



Cuyama Basin – North Fork Vineyard

Company Background plus Data Insights to
Support GSP Development for the Cuyama
Basin

*Presented by Grapevine Capital Partners and Cleath-Harris Geologists
April 26th, 2018*

Presentation Objectives

1. To (re-) introduce the Standing Advisory Committee and community to Grapevine Capital Partners
2. Update the SAC on information we have shared with Woodard & Curran and share highlights thereof
3. Answer questions from the SAC and community

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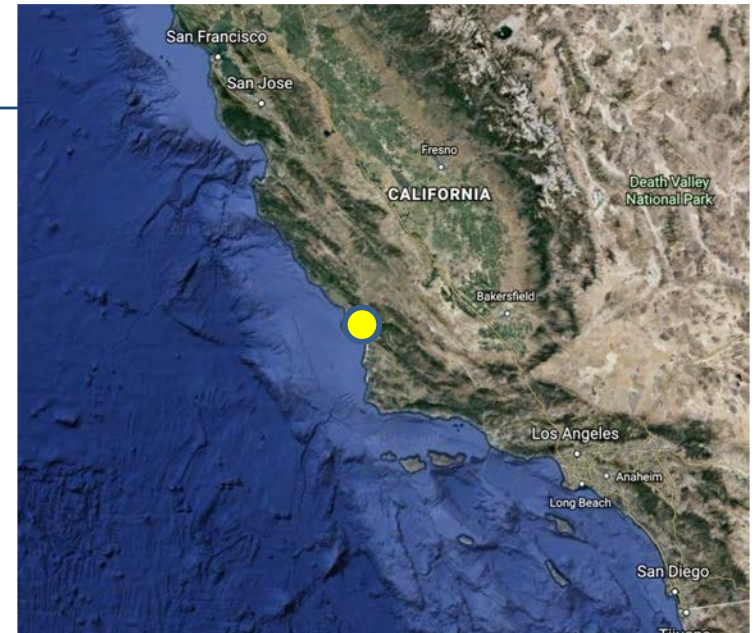
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Grapevine Capital Partners

- An agricultural investment management firm, based in San Luis Obispo, specializing in *permanent crops*
- Permanent crops require a **long-term vision**
- We build value for investors by developing projects for **long-term sustainability**
- We accomplish this through extensive **up-front planning** and **professional management practices**
- We work with multiple investors who share our values and are committed to long term sustainable agricultural projects that **positively impact the local communities** in which we operate



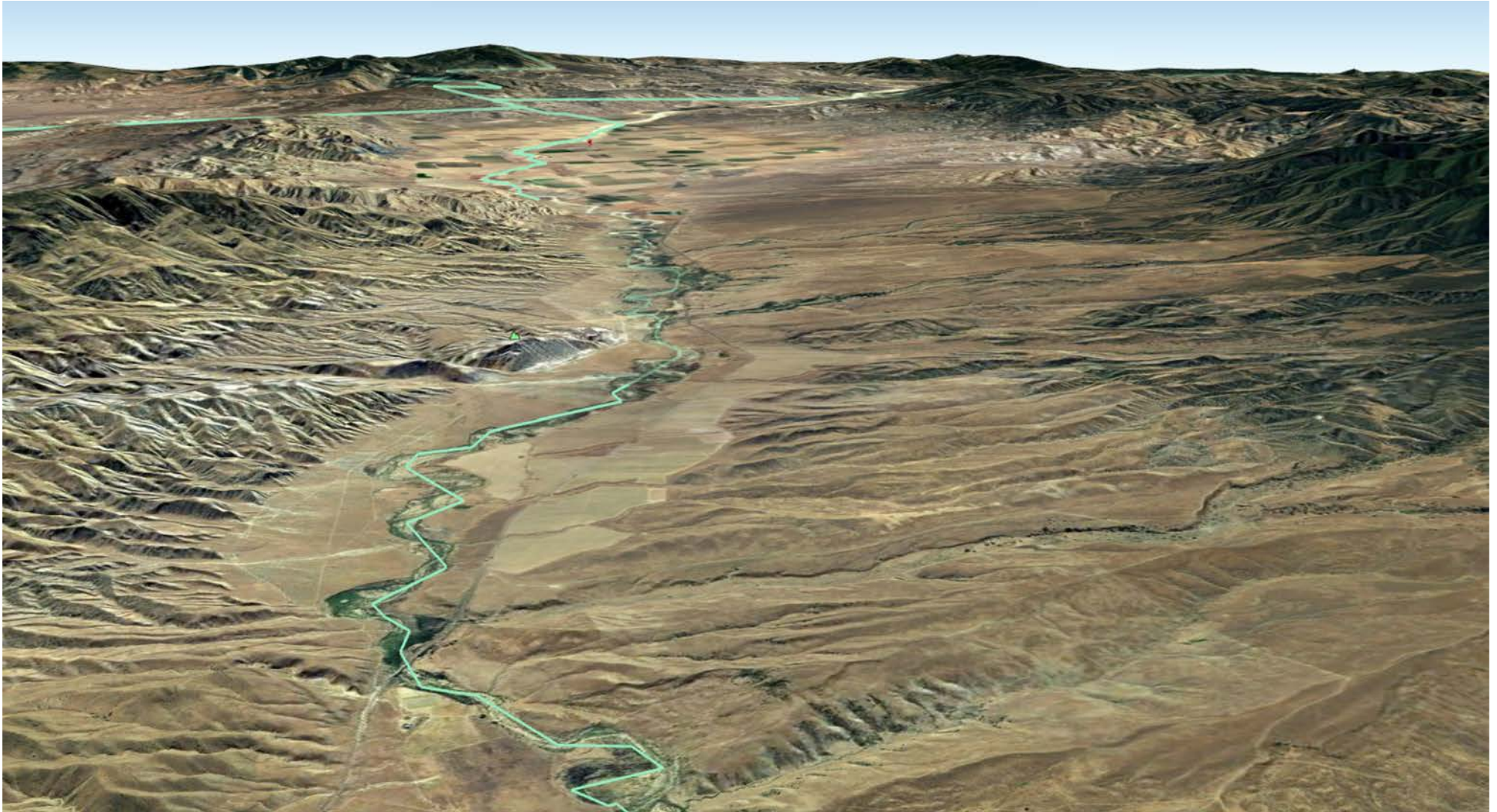
North Fork Vineyard

- North Fork will produce high quality grapes for Santa Barbara AVA wines
- The vineyard is designed for the climate and soil in the west end of the valley, including:
 - Variety and rootstock selection
 - Block organization and structure
 - Irrigation and frost protection
- We planted 850 acres based on our assessment of the local aquifer and its estimated annual recharge
- The total property is 8700 acres and spans most of the valley immediately west of the Russell Fault, and resides in San Luis Obispo and Santa Barbara Counties

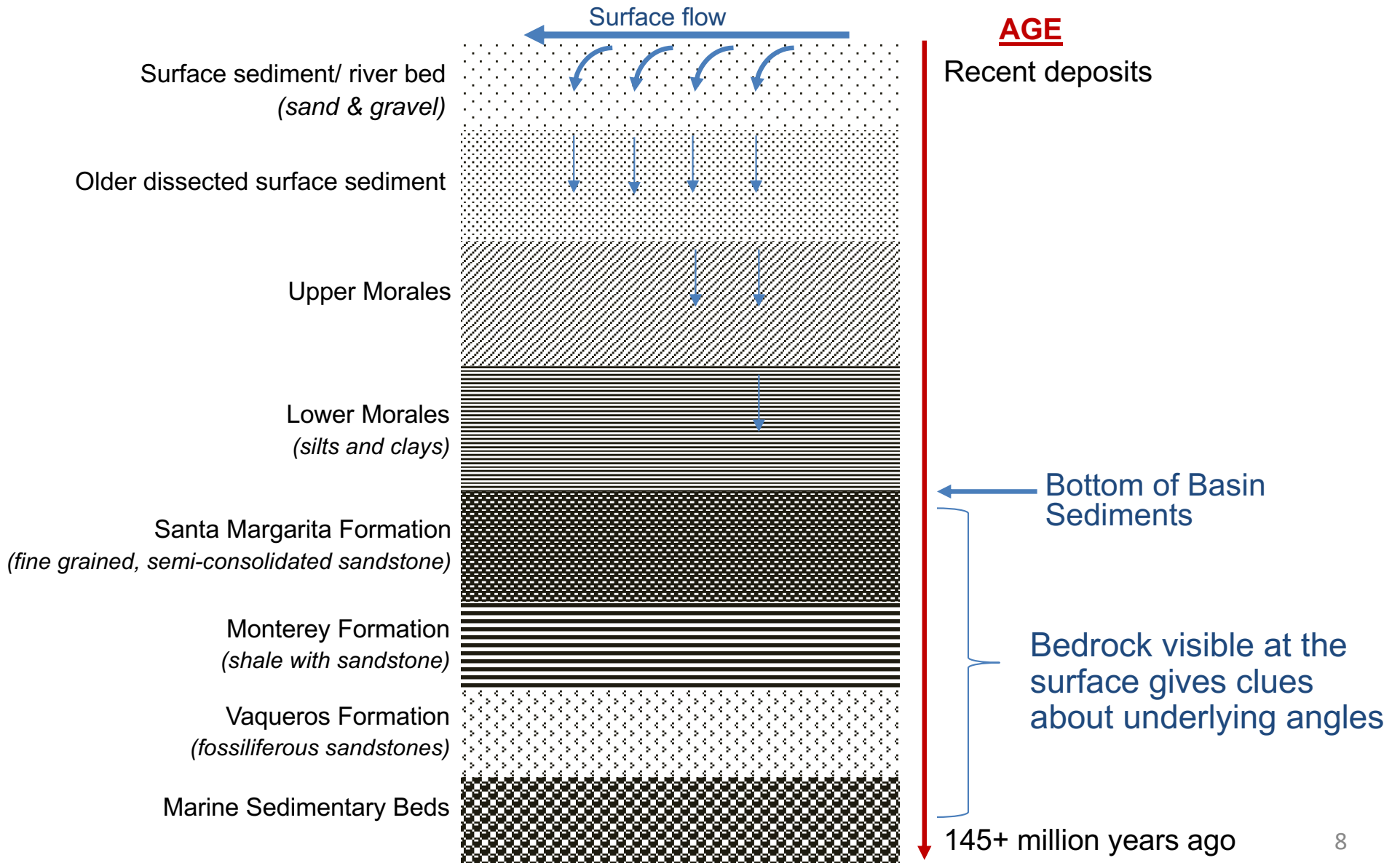


Property lines are drawn approximately

North Fork Vineyard









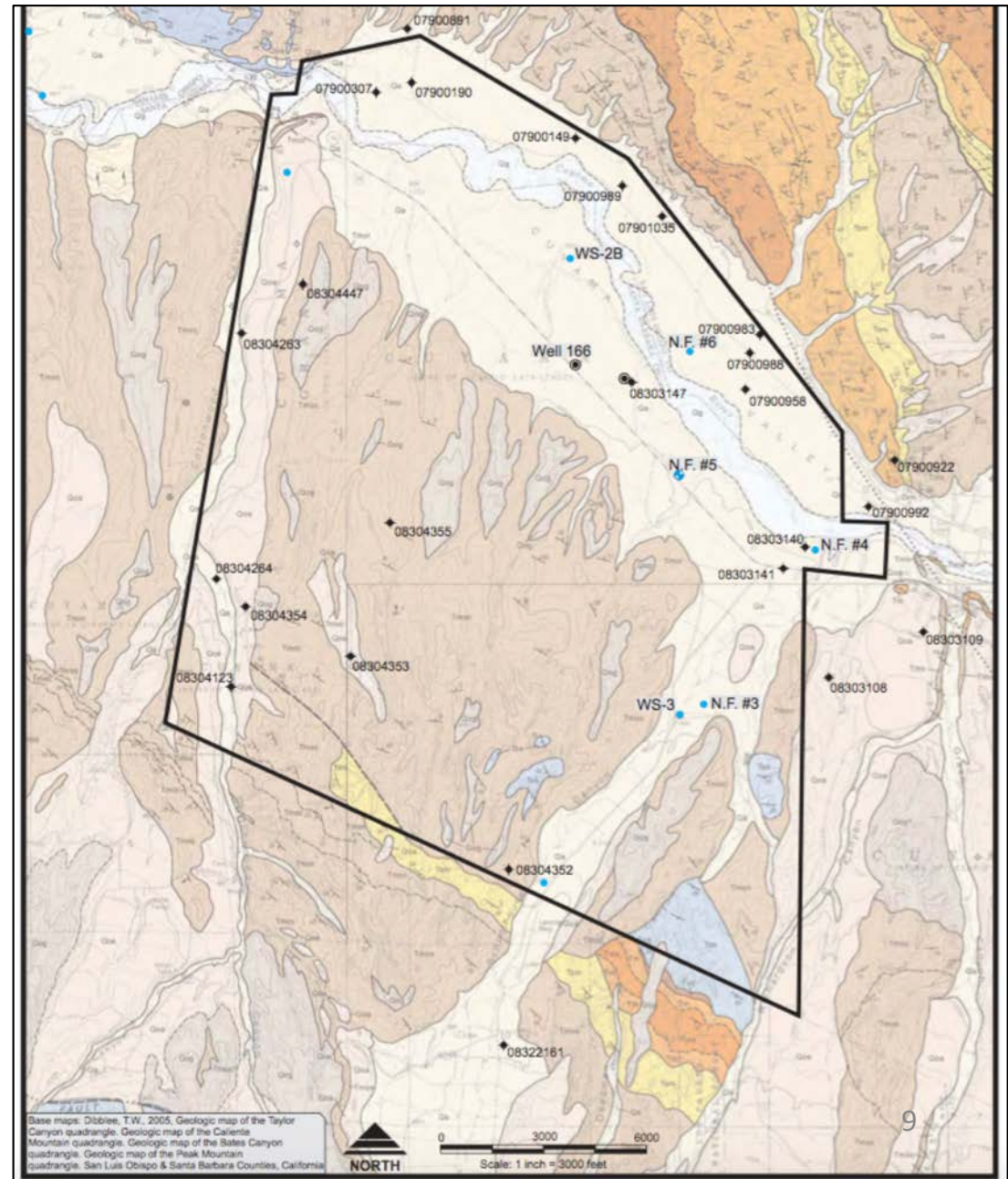
West Basin Sediment Layers (General) *and water retention*



