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TECHNICAL MEMORANDUM

DATE: March 20, 2025 **PROJECT #:** 9100.68

TO: Salinas Valley Basin Groundwater Sustainability Agency (SVBGSA)

FROM: Victoria Hermosilla, P.G., Tiffani Cáñez

REVIEWED BY: Abby Ostovar, Ph.D;

PROJECT: Salinas Valley Hydrogeological Conceptual Model (HCM) Updates

SUBJECT: Upper Valley Aquifer Subbasin HCM Update: Data, Methods, and Findings

INTRODUCTION

Since submittal of the Upper Valley Aquifer Subbasin (Upper Valley Subbasin or Subbasin) Groundwater Sustainability Plan (GSP) in 2022, SVBGSA and partner agencies have analyzed new information and filled data gaps identified in the GSP. With this information, Montgomery & Associates (M&A) updated the Hydrogeologic Conceptual Model (HCM) for the Subbasin to better inform management decisions and prepare for the upcoming 5-year Periodic Evaluation. M&A worked with key partners to acquire data and review analyses, including Monterey County Water Resources Agency (MCWRA). The updated HCM expands and strengthens the understanding of the Subbasin presented in the 2022 GSP to guide SGMA implementation with greater accuracy. This HCM update focused on improving the subsurface understanding of the Upper Valley Subbasin within the expanded boundary defined in the California Department of Water Resources (DWR) 2016 Bulletin 118, which shifted the southern boundary from between San Ardo and Bradley down to the Monterey County line. This extended it to include many portions of the foothills based on the surficial-mapped presence of the Paso Robles Formation. These areas had not previously been linked to the narrow river corridor that historically characterized Upper Valley Subbasin. The previous Subbasin boundaries have aligned more with the MCWRA Assessment Zones shown on Figure 1. Concurrently, the updated HCM refines the geologic model that forms the basis for the groundwater flow modeling.

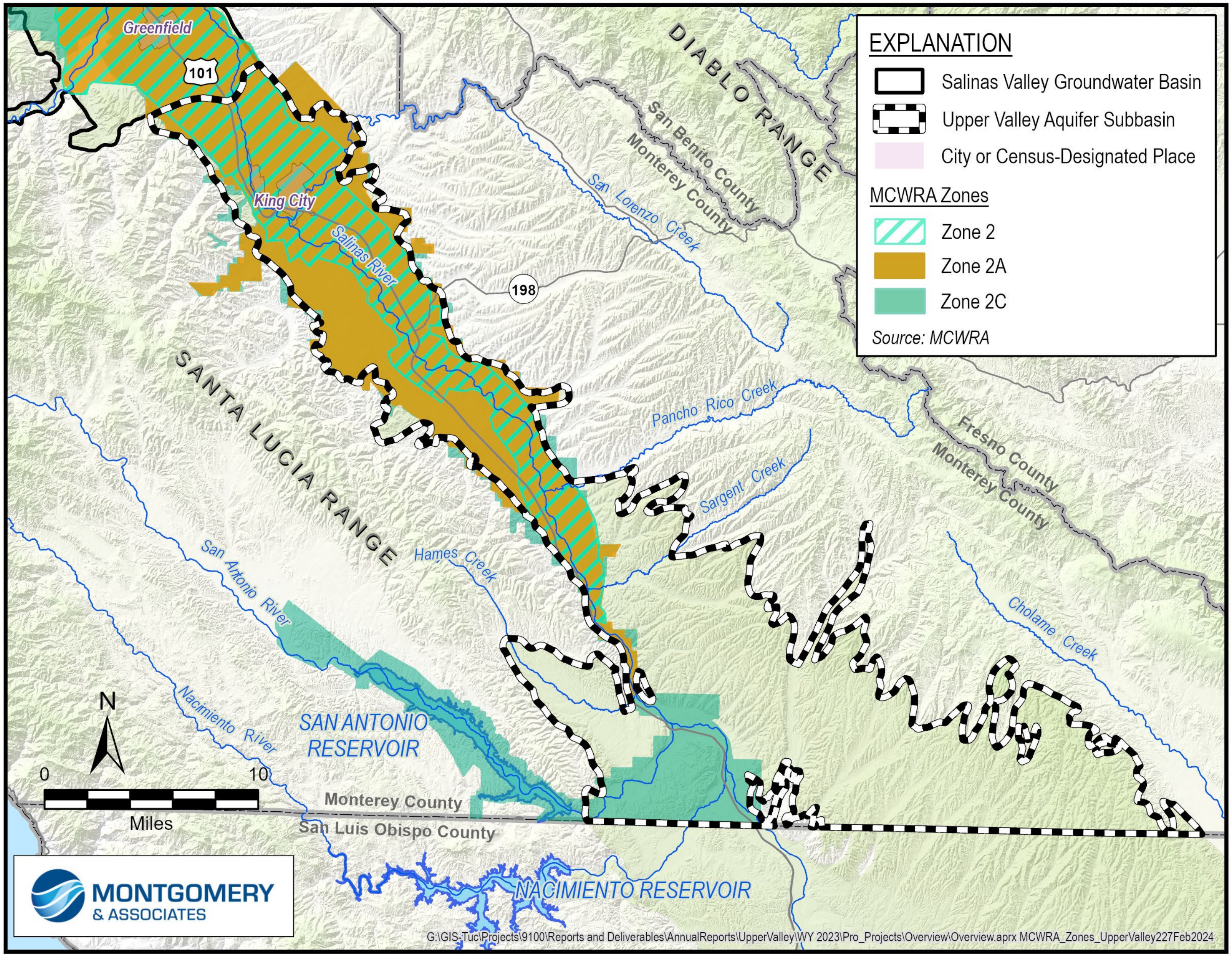

Figure 1. MCWRA Assessment Zones in Upper Valley Subbasin

The HCM update focused on key areas where new data indicated an updated understanding was needed. The primary updates to the HCM included:

- Revising what constitutes the bedrock and delineating the respective surface to define the bottom of the Subbasin
- Refining the extents and character of the Paso Robles Formation within the expanded Subbasin boundary
- Incorporating the Unnamed Sandstone into the geologic framework for the Subbasin and making accommodation to guide the groundwater modeling framework

This memo summarizes the data used, the analyses and methods employed, and the findings for the updated Upper Valley Subbasin HCM.

DATA

The data used to update the HCM are detailed in the following subsections.

Published Cross Sections and Reports

The 2022 GSP summarized published cross sections and reports. For this HCM update, the following reports and cross sections were reviewed again, compared with new data and information, and incorporated into the revised HCM.

