University of California Cooperative Extension

Sierra Valley Groundwater Cross-Sectional Analysis 2.0

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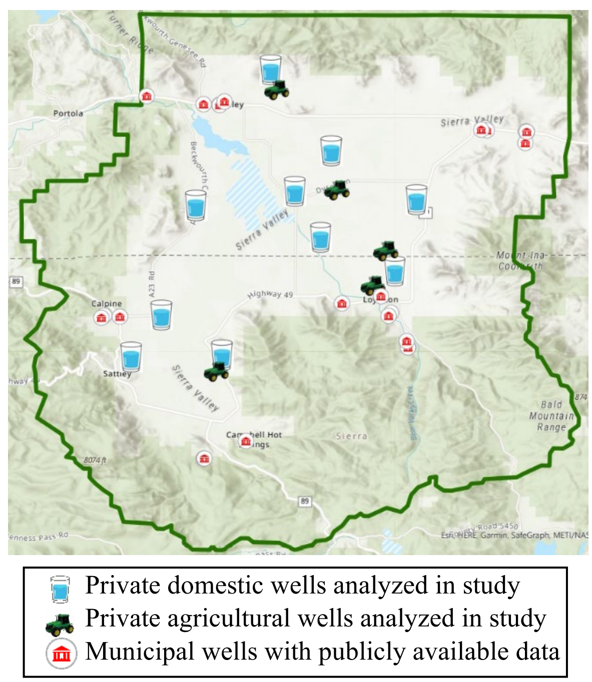
Background and Purpose