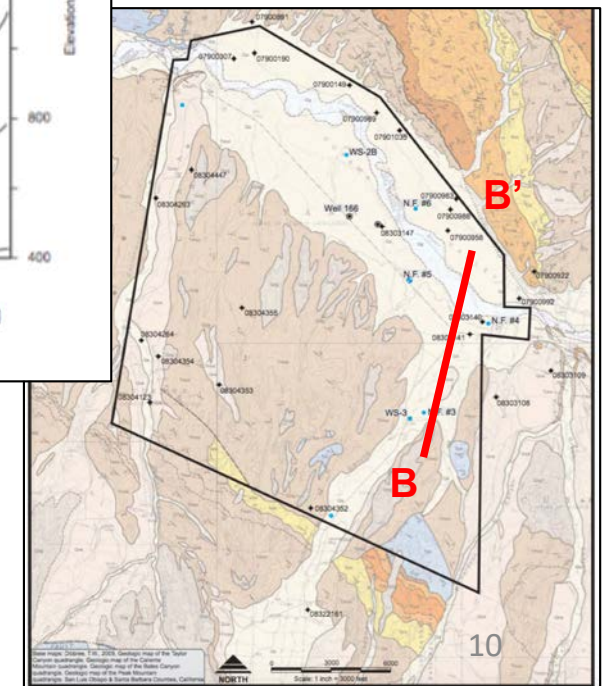
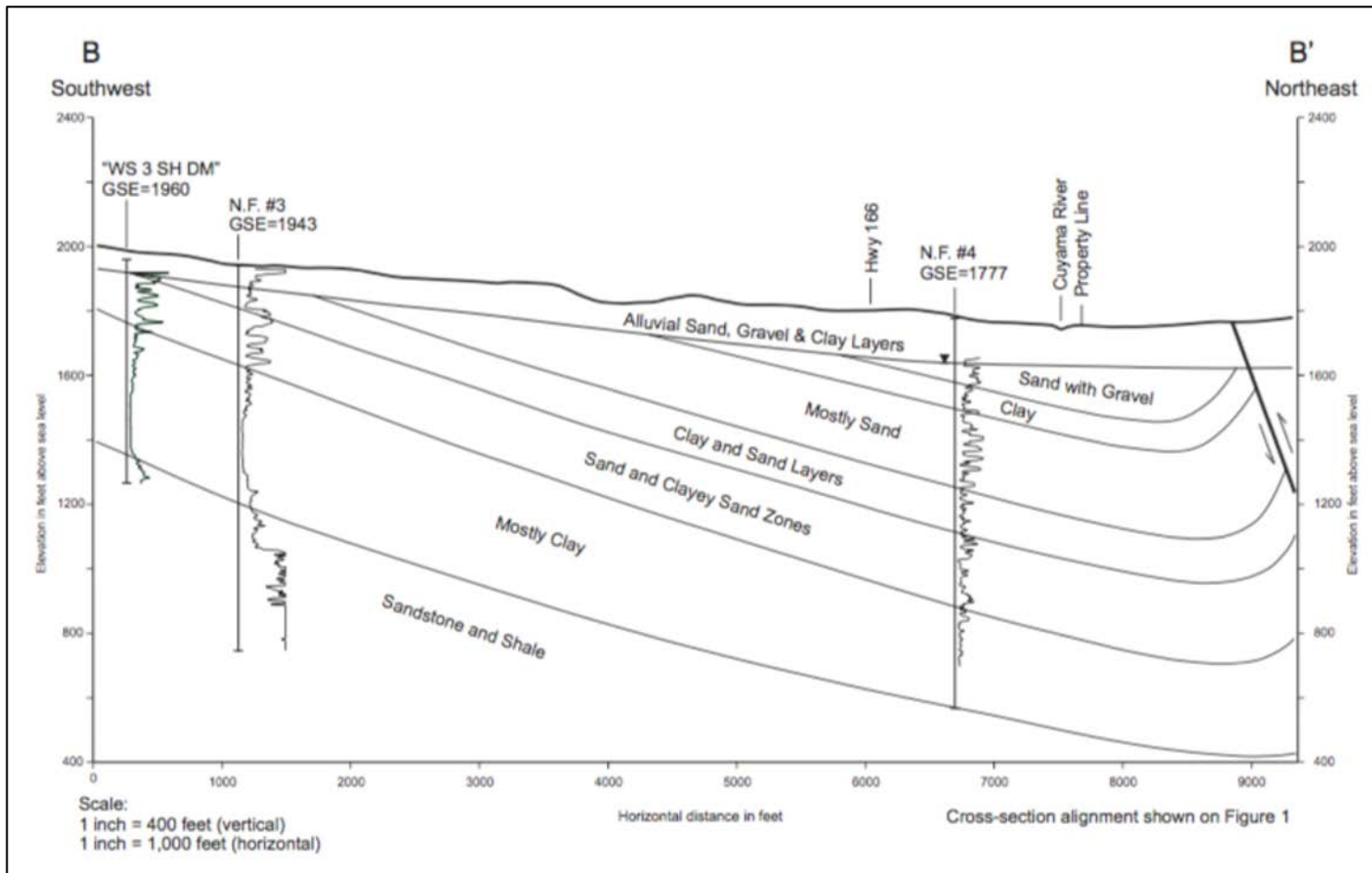
Prior to acquiring the property we analyzed existing well logs and drilled test wells

- The property already had extensive exploration wells from oil companies and a previous Santa Barbara hydrogeologist
- Our preliminary assessment was followed by an exploration program including several test holes

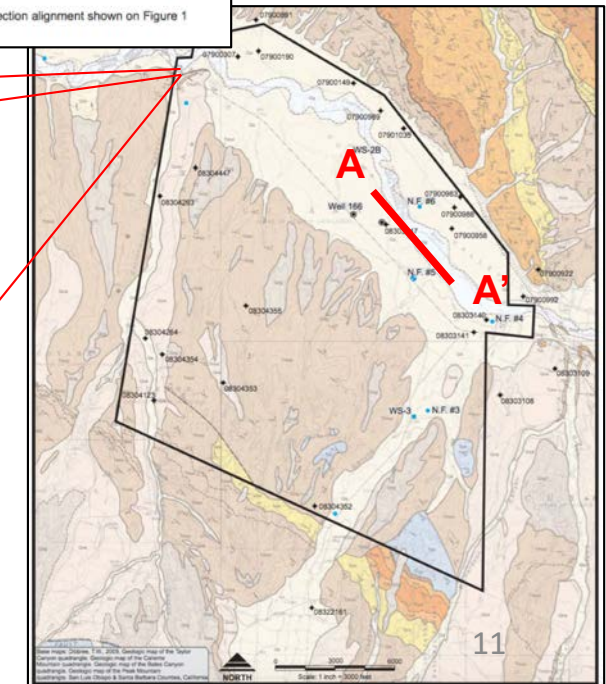
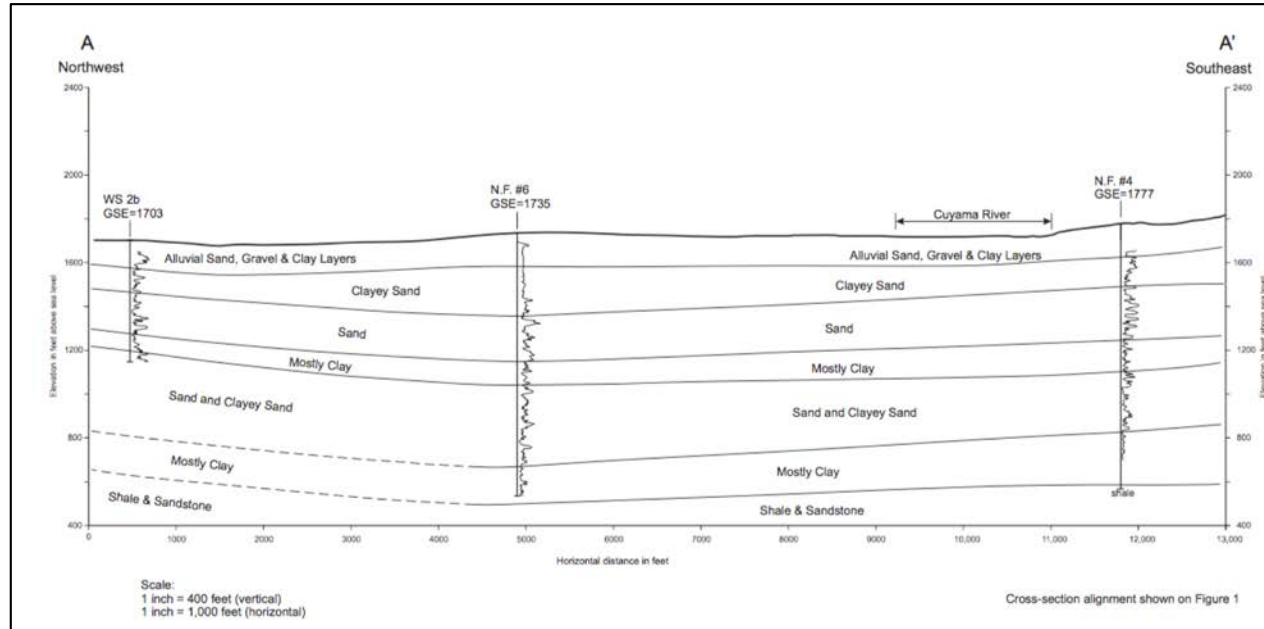
Explanation	
● Oil Well, Plugged	 -Surficial Sediments
● Test Hole, Log Available	 -Older Dissected Surficial Sediments
● Test Hole, No Log Available	 -Morales Formation
— Cross Section	 -Santa Margarita Formation
	 -Monterey Shale
	 -Marine Sedimentary Rock



Early exploration showed a structural basin which deepens on the north-east corner of the property