- *Geology of the Southern Salinas Valley Area, California* (Durham, 1974)
- *Two-Dimensional and Three-Dimensional Digital Flow Models of the Salinas Valley Ground-Water Basin, California* (Durbin, *et al.*, 1978)
- *State of the Salinas Rive Groundwater Basin – Hydrology Report* (Brown & Caldwell, 2015)
- *Final Report – Paso Robles Groundwater Basin Study, Phase 2 – Numerical Model Development, Calibration, and Application* (Fugro West, *et al.*, 2005)

Well Completion Reports

Well Completion Reports (WCRs) helped refine geologic interpretations and included important information such as driller-observed lithology, screen intervals, and date of well installation. Some WCRs were more detailed than others with more frequent lithologic descriptions, electric logs (e-logs), and other construction or water level details.

M&A obtained WCRs through the California Department of Water Resources (DWR) Online System for Well Completion Reports (OSWCR) database, the County of Monterey Health Department, Monterey County Water Resources Agency, other collaborating partner agencies, and private entities. In particular, MCWRA provided hundreds of WCRs that were mostly supplementary to other geophysical data, but in some regions they were the only data available.

Numerical Groundwater Flow Model Layers

Previous and current groundwater flow models reflect various conceptual understandings of the Subbasin. Models reviewed for the HCM update included:

- The provisional Salinas Valley Integrated Hydrologic Model (SVIHM). The Salinas Valley Geologic Framework (Sweetkind, 2023) defines the spatial extent, depth, and distribution of geologic material textures for the provisional SVIHM. This geologic dataset was developed by the U.S. Geological Survey (USGS) to cover the entire Salinas Valley and includes a geological framework with key documentation. The SVIHM covers the northern portion of the Upper Valley Subbasin, and primarily along the Salinas River corridor.
- The final Paso Robles Groundwater Model. The Paso Robles Groundwater Model was developed as a planning tool to quantitatively evaluate future water trends in the Paso Robles Basin (Fugro West, *et al.,* 2005). The foundational hydrogeologic conceptual model defines the spatial extent, depth, and distribution of geologic material textures. The Paso Robles Groundwater Model covers much of the expanded Subbasin area in Monterey County outside of the Salinas River corridor.

These models were primarily used to compare and refine the depths and thicknesses of the hydrostratigraphic layers for the Salinas Valley Groundwater Basin HCM update.

Geophysical Data

Airborne Electromagnetic (AEM) resistivity data was the primary type of geophysical data used in this HCM update. The DWR collected these data in 2020 as part of the DWR Survey Area 1 (DWR, 2020). These data provide a broad coverage of general lithologic trends.

AEM surveys measure the resistivity of materials, both solid and liquid, in the subsurface over large areas. Lower resistivity materials include clays, silts, and groundwater with high total dissolved solids (TDS) concentrations. Higher resistivity materials include sands and gravels, some types of bedrock, and groundwater with lower TDS concentrations. AEM data are useful for filling gaps between known data points such as wells. This effort focused on reviewing and analyzing the lower resistivities at various target depths where the bedrock was expected.

Geologic Maps

Geologic maps provide a visual representation of the rocks, formations, and structures encountered at land surface. The primary map used for this HCM update was Digital Geologic Map of Monterey County, California, 1934-2001 (Rosenberg, 2001). This geologic map anchored other data to the various lithologic units during the HCM update .

METHODS

Geologic modeling and visualization software was used to update the Subbasin hydrostratigraphy through the following steps, starting with the data with the most confidence:

1. Integrating and reviewing the data using Leapfrog Geo software
2. Prioritizing data based on reliability and availability
3. Selecting the best data to define the new hydrostratigraphic layers
4. Interpolating the data to create new hydrostratigraphic layers within Leapfrog Geo software

Geologic Modeling Software

Developed by Seequent, Leapfrog Geo software was the primary 3D modeling and visualization software used to relate and analyze the different types of data described above. All data were imported into the software, methodically reviewed, and compared to each other.

Data Prioritization

Various data have differing levels of confidence. The list below demonstrates the general hierarchy of confidence in the various data types used in this analysis:

1. Geologic Maps
2. Published Cross Sections and Reports
3. Borehole Logs (WCRs)
4. AEM data
5. Groundwater Flow Models

Concurrently using multiple data sources can improve confidence in geologic interpretations. For example, confidence in AEM data can be significantly improved when it is combined and coordinated with geologic maps or borehole logs.

Data are not uniformly distributed throughout the Subbasin. Wells and associated WCRs are more concentrated in areas with more infrastructure, whereas AEM flightlines generally cover areas with less or no infrastructure. Therefore, hydrogeologic interpretations are more strongly influenced by the availability of data in different areas.

Hydrogeologic interpretations initially focused on areas with a higher density of multiple data types to cross validate data. Developing confidence in any data type allowed analyses using those data to expand horizontally and vertically and revise the HCM as needed.

The decision-making procedures for updating the HCM generally used the following guidelines. These guidelines do not represent a decision-making hierarchy, rather they are a group of guidelines that interact in various ways based on circumstances in each particular area.

- Newer geologic maps were prioritized over older geologic maps.
- Newer published cross sections were prioritized over older published cross sections, unless there was higher confidence in older cross sections based on the author and how the sections correlated with other data.
- Geologic maps provided anchor locations for the geologic surface contacts including bedrock outcrops where available.
- The hydrostratigraphy was refined by jointly using AEM data, WCRs, and published cross sections in places where the various data types overlapped. This strengthened confidence in AEM data interpretation.
- Where AEM data and cross sections did not align, well logs used to develop the cross section were reviewed and used in conjunction with the AEM data.
- AEM data were the primary data source for hydrostratigraphic interpretation in areas with limited borehole data.
- Published cross sections were used where AEM data were not available and correlated with the nearest AEM data.
- WCRs were used as verification and interpolation points for key priority areas.
- Areas with no other nearby data relied on the SVIHM geologic model or SWI Model layers to interpolate the hydrostratigraphic layers.

Figure 2 shows a prime example of an analysis that encompasses many types of data and shows how they are correlated to provide a more cohesive understanding of the hydrostratigraphy of the Basin. The cross section on Figure 2 was exported from the Leapfrog geologic model and spans the 180/400-Foot Aquifer Subbasin, the Monterey Subbasin, and the Seaside Subbasin. Hydrostratigraphy in the north (left on Figure 1) is based on WCRs with finer sediments highlighted in blue. Hydrostratigraphy in the center of Figure 1 is based on AEM data, with finer sediments highlighted in blue. A previously published map of the Monterey Formation (HydroMetrics, 2009) provided structural data in the south, as well as locations of surface outcrops of Monterey Formation highlighted with yellow disks. Published cross sections, e-logs, and surface geology maps are not shown on the figure; however, in this location they were also reviewed for confirmation of other data. Through careful analysis and integration of all data types, a new bedrock surface was developed, shown in pink mesh and green contour lines on Figure 2. This figure best illustrates the data synthesis methodology applied to each subbasin within the Salinas Valley Groundwater Basin, and should be viewed as a conceptual depiction of the types of data and decision processes used to update the Upper Valley Subbasin HCM.