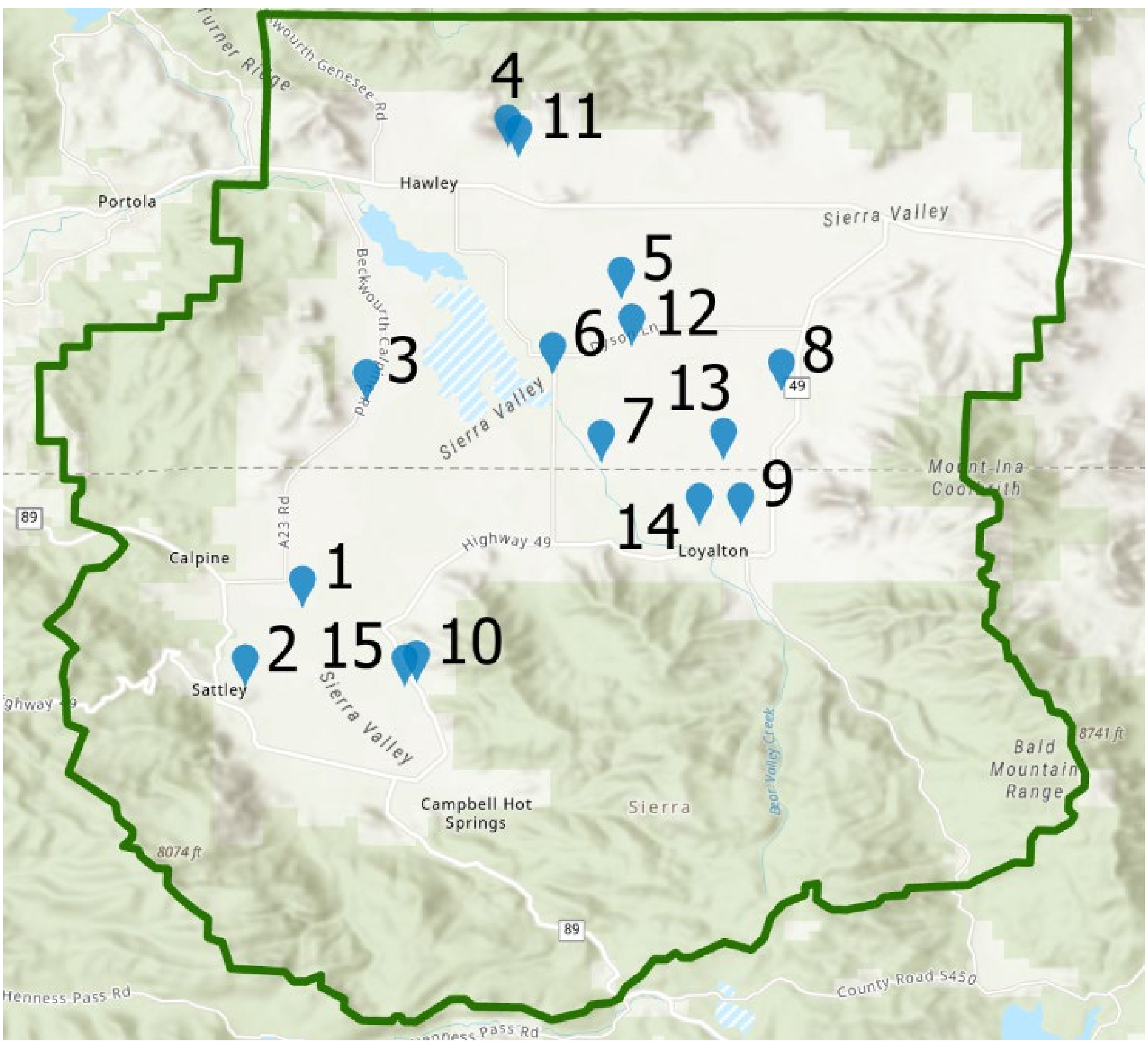


This Sierra Valley Groundwater Cross-Sectional Analysis conducted in 2025 was undertaken to provide an update in groundwater quality to the Sierra Valley Groundwater District. The University of California (UC) Cooperative Extension conducted a cross-sectional analysis to examine 1) Nitrate+Nitrite as N; 2) Arsenic; 3) Boron; and 4) Total Dissolved Solids in agricultural irrigation wells and domestic drinking wells. This document summarizes the findings of the research project in 2025 and 2021. Publicly available groundwater data from within Sierra Valley Groundwater District is from municipal well data near the perimeter of the valley. This information aids the Sierra Valley Groundwater Management District Board and Technical Advisory Committee (TAC) on the updates to the Sierra Valley Groundwater Sustainability Plan (SVGSP) required by the California Sustainable Groundwater Management Act. The 2025 update was funded by the Sierra Valley Groundwater Management District.

Methods

The cross-sectional water quality survey was completed across 10 private domestic drinking wells and 5 private agricultural irrigation wells within the Sierra Valley Groundwater Management District. Key wells were identified in 2021 to get a representative understanding of groundwater quality across the valley at deep agricultural irrigation wells and typically shallower drinking water wells. In 2025, the same 15 wells were sampled on May 13, 2025. One groundwater well (#15 was inaccessible and inoperable on the initial sampling date, and was sampled on June 17, 2025).

The sampling in 2025 in the spring followed a typical winter, with April and May storms. Water was collected in sterile containers provided by Basic Laboratory, Chico, which were immediately stored on ice. Water samples were collected at the nearest point of the wells (e.g. faucet at well head or irrigation outlet). We allowed water that may have been sitting in the pipes to flow out before collecting the water sample. Samples were submitted for analysis to Pace Analytical Services LLC (Formerly Basic Laboratory) on May 14, 2025 and June 18, 2025, accredited under California State Water Resources Control Board Environmental Laboratory Accreditation Program. All analysis were performed in strict adherence to established quality manuals, meeting the requirements of applicable accreditation standard.



Research Results and Discussion

Nitrate+Nitrite as N

All samples of drinking water wells and agricultural irrigation wells were significantly below the state Maximum Contaminant Level of 10 mg/l (22 CCR §63341), same as in 2021 study. The presence of nitrates in groundwater is generally associated with septic systems, treated wastewater, confined animal feeding operations or fertilizer use. Nitrite can interfere with the ability of red blood cells to carry oxygen to the tissues of the body, producing a condition called methemoglobinemia, and it is of greatest concern in infants and pregnant women (California Department of Public Health, 2014).