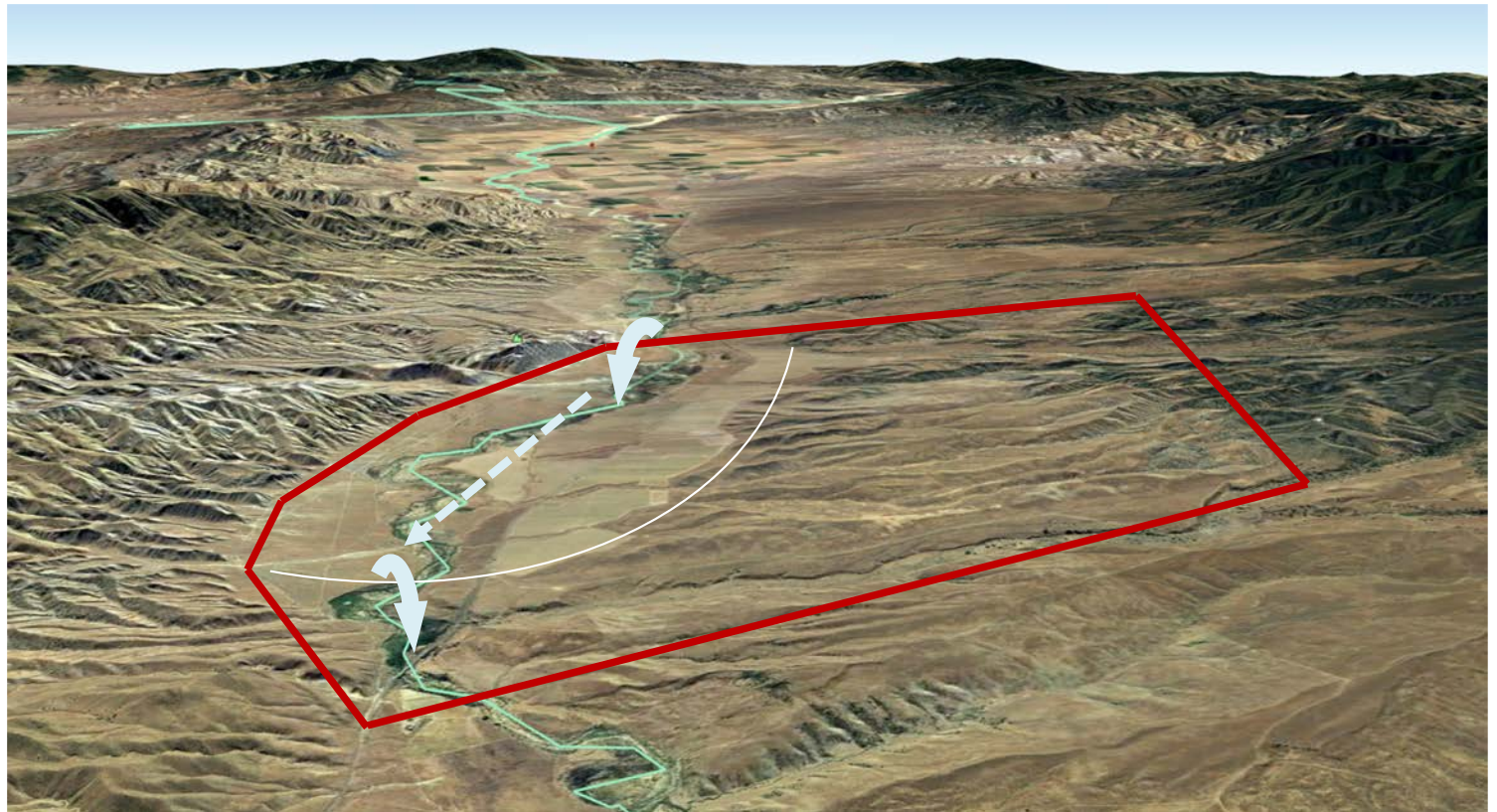


The deep deposits in the northeast corner of the property are truncated by the Russell fault to the east and by a structural high to the west



The vineyard's aquifer is in the northeast corner of the property

- The useful aquifer is immediately west of the Russell fault and ends were the river resurfaces on the west corner of the property.
- Primary recharge is from surface flow
- The depth and sediment composition enable recharge during river flow events



Lines are drawn approximately

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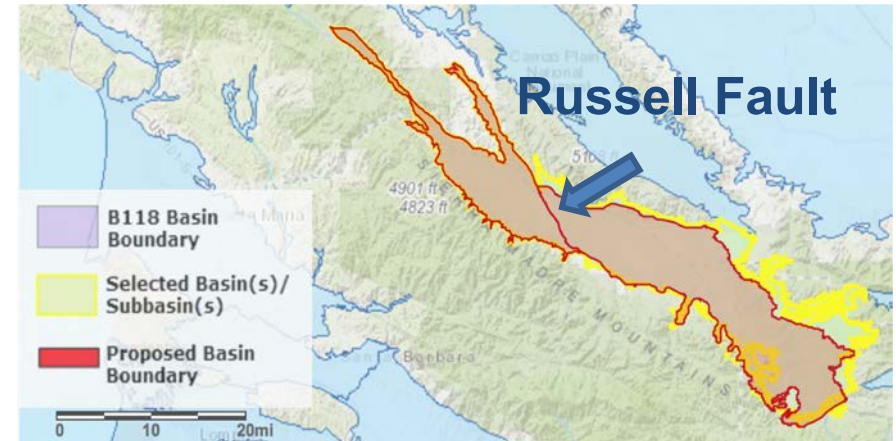
We feel confident in the water budget we calculated for ourselves and we welcome new analysis from the GSA process

Data we have shared with the Woodard & Curran team:

- Surface maps and geology assessment
- Well drilling logs (DOGGR and our own recordings)
- Original safe yield assessment report (Dec 2013)
- Cleath-Harris Geologists analysis of the Russell fault
- Water level data logs
- Production well capacity

In 2016, Santa Barbara County Water Agency requested a boundary revision for the Cuyama Basin

- The original submission was intended to “**facilitate sustainable management**” in the greater basin
- The submission describes the Russell Fault, a prominent geological feature in the basin, as a **barrier to flow** between the over-drafted aquifer of the east end from the down-stream west end of the basin.
- The firm the County used to develop the submission referred to the USGS study of Cuyama as their technical support material.



Ultimately, DWR did not accept the request on grounds that the USGS data used as technical reference did not conduct sufficient analysis of the Russell Fault

In 2017, Grapevine Capital Partners Engaged Cleath-Harris Geologists to further study the fault.

- CHG was tasked with evaluating the data/case for the Russell fault barrier
- We sought to provide documentation/evidence and analysis to support the removal based on our findings
- Our objectives going forward are:
 - **Immediate term:** Make the case for west of the Russell fault being a separate water management area in the GSP
 - **Long term:** Accumulate data with which to decide if an eventual resubmission to revise the basin boundary is appropriate.

In all scenarios, MORE DATA help us better manage our vineyard

The Cleath-Harris results and your additional review of them will help with the GSP

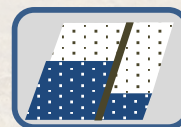
Key Focus Areas:

Scientific analysis of the Russell Fault

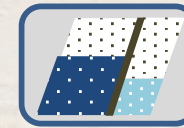
- §342.2(b) “a basin or sub-basin boundary may be modified, deleted, or added based on the presence or absence of a hydrologic boundary.”
- Presence of a Barrier can be evidenced in several ways:



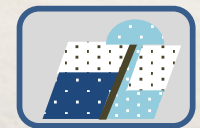
Rock layer
juxtaposition



Water
levels

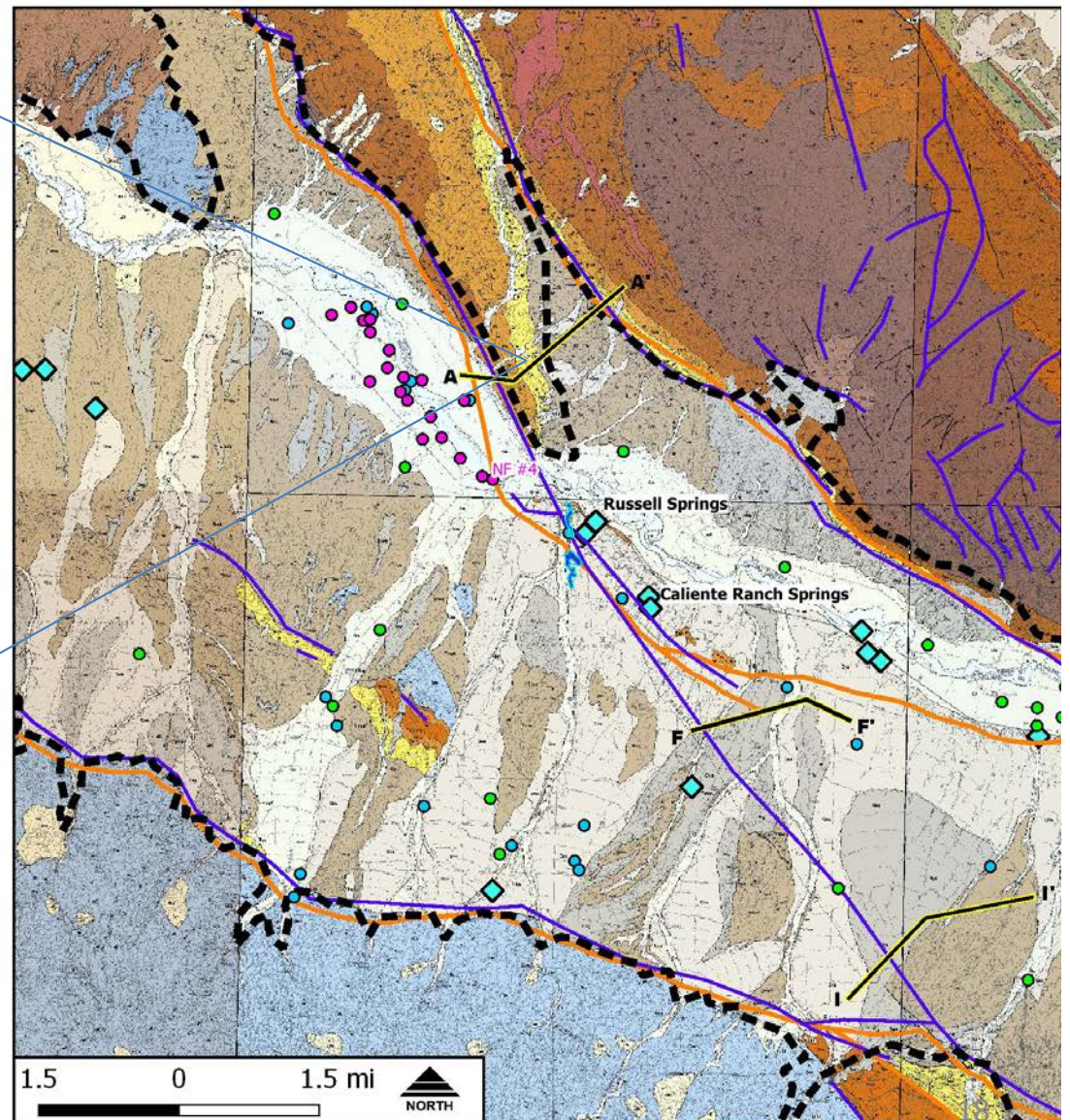
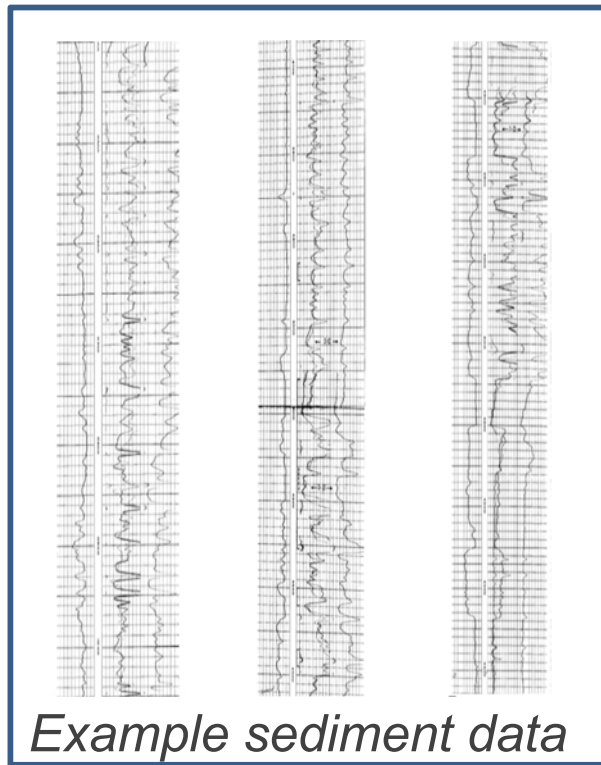


