TECHNICAL MEMORANDUM

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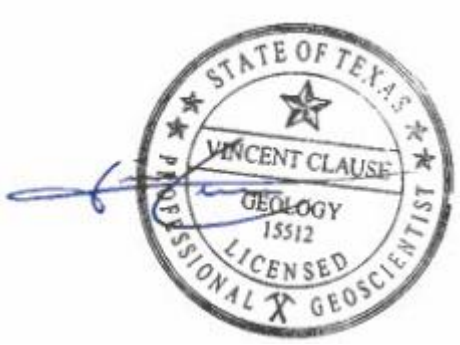
TO:	Ms. Genell Hobbs, and Kinney County GCD, Board of Directors
FROM:	Vince Clause, PG, GISP, Freese and Nichols, Inc.
SUBJECT:	Update on Task 4 Conceptual Model Project
PROJECT:	KG25636 – FY26 Hydrogeological Consulting Services
DATE:	August 20, 2026
CC:	Greg Ellis, GM Ellis Law Firm PC Jim Burton, EcoKai Environmental, Inc.



Freese and Nichols, Inc. (FNI) has made significant progress on the updated Conceptual Model for Kinney County. Over the past several months, our work has focused on bringing together and synthesizing available geologic, groundwater, and hydrologic data **to develop a clearer and more complete understanding** of the aquifer systems across the District.

The Conceptual Model brings together **multiple lines of evidence**, including aquifer geology and structure, groundwater levels, groundwater quality, springflow, precipitation, and recharge, to better understand the occurrence and movement of groundwater within Kinney County. Evaluating these datasets together allows us to better understand how different parts of the aquifer systems relate to one another and **provides a more defensible basis** for interpreting groundwater flow and other aquifer dynamics across Kinney County.

Important Note. This work provides an important technical foundation for the District's future groundwater management and planning efforts. However, is not intended to replace a numerical groundwater flow model. Importantly, it establishes the hydrogeologic framework and supporting data needed to build, update, and evaluate a numerical model. A numerical groundwater flow model can then use this framework to quantitatively simulate groundwater flow and evaluate how the aquifer may respond to changes in pumping or other stresses.

The following sections summarize key updates on the Conceptual Model, discuss recent rainfall and hydrologic conditions in Kinney County, and the remaining work needed to complete the project.

1. Conceptual Model Progress Update

Much of the work completed to date has focused on developing the individual components of the Conceptual Model and bringing those pieces together to develop a consistent interpretation for the aquifer system. Key areas of progress include the hydrostratigraphic framework, groundwater levels and development of potentiometric water level surfaces, recharge analysis, groundwater chemistry, and integration of other available hydrogeologic information.

Important Terminology Note. When discussing the hydrogeology of Kinney County, we collectively refer to the Edwards portion of the Edwards-Trinity (Plateau) Aquifer and the Edwards (Balcones Fault Zone) Aquifer as the Edwards.

Updated Hydrostratigraphic Framework

FNI has refined the hydrostratigraphic framework using available geophysical well logs, driller lithology descriptions, and other geologic information. These data are being used to better define subsurface relationships between the primary aquifer units across Kinney County.

The hydrostratigraphic framework is an important part of the Conceptual Model because the geologic units influence where groundwater occurs and how it moves through the aquifer system. This framework also provides the basis for assigning and interpreting groundwater levels, groundwater chemistry data, aquifer hydraulics, and other groundwater observations. The updated interpretations have been incorporated into a three-dimensional (3D) geologic model using Leapfrog (**Figure 1**). The 3D model provides a way to visualize the hydrostratigraphic framework across the county and evaluate relationships between the different aquifer units.