The low findings of Nitrate+Nitrite as N in groundwater is consistent with local knowledge of agricultural production systems. The Sierra Valley includes extensive irrigated agriculture, including hay farming and livestock grazing, with no confined animal feeding operations (Plumas County, 2019 and Sierra County 2019). A UC Cooperative Extension survey of irrigated agricultural producers within the Upper Feather River Watershed Coalition found nitrogen applications a rare practice in Sierra Valley (unpublished data Schohr, Tate and Saitone, 2020). The 2020 UC Cooperative Extension survey of agricultural producers in the Upper Feather River Watershed Coalition also found when nitrogen was applied, it was at levels below the agronomic potential of the field. Due to relatively low economic return of pasture and hay crops, growers carefully manage inputs, including nitrogen fertilizer (Wilson, et al. 2008).

Additionally, UC Davis research consistently finds agricultural management practices promote water quality and finds nitrogen entering these systems exceeding the amount discharged as tailwater, thus providing no excess nitrogen to be lost to groundwater (Tate, et al. 2005; Tate, et al. 2000; Bedard-Haughn, et al. 2005, Roche, et al. 2013). These results also align with sampling by the Upper Feather River Watershed Coalition that have found no nutrient exceedances during surface water testing from 2005-2018 in the region (Central Valley Regional Water Quality Control Board, 2019).

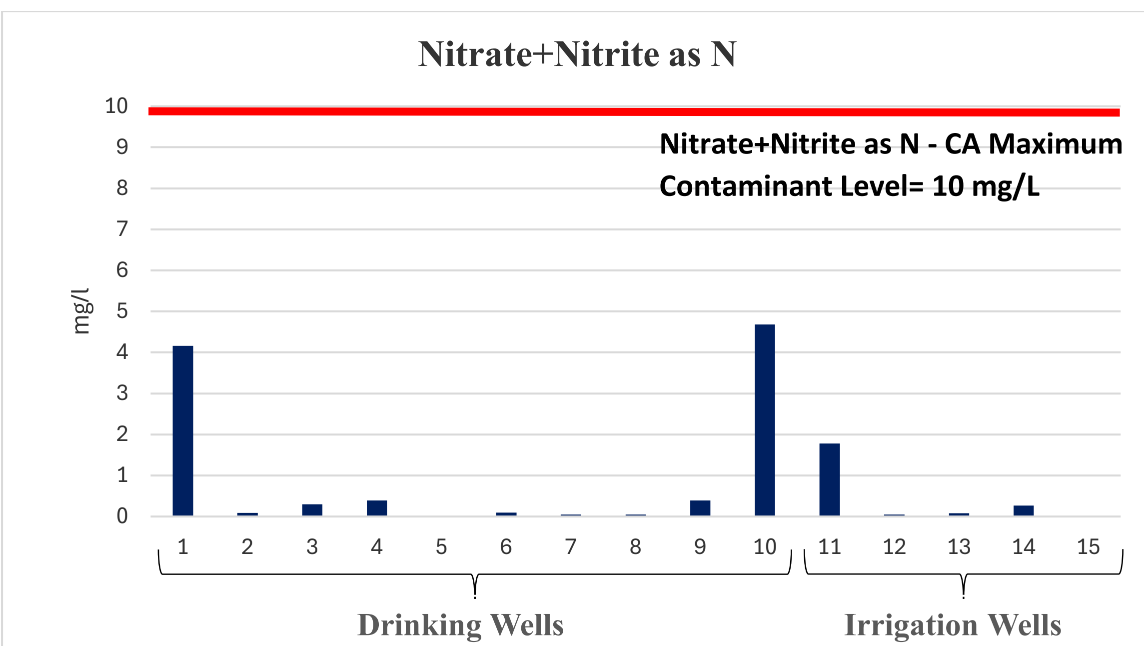


Table 1. Nitrate+Nitrite as N results from 2025 Sierra Valley Groundwater Cross-Sectional Analysis of Private Wells

Boron

There was only one well identified with Boron above the state notification level (CA-NL) of 1,000 micrograms per liter (µg/L) and all were significantly below the federal health advisory for non-cancer health effects of 5,000 µg/L. Boron is an unregulated chemical without an established Maximum Contaminant Level.