Water
quality



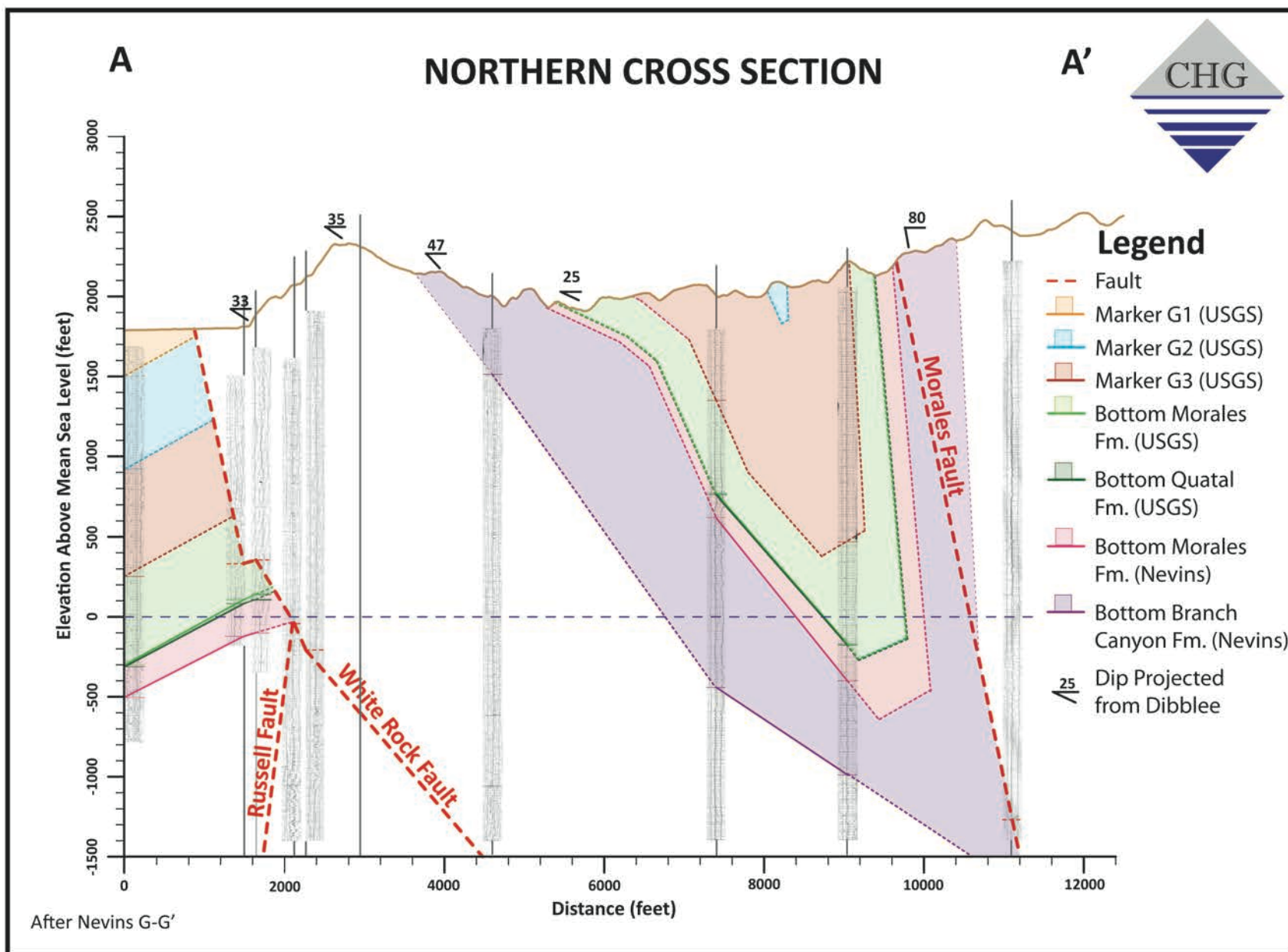
Springs

CHG analyzed oil well data on both side of the fault and drilled additional test holes on the west side

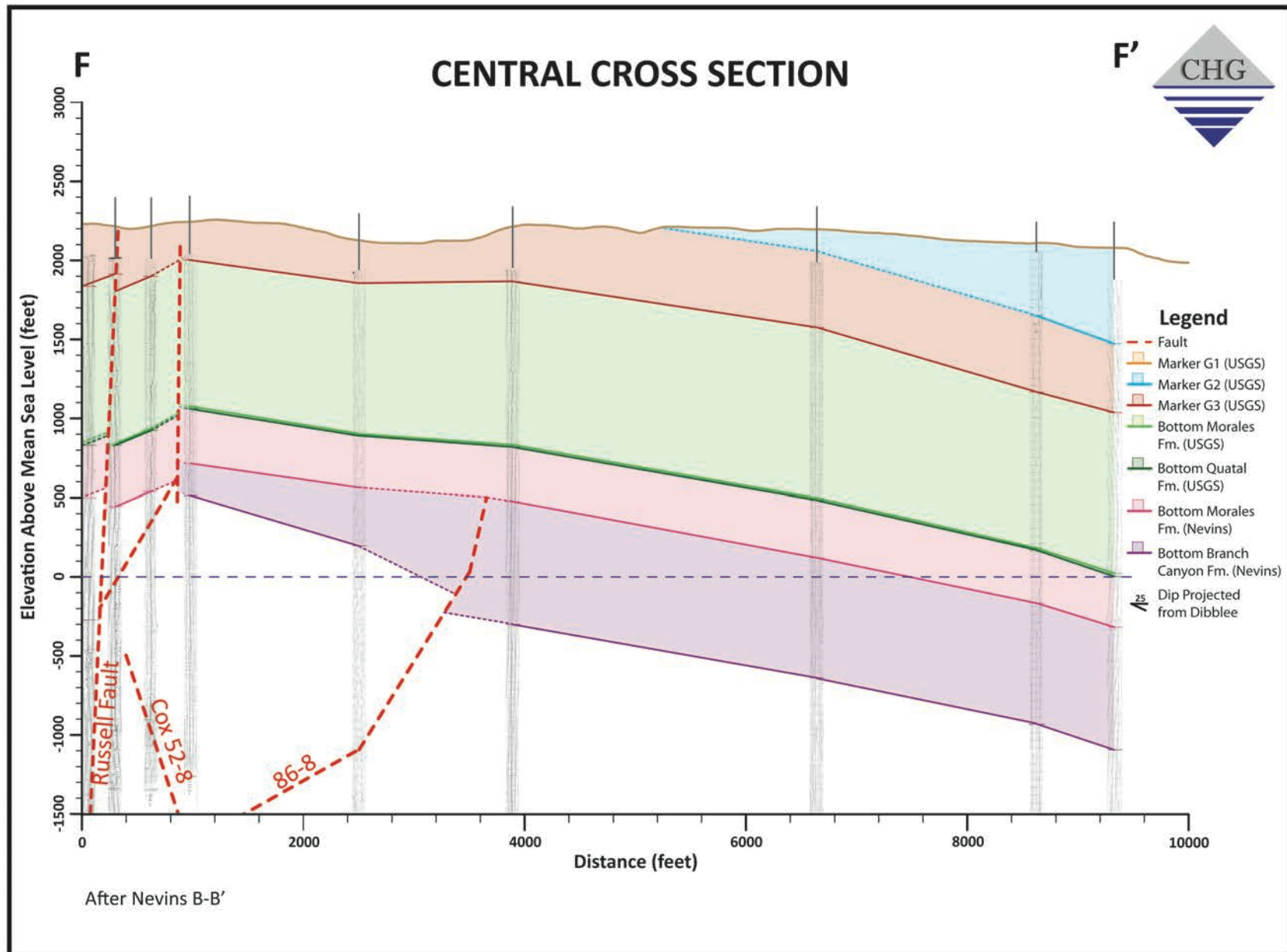


Test hole data provide a cross sectional view geological formations across the fault.

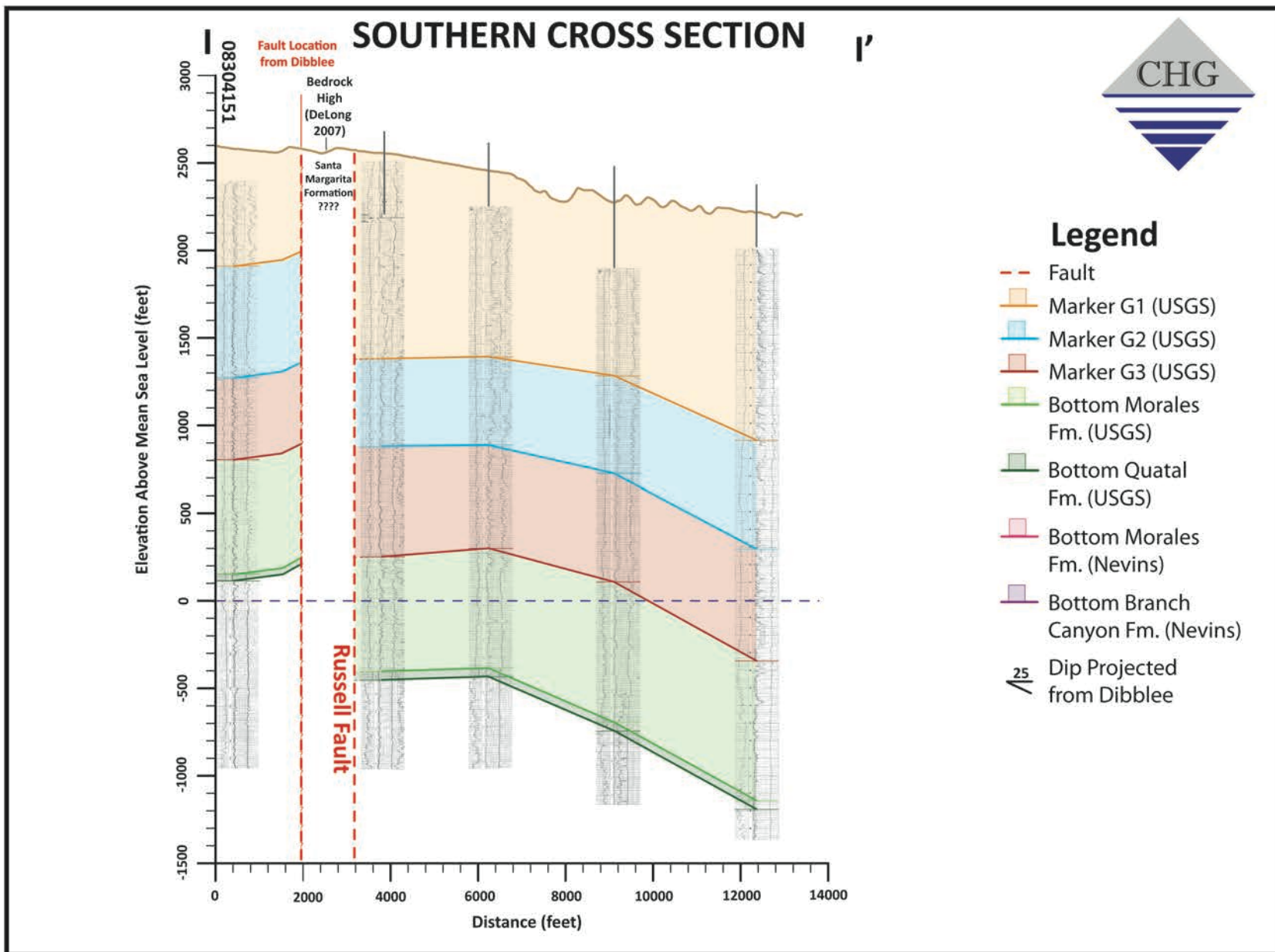
Cross section A-A' shows a distinct offset in formations across the fault



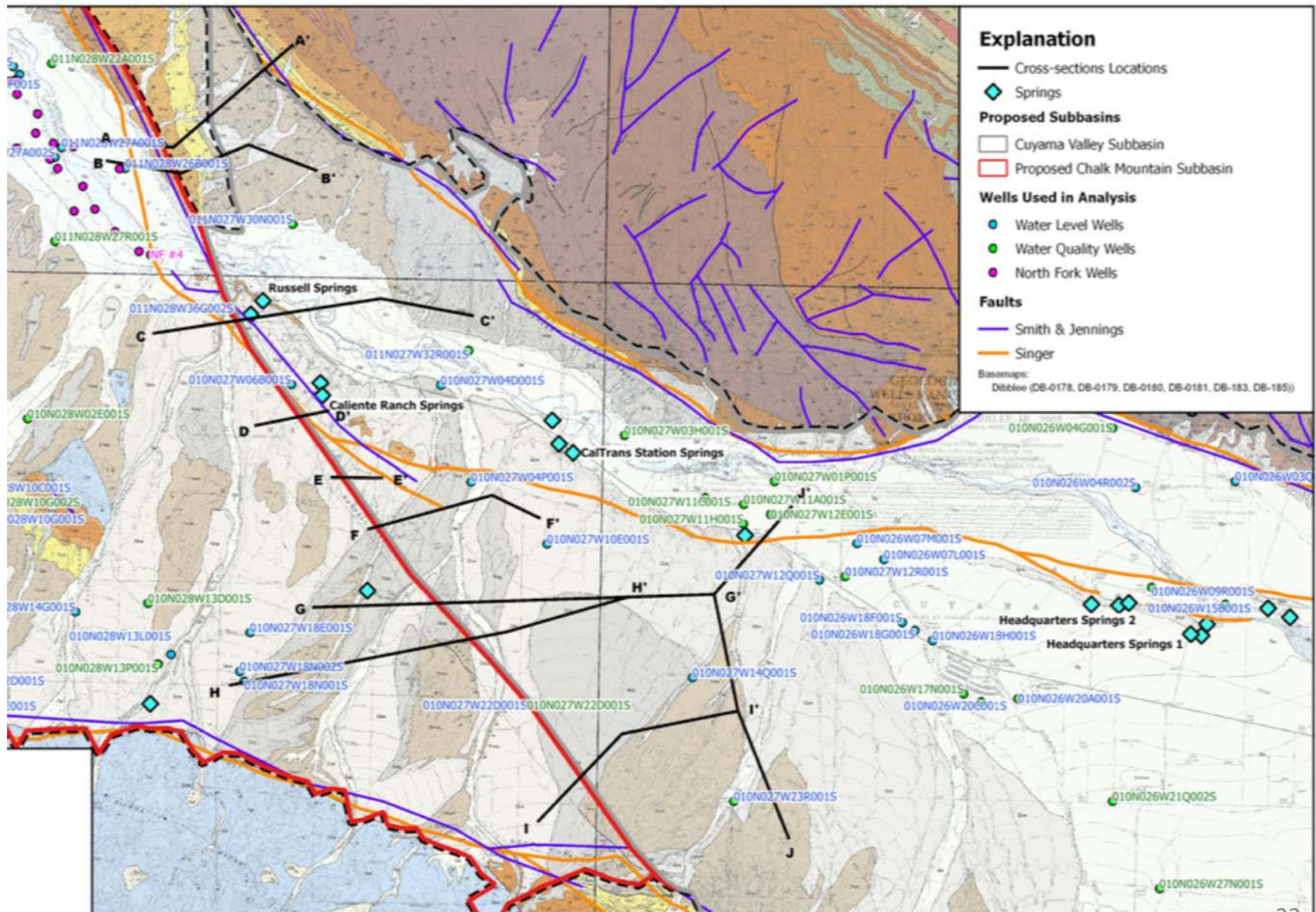
Other cross sections demonstrate the plane of failure across the Russell fault



