

MAY ADVISORY COMMITTEE MEETINGS

Shasta Valley Groundwater Advisory Committee Meeting



LARRY WALKER
ASSOCIATES
science | policy | solutions



Agenda

- Implementation Project Updates
 - Model updates
 - Groundwater quality sampling and RMPs
 - Data collection and sensor installation
 - Recharge project update
 - Upland Management
- Exploration and discussion on recharge opportunities
- Irrigation workshop recap

Timeline – Implementation Projects

2023 Q3

- Formation of work groups in August AC Meetings
- Work groups approve draft project scope and schedule
- Final grant awards expected in September

2023 Q4

- October AC Meetings- review of final funding awards
- Detailed scope and schedule for funded projects provided to Advisory Committee

2024 Q1

- February AC Meetings- updates from project work groups, updates depend on individual project schedules
- SGMA Compliance- Annual Report for WY 2023

2024 Q2

- May AC Meetings- Update on implementation projects, discussion on upland management project selection

Timeline through Fall 2024

2024 Q3

- Summer sample collection
- Select upland management project and preliminary monitoring design plan
- Continue development of well inventory and approach to the fee study
- August AC Meetings

2024 Q4

- Preliminary Database Management System (DMS)
- Model scenario results with different management actions
- October AC Meetings
- Continued data collection

Jan 1 Feb 1 Mar 1 Apr 1 May 1 Jun 1 Jul 1 Aug 1 Sept 1 Oct 1 Nov 1 Dec 1 Dec 31



 In Progress	 Added to Backlog
 Complete	 Blocked

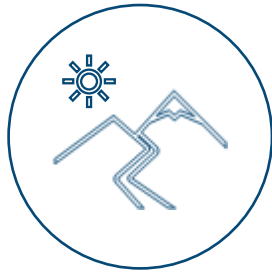
Implementation Grant Progress *Through May 2024*

#	Component	Notes	Status
1	SGMA Compliance and GSP Updates		
1.1	GSP 5-year Evaluation	Due January 2027	In Progress
1.2	Reporting (Data and Annual Report)	Annual Reports due April 1 of each year (Submitted AR 2023)	In Progress
1.3	Model Updates and Scenario Evaluation		In Progress
1.4	Data Gaps and Monitoring Expansion and DMS		In Progress
2	Fee Study and Economic Analysis		
2.1	Evaluation of Fee/Rate Options and Schedule Development		Not Started
2.2	Parcel scale groundwater use estimate		In Progress
2.3	Economic Analysis		Not Started
3	Well Inventory		
3.1	Database Development and Well Risk Assessment		In Progress
3.2	Monitoring Well Construction or Well Instrumentation		Not Started
4	Groundwater-Surface Water Connectivity Study		
4.1	Monitoring and data analysis	Identify new wells, install stream gauges, pumping tests	In Progress
5	Upland Management		
5.1	Project Planning and Environmental Documentation	Develop workplan	Not Started
5.2	Monitoring Design, Data Collection, and Data Analysis	Assess monitoring needs,	Not Started

Implementation Project Update

- Model updates
- Groundwater quality sampling and addition of RMPs
- Data collection and sensor installation
- Recharge project update
- Upland Management

Model Update



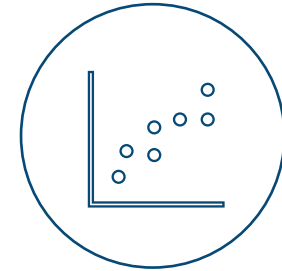
Updated geology

Incorporated new layer elevations and parameter zones



Updated hydraulic parameters

Assigned preliminary set of hydraulic parameters based on literature values



Ground-truthed new parameters

Compared groundwater levels timeseries between zones and estimated parameters from wells specific capacities

Jan 1 Feb 1 Mar 1 Apr 1 May 1 Jun 1 Jul 1 Aug 1 Sept 1 Oct 1 Nov 1 Dec 1 Dec 31



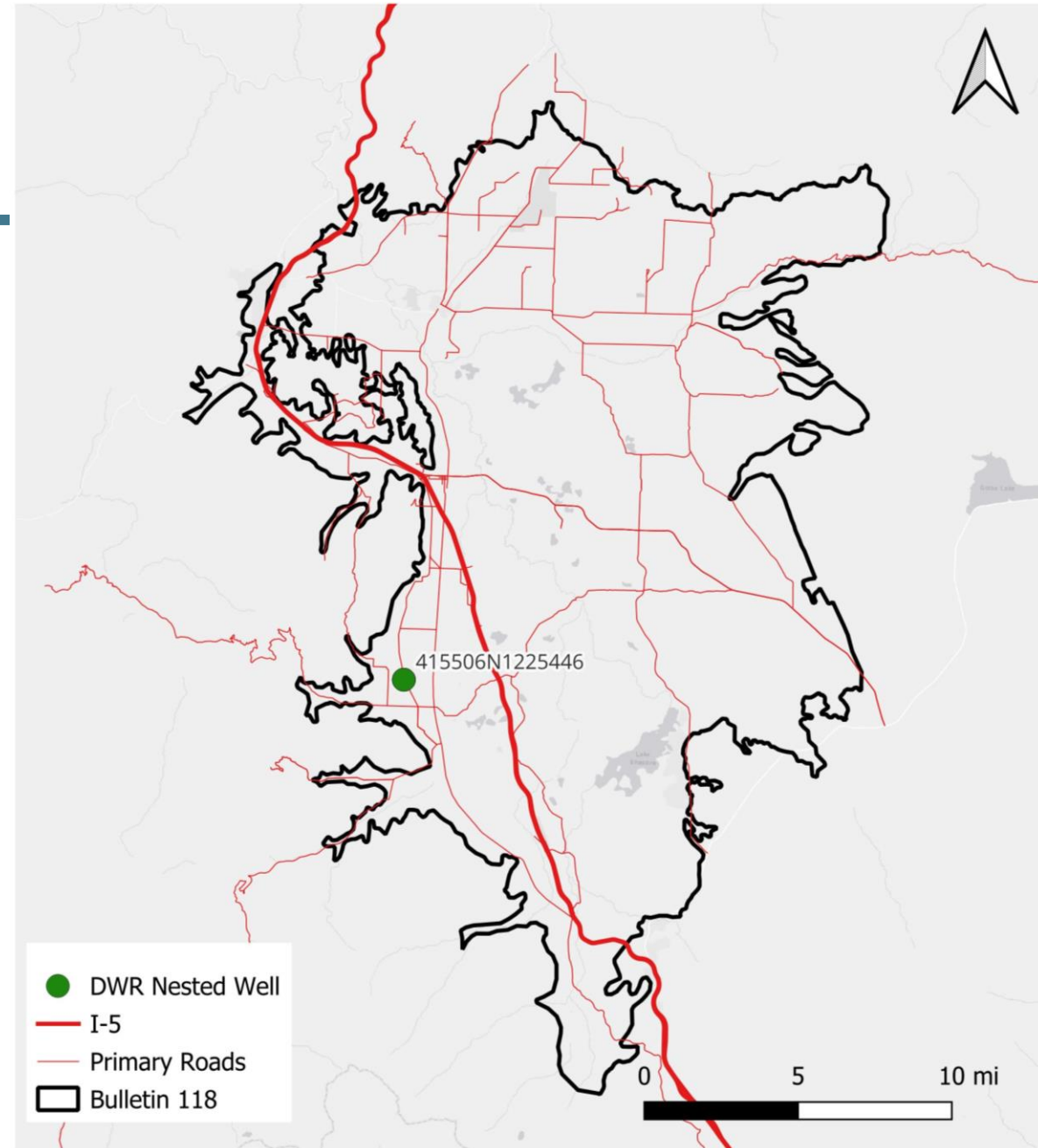
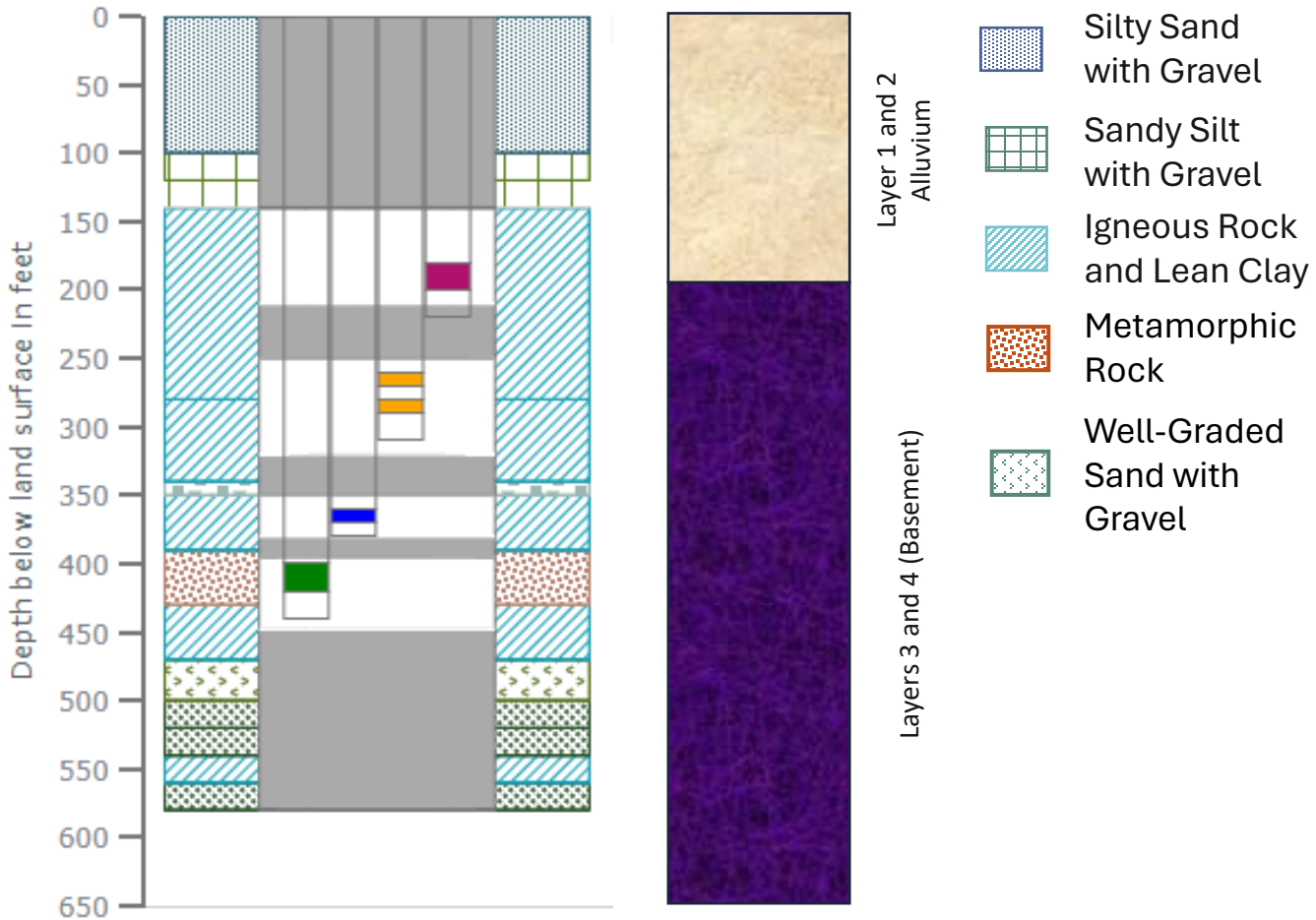
	<i>In Progress</i>		<i>Added to Backlog</i>
	<i>Complete</i>		<i>Blocked</i>

Model Progress and Priorities

Through May 2024

#	Activity	Description	Status
1	New geology	Update layer elevations and parameter zones based on new geologic model	Complete
2	Update hydraulic parameters	Incorporated a new set of parameters based on literature	Complete
3	Update pumping	Update groundwater pumping using soil water budget model SWAT	In Progress
4	Calibrate recharge and streamflow	Calibrate PRMS model	In Progress
5	Update irrigation ditches	Implement SFR package to represent unlined ditches and DRN package to represent lined ditches	Not Started
6	Update diversions	Update surface water diversions using new streamflow data	Not Started
7	Local sensitivity analysis	Identify key parameters by doing a sensitivity analysis using UCODE	Not Started
8	Implement CFP package in Big Springs	Represent Pluto Cave Basalt caves in Big Springs using the conduit flow package	Not Started
9	Global sensitivity analysis	Perform a global sensitivity analysis on key parameters using SALib	Not Started
10	Calibration	Parameter estimation using UCODE	Not Started

DWR Nested Well



DWR Nested Well, 2024

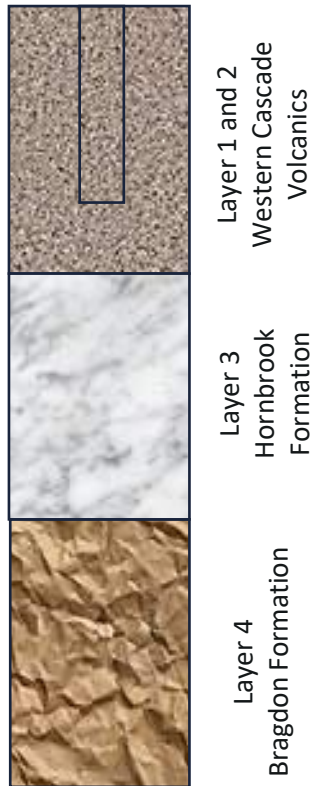
~10 ft of variation in water levels: Groundwater flows upwards from basement towards alluvium

