January 24, 2025
Project No: 20-10008

Bryan Bondy, PG, CHG
Executive Director
Upper Ventura River Groundwater Agency
202 West El Roblar Drive
Ojai, California 93023
Via email: bbondy@uvrgroundwater.org

Subject: Camino Cielo Stream Flow Monitoring Annual Data Transmittal for Water Year 2024 Upper Ventura River Groundwater Agency, Ventura County, California

Dear Mr. Bondy:

Rincon Consultants, Inc. (Rincon) has prepared the following Annual Data Transmittal for the 2024 Water Year (October 1, 2023, through September 30, 2024) for stream flow monitoring activities performed at Camino Cielo located in the most northern portion of the Upper Ventura River Groundwater Basin in Ventura County, California (Figure 1). This memorandum was prepared for Upper Ventura River Groundwater Agency (UVRGA) in accordance with UVRGA's Monitoring and Data Collection Protocols and Data Quality Control Review Procedures.

Monitoring activities for the 2024 Water Year commenced on July 2, 2024, which included redeployment of a Solinst Levelogger automated pressure transducer within the standpipe stream gage affixed to the downstream abutment of the County-owned culvert at Camino Ceilo. Changes to the channel morphology attributed to rainy season high flows appear to have affected the surface water flow conditions at the monitoring location. These changes reduced the surface water level across the culvert. Lower surface water level conditions below the performance limitations of the pressure transducer appear to have impacted the data quality of the continuous level measurements.

Observed Changes to the Monitoring Location

An initial cross section survey adjacent to the Camino Cielo culvert was completed on July 5, 2023 (Figure 2). An initial channel slope was surveyed on July 5, 2023, and was resurveyed on August 5, 2024 (Figure 3). Instantaneous discharge measurements recommenced on July 2, 2024, and were collected through December 5, 2024 (Figure 4).

Over the previous water year monitoring period during the summer and fall of 2023, baseflow stage consistently measured around 1.5 feet at the Camino Cielo culvert. During this water year monitoring period in summer and fall of 2024, data collection and visual observations show a sharp decrease to around approximately 0.1 feet at the culvert. Despite this reduction in baseflow stage, July through November measured baseflow discharge rates remained relatively consistent at approximately 10 to 20 cubic feet per second, with only a slight decrease noted in Water Year 2024 relative to Water Year 2023.

The observed shift in baseflow stage appears to be linked to morphological changes in the channel. As shown in Figure 3, the water surface slope within 50 feet upstream and downstream of the Camino Cielo culvert was approximately 0.1% during the July 2023 survey. However, the August 2024 survey indicates a slope of approximately 1.5%. This increased slope would result in higher streamflow velocities, reducing the depth required to convey a given discharge rate. Supporting evidence from Google Earth imagery and site photos confirms the presence of pools both upstream and downstream

of the Camino Cielo culvert during Water Year 2023. In contrast, site photos from Water Year 2024 illustrate a transition to a stream structure dominated by riffles.

Pressure Transducer Measurement Limitations and Recommendations

Rincon's review of the Levelogger-measured water level data collected over the 2024 Water Year monitoring period revealed significant fluctuations that are inconsistent with typical diurnal patterns. Transducer data from this period is unreliable due to the low flow depth conditions, preventing development and application of a rating curve for a continuous level and flow dataset and figure.

Leveloggers measure water level via a pressure sensor located along the long (vertical) axis of the transducer. The point of measurement is approximately 0.1 feet above the bottom of the transducer. Solinst recommends that the transducer installation does not contact the bottom, in practice requiring installation at least 0.1 feet above bottom under the most ideal conditions. At least 0.1 feet of submergence above the sensor is required to record data with a usable data to noise ratio. Sources of noise include pressure fluctuations due to turbulence, eddies, ripples, and highly localized atmospheric turbulence such as wind that may not be captured and compensated by barometric logger data. As a result, under the most ideal conditions, usable data is only collected when at least 0.3 feet of water is present measured from the bottom of the channel to the surface. As a result, pressure transducer data obtained during Water Year 2024 is unreliable due to the low flow depth conditions, preventing development and application of a rating curve and calculated discharge hydrograph.