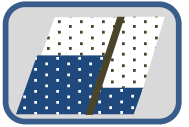
Offsets in the Morales at section I-I' exceed 500 feet



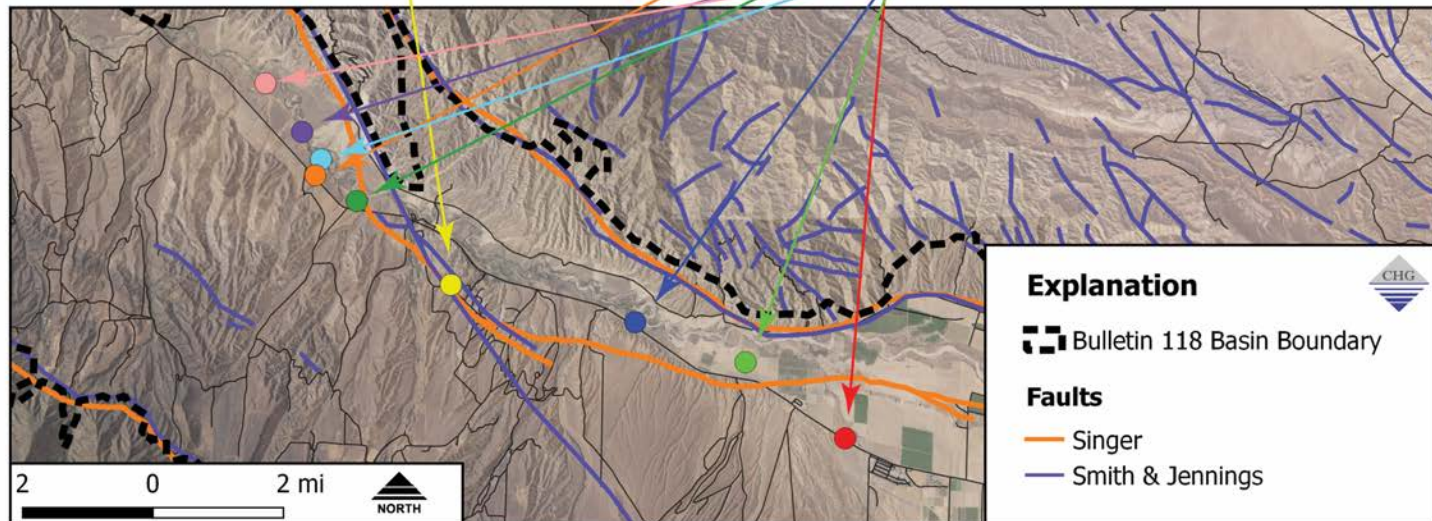
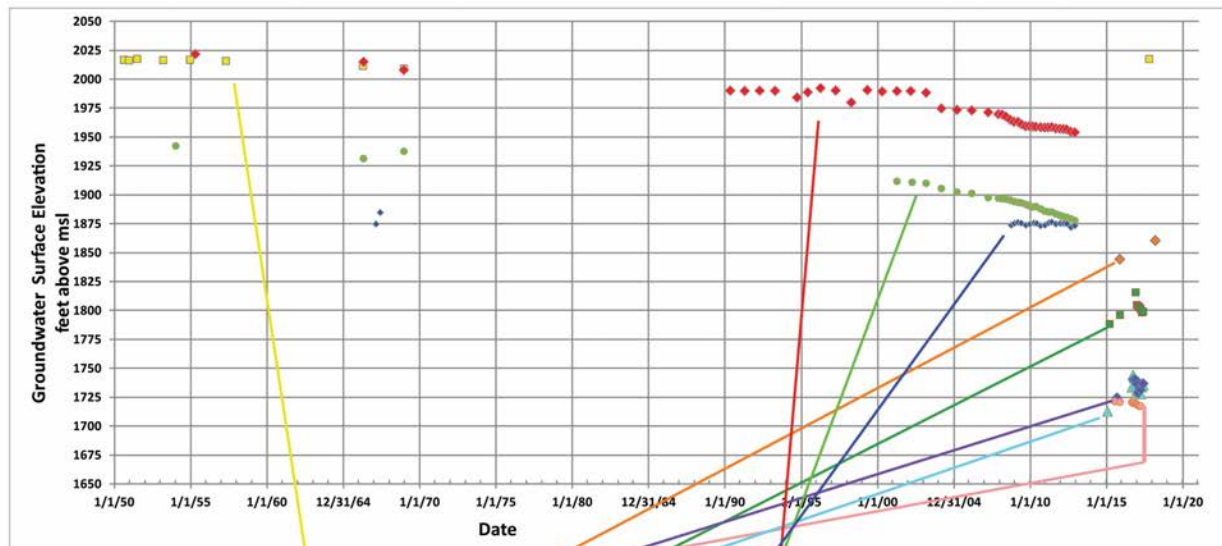
Additional cross-sections were also analyzed and were made available to Woodard & Curran



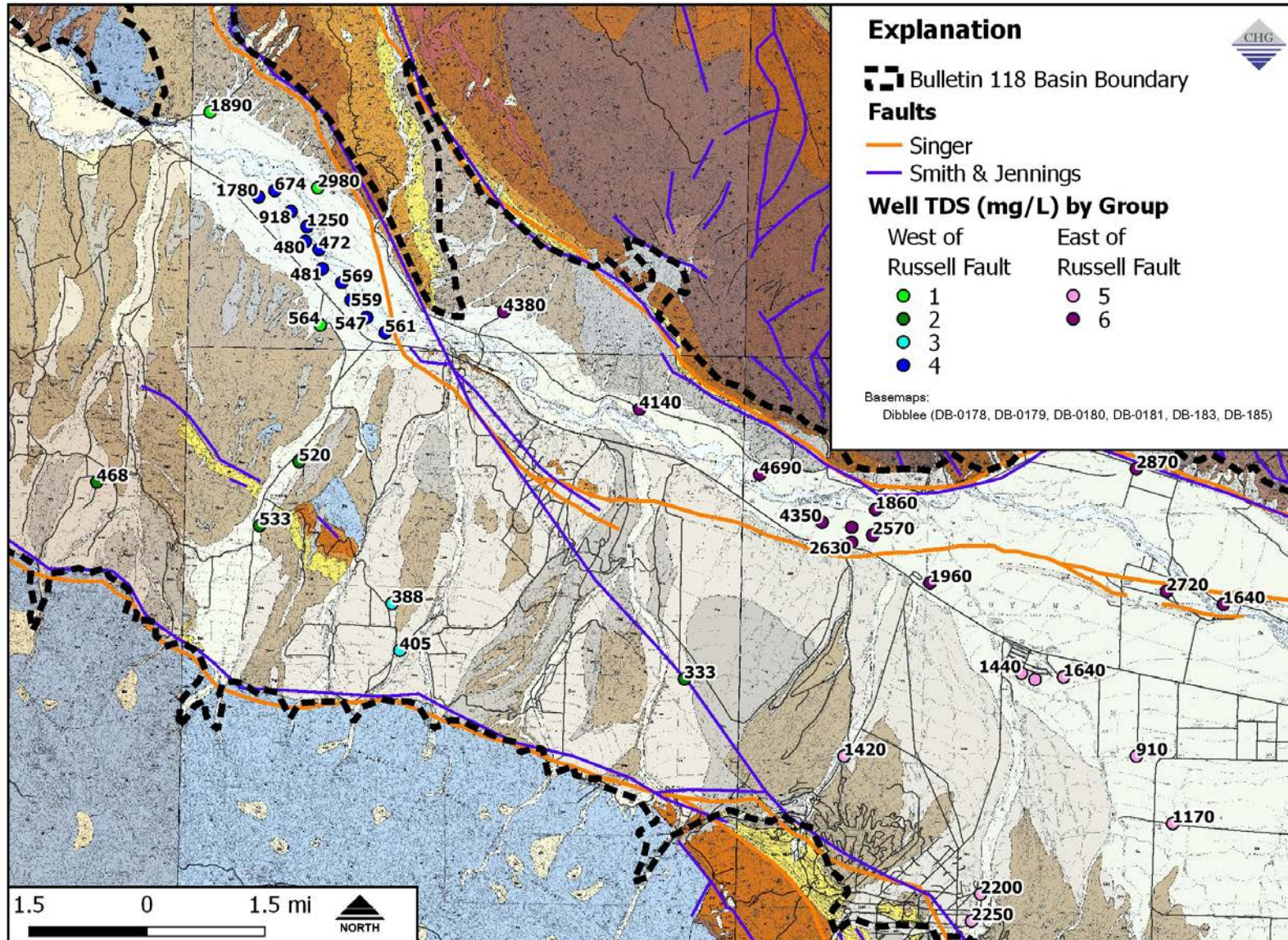
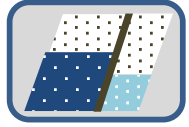
Water levels at the fault have remained stable since the 1950s



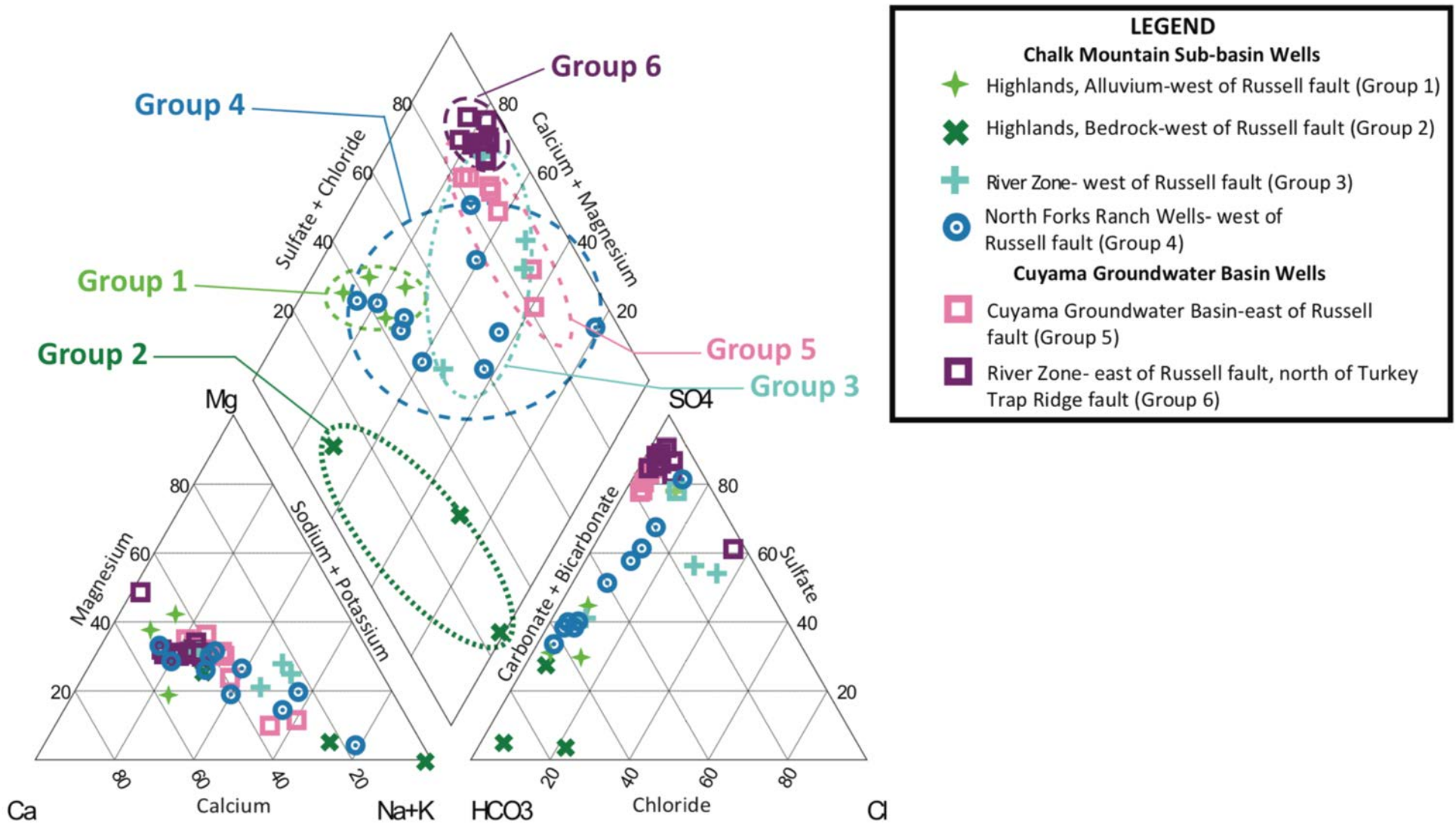
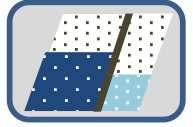
When measured last month by USGS, our well levels were 40-60 feet below the ground level