DWR nested well site 415506N1225446

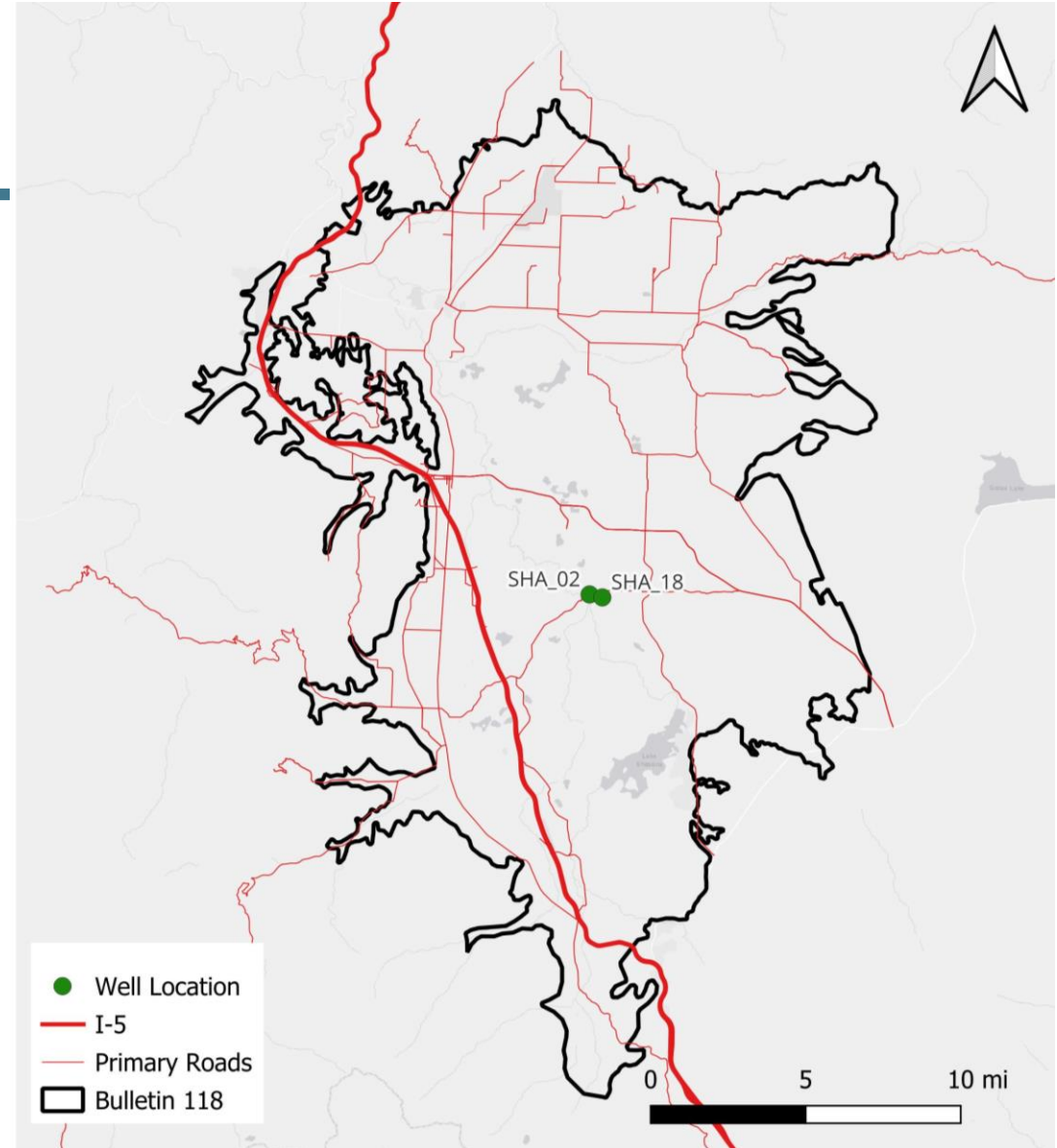


Wells SHA_02 and SHA_18 (Big Springs)

SHA_02



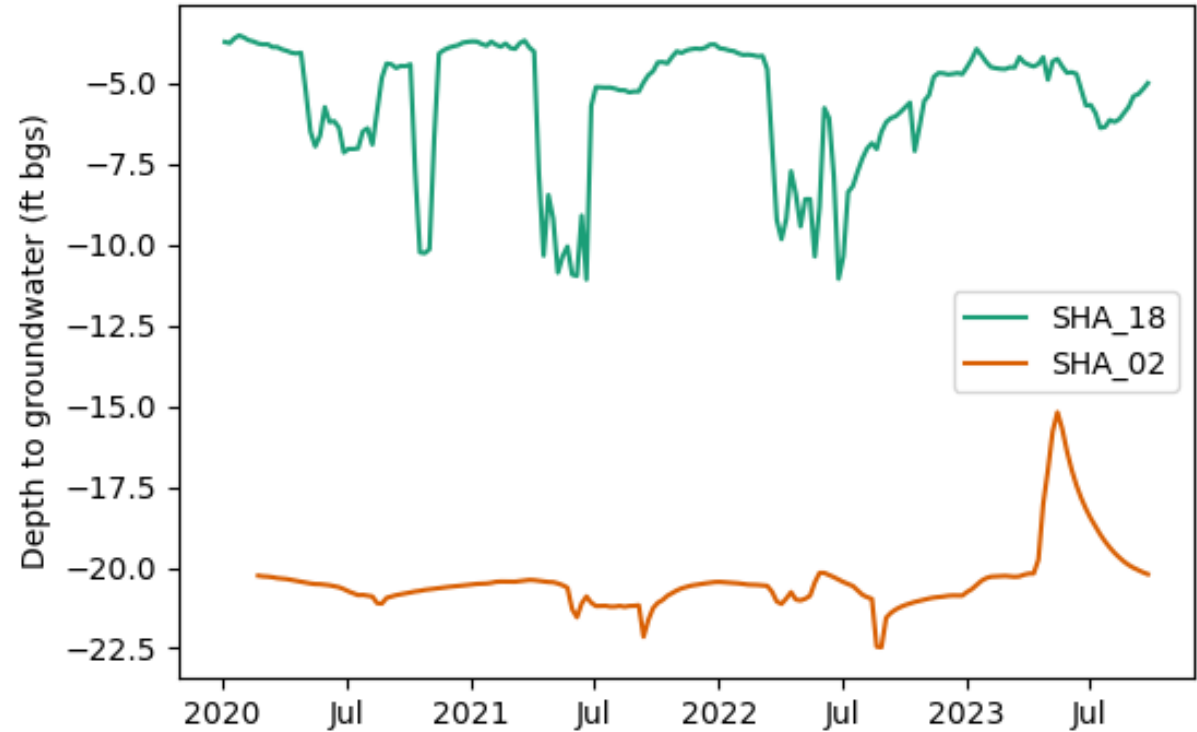
SHA_18



* Well depths estimated from groundwater elevation data

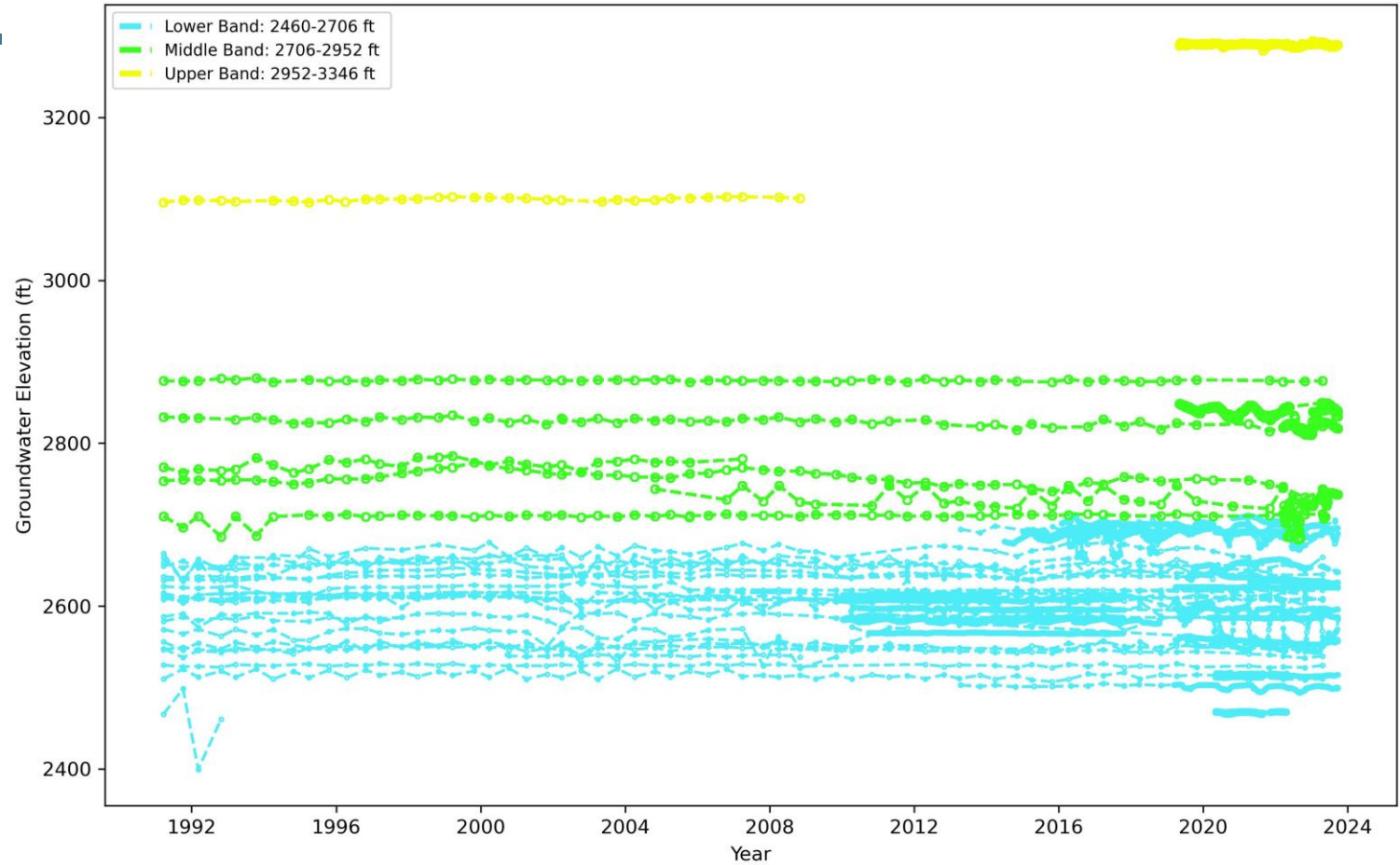
Wells SHA_02 and SHA_18 (Big Springs)

- SHA_18 is screened in Qb-Pluto Cave Basalt Flow
- SHA_02 is screened in Tv-Western Cascade Volcanics
- Pluto Cave Basalt presents a higher head and large seasonal variations
- Western Cascade Volcanics exhibit lower heads and more dampened dynamics



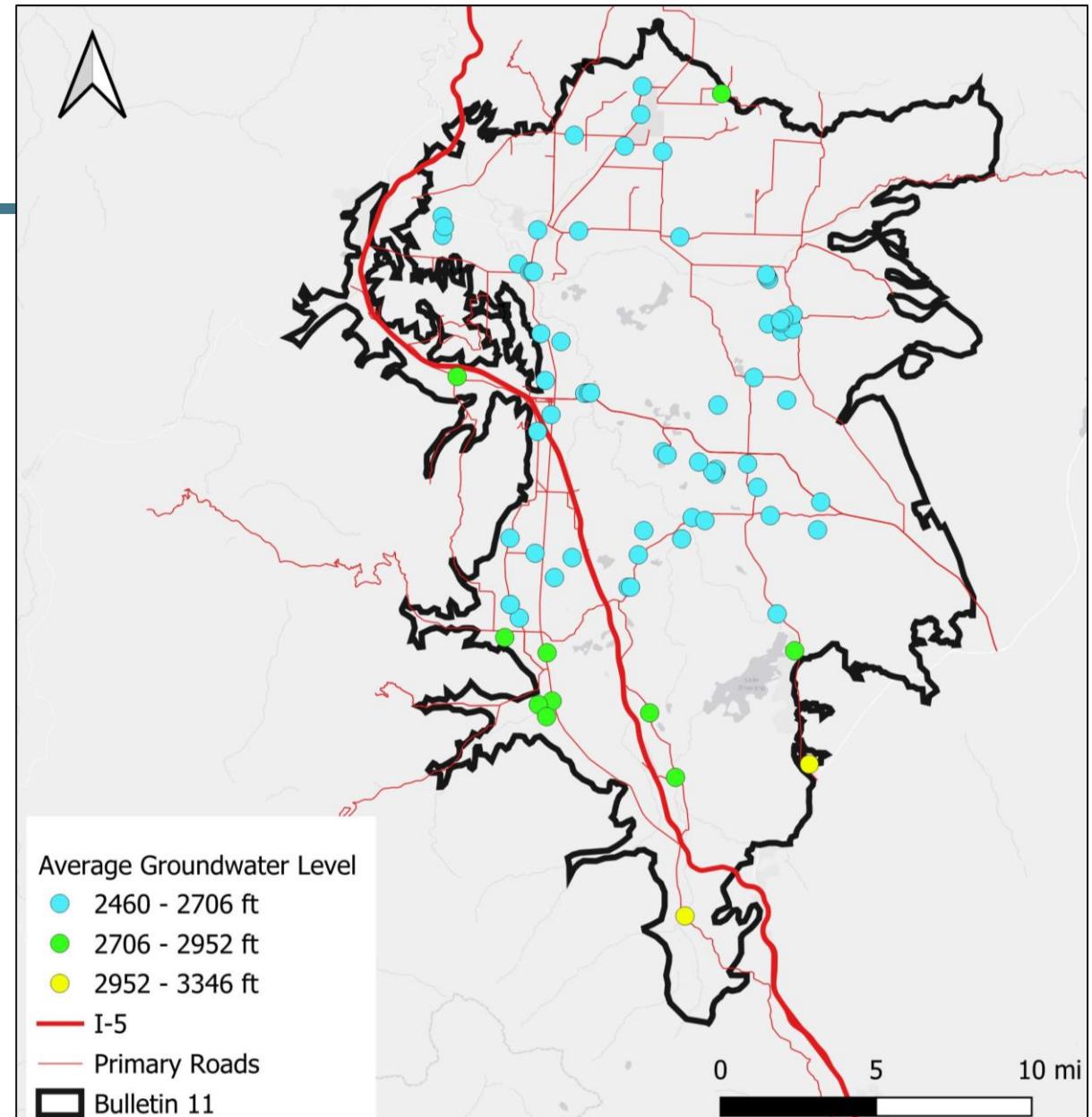
Groundwater Elevations

- Wide range of elevations:
 - 2,400 ft to 3,300 ft
- Grouped into three bands:
 - Lower
 - Middle
 - Upper