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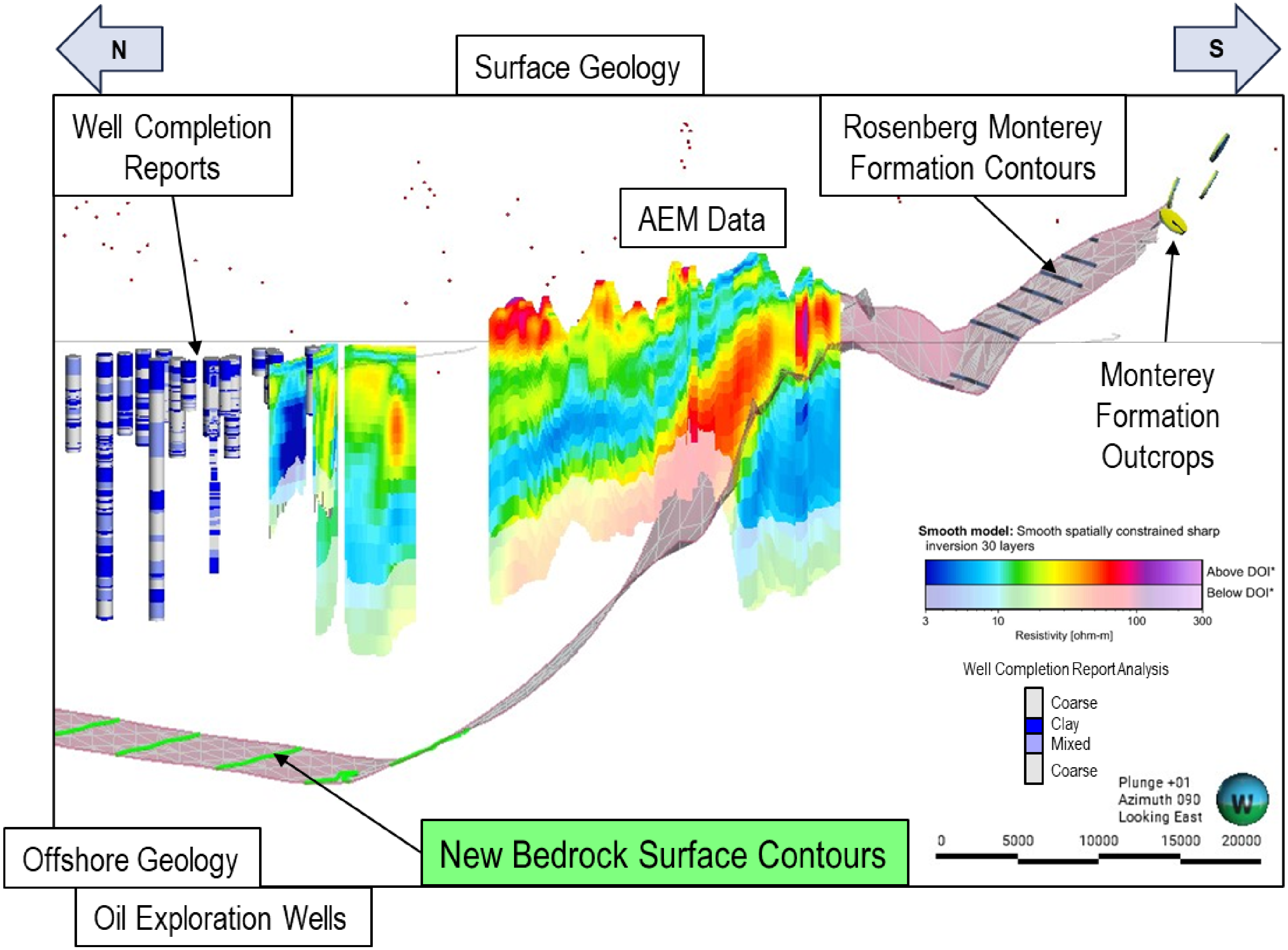

Figure 2. Example of Different Types of Data Juxtaposted in Leapfrog Geo Software to Delineate Updated Bedrock Surface

Across the Subbasin, hydrostratigraphic decision making was prioritized from deepest layers to shallowest layers. The bedrock surface was the first priority and was modified using AEM data and surface geology maps. After revising the bedrock surface, the HCM was revised focusing on the geologic formations that comprise the principal aquifer through delineating the Alluvial sediments, the Paso Robles Formation, and the newly included Unnamed Sandstone.

RESULTS/FINDINGS

Results of the 3 primary HCM updates listed in the introduction are detailed below.

Bedrock Surface

Principal Data Used: surface geology maps, AEM data, published cross sections

Understanding the depth and geometry of the bedrock helps determine the available aquifer space for groundwater storage in the Upper Valley Subbasin. The previous conceptualization of the bedrock was based on the findings of Durham (1974), various oil exploration studies, and Durbin, *et al.* (1978). Identifying the contact with crystalline rocks was the primary focus of Durham (1974) and the oil exploration studies, while Durbin *et al.,* (1978) focused on the "usable" portion of the groundwater basin and constrained the Upper Valley to a narrow corridor along the Salinas River. Both of these approaches show a shallowing and narrowing of the Basin from northwest to southeast, mirroring large structural influences through this region. Historically, defining the bedrock surface with respect to groundwater production outside of the river corridor has not been extensively explored.

The updated conceptual understanding brings together the previous sources of information with newly available AEM data to define the bedrock across the whole Subbasin. The northernmost areas of the Subbasin define the bedrock as the contact with either the Monterey Formation along the Santa Lucia Range or the crystalline rocks of the Gabilan Range. Both of these formations are low permeability and generally non-water bearing, thereby comprising a combined bedrock to define the Basin bottom. This aligns with the combined bedrock layer in the SVIHM which comprises the Monterey Formation and Gabilan granites (Sweetkind, 2023). The southernmost areas of the Subbasin rely on the work conducted by Fugro West *et al.,* (2005) in the adjacent Paso Robles Subbasin, which defines the Basin bottom as the contact with the Pancho Rico Formation. The Paso Robles Subbasin geologic and numerical models do not include the Pancho Rico Formation as part of its water-bearing formations because of its low permeability and high saline content if groundwater is present (Fugro West *et al.*, 2005).