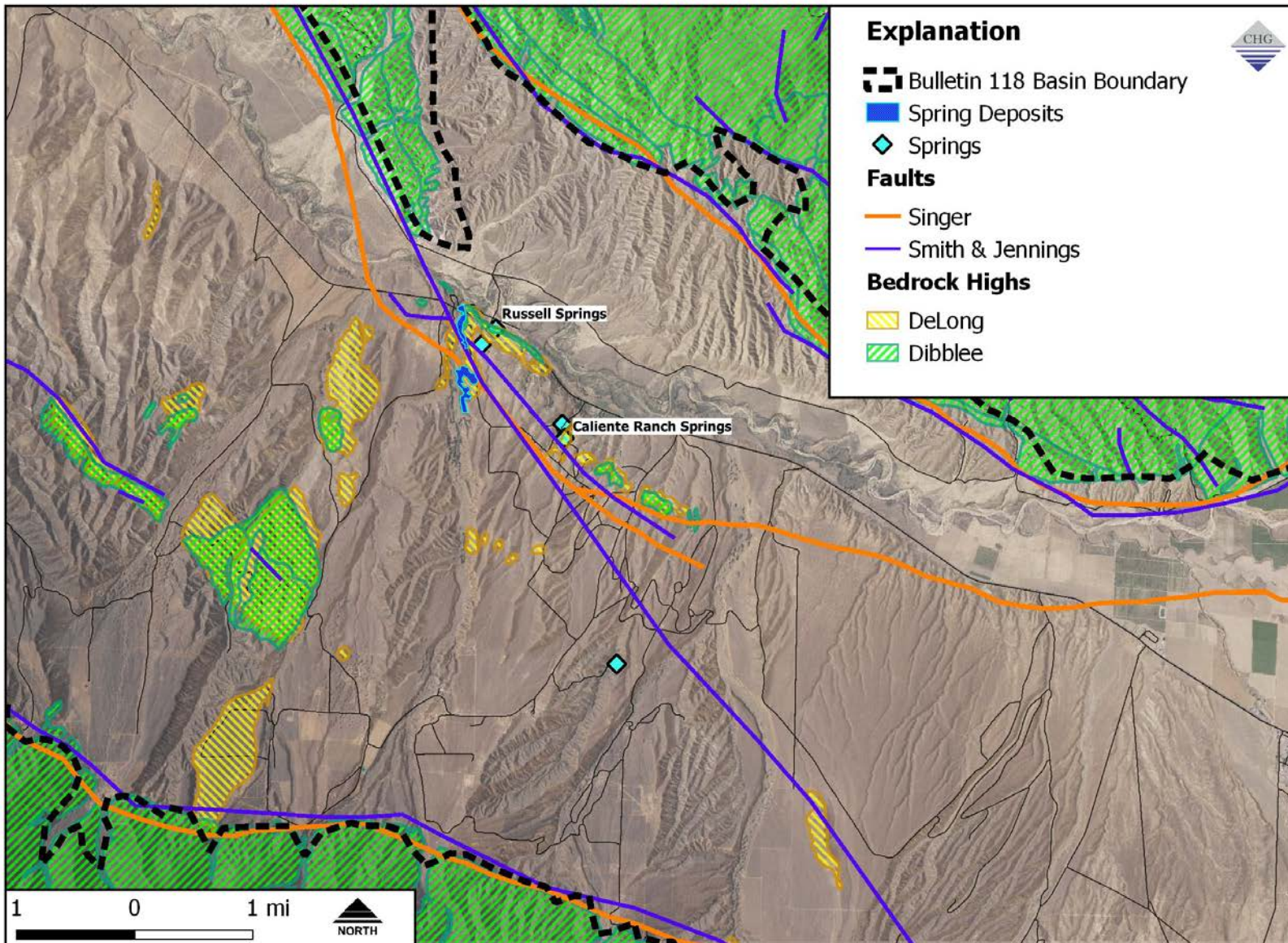
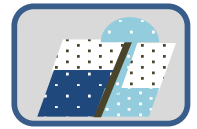
Total Dissolved Solids are distinctly different between the west and east side of the fault



Water quality east and west of the fault are noticeably different by mineral



The presence of springs along the fault provide further proof of barrier to flow



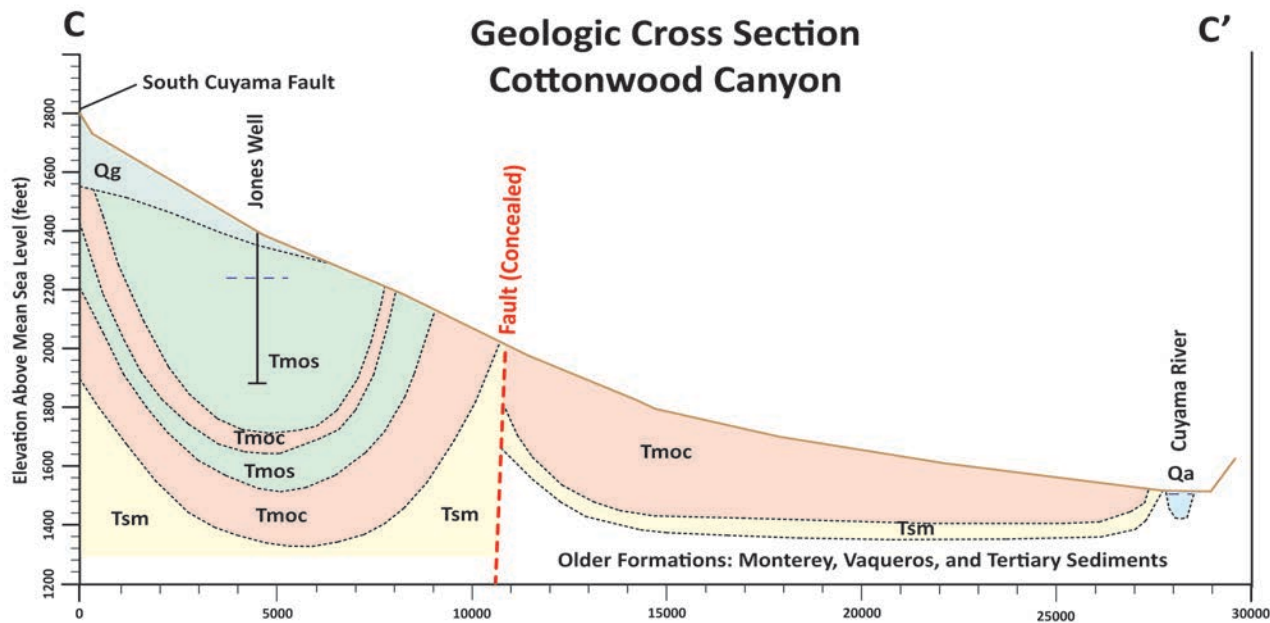
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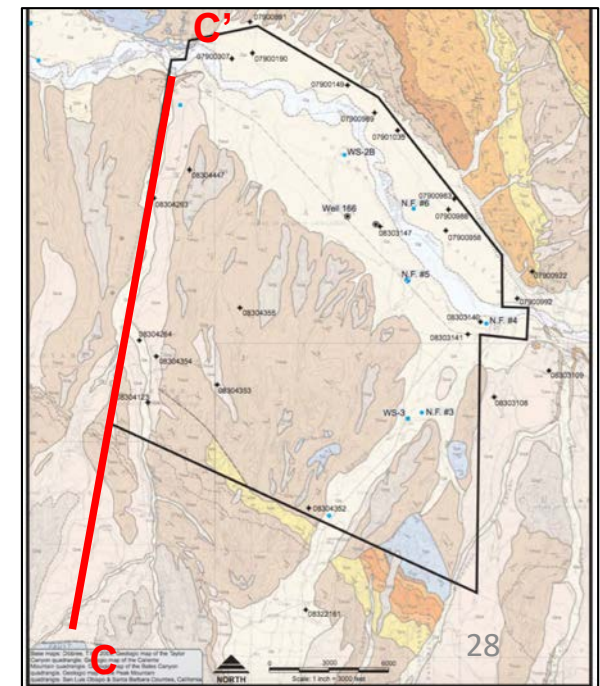
We have heard misconceptions that our pumping is effecting residential wells up Cottonwood Canyon

- The upper basin in Cottonwood Canyon is separated from our downhill aquifer by a fault on the south end of our property.
- Bedrock formations at the fault dip to the south at 60deg angles and are visible from Cottonwood Canyon Road.
- The water levels of our production wells are ~500 ft below water levels in this community. If the aquifers were connected it would result in over 200 psi pressure at our end, which is not the case.