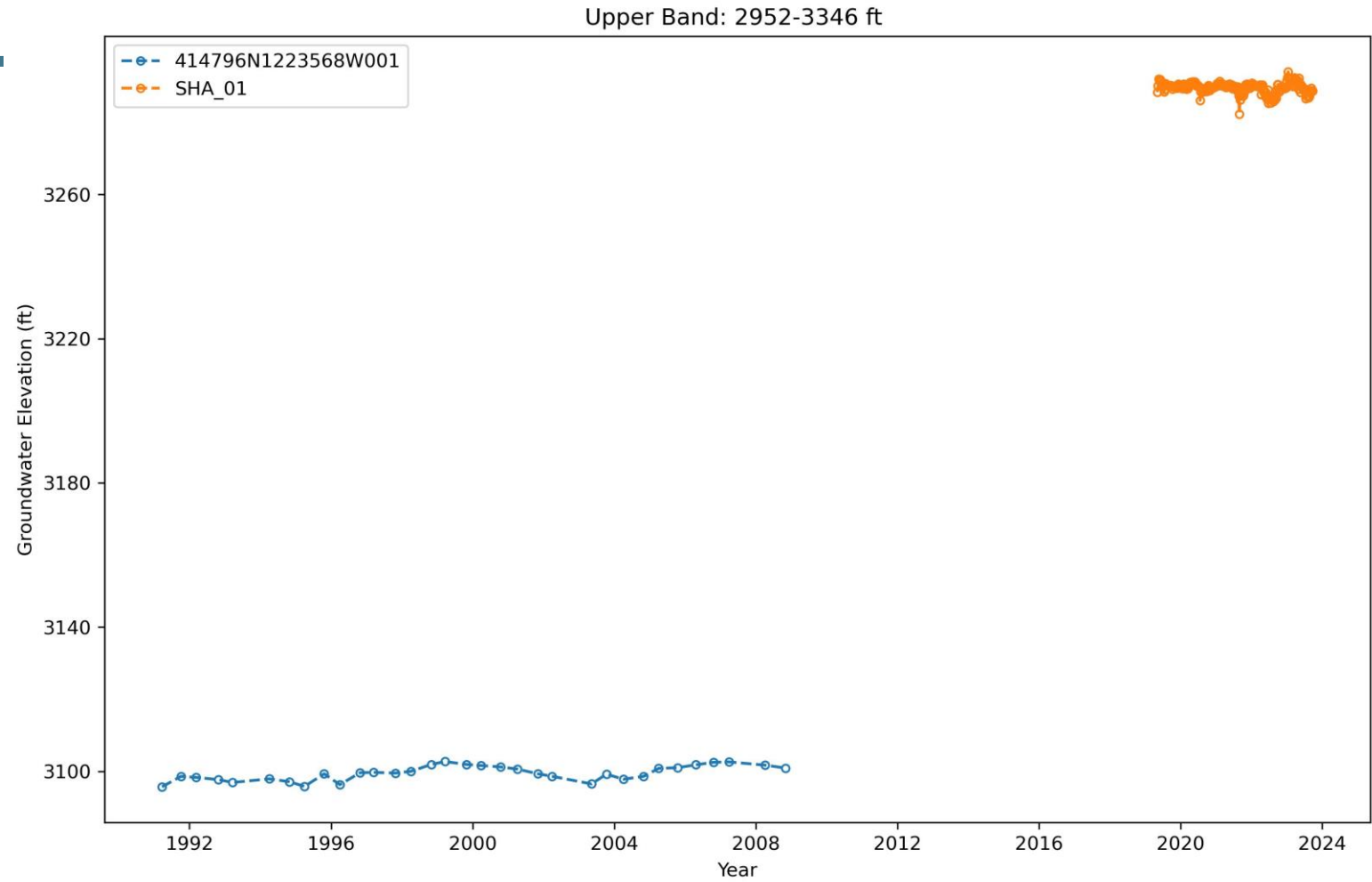
Elevation Bands Distribution

- Upper band:
 - Southwest boundary of basin
- Middle band:
 - Southern section of basin
 - East of Grenada
 - Northwest of airport
 - East of Lake Shastina
- Lower band
 - Inner basin
- Transition zones:
 - Northwest of Gazelle
 - Lake Shastina



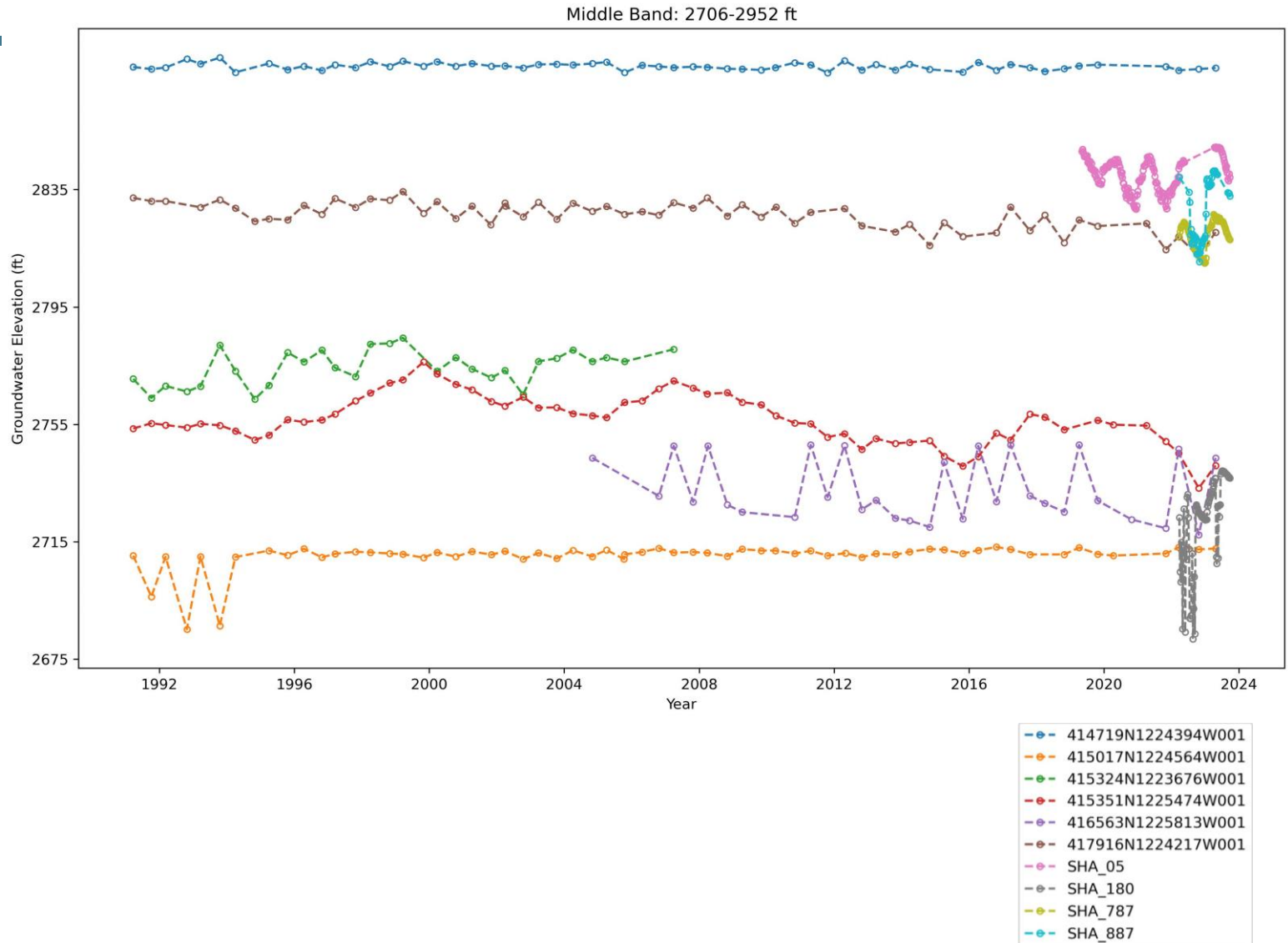
Upper Band

- SHA_01:
 - Southern basin
 - Qvs- Volcanic rocks of Shasta Valley
- 414796N1223568W001
 - SW of Lake Shastina
 - Interface between Qv- Pleistocene Volcanic rocks and Tv- Western Cascade Volcanics



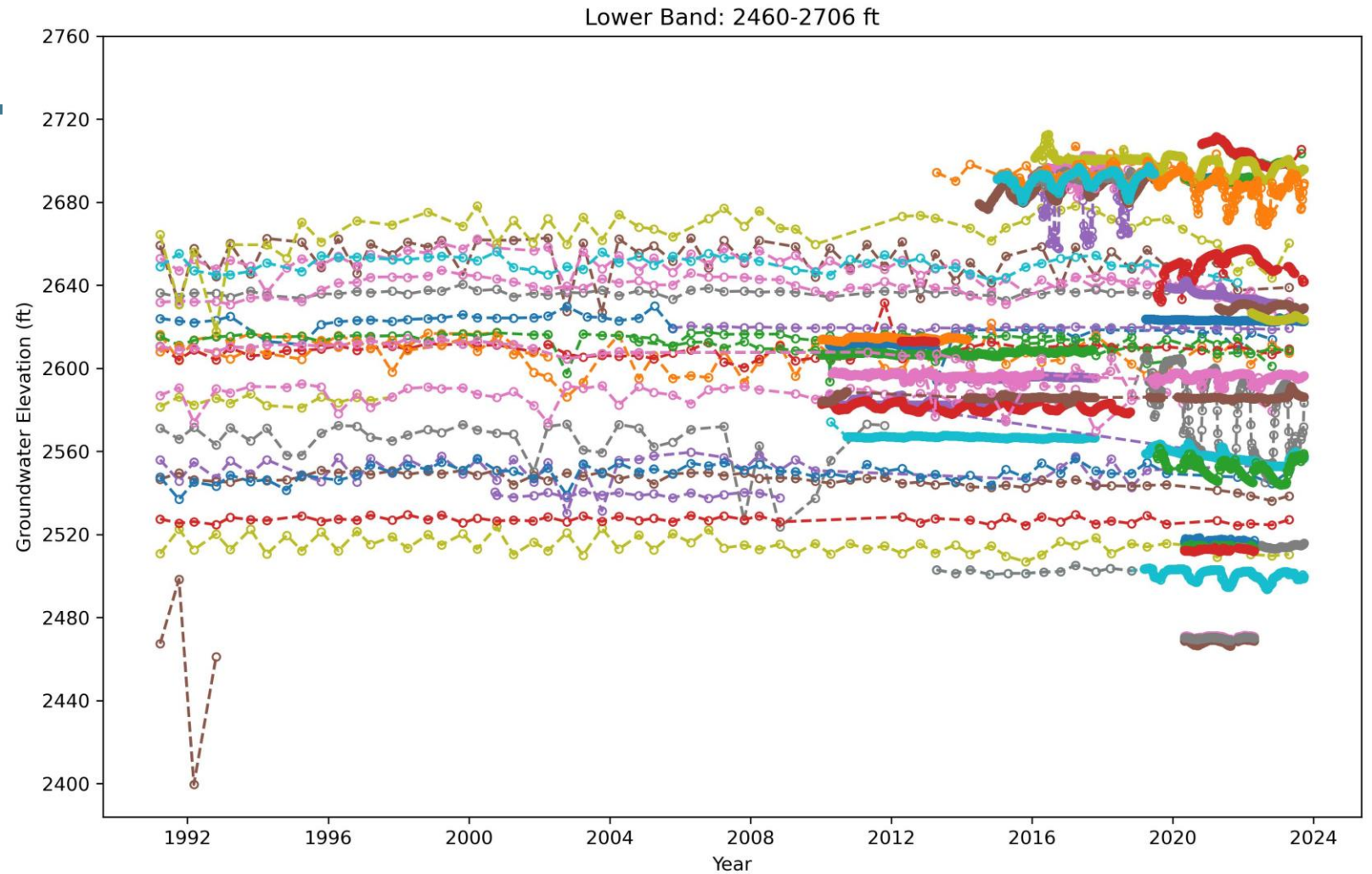
Middle Band

- Q- Alluvium
 - Ranging from moderate variability in Gazelle (415351N1225474W001) to high variability west of Grenada (416563N1225813W001)
- Qvs- Volcanic rocks of Shasta Valley
 - High variability north of Gazelle (SHA_180) and low variability in southern basin (414719N1224394W001 and 415017N1224564W001)
- Tv- Western Cascade Volcanics
 - Low variability to the northeast of the Siskiyou County airport (417916N1224217W001)
- Qg- Glacial deposits
 - Moderate variability east of Lake Shastina (415324N1223676W001)