According to the State Water Resources Control Board (SWRCB) the most prevalent sources of boron in drinking water are from the leaching of rocks and soils, wastewater, and fertilizers/pesticides. Boron can be lethal at high concentration, whereas at low concentrations can cause gastrointestinal tract distress, vomiting, abdominal pain, diarrhea, and nausea. However, low boron intake can impact cellular functions and metabolism of other important substances including calcium, copper, glucose, etc. (SWRCB, 2017)

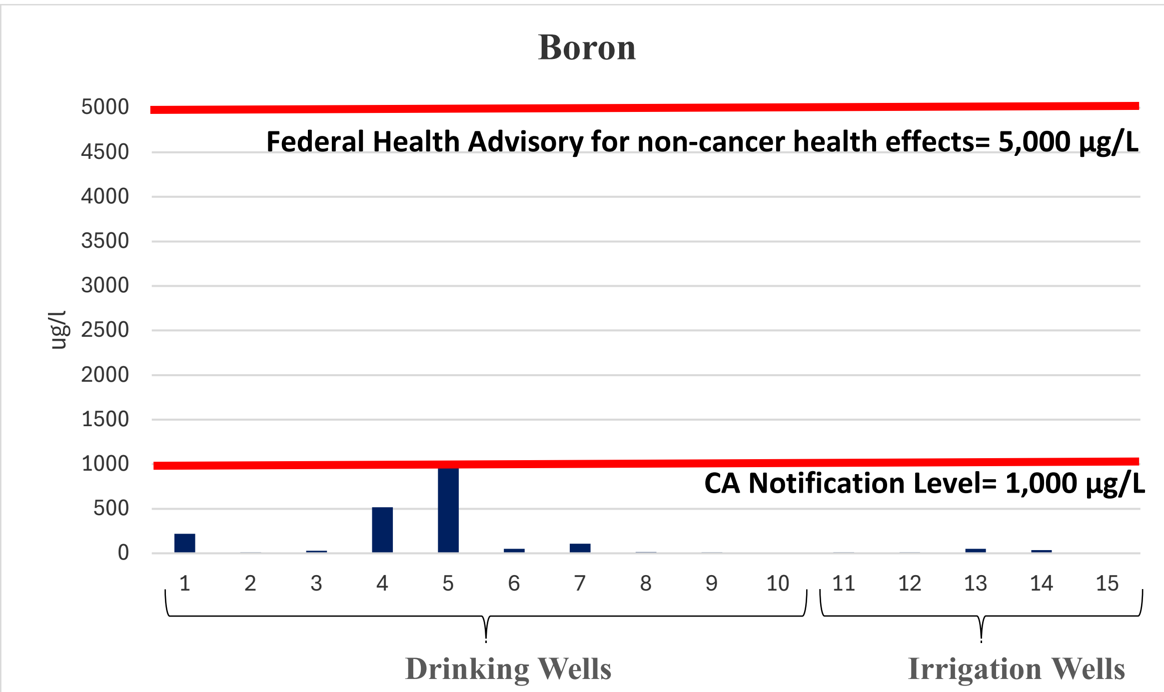


Table 2. Boron results from 2025 Sierra Valley Groundwater Cross-Sectional Analysis of Private Wells