AEM data were used to verify the locations and depths of the Monterey Formation, crystalline rocks, and Pancho Rico Formation, where previously published cross sections had defined them. These formations constitute the generally non-water-producing formations in the Subbasin.

Then, the AEM transects between the northernmost and southernmost locations of verified data were used to delineate the top of the bedrock surface that demarcates the overlying water-producing sediments from the underlying non-water-producing formations. This linked the Pancho Rico Formation to the previously defined bedrock for the rest of the Salinas Valley Groundwater Basin. Therefore, the Pancho Rico Formation is grouped into the combined bedrock layer that defines the Subbasin bottom. The bedrock surface is now conceptualized to be shallower than that in the SVIHM since it includes the Pancho Rico Formation.

Figure 3 demonstrates as an example of how published cross sections and AEM data were used together to define the bedrock surface. The figure shows an AEM transect north of King City where the alluvium is represented by the hotter colors indicating high-resistivity data, and the cooler colors symbolize the less resistive Paso Robles and Pancho Rico Formations. In this Subbasin, the AEM data do not always show a clear distinction between the Paso Robles and Pancho Rico Formations. This is due to the higher clay content within the Paso Robles Formation and the higher salinity in the Pancho Rico Formation, which can sometimes muddle the resistivity signal. To help identify the top of the Pancho Rico Formation, published cross sections were used as a starting point to anchor the AEM data, then interpolated outward. The cross sections developed by Durham (1974) were primarily used in the northern portion of the Subbasin. Based on Durham (1974), the contact between the Paso Robles and Pancho Rico Formations occurs at an elevation of approximately -400 feet (NAVD88) in this area as indicated by the dashed line on Figure 3. This contact was refined with AEM data to update the surface of the Pancho Rico Formation and, accordingly, the Subbasin bottom.

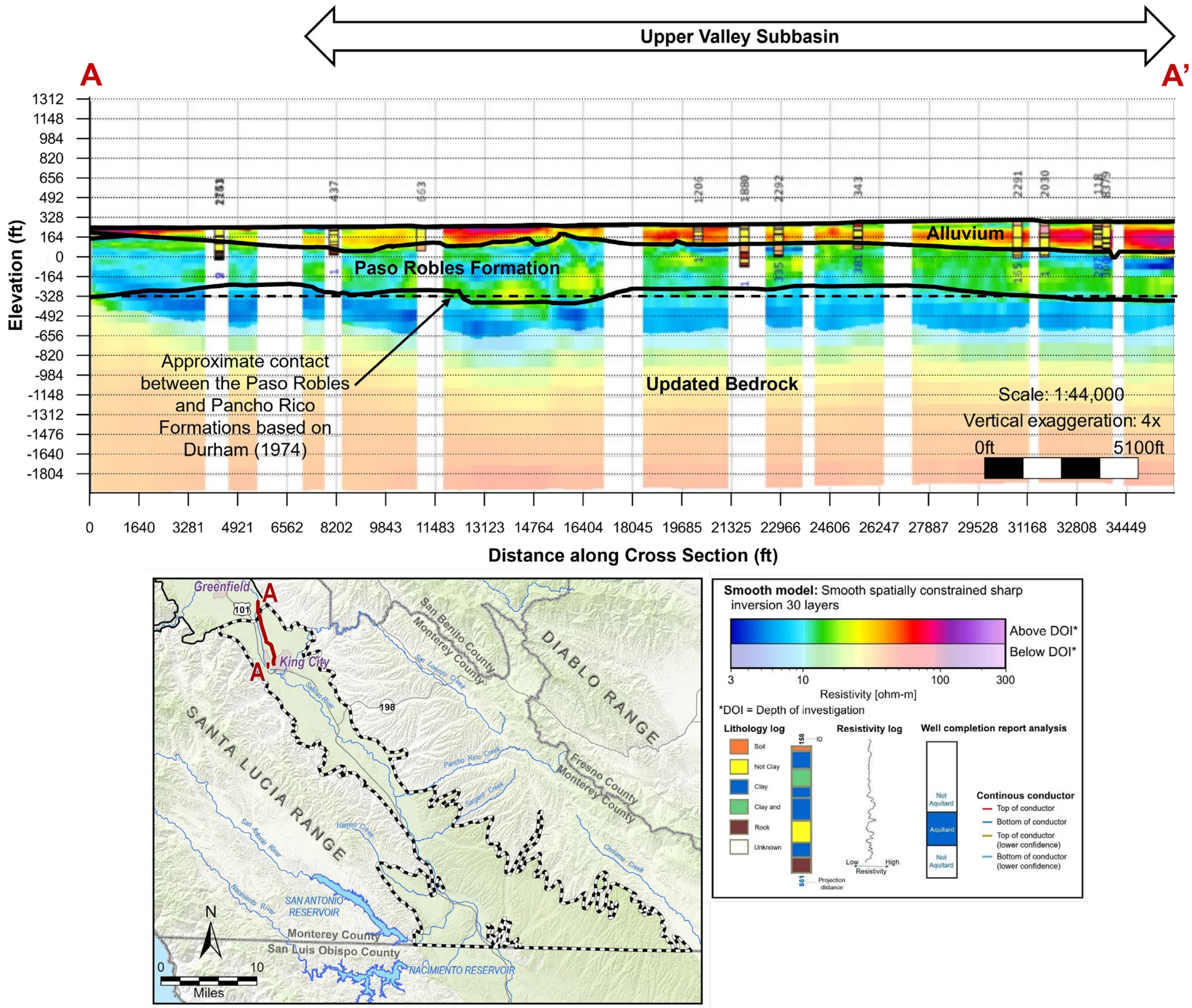

Figure 3. Updated Conceptual Understanding of Bedrock Surface and Key Data Used

Refining the Paso Robles Formation in the Expanded SGMA Area

Principal Data Used: surface geology maps, AEM data, published cross sections

The previous conceptualization of the Upper Valley Subbasin focused on the shallow alluvium along the river corridor in the northernmost areas, as this is where most of the groundwater production occurs. Previous reports noted the underlying geology but did not delineate their extents or depths as these were not pertinent to the bulk of groundwater wells in the area. The SGMA boundary expansion southward to the county boundary is tied to the mapped extent of the Paso Robles Formation to the east and west. The Paso Robles Formation is a primary component of hydrostratigraphy throughout the subbasins under SVBGSA's jurisdiction and the adjacent Paso Robles Subbasin, and its expanded inclusion in the Upper Valley Subbasin acknowledges the Paso Robles Formation's significance in groundwater management.