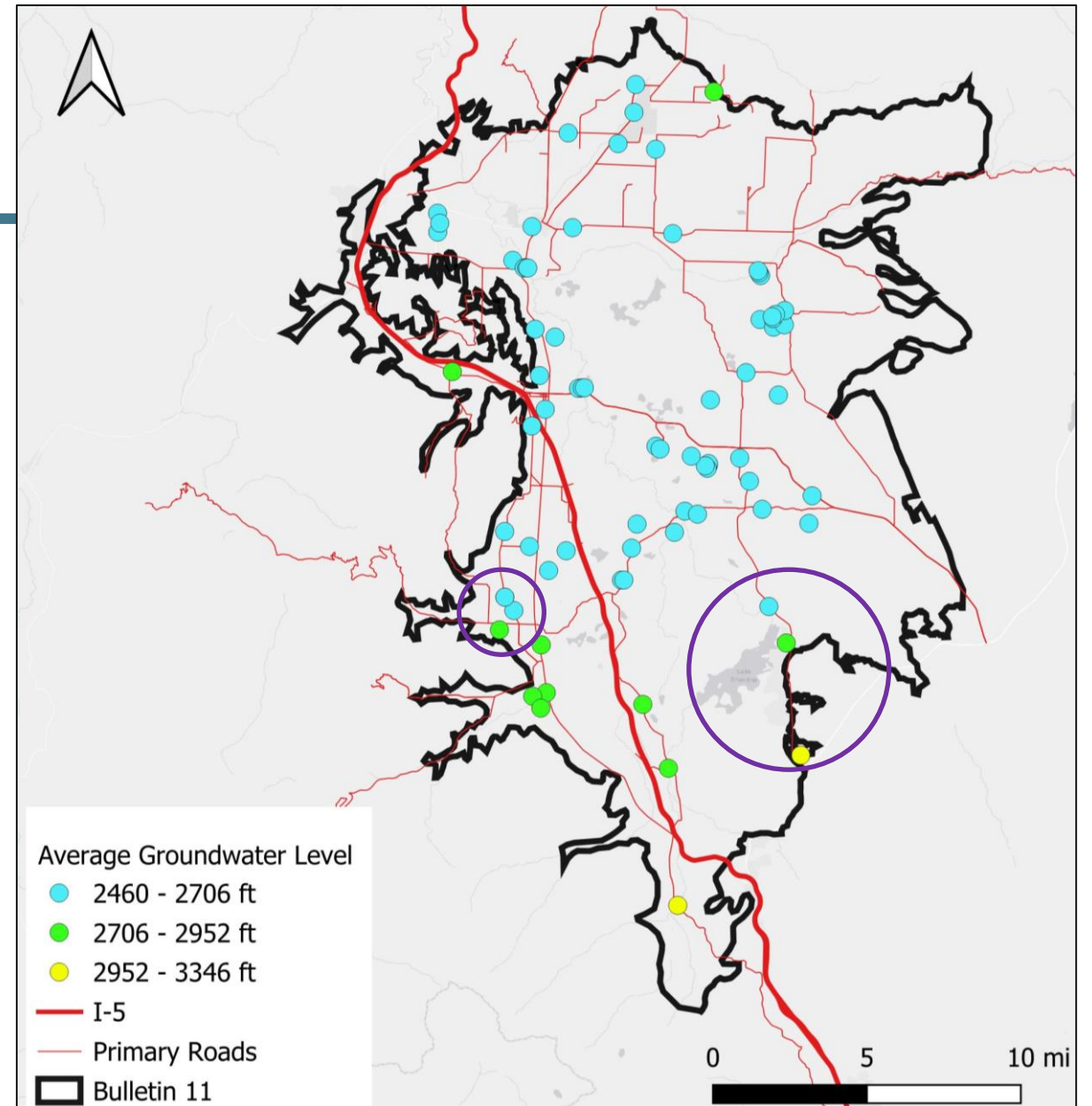
Lower Band

- Heterogeneity and variability and trends
- Multiple geologic units:
 - Kh- Hornbrook Formation
 - Q- alluvium
 - Qg- Glacial deposits
 - Qvs- Volcanic rocks of Shasta Valley
 - Tv- Western Cascade Volcanics
 - Qb- Pluto Cave Basalt Flow
 - Basement



Transition Zones

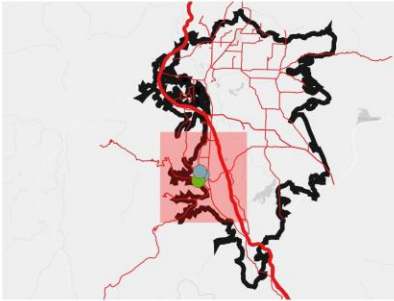
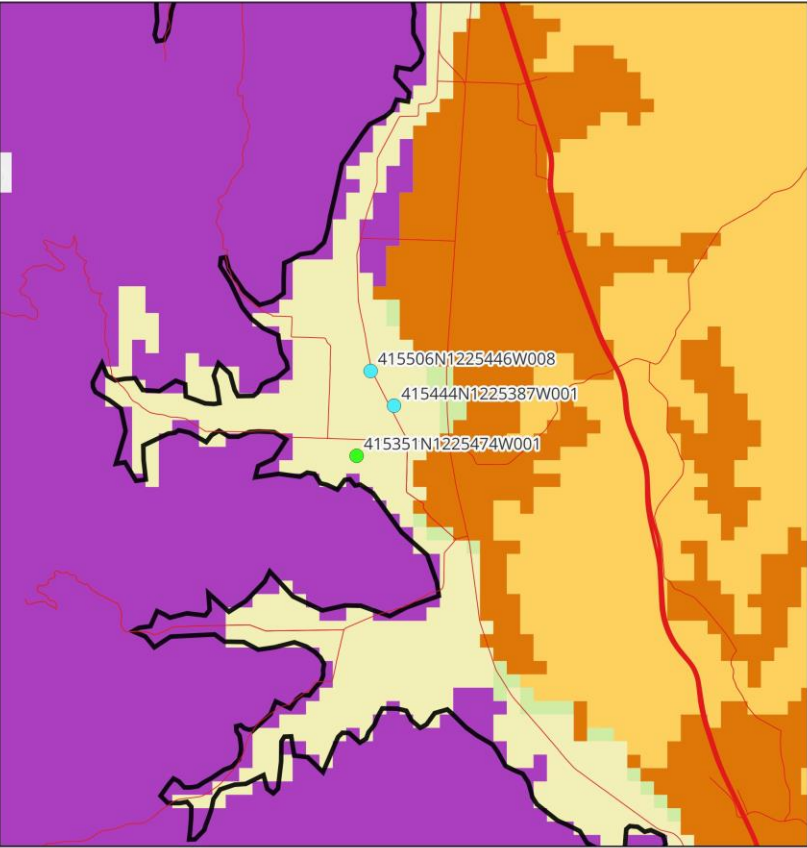
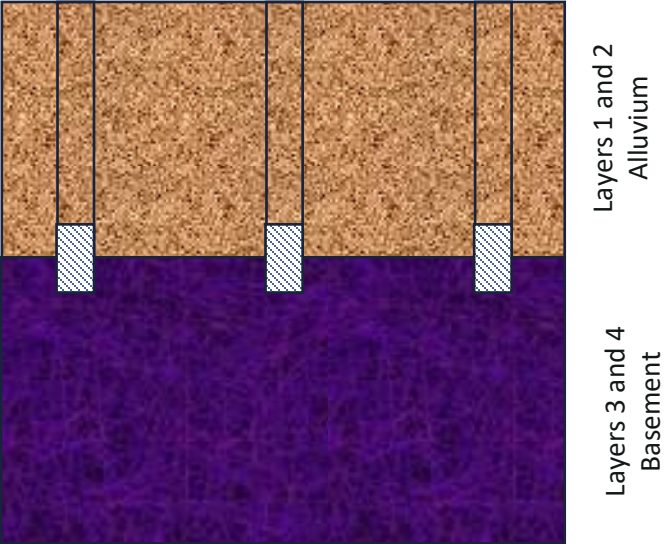
- Northwest of Gazelle
- Lake Shastina



Northwest of Gazelle

- All wells screened in the same geologic units
 - Q – Alluvium
 - Basement

415506N1225446W008 415444N1225387W001 415351N1225474W001



Layer I Geology

- Kh- Hornbrook Formation (2)
- Q- Alluvium (12)
- Qvs- Volcanic rocks of Shasta Valley (16)
- Tv- Western Cascade Volcanics (20)
- Basement (group) (31)

