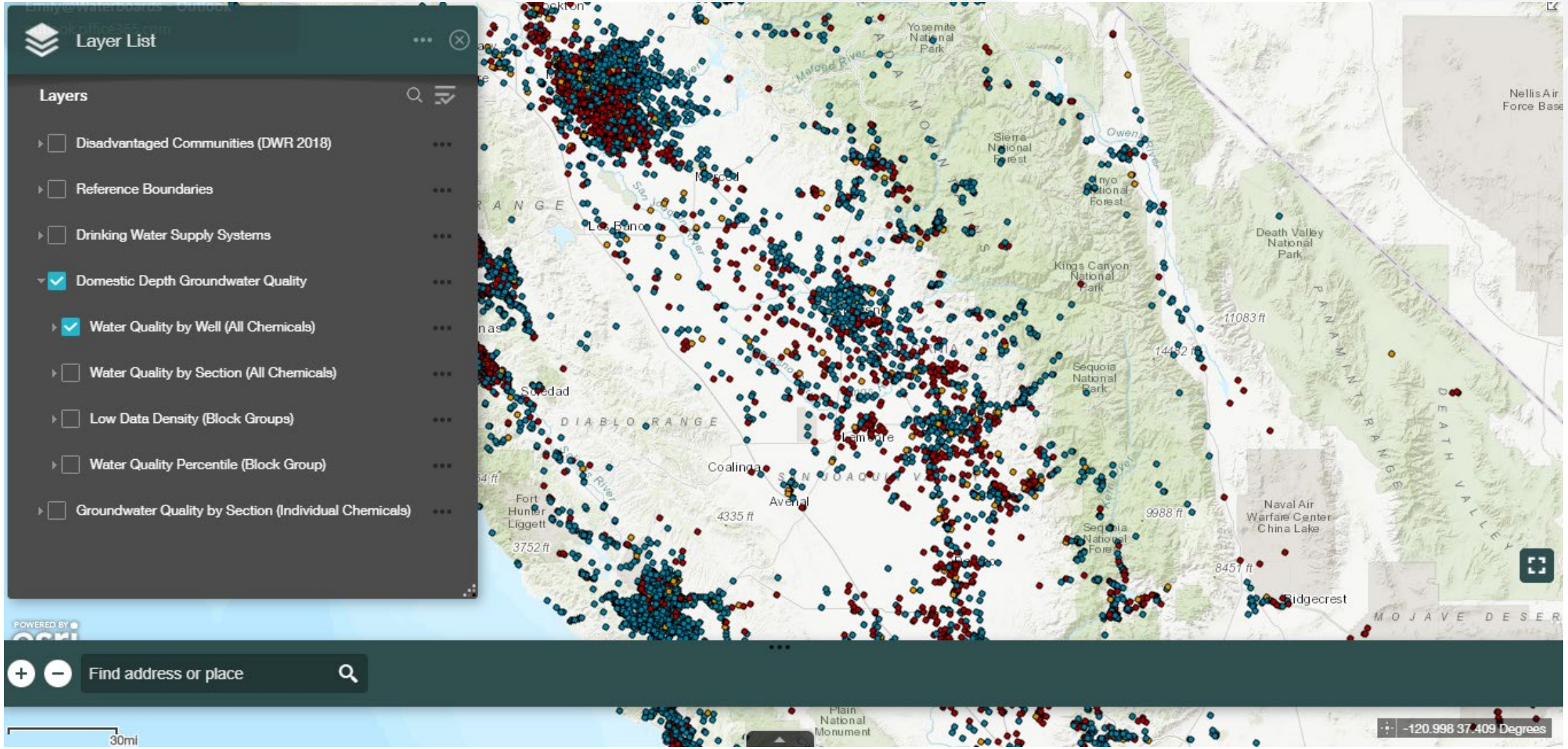

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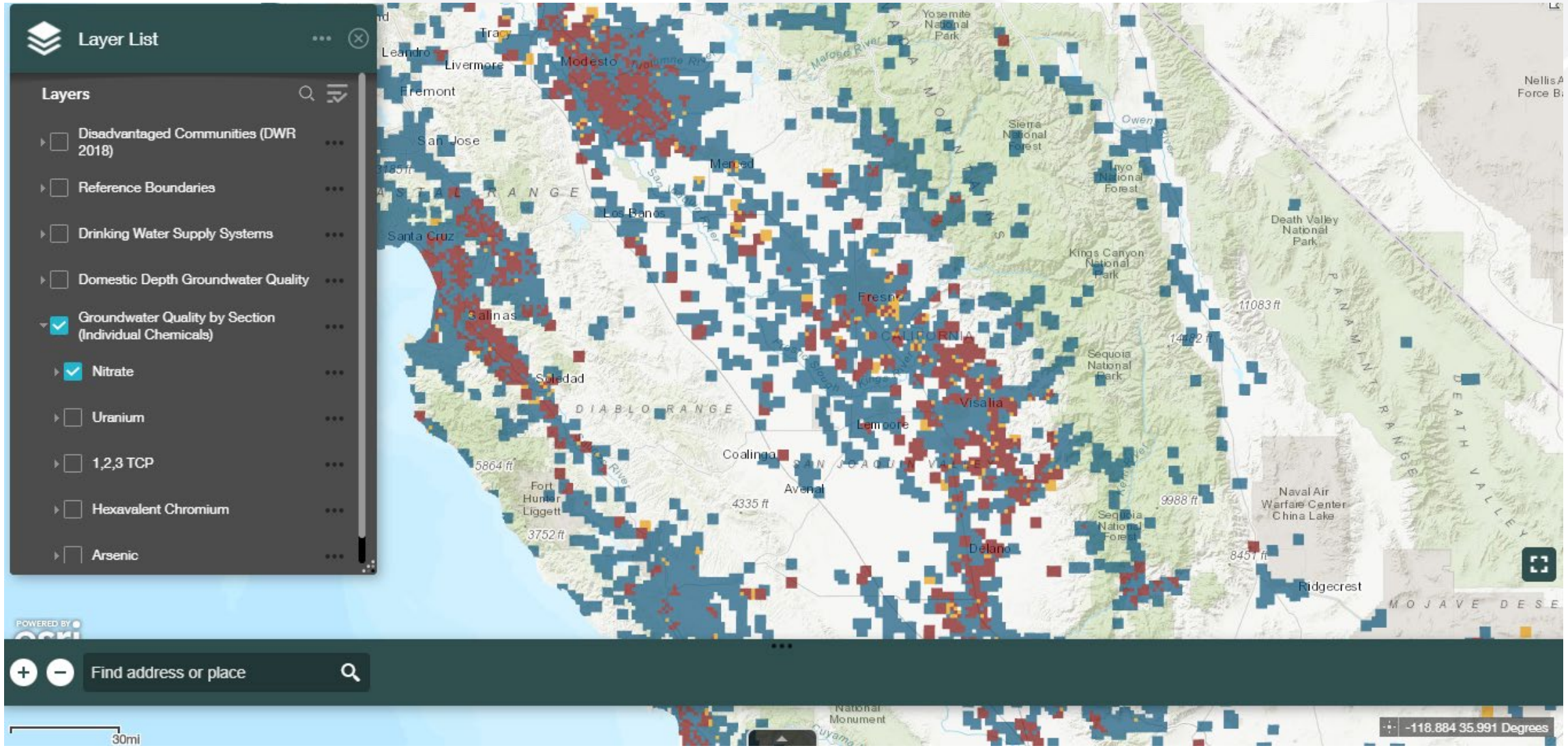

