EXHIBIT D – GROUNDWATER-LEVEL MONITORING PLAN
SURFACE MINIING LAND USE PLAN
TWIN PINES MINERALS, LLC SAUNDERS DEMONSTRATION MINE (ID NO. 2073)
ST. GEORGE, CHARLTON COUNTY, GEORGIA

The goal of groundwater monitoring is to ensure that the post-mining conditions approximate pre-mining conditions. Any return to "normal", defined as the mean of groundwater elevations, must account for natural seasonal and climatic changes over time.

As is typical, groundwater at the site is a dynamic system that fluctuates in response to meteorological events of varying temporal scales (i.e., high precipitation events and droughts). TPM has reviewed daily groundwater elevation data recorded in 76 piezometers and observation wells in the study area beginning in January 2019 and ending in April 2021. The data reflect considerable variation, as shown on Figure 1.

Given these natural variations, TPM proposes to use the natural range of pre-mining groundwater elevations, rather than the elevation observed on a single date in history, to establish the baseline for determining if conditions have returned to normal. This approach provides an objective and statistically defensible basis for determining if mining activities have caused unexpected impacts to groundwater hydrology.

Daily groundwater elevations beginning in January 2019 and ending in April 2021 were used to develop the baseline range of normal pre-mining groundwater elevations (Figure 2). The data were normalized by calculating the normal groundwater elevation at each individual well and subtracting that from the observed daily value, to determine the deviation from the normal (Figure 1). A site-wide standard deviation of groundwater elevations from the normal was 0.9 feet. Therefore, it is proposed that a range of plus or minus three standard deviation values (±2.7 feet) be used to establish a range of acceptable post-mining groundwater levels (Figure 3). This approach should account for greater than 99.7% of naturally varying groundwater elevation observations. To eliminate the possibility of spurious observations (i.e., noise), it is proposed that a 30-day running mean be applied to the observations (Figure 3). The combination of applying a three-standard deviation range and a 30-day running mean should account for nearly 100% of natural groundwater elevation observations.

For further validation, TPM proposes that groundwater fluctuations in the mined area be compared to those in geographically similar locations unaffected by mining. The mine area and adjacent TPM owned properties has been divided into three regions (Figure 2) based on the locations of three rain gauges [north (RG01), central (RG02) and south (RG03)]. Figure 4 shows the mean daily (thin dashed colored lines) and 30-day running mean (thick colored lines) deviations from the normal groundwater elevation. The lines demonstrate a near match between the north, central, and south sections, with a near perfect correlation coefficient (0.98). Therefore, it can be assumed that fluctuations in groundwater elevations between the north, central, and south sections will mimic each other and can be used as a proxy for post-mining comparison.

If the groundwater-level data in all three sections fluctuate in a similar relationship to one another, then the change in water levels can be attributed to natural variations in the hydrologic cycle of the area. If fluctuations in the southern section do not mimic fluctuations in the north and central sections, however, this would suggest an impact from mining activities, and further evaluation will be initiated. If the deviations cannot be attributed to factors unrelated to mining activity, a plan to restore groundwater levels will be submitted to EPD for review and approval.

1.0 Groundwater-Level Monitoring and Adaptive Management Plan

1.1 Frequency of Water-Level Monitoring

Water-level data will be recorded using Rugged Troll data loggers. Data loggers will be programmed to record daily water-level measurements at each of the 69 existing (PZ) and 24 new (MPZ) piezometers within the mine footprint and adjacent TPM-owned property (see Table 1.1 below).