Average Groundwater Level

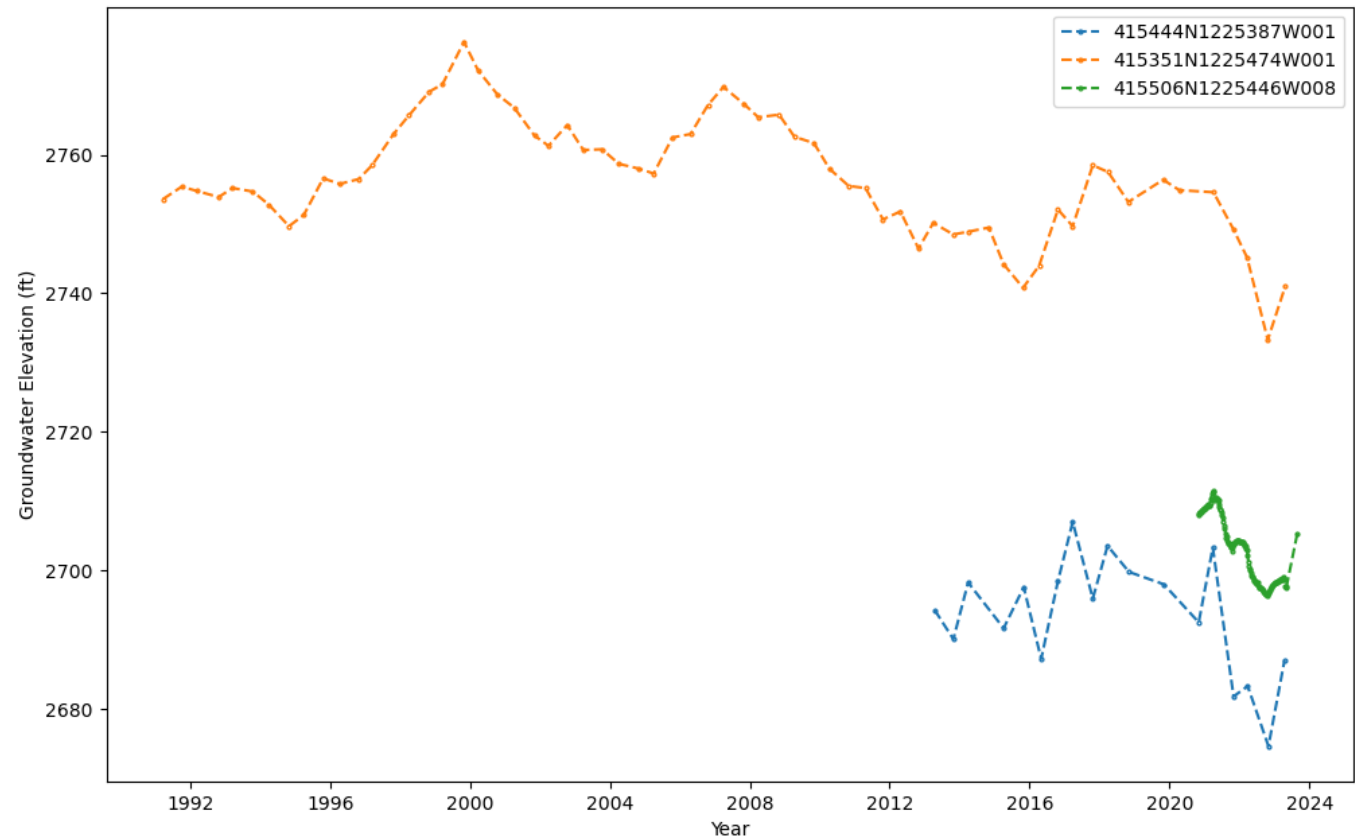
- 2460 - 2706 ft
- 2706 - 2952 ft

0 5,000 10,000 ft



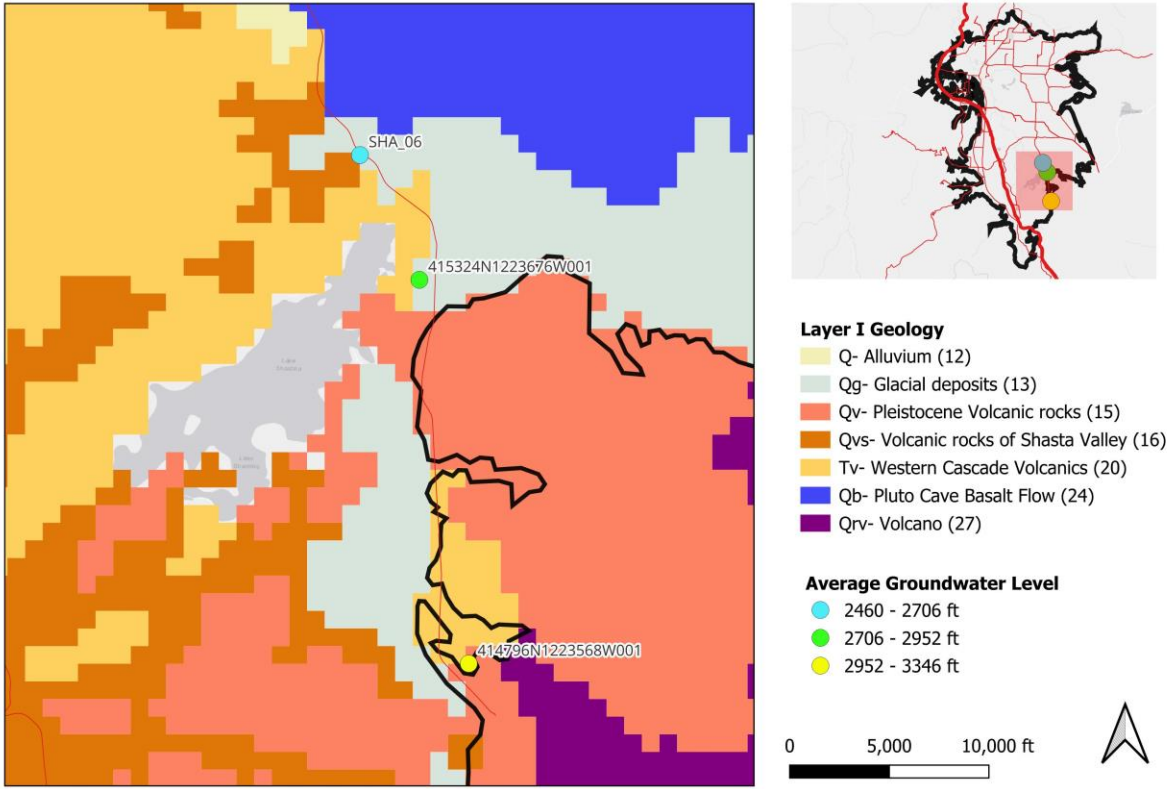
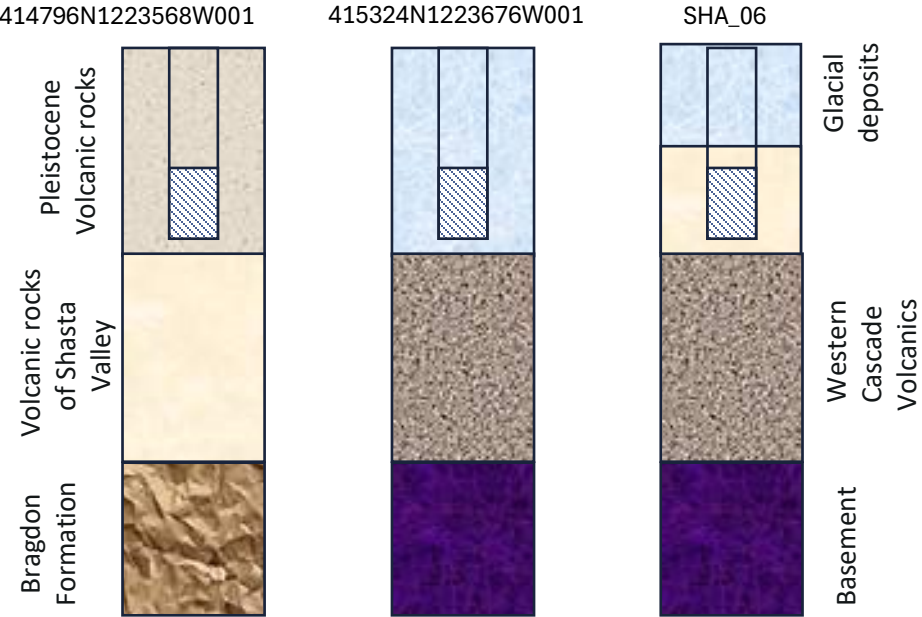
Northwest of Gazelle

- Flow direction to the east
- Wells exhibit similar dynamics



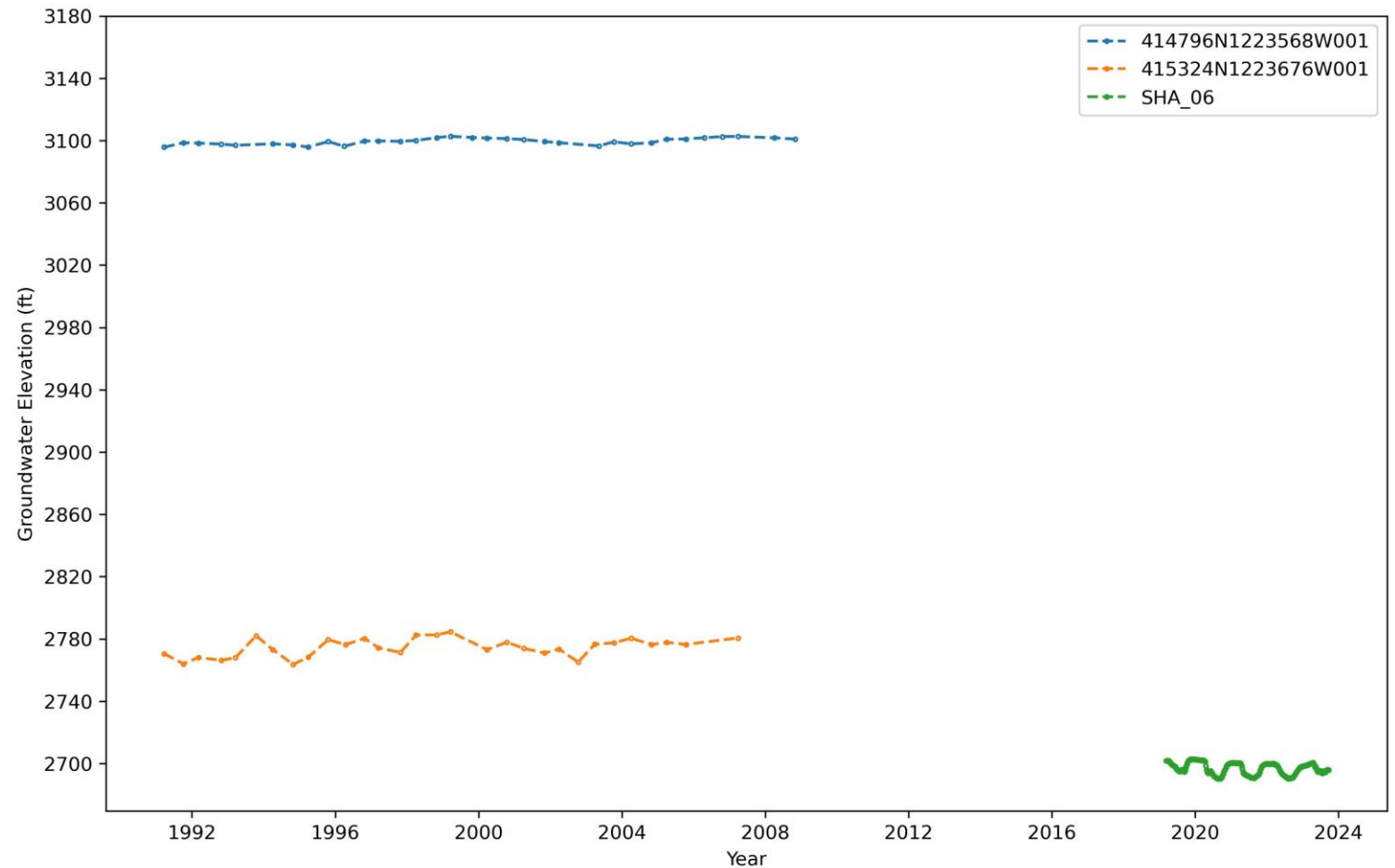
Lake Shastina

- Sha_06 and 415324N1223676W001:
 - Interface Qvs-Volcanic rocks of Shasta Valley and Qg-Glacial deposits
- 414796N1223568W001:
 - Interface Qv- Pleistocene Volcanic rocks and Tv- Western Cascade Volcanics



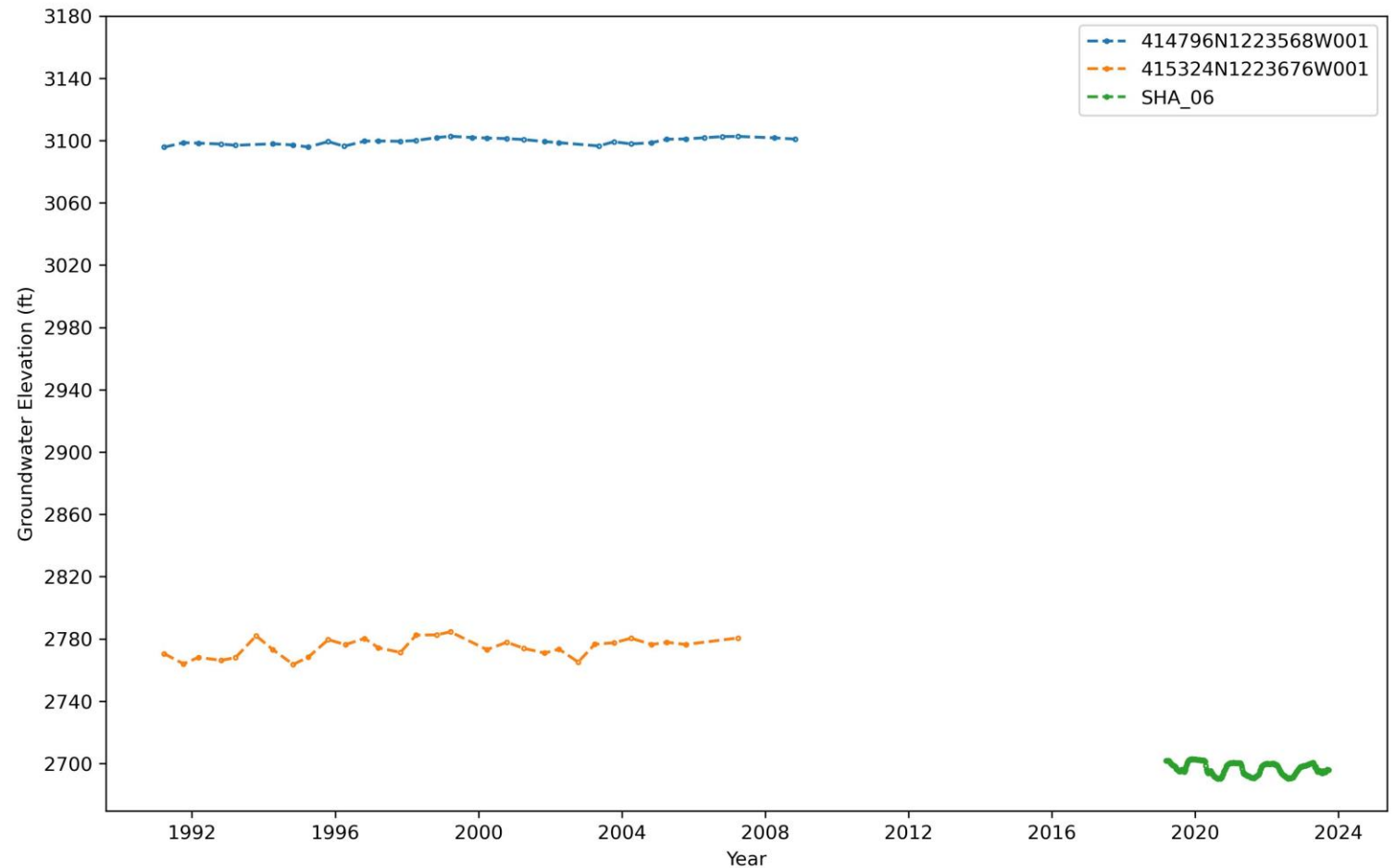
Lake Shastina

- Groundwater elevations in Pleistocene volcanic rocks higher than in glacial deposits
- Flow direction to the north



Lake Shastina

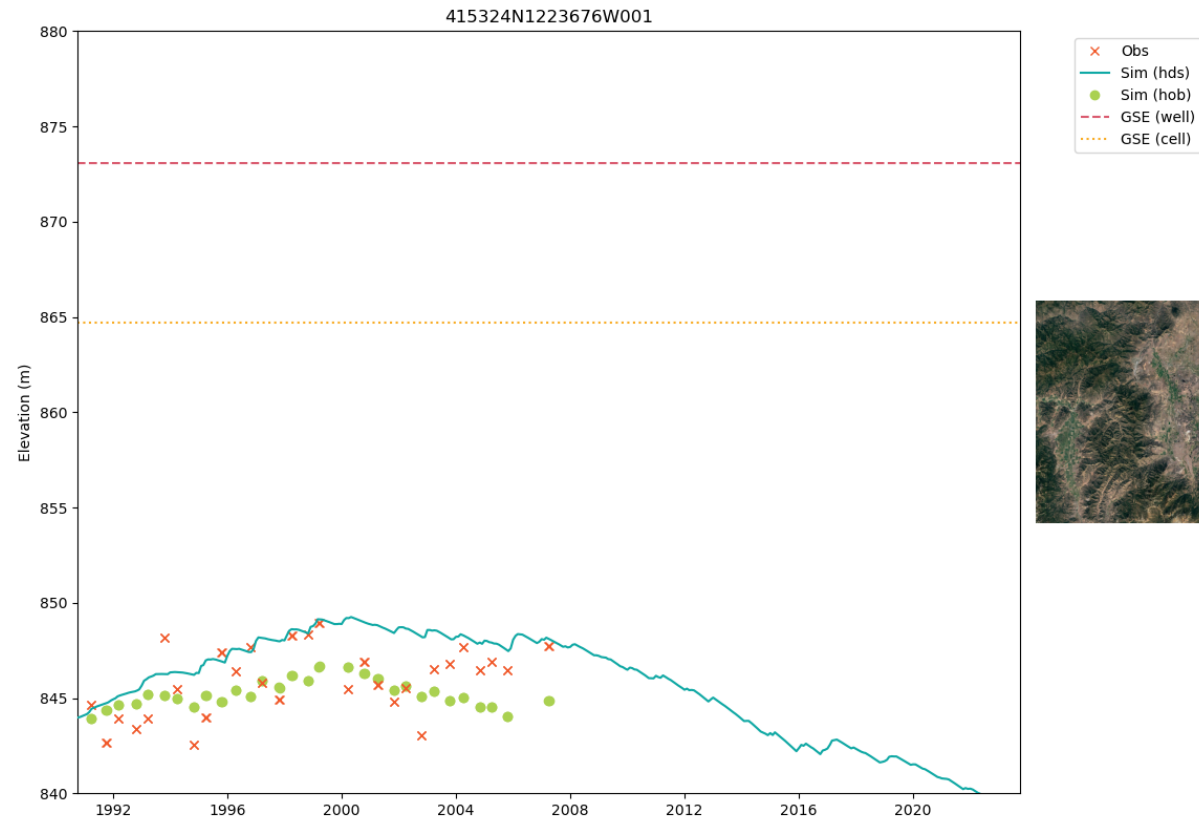
- Groundwater elevations in Pleistocene volcanic rocks higher than in glacial deposits
- Flow direction to the north