To address challenges posed by shallow flow depths, the following four potential solutions are proposed. Implementing one of these strategies could improve reliable data collection and enable the development of a robust rating curve aligned with the site's unique conditions.

- One approach is to develop a hydrograph using frequent (i.e., weekly) field discharge measurements.
- A second approach involves countersinking the standpipe into a deeper stilling well core drilled into the bridge apron. This would increase the submergence and improve data quality at low stage levels. A staff gage could be affixed to the standpipe to provide rapid field verification of water level via photographs during site visits. County permission would be required to modify the installation as described.
- A third approach involves relocating the pressure transducer to a deeper section of the channel, allowing for consistent water level measurements above the 0.3-foot threshold. These level measurements would then be used in tandem with discharge measurements collected at the Camino Cielo bridge to develop the level-discharge rating curve.
- A fourth approach that could be considered if relocation is not feasible would be to identify and implement a measurement device designed to accurately measure lower water levels (e.g., water level bubbler systems, area velocity flow meters, acoustic doppler, etc.).

Attachment 1 includes a Microsoft Excel file containing sheets with instantaneous discharge measurements, channel cross-section, and slope data. Please note that the level data, rating curve, and subsequent hydrograph are not accurate representations of actual conditions and should not be used for analysis or decision-making purposes. We appreciate the opportunity to support this project and are available to address any questions or provide clarification as needed.

Sincerely,
Rincon Consultants, Inc.

Thomas Sanford
Senior Watershed Scientist

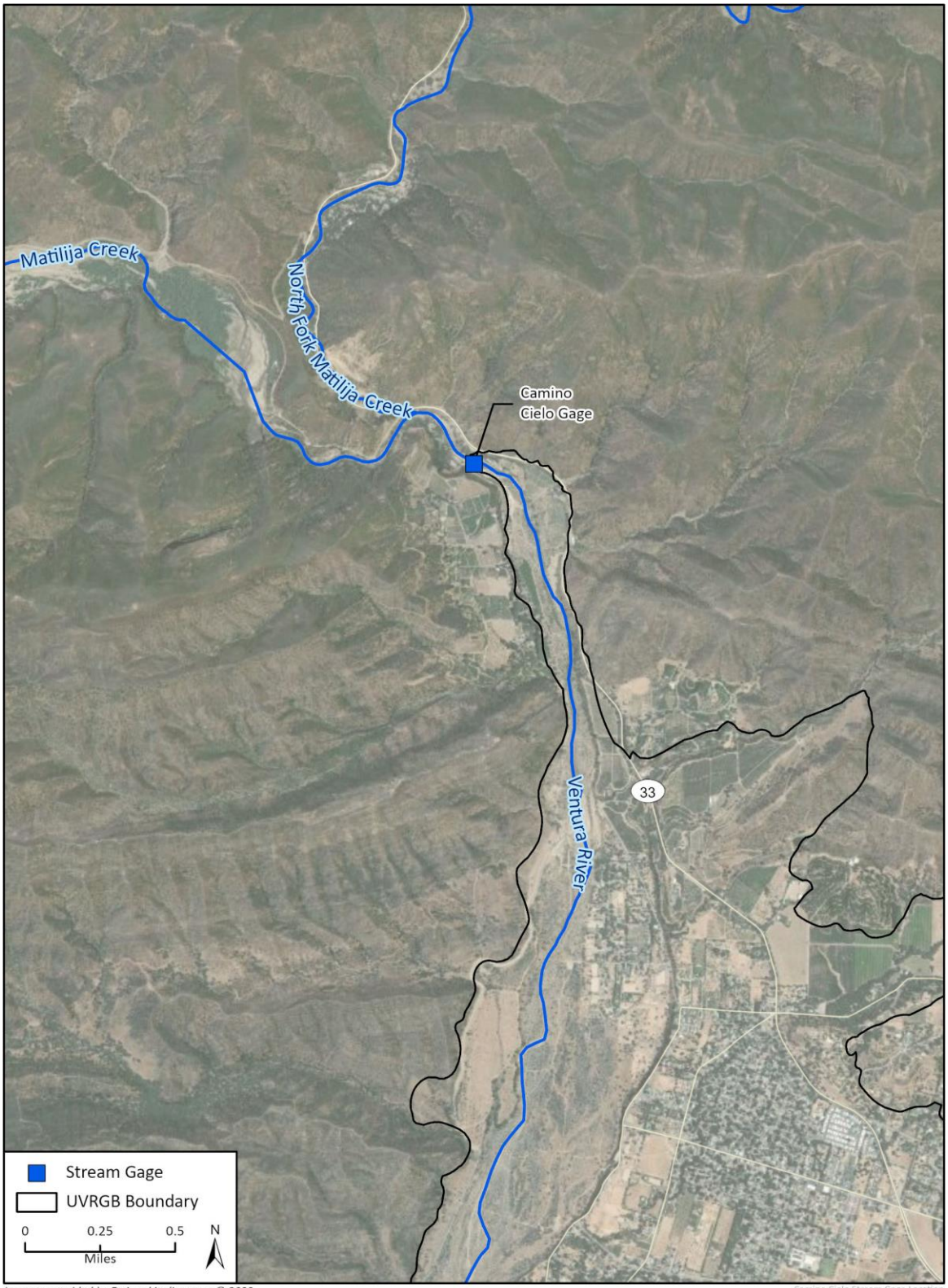
Kiernan Brtalik
Director Watershed Sciences