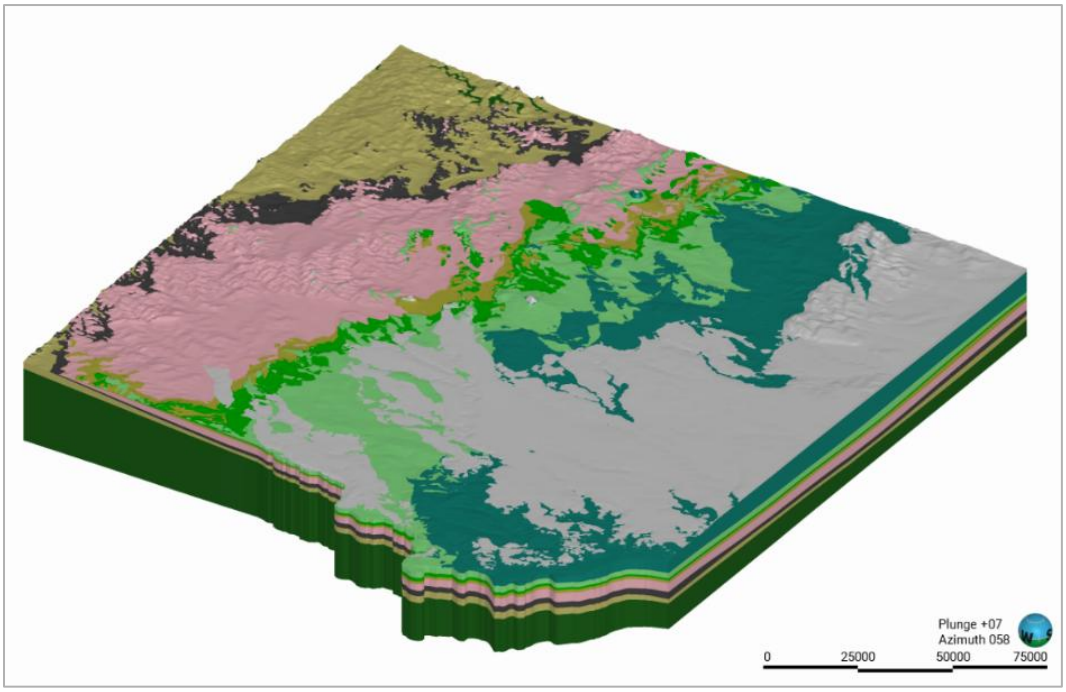


Figure 1. Draft 3D Model of the Hydrostratigraphic Framework in Kinney County

Groundwater Levels and Flow

FNI has compiled and evaluated available static groundwater level data for the Edwards and Austin Chalk aquifers. These data provide an important line of evidence for understanding regional groundwater level patterns and the direction of groundwater flow within the aquifer systems.

Groundwater levels are being evaluated together with the updated hydrostratigraphic framework rather than as a standalone dataset. This allows for this data to be considered in the context of the underlying geology and helps identify trends that may be related to structural features or other aquifer relationships. Collectively, these datasets refine our interpretation of groundwater flow directions and patterns across the District.

Groundwater Chemistry

Groundwater Chemistry provides another important line of evidence for understanding groundwater occurrence and movement within the aquifer system. FNI evaluated available groundwater chemistry data from the TWDB and published literature using Piper diagrams (**Figure 2**). Initial results indicate that groundwater from the Austin Chalk generally has higher chloride concentrations relative to the Edwards. Published literature indicates that elevated chlorides in otherwise fresh groundwater can be associated with anthropogenic sources, including wastewater/septic systems and agricultural activities; however, the available data are not sufficient to identify the source of the elevated chloride in the Austin Chalk.

Available Austin Chalk groundwater chemistry data are relatively old and may not represent current conditions. More recent water quality data collected by EcoKai will be incorporated into the Conceptual Model to further evaluate groundwater chemistry, possible anthropogenic influences, and differences between the Edwards and Austin chalk.