Model Results

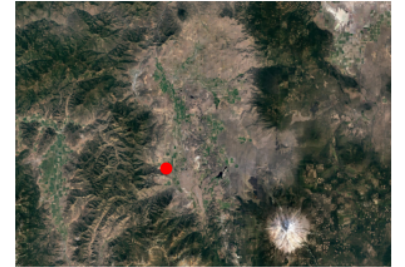
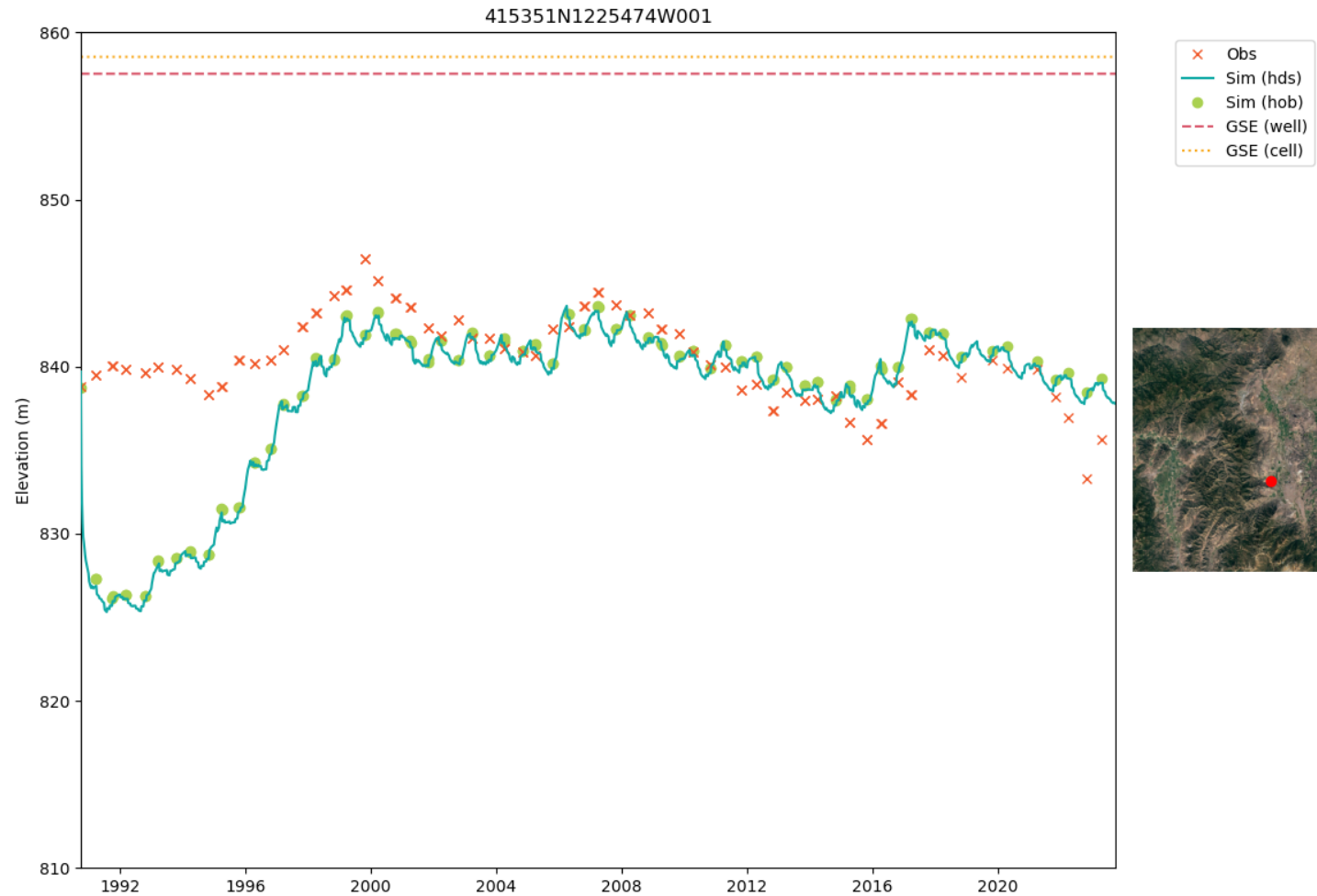
415324N1223676W001

- East of Lake Shastina
- Screened in layer 2
- Glacial deposits



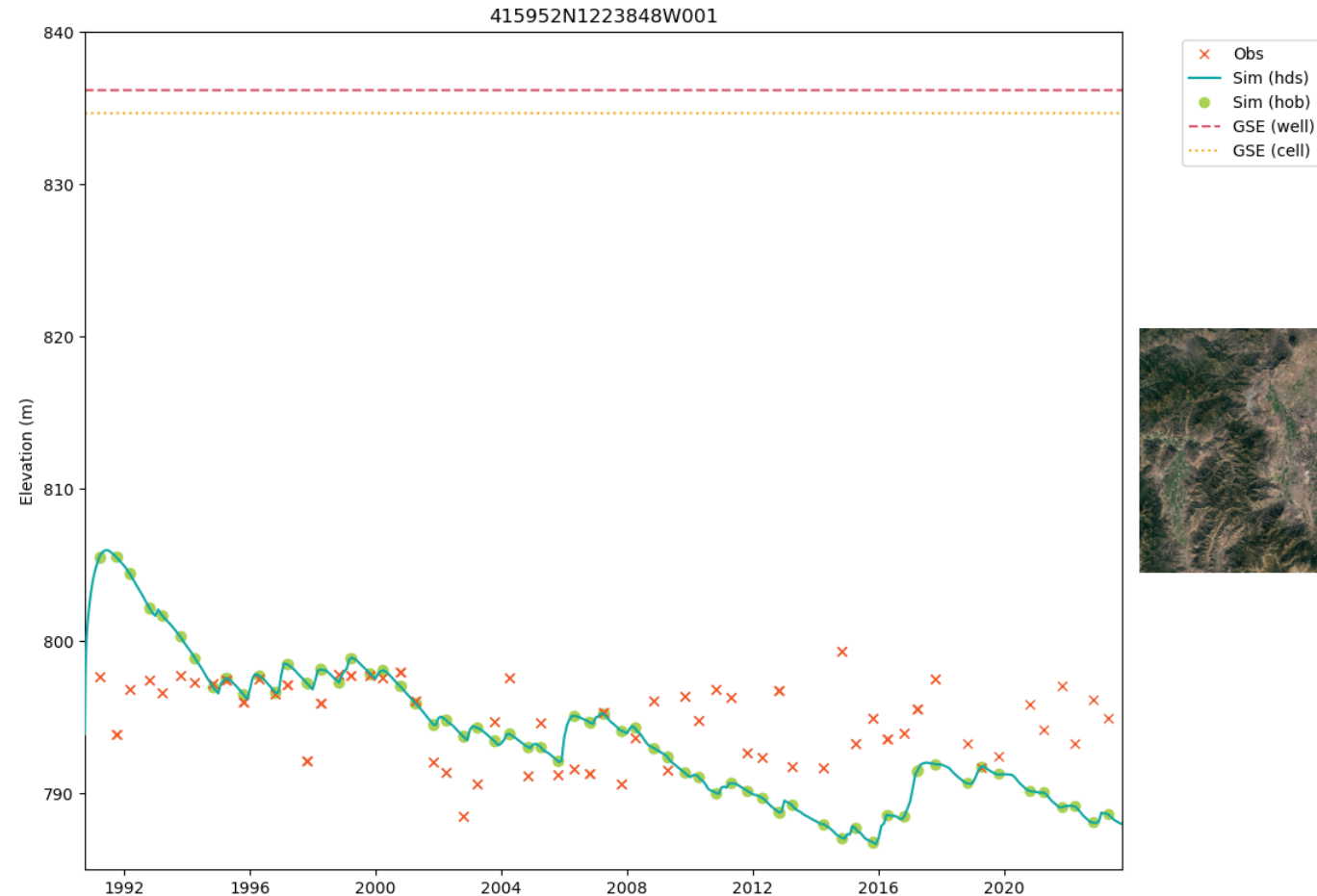
415351N1225474W001

- Northwest of Gazelle
- Screened in
 - Layer 2 (Alluvium)
 - Layer 3 (Basement)



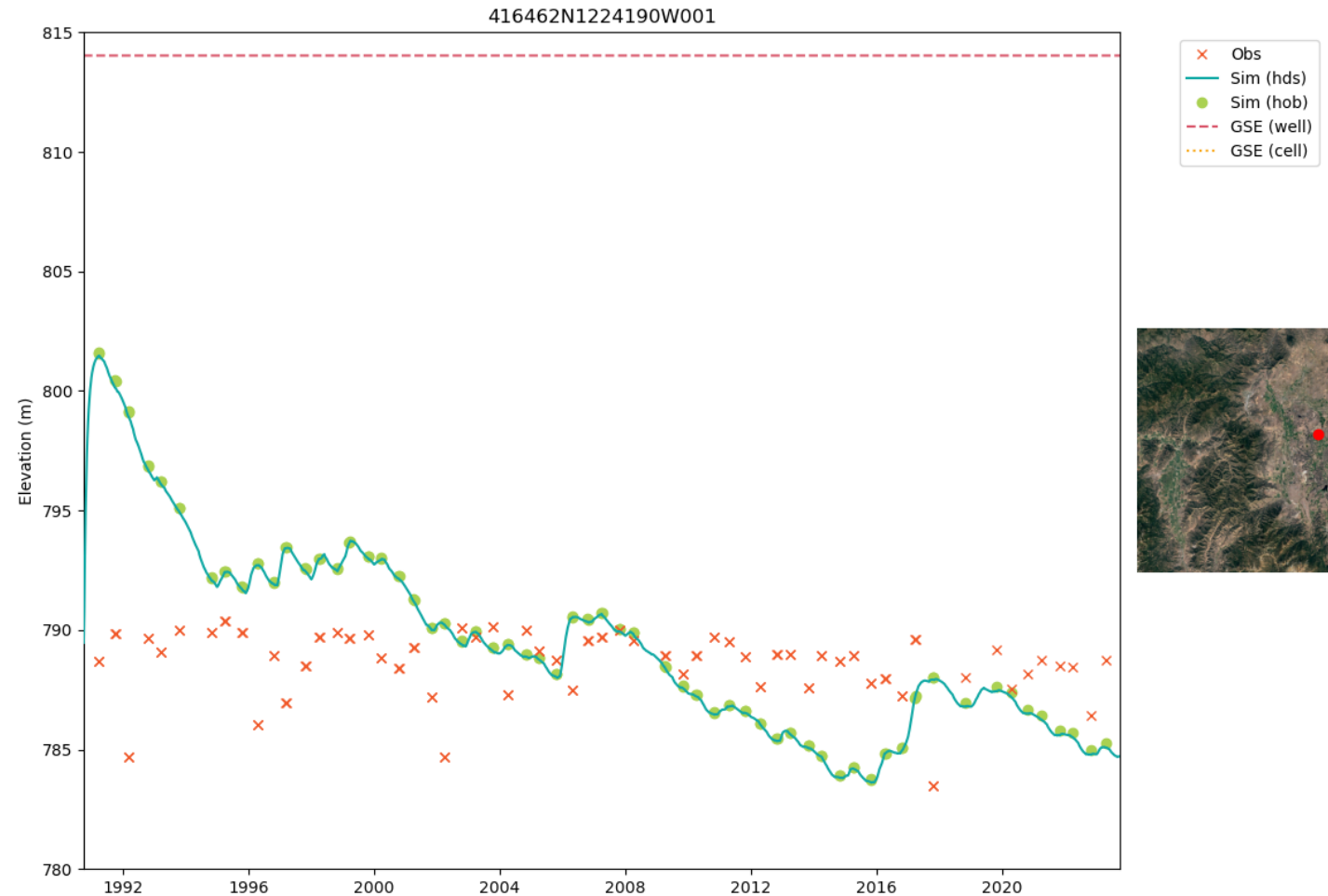
415952N1223848W001

- Northwest of Gazelle
- Screened in layer 2 Qb-Pluto Cave Basalt Flow
- East of Big Springs