The 2022 GSP defines the Subbasin as having 1 principal aquifer, which consists of the alluvium and the Paso Robles Formation as there is no consistent clay layer that separates these 2 water-bearing units. However, gaining a better understanding of the Paso Robles Formation within the expanded area is an important component to understanding the Subbasin as a whole. Figure 4 illustrates the surface geology of southern Monterey County and can be used to explain the expansion of the Subbasin's boundary in relation to SGMA. This figure shows the alluvium (Qt) as pastel yellow colors and the Paso Robles Formation (QTp, QTcl, QTm, and QTpc) as the taupe color. To the west along the Santa Lucia Range, both formations generally terminate at the Monterey Formation (Tmi, Tm, Tml), represented by the pastel orange color. The Subbasin boundary to the east is roughly delineated by the contact of the alluvium or Paso Robles Formation against the Pancho Rico Formation (Tpo, Tpi, Tpd, and Tps) or the Unnamed Sandstone (Tucs, Tucc), yellow-brown and pastel coral, respectively.

The updated conceptualization of the Paso Robles Formation in the Subbasin was refined using surface maps to guide the areal extent and AEM data to guide the vertical extents. In the expanded area of the Subbasin, the Paso Robles Formation and underlying sedimentary sequence generally dip to the west. The Paso Robles Formation unconformably overlies the Unnamed Sandstone or the bedrock units, depending on where it is encountered in the Subbasin. In other locations, the bottom of the Paso Robles Formation could not be identified in the AEM data due to its variable clay content, or the limited AEM depth of investigation throughout the Subbasin. Reasonable estimates of its thickness were determined based on published reports. Figure 5 shows an AEM transect across the southern area of the Upper Valley Subbasin where the Paso Robles Formation is at the surface. This transect demonstrates the variable thickness and clay content of the Paso Robles Formation. The higher clay content in the Paso Robles Formation, and thus lower hydraulic conductivity, potentially impacts hydraulic connectivity with the overlying alluvium by impeding groundwater flows. It is important to note that for this HCM update, the Paso Robles Formation was identified laterally and vertically, but identifying extensive clay deposition within the formation was not a priority at this time.

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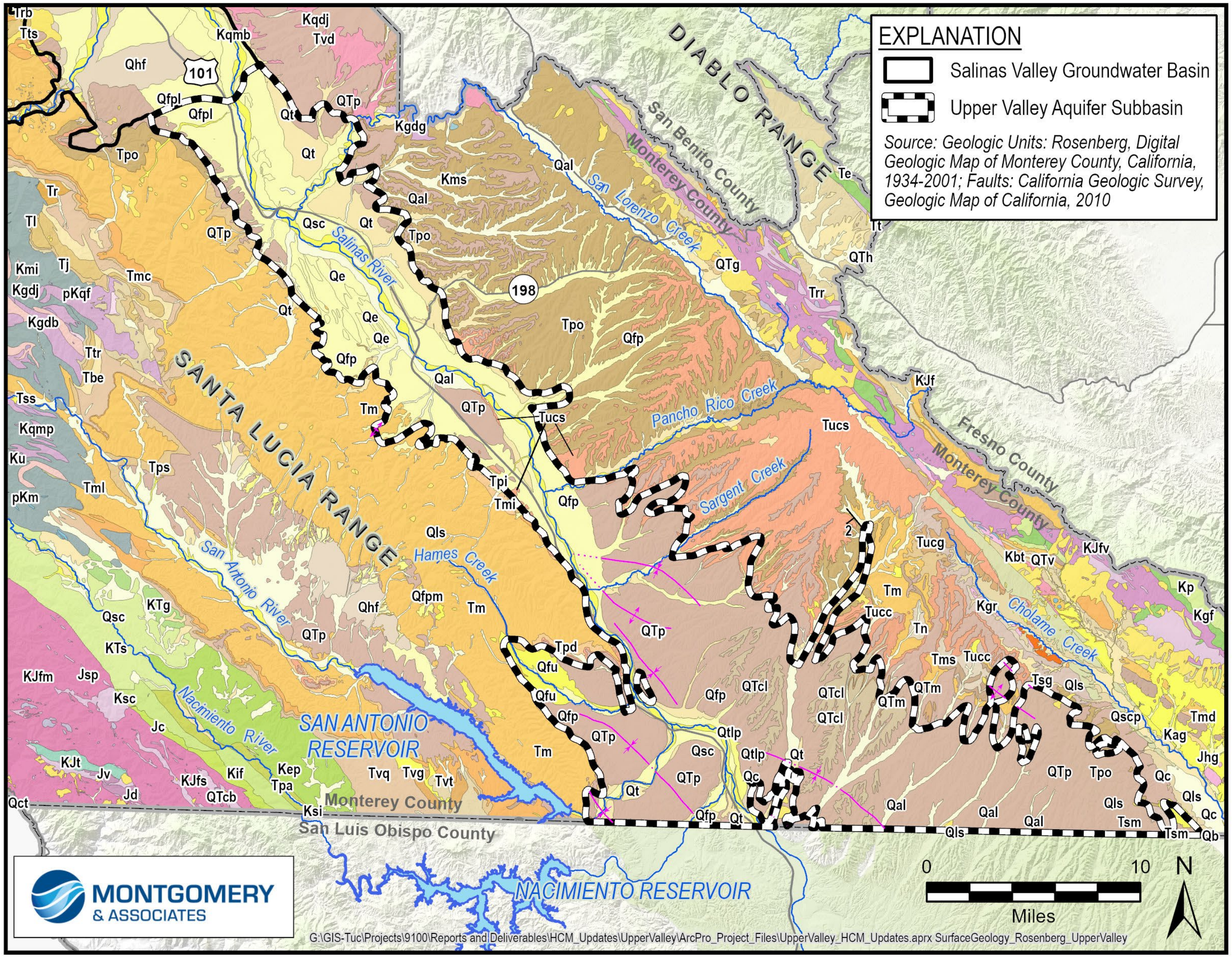

(from Jennings, et al., 2020; Rosenberg, 2001)

Figure 4. Surface Geology of the Upper Valley Subbasin and Southern Monterey County

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FIGURE 4 EXPLANATION

QUATERNARY

- Qal — Alluvial deposits, undifferentiated
- Qhf — Alluvial fan deposits, Holocene
- Qfpl — Alluvial fans, late Pleistocene
- Qfpm — Alluvial fans, middle Pleistocene
- Qb — Basin deposits
- Qct — Coastal terraces
- Qc — Colluvium
- Qd — Dune deposits
- Qe — Eolian deposits
- Qfp — Flood-plain deposits, undifferentiated
- Qt — Fluvial terrace deposits, undifferentiated
- Qtlp — Fluvial terrace deposits, late Pleistocene
- Qls — Landslide deposits
- Qfu — Pleistocene alluvial fans, undifferentiated
- Qscp — Sandstone and conglomerate
- Qsc — Stream channel deposits