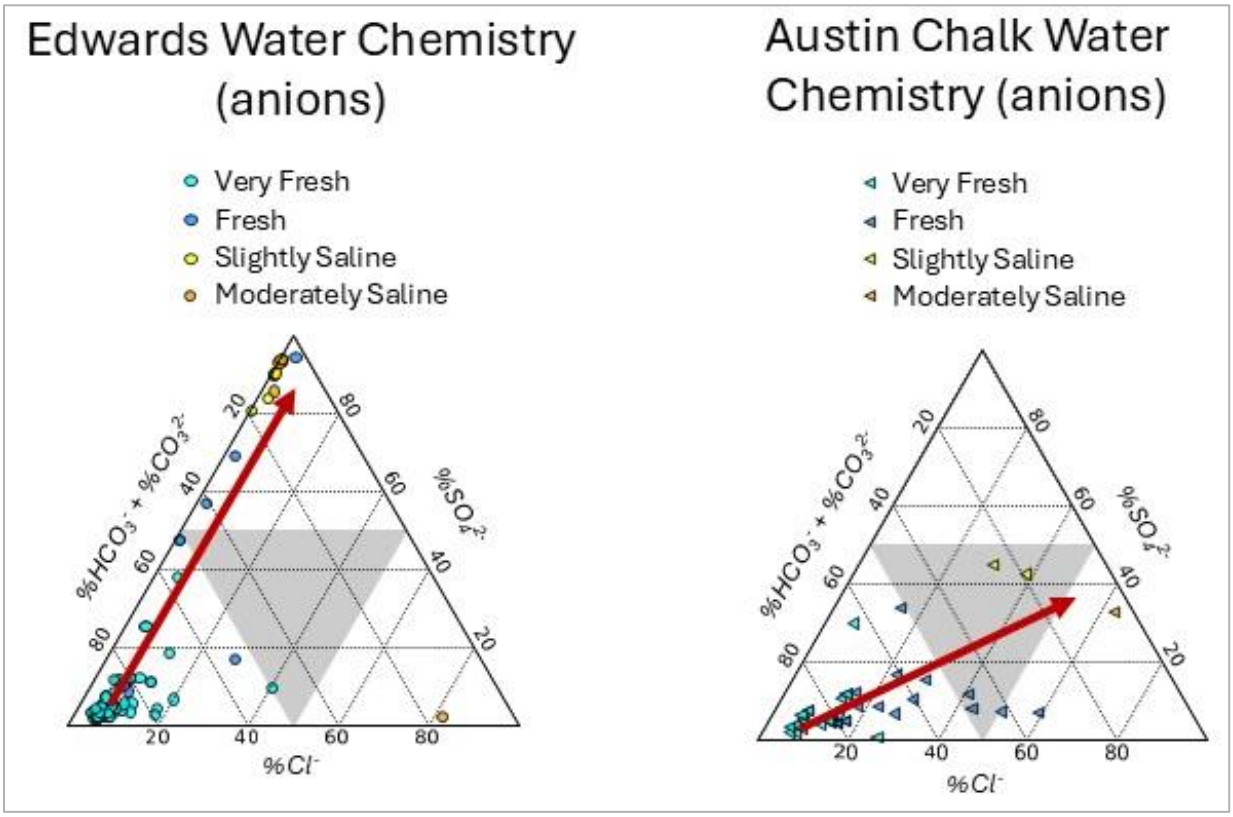


Figure 2. Edwards and Austin Chalk Piper Diagrams

Recharge

FNI has updated estimates of recharge to the Edwards. The analysis follows the general workflow outlined by Mace and Anaya (2004)[1], incorporates West Nueces River gage data, and includes estimates of both direct and diffuse recharge.

Recharge varies substantially from year-to-year depending on precipitation and hydrologic conditions (**Figure 3**). Developing a long-term recharge record provides useful context for understanding how wet and dry periods affect the amount of water entering the aquifers. The updated recharge estimates are being evaluated alongside groundwater levels, springflow, precipitation, and the hydrostratigraphic framework to better understand the relationship between climatic conditions and aquifer response.