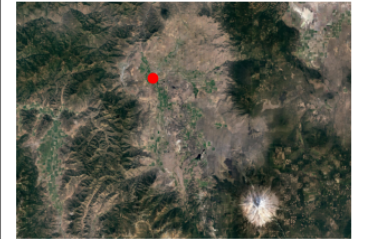
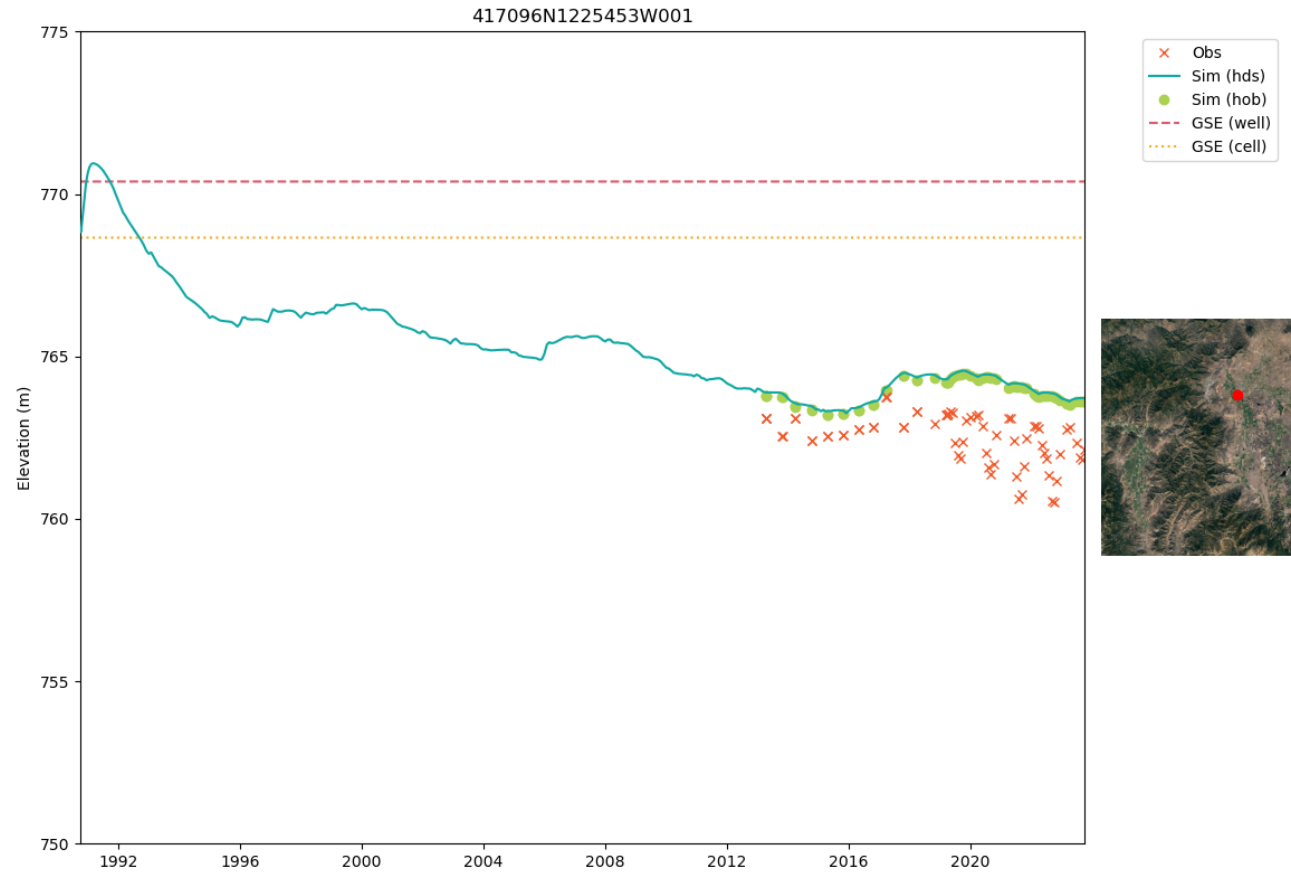
416462N1224190W001

- North of Big Springs
- Screened in layer 1 Qb-Pluto Cave Basalt Flow
- East of Big Springs



417096N1225453W001

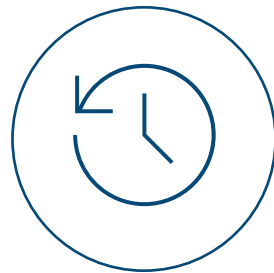
- South of Montague
- Screened in layer 2 Kh-Hornbrook Formation



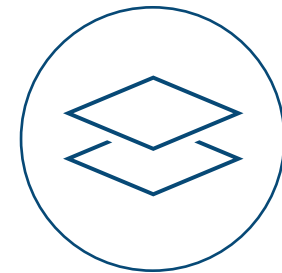
Next Steps



Reviewing
geologic units
where
hydrographs are
incorrect



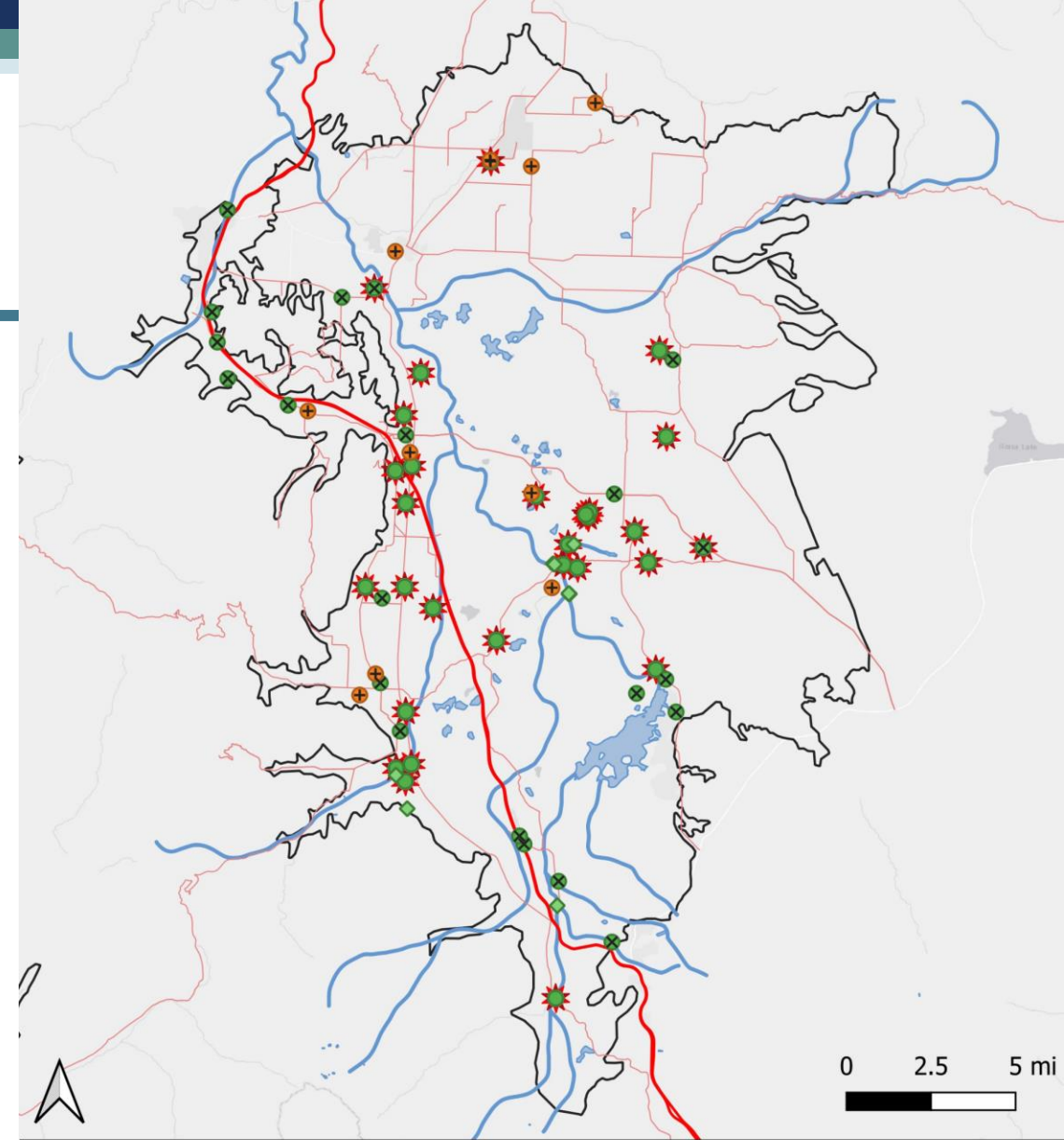
Refine initial
conditions



Incorporate new
continuous data
near the Shasta
River

Current Monitoring

- Active monitoring sites
- Western Weather data are now available and will be evaluated for rainfall distribution

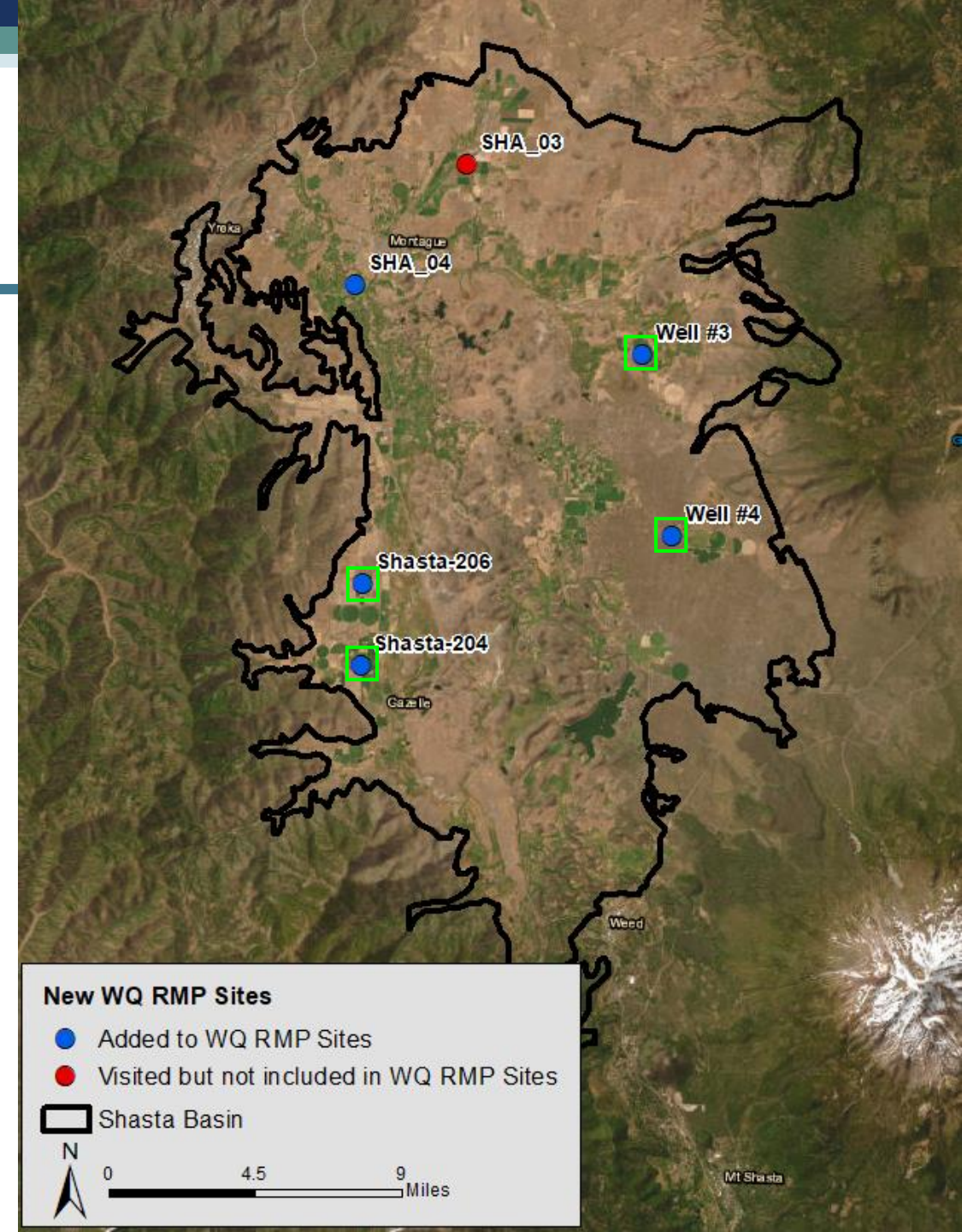


Shasta Valley Active Monitoring Locations

Groundwater Basin	WQ RMP	Groundwater	Surface Water
I-5	WL RMP	LWA Active	LWA Active
Primary Roads	Continuous	RMP Active*	
Rivers and Lakes			