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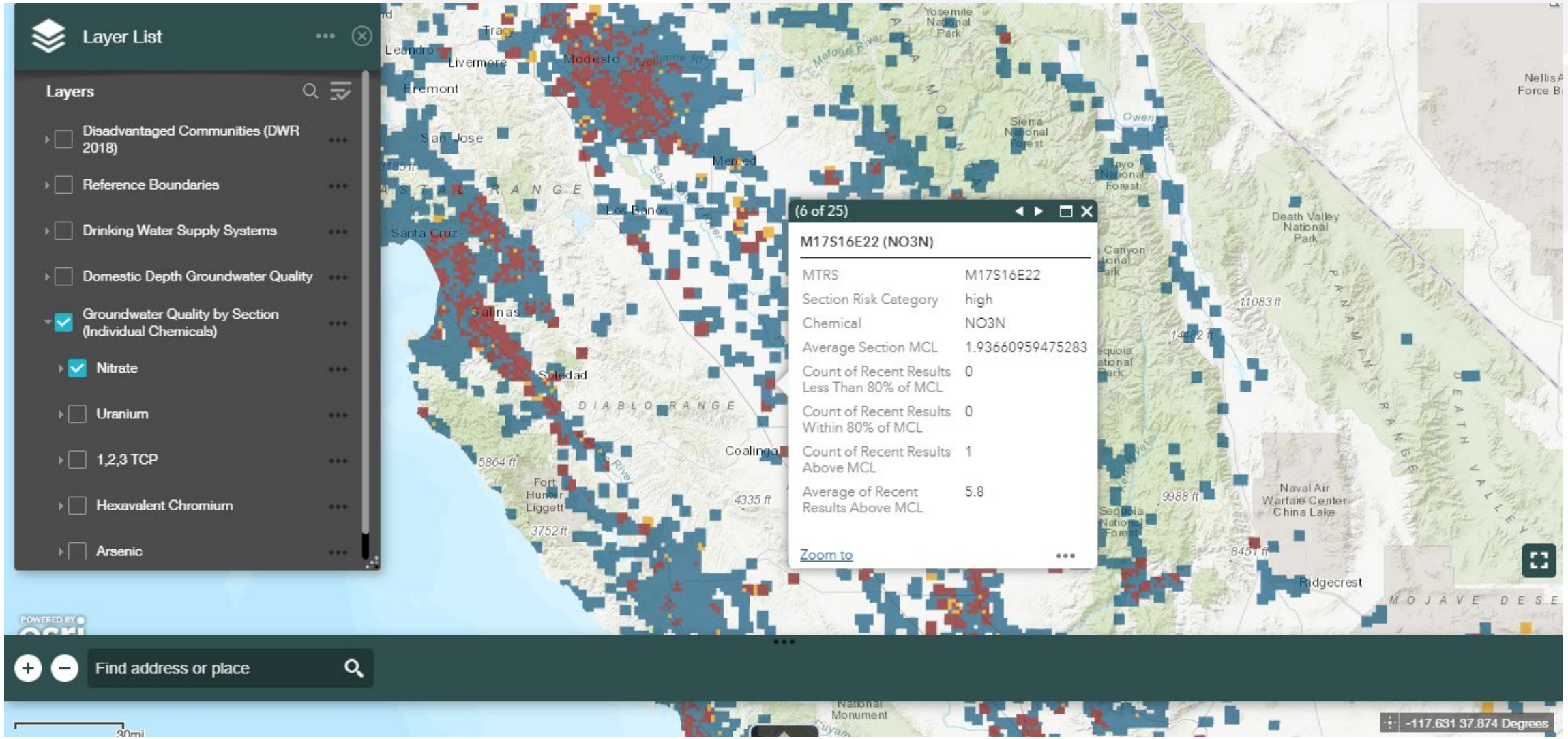