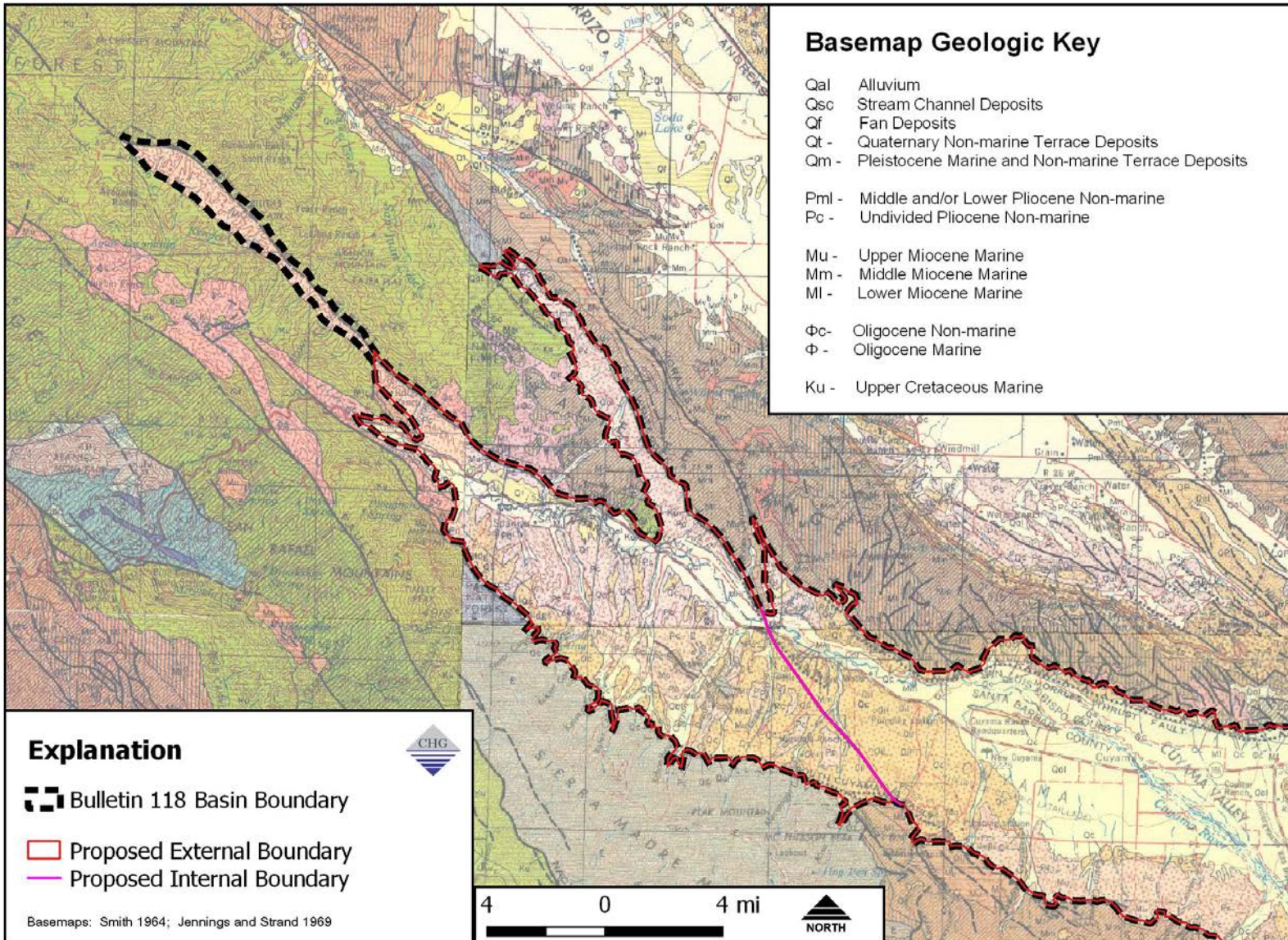


Explanation

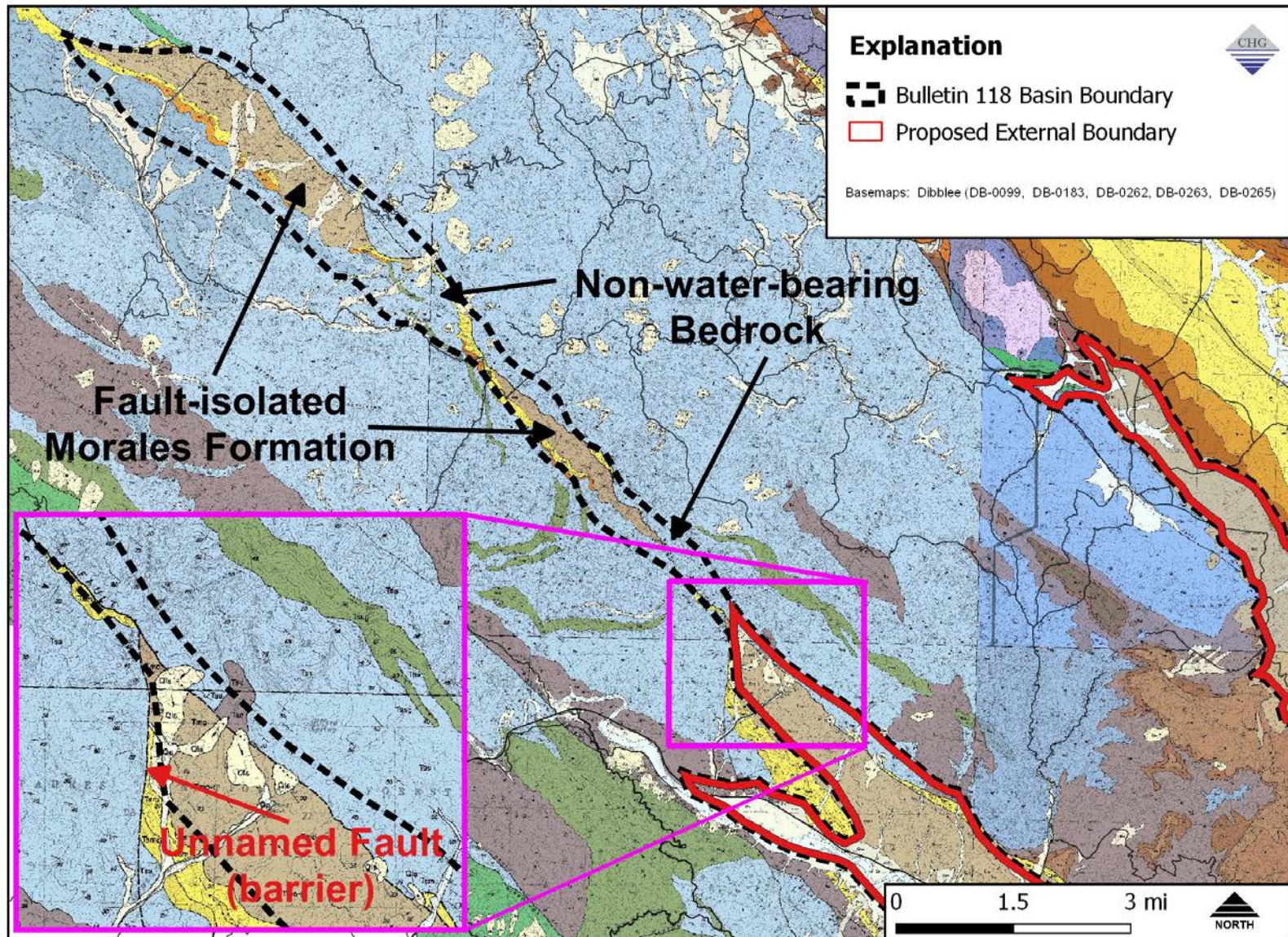
- Qa: alluvium
- Qg: fan gravels
- Tmos: Morales- sands and clays
- Tmoc: Morales- clays
- Tsm: Santa Margarita Sandstone
- - - water level



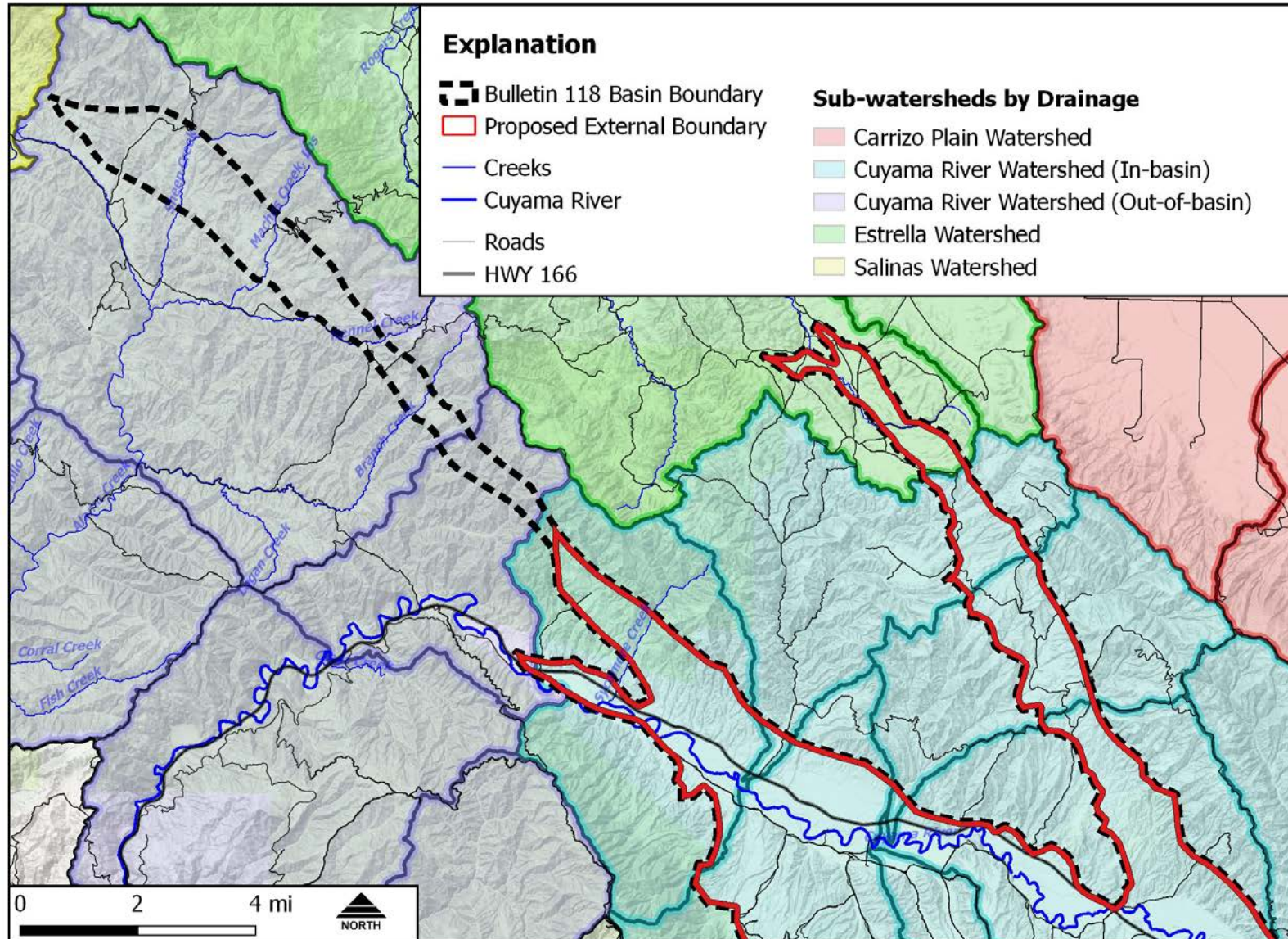
Additional mapping and geological data are available for the western sub-basin



The GSA may find it useful to further modify the basin boundary to exclude the upper “fingers”

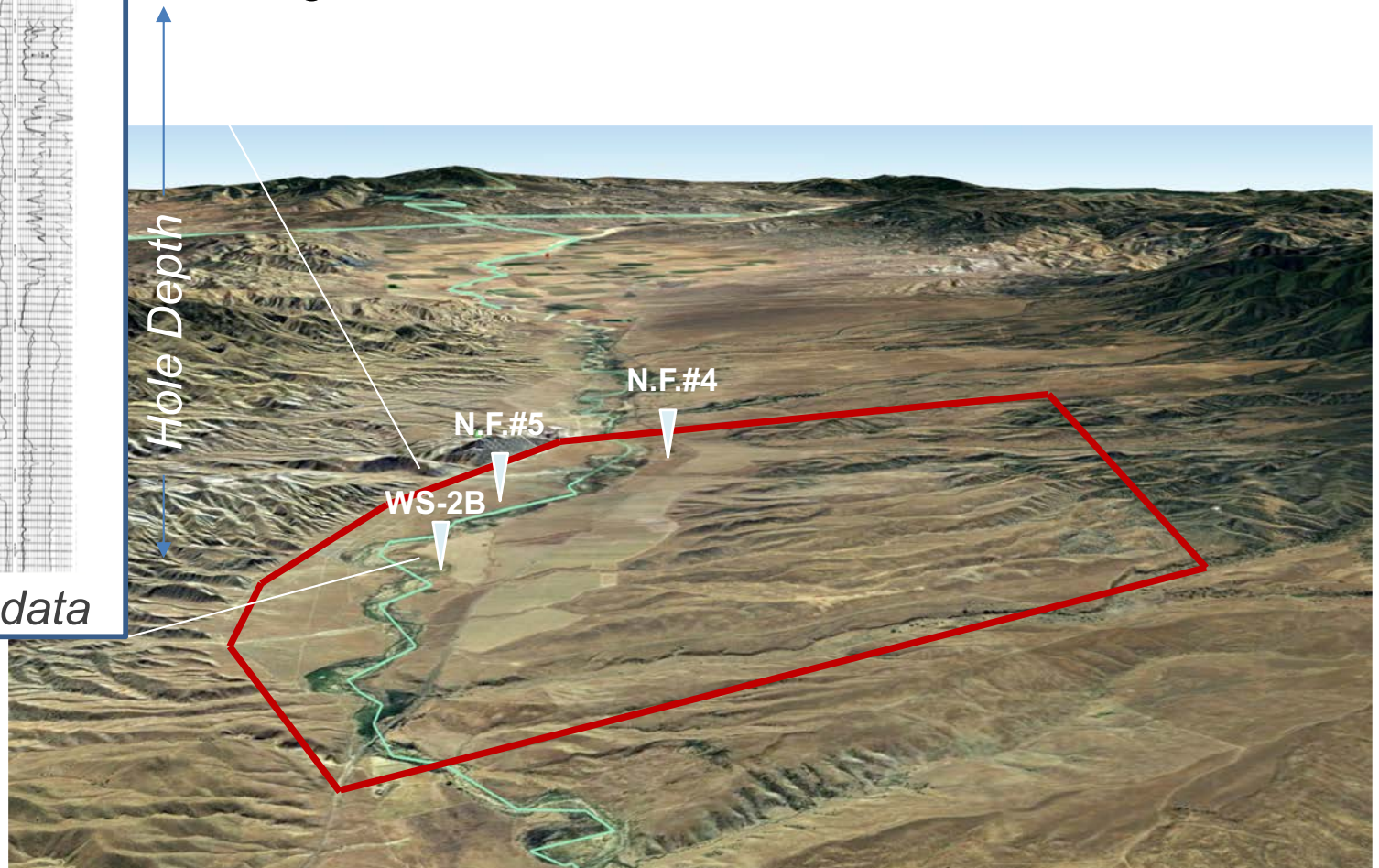
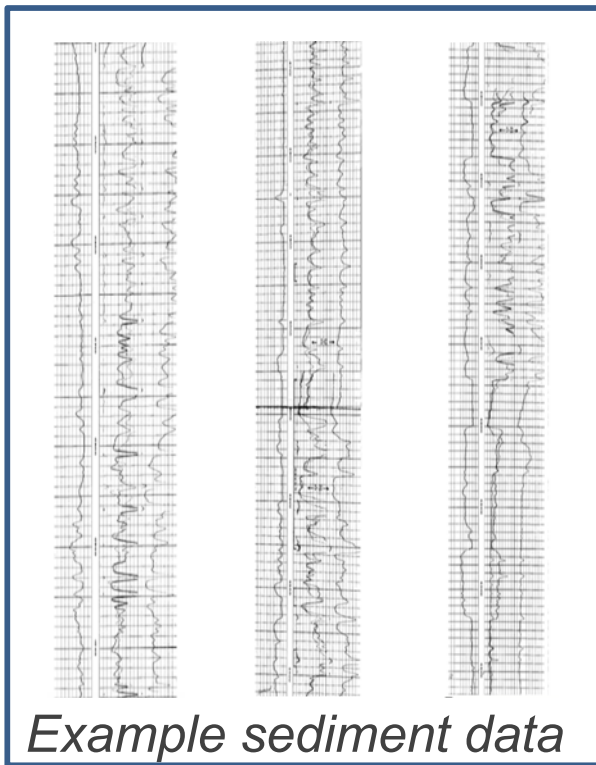