Table 1.1. Groundwater-Level Monitoring Locations					
PZ01S	PZ11	PZ20S	PZ28S	PZ46	PZ56S
PZ01D	PZ12S	PZ20D	PZ28D	PZ47	PZ56D
PZ02	PZ12D	PZ21	PZ38	PZ48S	PZ57S
PZ03S	PZ13	PZ22S	PZ39S	PZ48D	PZ57D
PZ03D	PZ14	PZ22D	PZ39D	PZ49	PZ58S
PZ04	PZ15	PZ23	PZ40	PZ50	PZ58D
PZ05	PZ16S	PZ24	PZ41	PZ51S	OWB1BS
PZ06	PZ16D	PZ25S	PZ42	PZ51D	OWB1S
PZ07	PZ17S	PZ25D	PZ43	PZ52	OWB1D
PZ08	PZ17D	PZ26	PZ44	PZ53	
PZ09	PZ18	PZ27S	PZ45S	PZ55S	
PZ10	PZ19	PZ27D	PZ45D	PZ55D	
MPZ-01S	MPZ-04	MPZ-07	MPZ-10D	MPZ-13D	MPZ-16D
MPZ-01D	MPZ-05S	MPZ-08	MPZ-11	MPZ-14	MPZ-17S
MPZ-02	MPZ-05D	MPZ-09	MPZ-12	MPZ-15	MPZ-17D
MZP-03	MPZ-06	MPZ-10S	MPZ-13S	MPZ-16S	MPZ-18

The daily water-level measurements recorded with the data loggers will be downloaded monthly to evaluate water-level data within and adjacent to the proposed mine. The frequency of data downloading may be adjusted (increased or decreased) as needed during the life of the mine.

1.2 Frequency of Weather Station Monitoring

Data from the three on-site rain gauges will be manually downloaded in the field by TPM representatives or TPM's consultants on a monthly basis.

1.3 Data Analysis

For the purpose of comparing pre- and post-mining groundwater levels, sufficient time must elapse after the dragline excavator has passed to ensure the post-mining data is not influenced by the on-going mining to the north. TPM estimates that groundwater impacts will extend approximately 1,000 feet from the edge of the mining pit. Therefore, the comparison of pre- and post-mining groundwater levels will be made after the dragline excavator has moved approximately 1,000 feet to the north of a mined transect (see Figure 5).

After the dragline excavator has moved the required distance, post-mining groundwater-level data in the piezometers 1,000 feet south of the moving mine will be compared to pre-mining water-level data (see Figure 5). The post-mining groundwater-level data will be used to calculate the daily groundwater deviation from normal, which will be added to the historical hydrograph data shown on Figure 3. The criteria in Part 1.4 will be used to determine if groundwater has been restored, or if adaptive management is required.

1.4 Action Levels for Adaptive Management

Post-mining groundwater levels will be considered to approximate pre-mining levels and the groundwater table will be considered to have been restored if:

1. Post-mining groundwater-levels remain within the normal range (2.7 feet above or below normal) established in Figure 3; and/or
2. Post-mining groundwater levels fluctuate uniformly in the north, central and south sections.

1.5 Adaptive Management and Contingency Planning

If the conditions described in Part 1.4 are not achieved, TPM will notify the Director within 30 days of determining an impact condition exists. Such notice will include the monitoring data along with relevant information.

No further action will be required if the unexpected condition can be attributed to factors unrelated to the mining activity. If other causes for the change in water-level conditions cannot be identified, however, TPM will conduct further investigations to determine the significance of the change, potential causes, and potential solutions. A contingency plan to restore groundwater levels to pre-mining conditions will be prepared and submitted to EPD for its review and approval prior to implementation.

The contingency plan will propose engineered solutions potentially including following:

1. If groundwater levels above normal are causing groundwater to pond above the land surface, and if these conditions cannot be explained by factors unrelated to mining, the proposed solution may be to pierce the existing bentonite layer or otherwise increase its hydraulic conductivity, and/or to cease or modify the soil amendment plan going forward.