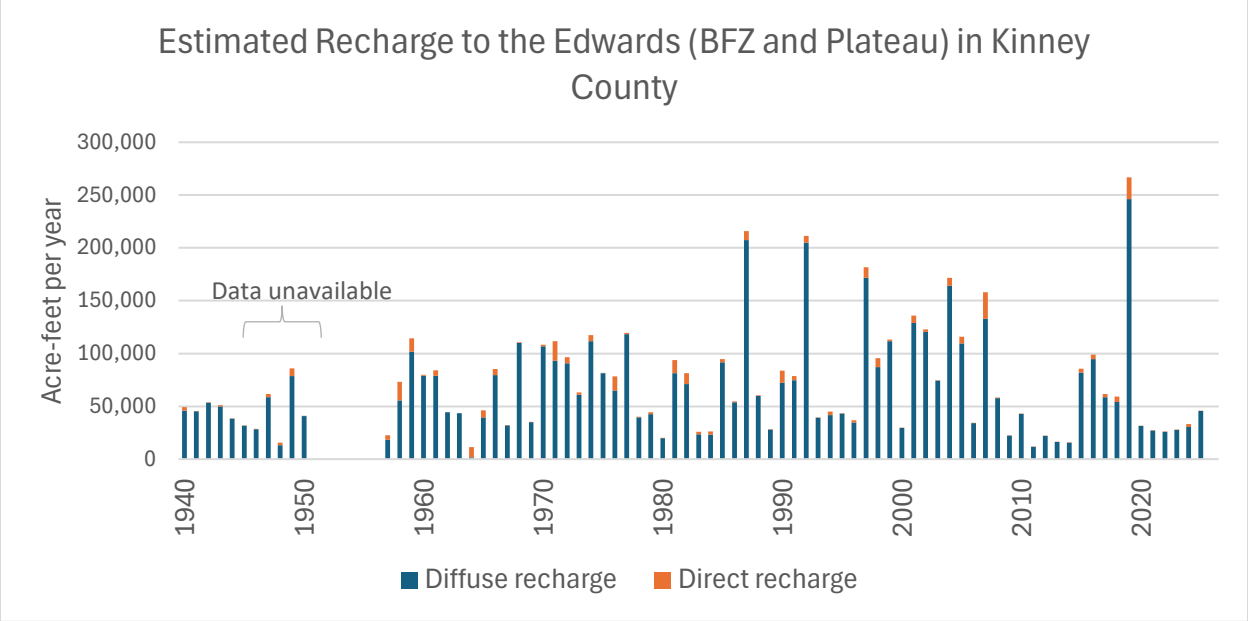


Figure 3. Estimated Recharge to the Edwards in Kinney County

Integrated Hydrogeologic Interpretation

An important part of the Conceptual Model is bringing these individual analyses together. Hydrostratigraphy, water level elevations, groundwater chemistry data, recharge, precipitation, and springflow each provide a different and useful piece of information about the aquifers. Like pieces of a jigsaw puzzle, no single dataset provides the complete picture, but when carefully brought together, these multiple lines of evidence can provide a clearer and more defensible understanding of the aquifer system. This integrated approach will form the foundation of the Conceptual Model and provide the framework needed for future groundwater modeling efforts and management of groundwater resources in Kinney County.

[1] https://www.twdb.texas.gov/publications/reports/numbered_reports/doc/R360/Report360.asp

Next steps

The project has now moved forward from the development of the individual technical analyses towards integration and completion of the Conceptual Model. The remaining work will focus on the following:

- Incorporating available data and observations from the July 2026 precipitation event
- Completing the integrated interpretation of hydrostratigraphy, groundwater levels, recharge, groundwater chemistry, and groundwater flow paths
- Finalizing the conceptual model report chapters and supporting figures
- Finalizing the project database, GIS, and Leapfrog deliverables
- Completing technical quality control reviews of the analyses and report
- Preparing the draft Conceptual Model for District review.