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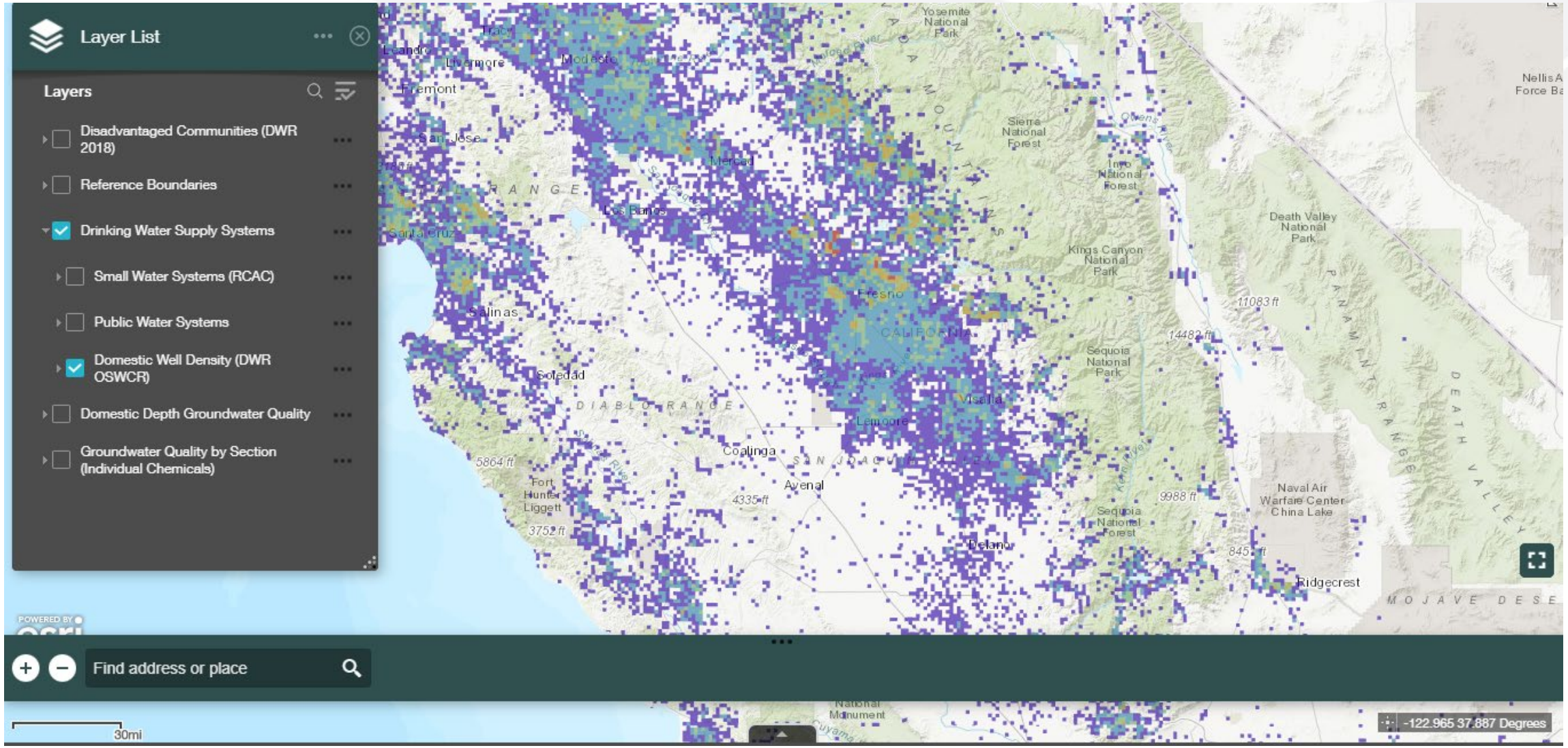

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