QUATERNARY-TERTIARY

- QTp — Paso Robles Formation, undifferentiated
- QTcl — Paso Robles Formation, clay
- QTm — Paso Robles Formation, marl
- QTg — Paso Robles Formation, gravel
- QTpc — Paso Robles Formation, clay and gravel
- QTcs — Sedimentary rocks of Crystal Knob
- QTcb — Basalt of Crystal Knob
- QTv — Varian Ranch beds
- QTh — Hans Grieve Formation

TERTIARY

- Tucc — Unnamed clastic sedimentary unit
- Tucs — Unnamed clastic sedimentary unit
- Tucg — Unnamed clastic sedimentary unit
- Te — Etchegoin Formation
- Tpd — Pancho Rico Formation
- Tpd — Pancho Rico Formation, diatomite
- Tpo — Pancho Rico Formation, mudstone
- Tps — Pancho Rico Formation, sandstone
- Tpi — Pancho Rico Formation, siltstone
- Tsm — Santa Margarita Sandstone
- Tm — Monterey Formation, siliceous
- Tmi — Monterey Formation, siltstone
- Tml — Monterey Formation, semi-siliceous
- Tmc — Monterey Formation, clay shale
- Tmd — Monterey Formation, Devilwater member
- Tms — Unnamed clastic sediments, marine sandstone
- Tn — Unnamed clastic sediments, red beds
- Tsg — Unnamed conglomerate and sandstone
- Trb — Red beds
- Tts — Marine sandstone
- Trr — Reef Ridge Shale
- Tt — Temblor Sandstone
- Tvr — Rhyolite breccia and obsidian
- Tvd — Dacitic felsite
- Tvt — Vaqueros Formation
- Tvg — Vaqueros Formation
- Tvq — Vaqueros Formation
- Tbe — Berry Formation
- Ttr — The Rocks Sandstone
- Tl — Lucia Shale
- Tj — Junipero Sandstone
- Ttj — Tejon Formation
- Tpa — Piedras Altas Formation
- Tr — Reliz Canyon Formation
- Tss — Unnamed marine sandstone

CRETACEOUS

- KTs — Marine clastic sedimentary rocks
- KTg — Marine clastic sedimentary rocks
- Kep — El Piojo Formation
- Ksi — Shut-in Formation
- Kif — Italian Flat Formation
- Ksc — Steve Creek Formation
- Ku — Unnamed sedimentary rocks, eastern facies
- Kgf — Gravelly Flat Formation
- Kp — Panoche Formation
- Kgr — Granitic rocks, undifferentiated
- Kgdg — Granodiorite of Gloria Road
- Kgdb — Granodiorite-quartz diorite of Bear Mountain
- Kqdj — Quartz diorite-granodiorite of Johnson Canyon
- Kgdj — Porphyritic granodiorite of Junipero Serra Peak
- Kqmb — Quartz monzonite of Bickmore Canyon
- Kqmp — Quartz monzonite of Pinyon Peak
- Kbt — Biotite tonalite
- Kag — Aplitic granite
- Kmi — Gabbro and diorite (Santa Lucia Range)
- Kms — Schist of Sierra de Salinas

JURASSIC-CRETACEOUS

- KJt — Toro Formation
- KJf — Franciscan complex, undifferentiated
- KJfs — Franciscan complex, graywacke
- KJfv — Franciscan complex, greenstone
- KJfm — Franciscan complex, melange

JURASSIC

- Jd — Diabase and diorite
- Jhg — Hornblende quartz gabbro of Gold Hill
- Jsp — Serpentinite
- Jv — Mafic volcanic rocks
- Jc — Radiolarian chert

PRE-CRETACEOUS

- pKm — Marble
- pKqf — Quartzofeldspathic rocks

GEOLOGIC FEATURES

- anticline, certain
- plunging anticline, certain
- anticline, concealed
- plunging anticline, concealed
- syncline, certain
- syncline, concealed
- fold axis, certain
- fold axis, concealed
- 2 Strike and dip