Tentative Draft Report Date: September 30th. We also plan to request a project extension at the September Board meeting. FNI's current contract with the District extends through September 30th, and an extension would provide adequate time for District review, incorporation of comments received from the Board, and finalization of the report following delivery of the draft.

As a reminder, the project schedule has evolved as other District priorities and new information have emerged. Earlier this year, progress on the Conceptual Model was slowed to accommodate the District's request to revisit and revise the DFC methodology, with the understanding that this additional effort could affect the Conceptual Model schedule. More recently, the July rainfall event has provided an important opportunity to observe the aquifer under substantially different hydrologic conditions. Over the past month, FNI has focused additional effort on understanding this event and its implications for springflow and aquifer response.

2. Recent Rainfall Event

The substantial rainfall that occurred across Kinney County in July 2026 provides a timely opportunity to evaluate the groundwater system under conditions that are considerably different from those experienced during much of the recent record. Kinney County received substantial precipitation in mid-July, resulting in significant flooding across portions of the area. The event was followed by pronounced and sustained response at Las Moras Springs, where discharge has remained above approximately 40 cubic feet per second since July 16th.

This rainfall and spring response is particularly notable when viewed in the context of the long-term precipitation record. Despite the substantial July rainfall and widespread flooding, Kinney County remains approximately 30 inches below normal precipitation since mid-2019 (**Figure 4**). The July event represents a significant improvement in recent hydrologic conditions, but it does not erase the precipitation deficit that developed over the past several years. This distinction is important when considering current groundwater conditions. As has been seen before, a significant rainfall event can result in relatively rapid response within portions of the aquifer system, while the longer-term record may still reflect the effects of an extended dry period. Without continued precipitation, drought conditions could return. Current climate outlooks should also continue to be monitored after the project is completed as the potential for wetter conditions during the coming winter and early spring could provide for additional opportunities to observe how the aquifers respond to changes in hydrologic

conditions. NOAA is forecasting strong El Niño conditions to develop and persist through 2026 and into 2027. El Niño typically results in wetter winters and springs in Kinney County (**Figure 5**).

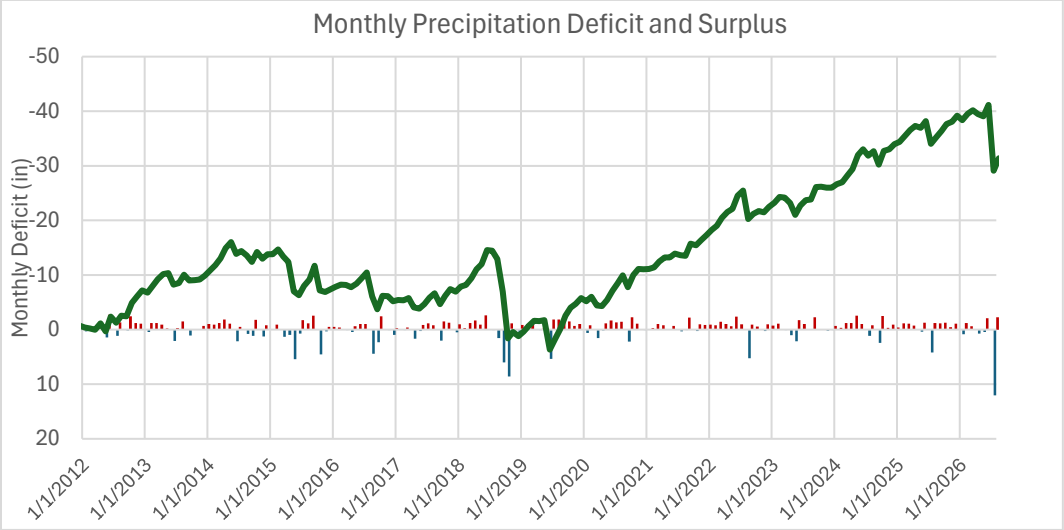


Figure 4. Monthly Precipitation Deficit and Surplus[2]