Arsenic

There was only one well identified with arsenic above the established State Maximum Contaminant Level in drinking water of 10 µg/L. This well is located in a region with "BeG—Basic rock land" with parent material of residuum weathered from basalt (NRCS, 2021). High concentrations of arsenic are associated with volcanic deposits, including basalt (Welch, et. al. 1988). According to the State Water Resources Control Board the primary source of arsenic in the environment is from the weathering of arsenic-containing rocks. Arsenic is a known human carcinogen, and ingestion of arsenic has been reported to increase the risk of cancer in the liver, bladder, kidney, lungs, and skin. (SWRCB, 2017)

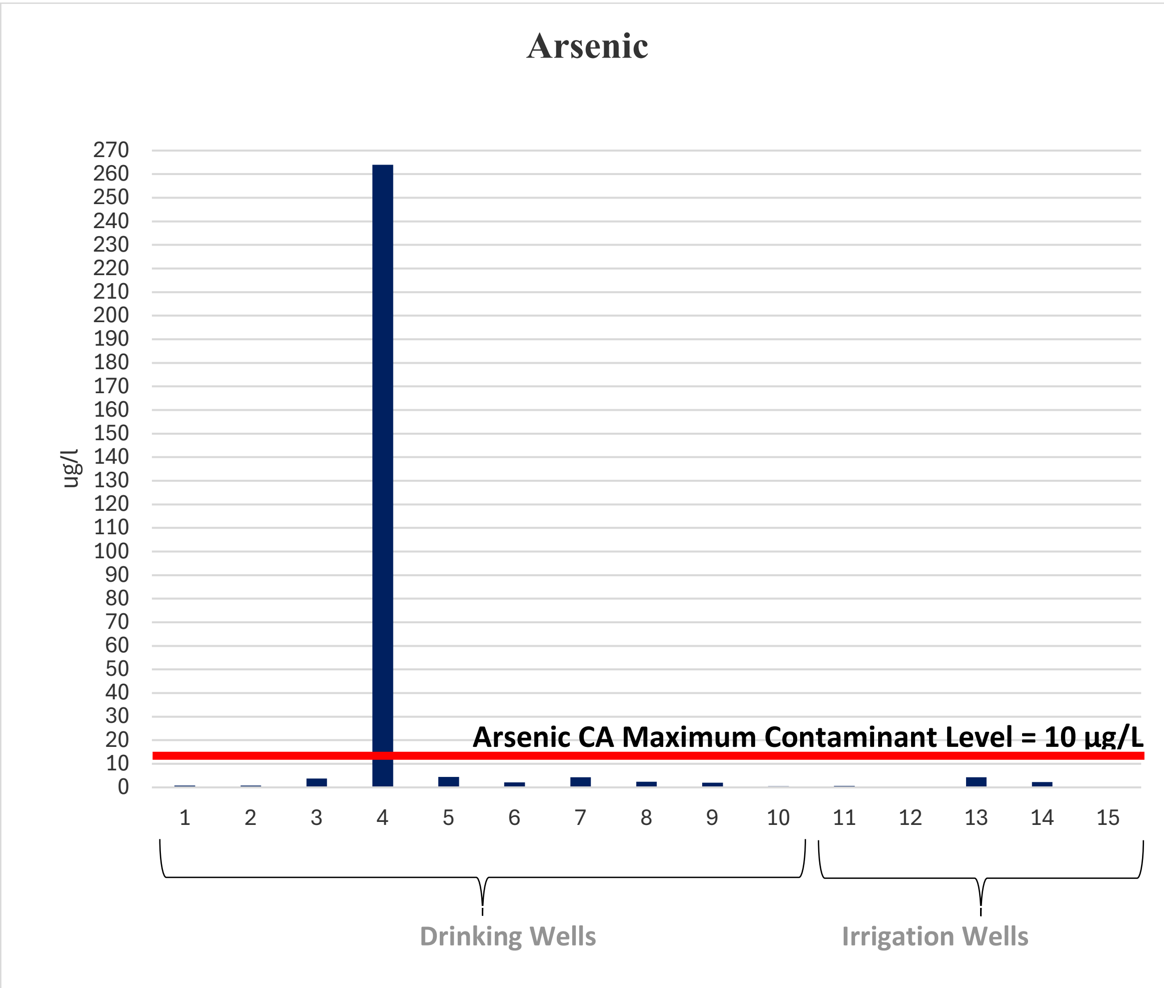


Table 3. Arsenic results from 2025 Sierra Valley Groundwater Cross-Sectional Analysis of Private Wells