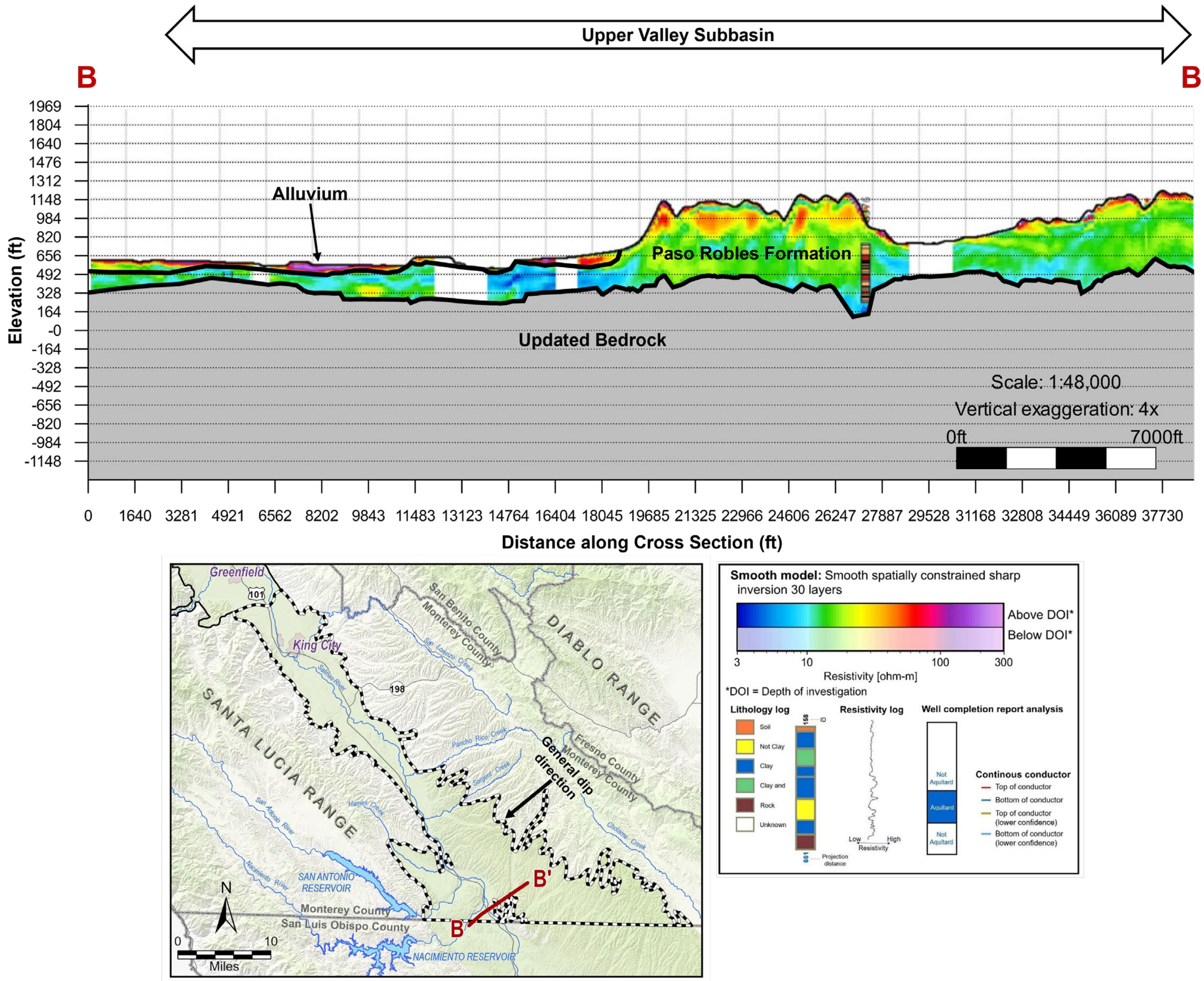

Figure 5. Key Data Demonstrating Variability of Paso Robles Formation within the Upper Valley Subbasin

Inclusion of the Unnamed Sandstone

Key Data Used: AEM data, surface geology maps

Prior to the expansion of the southern half of the Upper Valley Subbasin to the county line, the Unnamed Sandstone was not associated with the Subbasin. With the expanded boundary, portions of the Unnamed Sandstone are now included at the margins, but the unit is also exposed in the center of the Subbasin due to the general westerly dipping nature of the sedimentary sequence that includes the Monterey Formation stratigraphically up to the Paso Robles Formation. The portions of this formation that are included within the Subbasin boundary, designated by the symbol Tucs, are shown on Figure 4. This formation has been identified and described at other locations within the Coastal California sedimentary sequence, and in the Subbasin is situated between the Paso Robles and Pancho Rico Formations.

Although the Unnamed Sandstone is not as extensive on the surface as other formations within the Upper Valley Subbasin, AEM data indicate that it is present in more areas in the Subbasin than previously understood. Figure 6 displays an east-west AEM transect that meets the Subbasin's southeastern boundary. Along this transect, the Unnamed Sandstone is exposed at the surface on the easternmost side (based on surface geology) and then dips to the west beneath the Paso Robles Formation (based on AEM data). The Unnamed Sandstone is distinguished by the higher-resistivity data represented by the larger yellow patch in the transect (Figure 6).

A sliver of the Unnamed Sandstone is mapped along the main river corridor where most of the wells in the Subbasin are found, however there are no known wells completed in this unit. Figure 7 shows a northwest-southeast AEM transect that intersects with the Unnamed Sandstone across the middle of the river corridor. The surficial high-resistivity data represents the alluvial sediments that overlay the Paso Robles Formation, demarcated by the cooler colors indicative of lower resistivity data. The Paso Robles Formation is underlain by another set of high-resistivity data depicting the Unnamed Sandstone. The thickness of the Unnamed Sandstone here shows the westerly-dipping sedimentary sequence, first observed along the eastern margins of the Subbasin, and continuing underneath the Paso Robles Formation even to the center of the Subbasin. This suggests that although the mapped outcrops of the Unnamed Sandstone unit are minimal within the Subbasin boundary, the areal extent of the unit is significant.

The updated understanding of the Unnamed Sandstone is as a separate geologic unit due to its mapped outcrops and distinctly separate resistivity profile in the subsurface. However, there are no aquifer test data or wells completed within the Unnamed Sandstone that could provide hydrologic data or information about it. Therefore, for SGMA purposes, it will be modeled and managed as part of the Paso Robles Formation in the Subbasin.