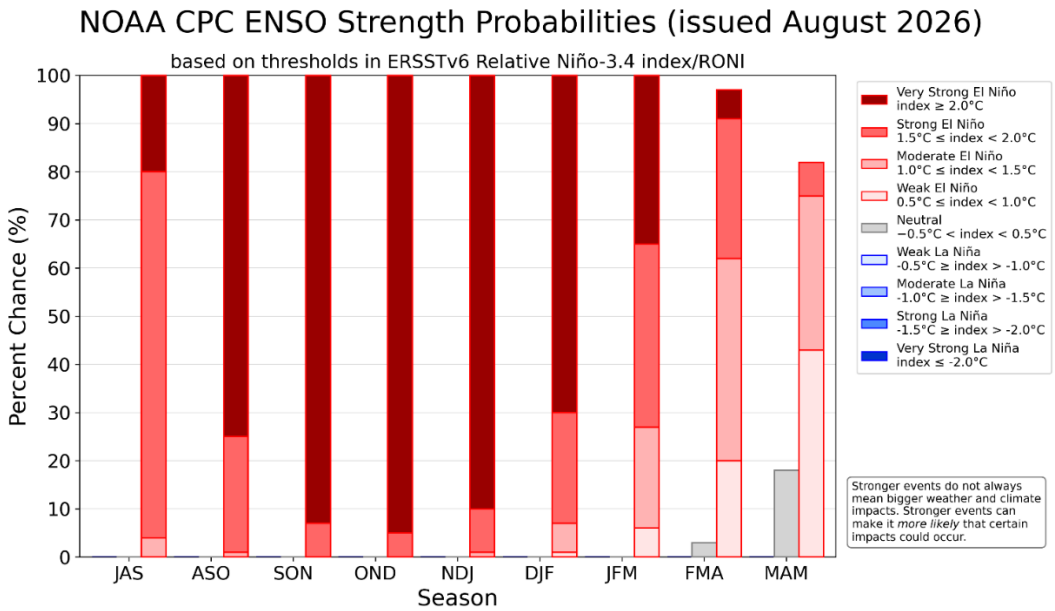


Figure 5. NOAA El Niño Probabilities (Source: National Weather Service)

[2] Precipitation data is a composite of data from Quad 807 (2012-2025) and the Brackettville weather station US1TXKY0025 (Jan 2026 to through Jul 2026)

3. On the Horizon

Over the coming months, FNI will continue to evaluate the available information associated with the July rainfall event. Of particular interest is the persistence of increased discharge at Las Moras Springs, changes in groundwater levels where recent measurements are available, and the relationship between the observed spring discharge and groundwater levels response.

The TWDB Science Grant provides a natural continuation of the Conceptual Model work. The current project establishes the hydrogeologic framework and identifies important relationships and remaining uncertainties, while the Science Grant will provide additional analysis and subsurface data to test and refine that understanding. A brief review of the TWDB Science Grant Scope objectives is provided below:

- Task 1 Objective (Discharge Attribution and Monitoring Defensibility): Quantify and defensibly allocate the flow measured at USGS gage 08456310 into component sources (spring/pool-system discharge, upstream creek inflow, and runoff contributions) under representative seasonal and hydrologic conditions and evaluate whether monitoring improvements or gage relocation are warranted.
- Task 2 Objective (Proxy Water-Level Development): Compile and evaluate groundwater-level records and assess statistical relationships between groundwater levels and springflow to identify one or more “proxy” monitoring wells (or composite indices) that provide an early warning and management relevant indicator of spring discharge conditions.
- Task 3 Objective (Subsurface Data for Zoning and Future Modeling): Collect geophysical well logs from water wells within District management zones to improve characterization of aquifer strata, strengthen the District’s conceptual model, and support development of defensible groundwater management zones (including a 3D definition for Zone 1), with direct value to future District and TWDB investigations.