Total Dissolved Solids

In this project we measured salinity as Total Dissolved Solids (TDS), including organic and suspended particles. Results found 2 drinking wells with Secondary Maximum Contaminant Level (SMCL) above the recommended threshold of 500 mg/L, however all wells were well below the upper SMCL level of 1,000 mg/L. High concentrations of TDS/salts can damage agricultural productivity, impact plant growth, damage equipment and causes aesthetic concerns for drinking water. There are no public health goals (PHGs) or maximum contaminant level goals (MCLGs) for these constituents because secondary standards are set based on aesthetic concerns. (SWRCB, 2017 and 2018)

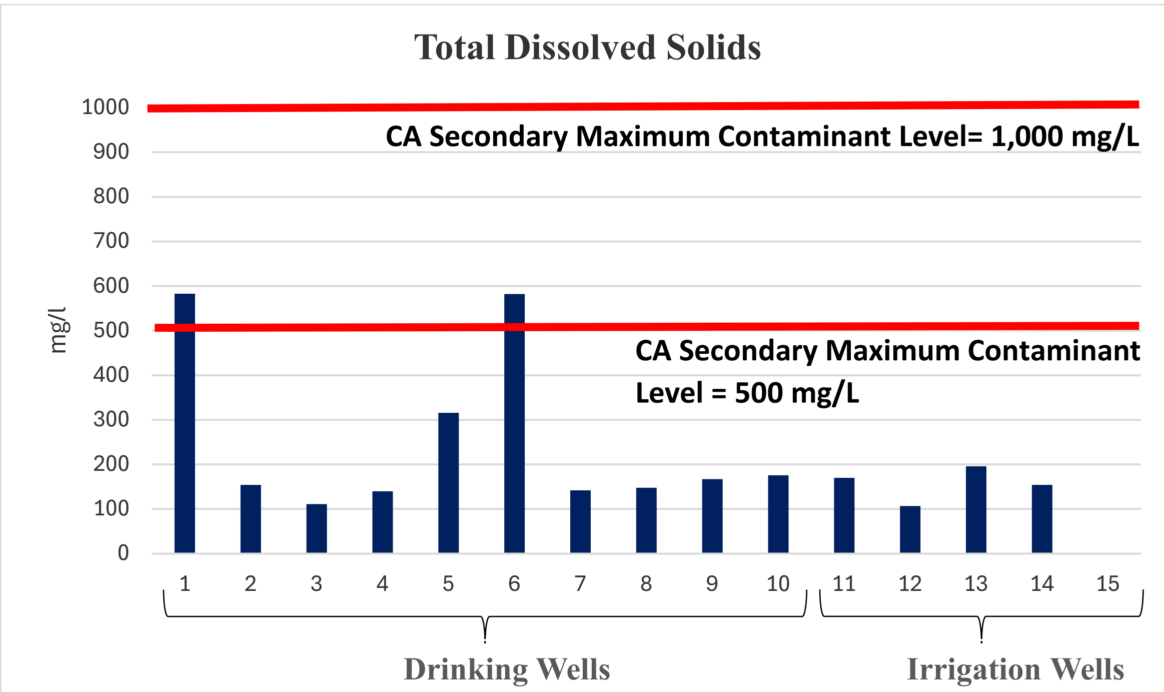


Table 4. Total Dissolved Solids results from 2025 Sierra Valley Groundwater Cross-Sectional Analysis of Private Wells**.**