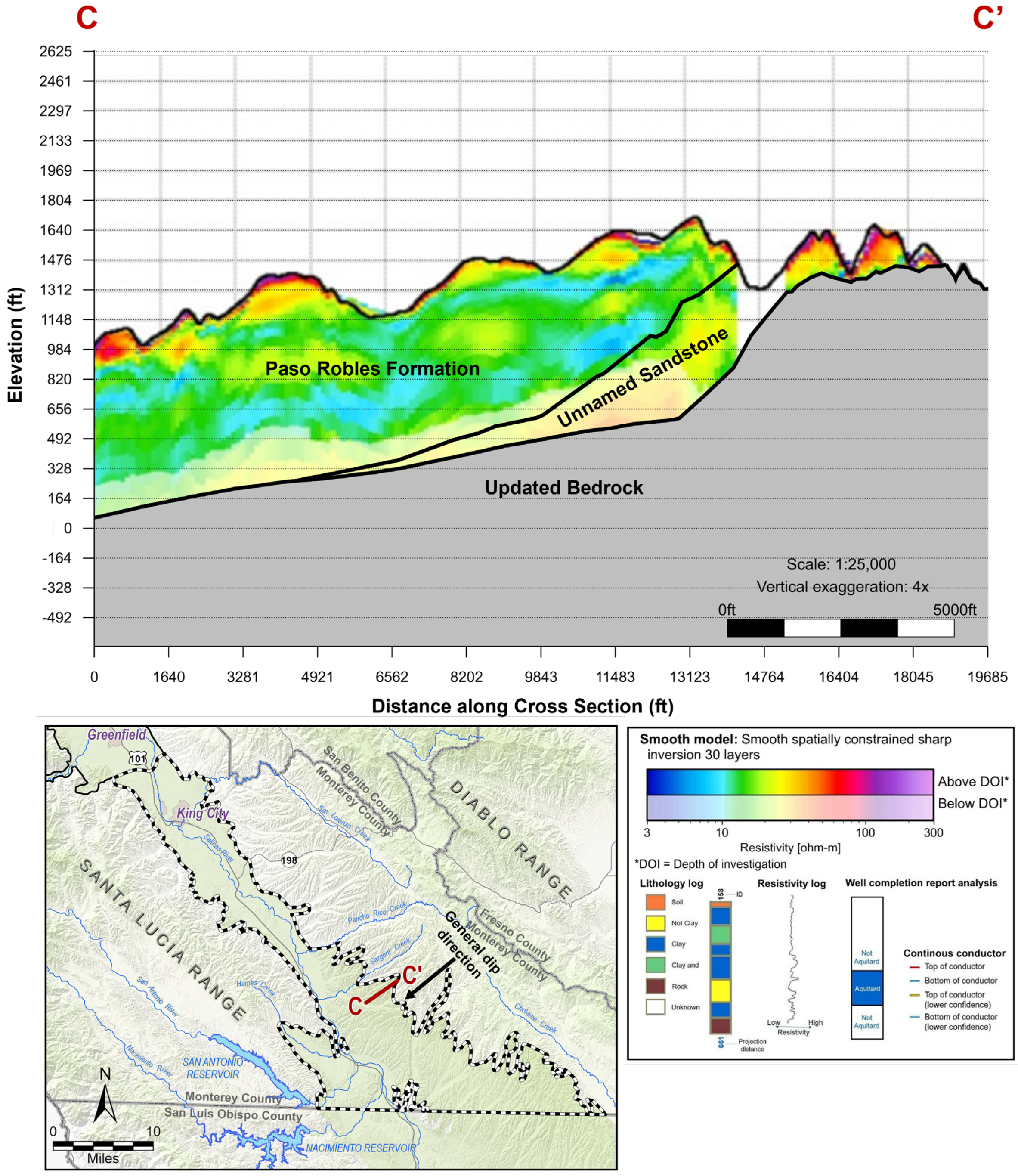

Figure 6. Example 1 of the Updated Conceptual Understanding of the Unnamed Sandstone and AEM Transect

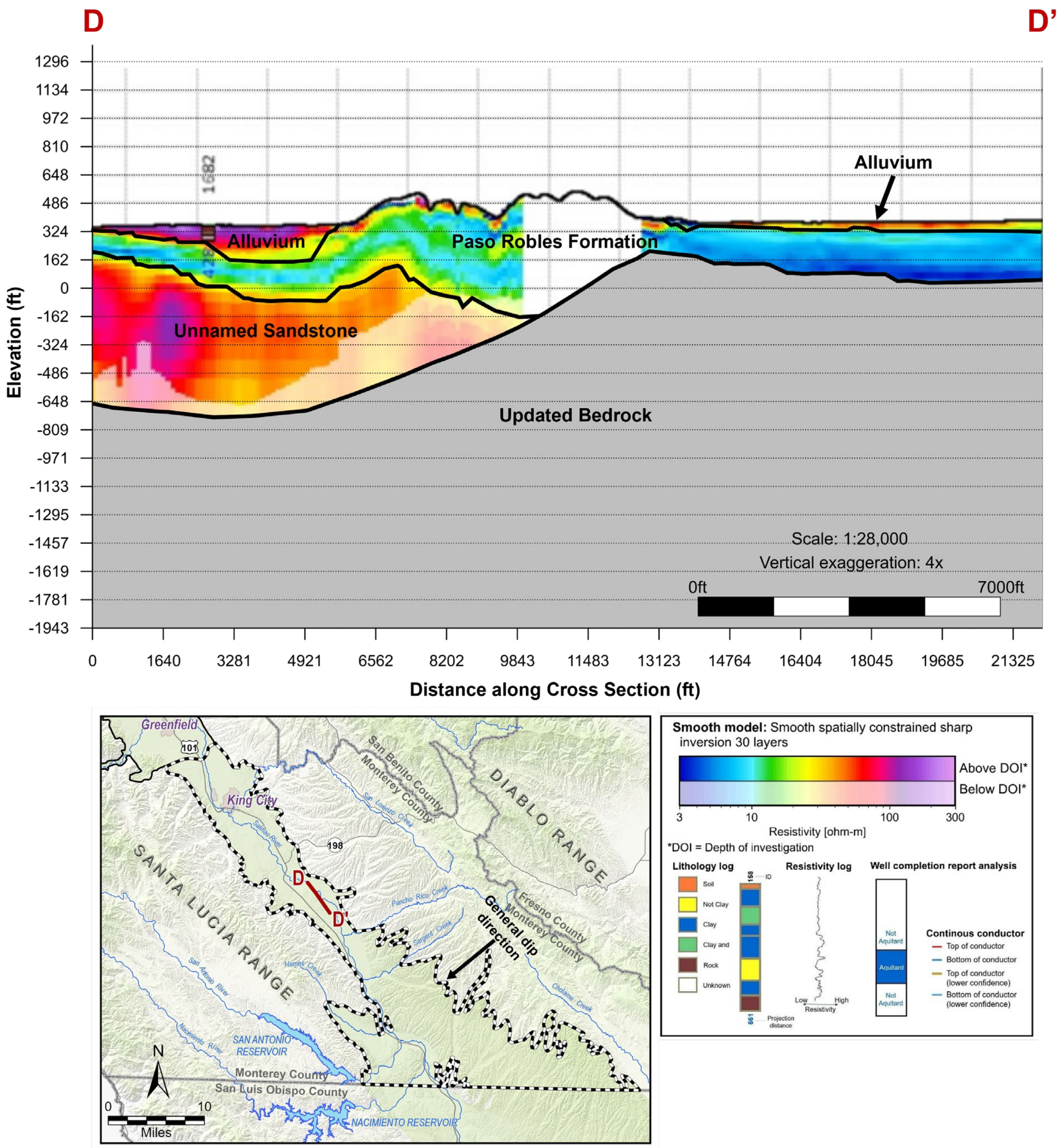

Figure 7. Example 2 of the Updated Conceptual Understanding of the Unnamed Sandstone and AEM Transect

CONCLUSIONS

The Upper Valley Subbasin HCM presented in the GSP was developed using the best available data and information at the time. This HCM update uses the best available data and information procured since GSP development and provides clear refinements for the Subbasin overall.

The following are principal updates to the Upper Valley Subbasin HCM:

- The bedrock surface that delineates the bottom of the Subbasin has been updated to include the Pancho Rico Formation along with the established Monterey Formation and crystalline rocks. Therefore, the bedrock surface has also been found to be shallower than previously understood. These 3 formations mark the top of the non-water-bearing sediments, depending on location within the Subbasin.

- The Paso Robles Formation is generally westerly dipping in the expanded area of the Subbasin and was refined with AEM data to delineate its depth, thickness, clay content, and contact with other formations throughout the Subbasin.

- The Unnamed Sandstone follows the westerly dipping trend of the Paso Robles Formation and is now recognized as an extensive and distinct geologic formation in the Subbasin. However, it lacks hydrogeologic data and will be grouped with the Paso Robles Formation for groundwater flow modeling and management purposes, subject to future refinements as additional data acquisition may warrant.

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