Groundwater Quality Sampling and Addition of RMPs

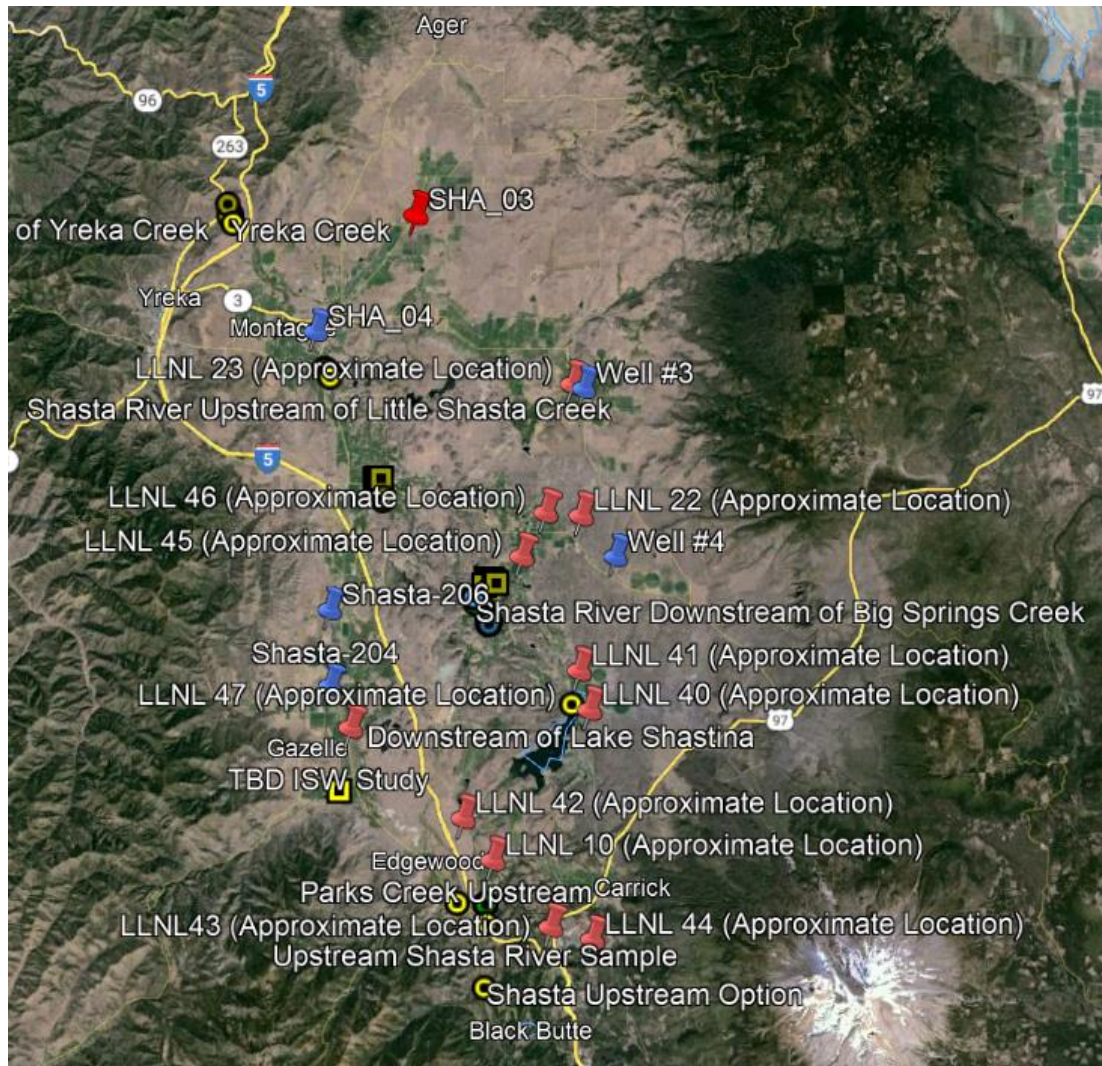
- SC, Nitrate, Major Ions, and Isotopes collected
- Southern-most 4 wells are targets for addition to the RMP water quality network (outlined in green). These wells were recently sampled for GSP Constituents (nitrate and EC).
- SHA_04 and SHA_03 were also recently sampled for GSP constituents.
- SHA_03 will likely not work for WQ sampling due to an exceptionally large pressure tank and no reliable sampling point.
- SHA_04 worked out well but is <1 mile away from another, existing RMP well.



Shasta Geochemistry: Goal

- Establish a basin-wide geochemistry monitoring network for groundwater and surface water.
 - Groundwater aims to be spatially representative as well as characterize unique features. The aim is to not reinvent the wheel and visit sites that we already have access to or have been visited for similar studies in the past (Lawrence Livermore National Lab).
 - Surface water sites aim to characterize the major tributaries to the Shasta River as well as the Shasta River between these major tributaries.

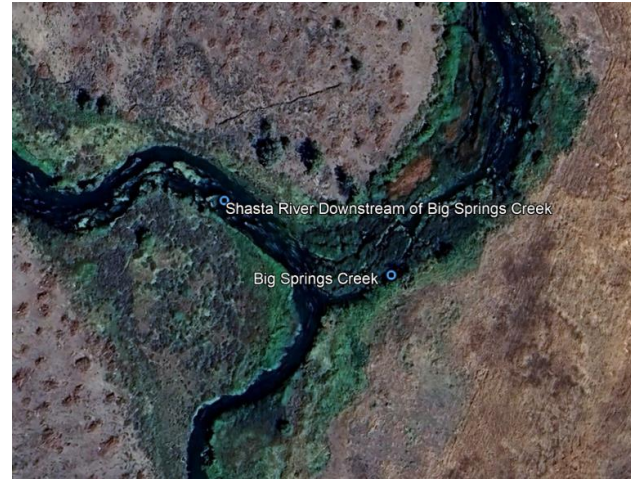
Target Locations



Coordination with Lawrence Livermore to obtain landowner information and create access agreements

- 24 Surface Water Sites
- 17 Groundwater Sites
- 3 ISW Sites
 - Includes multiple wells and surface water features.

Sampled Locations: Geochemistry Surface Water



- South Fork of Parks Creek fully sampled
- Big Springs Creek confluence sampled without an upstream sample
- Shasta River only sampled upstream of Boles Creek



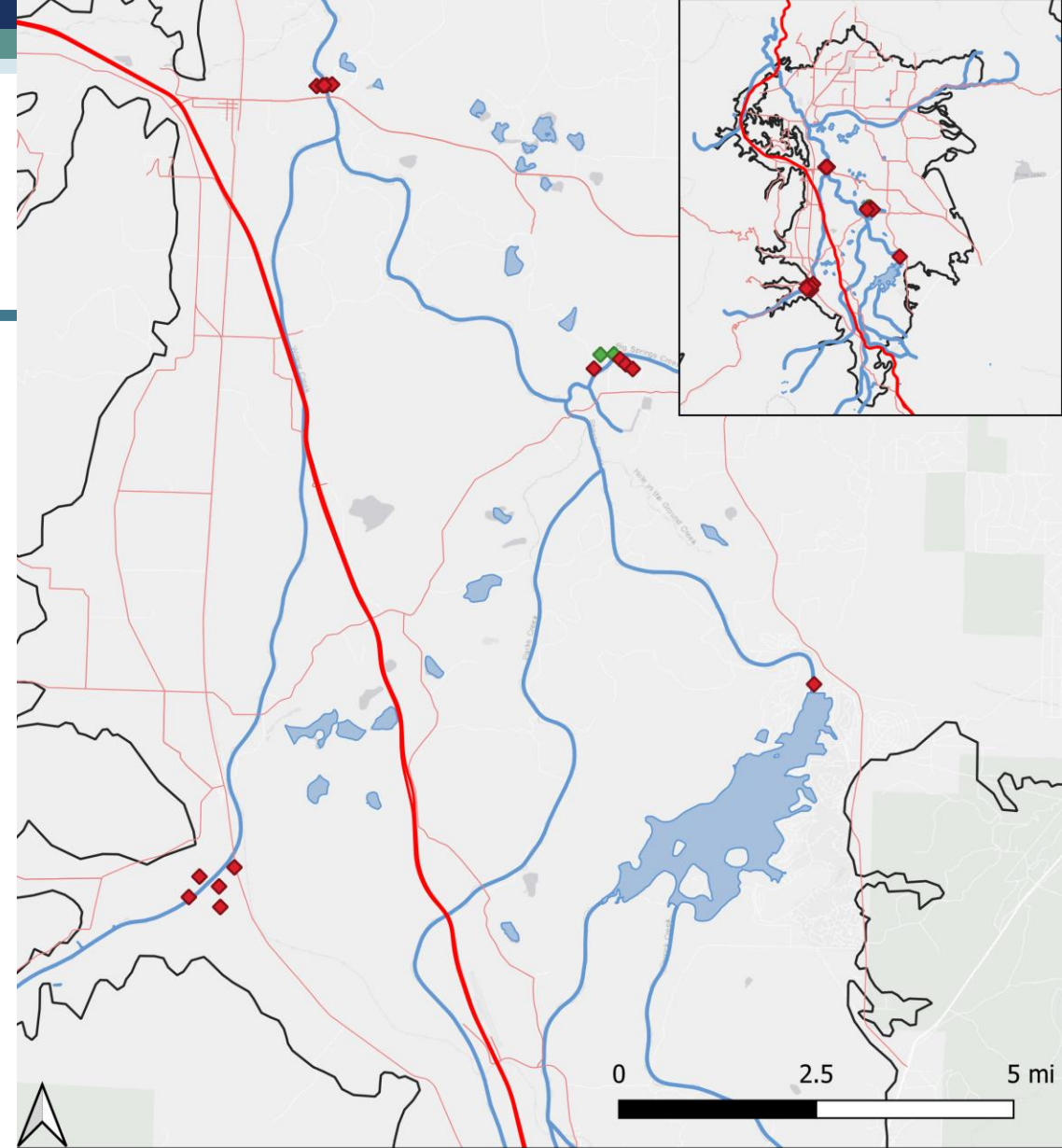
Sampled Locations: ISW / Radon



- Hand dug well ~12' to water with TD ~15'. Not sampled due to short water column, large purge volume (~24" casing), and lots of debris in the well (no secure cap)
- Solar well and associated Big Springs Creek sampled for radon
- Solar well also sampled for major ions and isotopes
- Yellow points are future/optional sampling locations

Shasta

All Active and Targeted ISW Sites



Shasta Valley Interconnected Surface Water Monitoring Locations and Targeted Additions

- | | | |
|-------------------|---------------|----------------|
| Groundwater Basin | I-5 | All ISW |
| Lakes and Rivers | Primary Roads | Active |
| | | Targeted |

March 2024 Equipment Installation

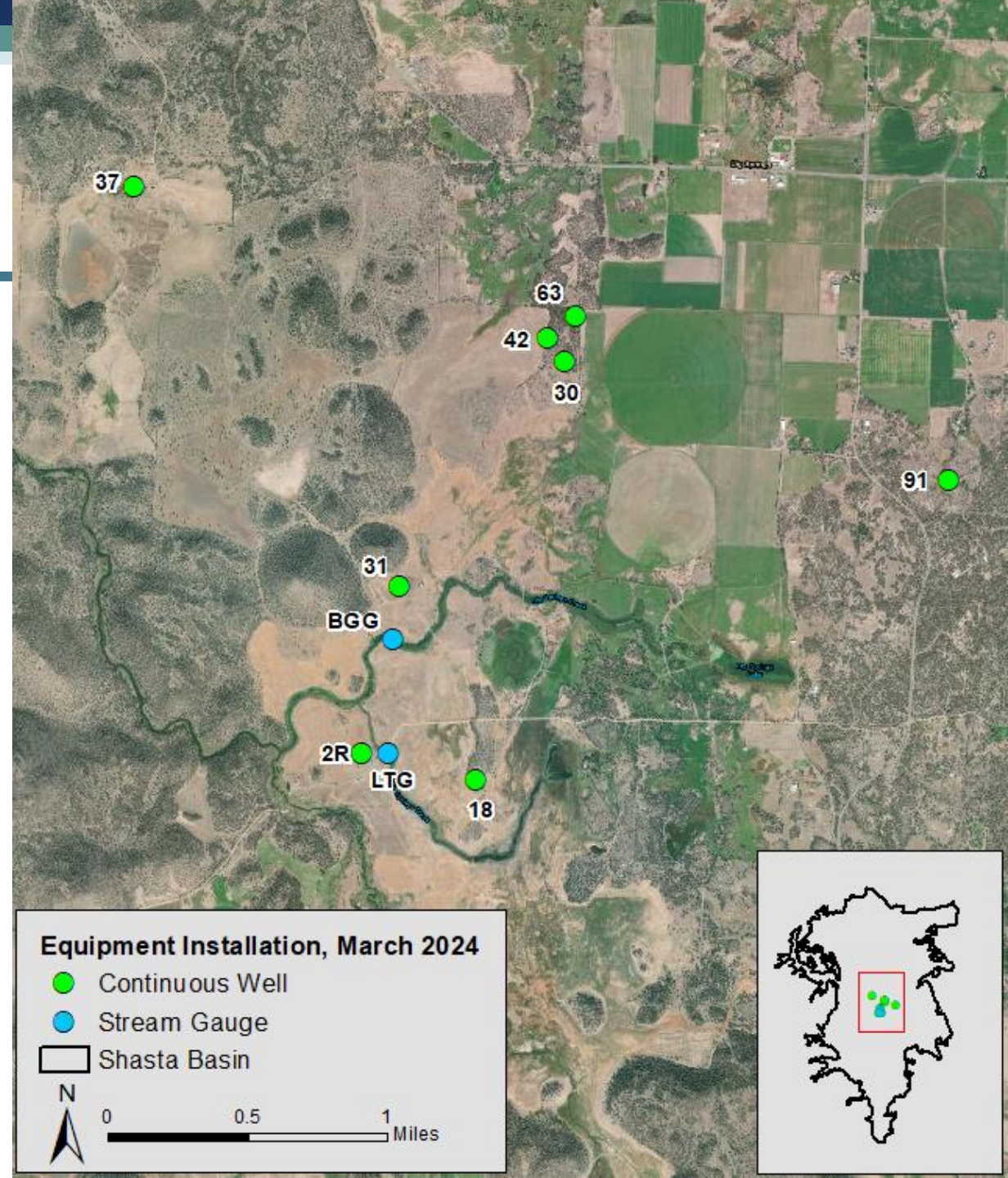
Shasta – Westside

- Installation of 2 stream gages
- Installation 6 continuous monitoring wells

March 2024 Equipment Installation

Shasta – Big Springs, CDFW

- 2 stream gauges (blue)
- Continuous wells (green)



“Umbrella” Recharge Project – Status Update

- Developing locations
 - GID/China Ditch – Benefits to shallow/rural residential wells in the Grenada/Gazelle areas
- Establishing baseline gw monitoring grid
- Application target to submit in May, to divert Jan-Mar 2025
- Water Availability Analysis
 - The “90th Percentile / 20 Percent Method”
- Water Availability Analysis for Streamlined Recharge Permitting
 - https://www.waterboards.ca.gov/waterrights/water_issues/programs/applications/groundwater_recharge/docs/streamlined_waa_guidance.pdf



Upland Management

- Identify existing upland management projects and evaluate the impact on water supply (up to 3 projects)
 - Management of upland forest vegetation
 - Juniper Native Invasion Management for Multiple Benefits Project
- Design and install monitoring network to quantify impact to groundwater
- Collect and evaluate data
- Incorporate results into modeling scenarios
- Evaluate watershed responses under differing upland management strategies

Irrigation Efficiency Workshop - Recap

- “Workshop on Efficient Water Management for Forage Crops”
- Held Wednesday March 13th
- Field visits with irrigation specialist May 21, 22, 23
- Link to survey: <https://us11.list-manage.com/survey?u=2516c89941f49355f514cefb8&id=3435a2de67&attribution=false>



Thank You