Conclusion

The 2025 Sierra Valley Groundwater Cross-Sectional Analysis was conducted as an update to assess the groundwater in the Sierra Valley. Additionally, this project fills a knowledge gap of water quality in the Groundwater Ambient Monitoring and Assessment (GAMA) program, testing wells in areas of the Sierra Valley Groundwater District not represented in the online database. The results from the analysis of 4 constituents on 10 domestic wells and 5 irrigation wells found exceptional water quality. Granted there was one well reporting high levels of arsenic located in a region with known volcanic rocks, a localized concern. Overall results for Nitrate, Boron, Arsenic and Total Dissolved Solids tested in the Cross-Sectional Analysis provide evidence of the good quality water across the district. This analysis only looks at one point in time, but provides valuable insight to water quality when coupled with the 2021 cross sectional analysis results and municipal well data near the perimeter of the valley, providing valuable insights to the Sierra Valley Groundwater Management District Board and TAC on the update of the SVGSP.

Acknowledgments

Thank you to the domestic well owners and agricultural producers who allowed us access to monitor their wells. Also, to Sierra Valley Groundwater Management District Board Members who assisted with collecting samples. This project was funded by the Sierra Valley Groundwater Management District,

Contact

For questions or additional information on the study please contact principle investigator Tracy Schohr, Livestock and Natural Resources Advisors in Plumas, Sierra and Butte Counties, University of California Cooperative Extension at (916) 716-2643 or tkschohr@ucanr.edu.

Citation

Schohr, T. (2025). Sierra Valley Groundwater Cross-Sectional Analysis 2.0. University of California Cooperative Extension.

Appendix 1 - Results from 2025 Sierra Valley Groundwater Cross-Sectional Analysis

Well ID	Description	Nitrate+Nitrite as N mg/l	Arsenic ug/l	Boron ug/l	Total Dissolved Solids mg/l
1	Drinking Well	4.16	0.81	220	583
2	Drinking Well	0.0879	0.78	10.9	154
3	Drinking Well	0.296	3.8	27.3	111
4	Drinking Well	0.389	264	518	140
5	Drinking Well	ND	4.42	1020	316
6	Drinking Well	0.097	2.13	51.3	582
7	Drinking Well	0.0495	4.3	106	142
8	Drinking Well	0.048	2.46	15.4	148
9	Drinking Well	0.39	2	10.8	167
10	Drinking Well	4.68	0.54	8.2	176
11	Irrigation Well	1.78	0.6	10.2	170
12	Irrigation Well	0.048	0.41	12.5	107
13	Irrigation Well	0.0767	4.31	50.3	196
14	Irrigation Well	0.268	2.3	37.3	154
15	Irrigation Well	0.262	1.83	33.4	155

ND=Not Detected at or above the detection limit

Appendix 2 - Results from 2021 Sierra Valley Groundwater Cross-Sectional Analysis

Well ID	Description	Nitrate+Nitrite as N mg/l	Boron ug/l	Arsenic ug/l	Total Dissolved Solids mg/l
1	Drinking Well	1.68	501	ND	552
2	Drinking Well	ND	ND	ND	167
3	Drinking Well	ND	ND	3.44	115
4	Drinking Well	ND	662	327	150
5	Drinking Well	ND	1020	4.84	305
6	Drinking Well	ND	ND	3.24	606
7	Drinking Well	ND	170	ND	145
8	Drinking Well	ND	ND	3.64	140
9	Drinking Well	ND	ND	ND	171
10	Drinking Well	2.52	ND	ND	156
11	Irrigation Well	2.54	13	0.83	165
12	Irrigation Well	ND	353	3.44	ND
13	Irrigation Well	ND	58.1	3.95	ND
14	Irrigation Well	0.25	37.4	2.26	153
15	Irrigation Well	0.28	38.3	1.97	144

ND=Not Detected at or above the detection limit

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