Menso de Jong, PhD, PG
Senior Watershed Scientist

Attachments

Attachment 1 Camino Cielo Flow Data (Microsoft Excel File provided electronically)

Figure 1 Camino Cielo Stream Gage Location



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Camino Cielo Stream Gage Location
Aquatic GDE Assessment Figures

Figure 2 Camino Cielo Cross Section

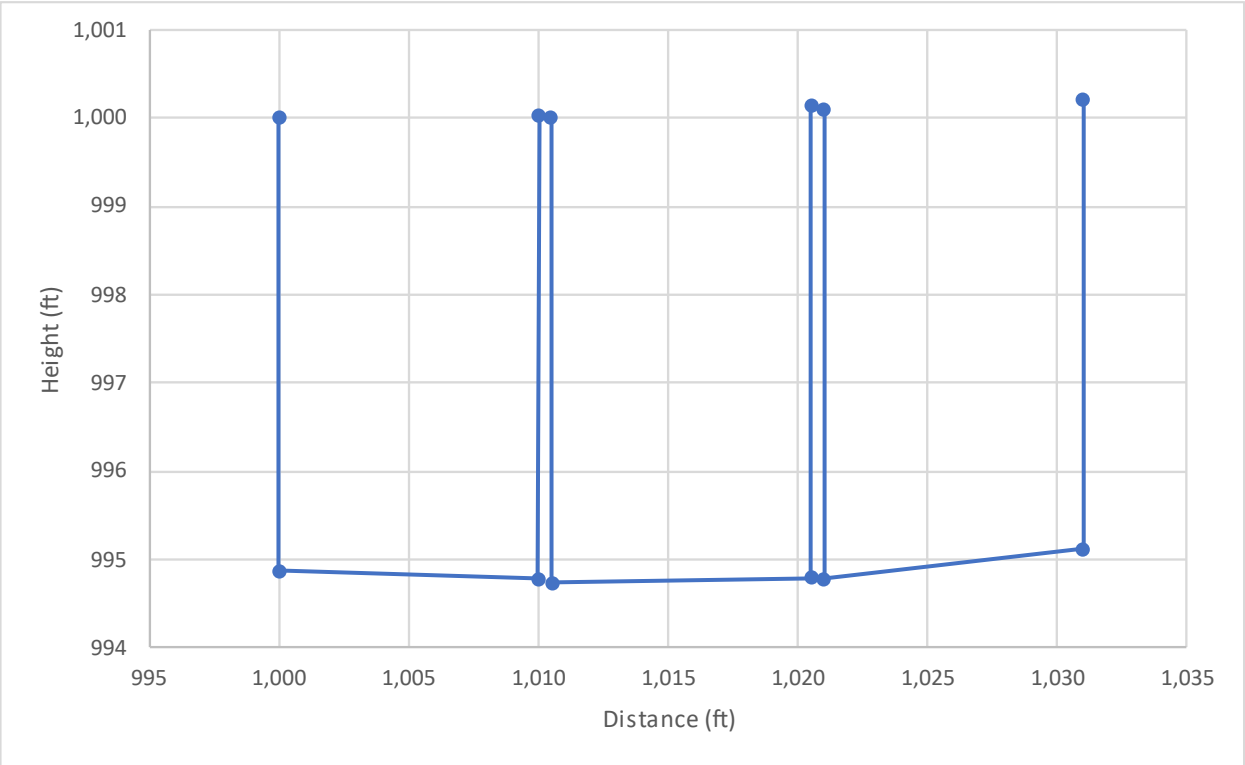

Figure 3 Camino Cielo Channel Slope

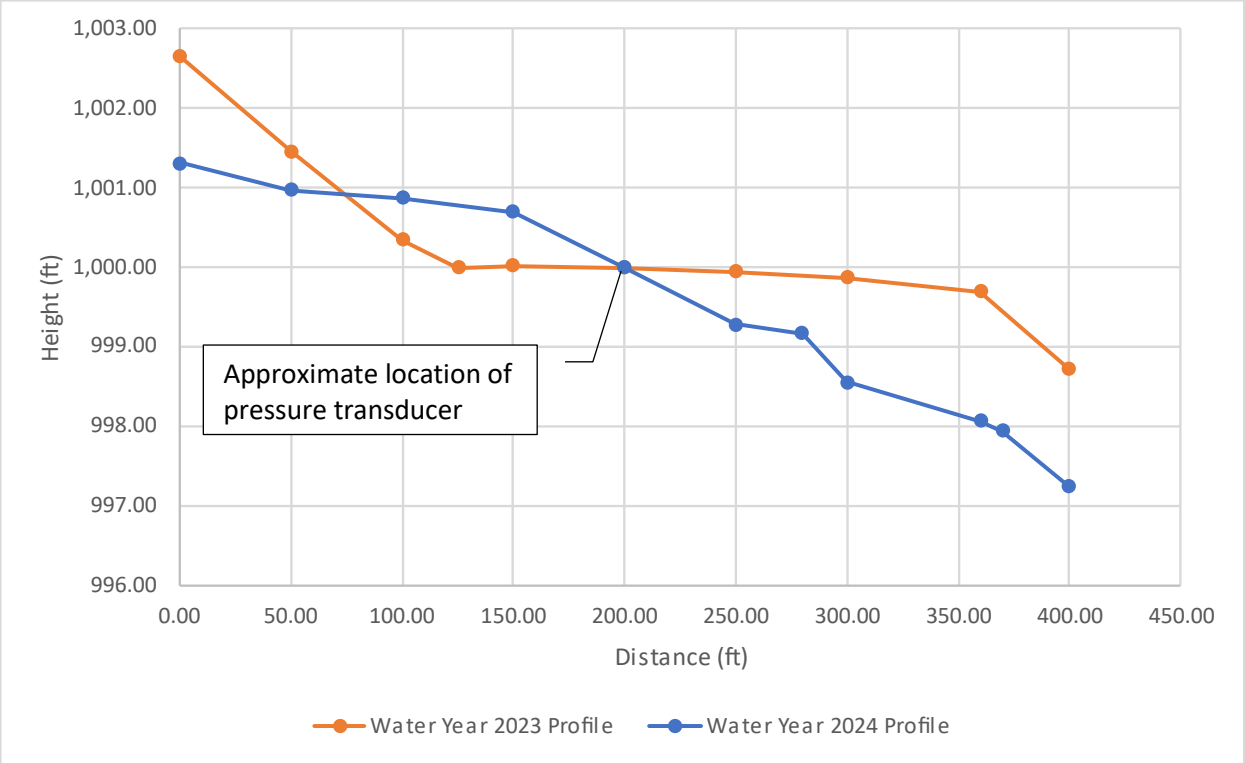

Figure 4 Camino Cielo Instantaneous Discharge Measurements