The western most finger does not contribute to the basin watershed



Well drilling logs tell us accurate details of sub-surface sediment layers

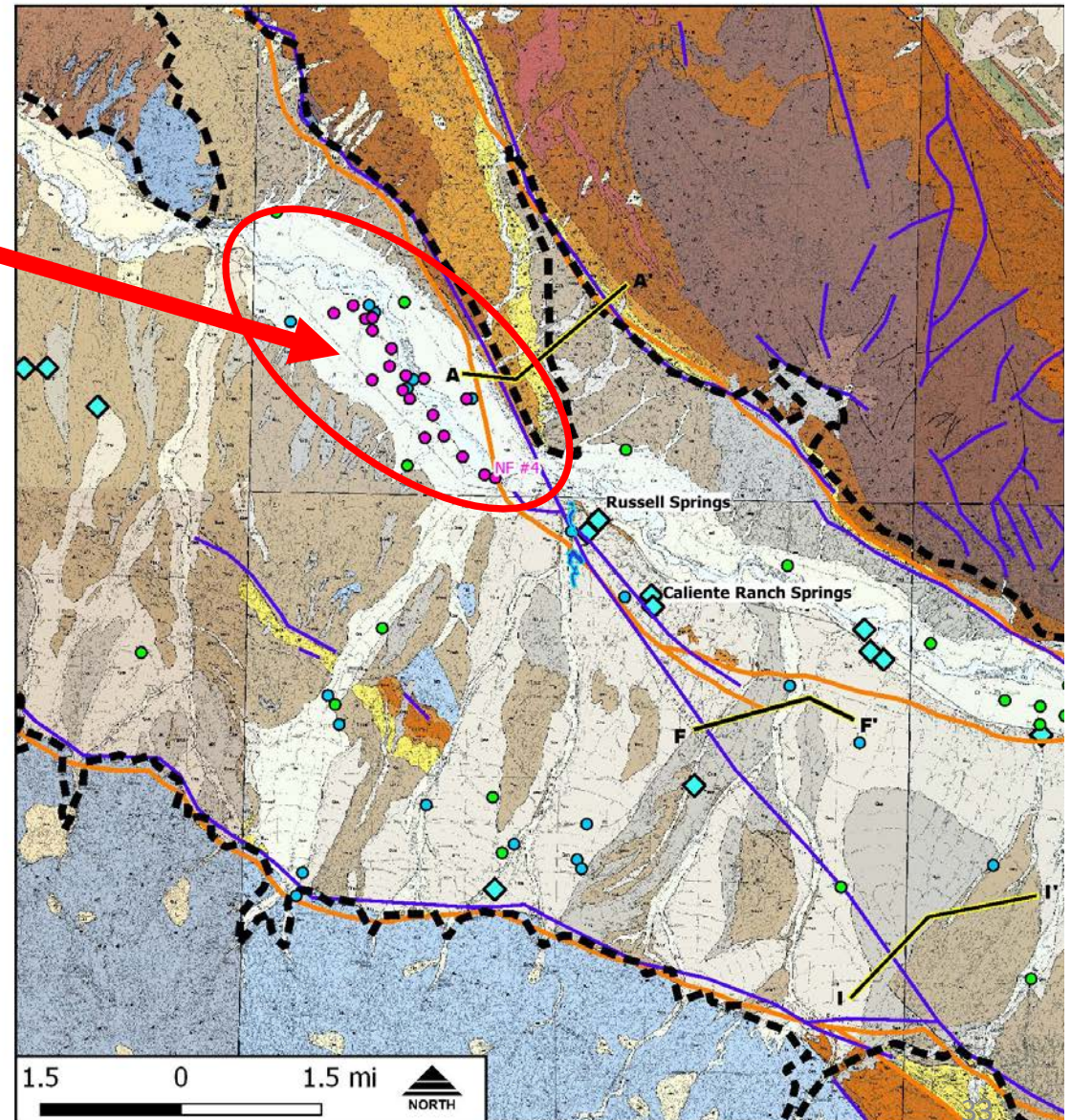
- Well casings are perforated where productive water is available and blocked above and below target zones



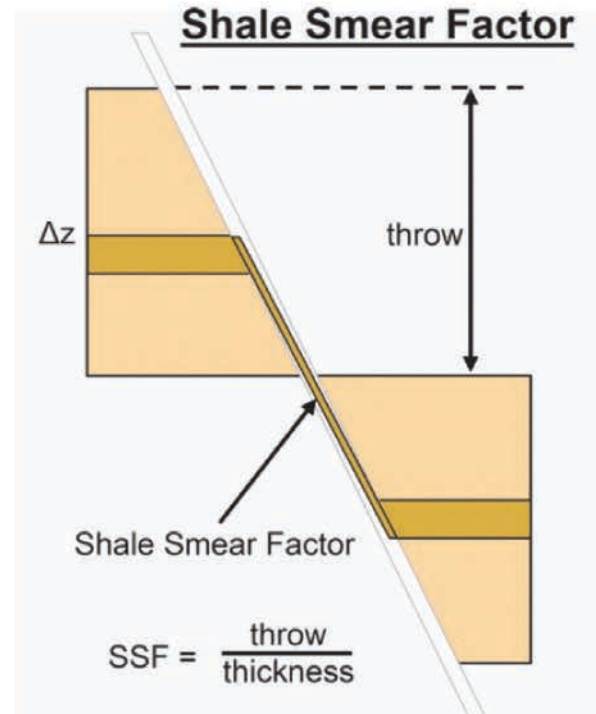
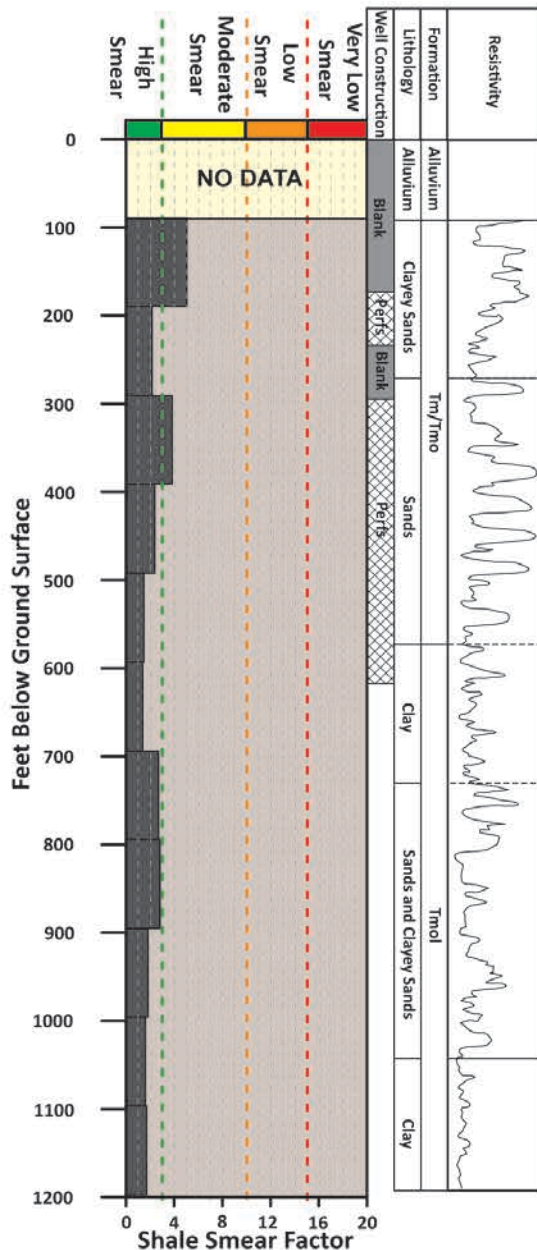
Lines are drawn approximately

Based on exploration and preliminary safe yield estimates we installed 12 production wells

- Production well water levels are monitored and recorded every 5 minutes

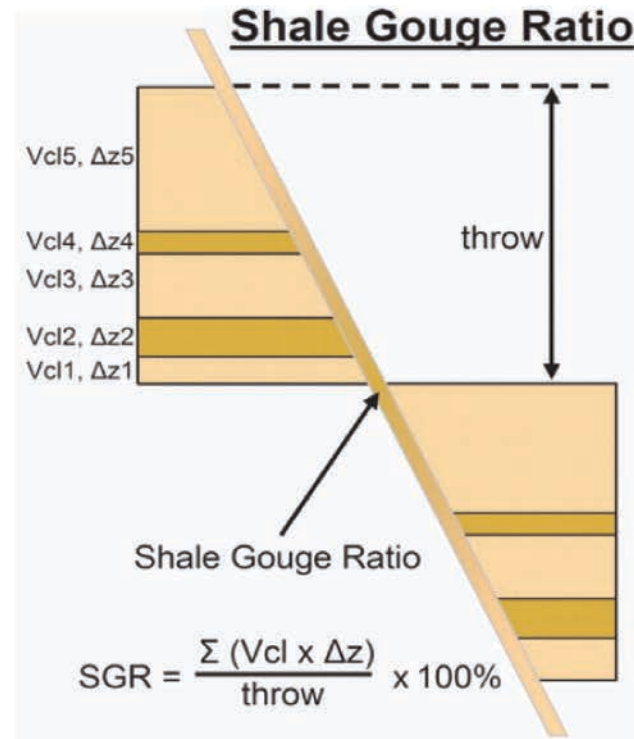
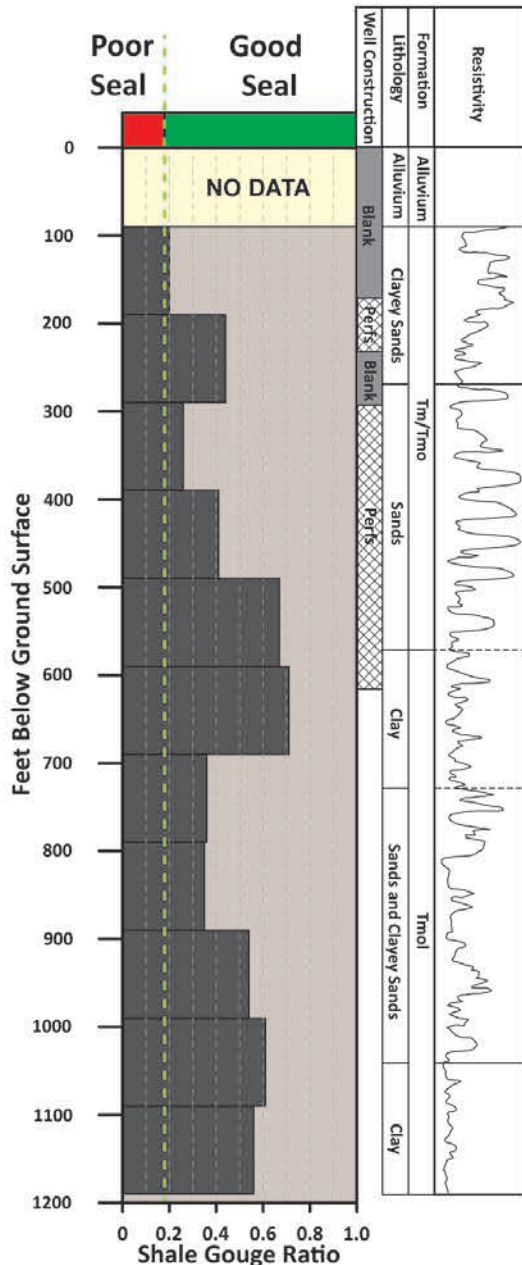


Additional analyses were conducted to estimate clay smearing across the fault



SSF Calculated using NF #4 Well Log and 100' of fault offset

Shale gouge ratio and shale smear factor both demonstrate a good seal on the fault



SGR Calculated using NF #4 Well Log and 100' of fault offset

A unique but telling feature on our property is an artesian well with ~25psi static pressure

- This well is on the east end of our property, in line with the cattle corral up-hill to the south
- Pressure has increased 10 psi since drilling
- Like the other wells, drilling logs are available





We are motivated to support the GSA Board in all aspects of sustainable water management in the Cuyama basin