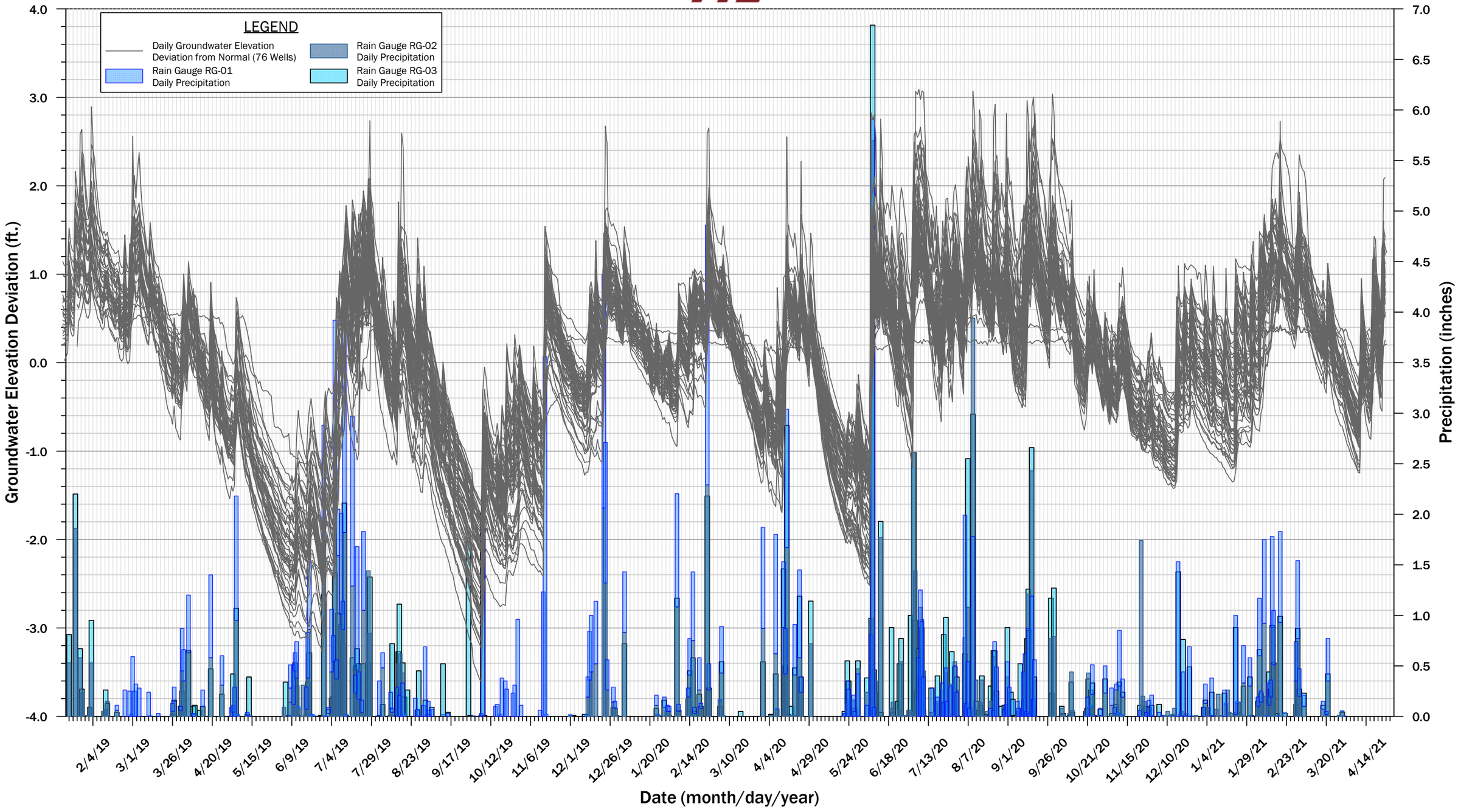
2. If groundwater levels are below normal, and if the condition cannot be explained by factors unrelated to mining, the proposed solution may be to increase the percentage of bentonite added to the low-permeability layer going forward; and, if necessary and appropriate, to inject additional bentonite slurry within a discrete subsurface soil interval (i.e., 7 to 10 feet below land surface). TPM may also propose other feasible engineered solutions.

FIGURES

FIGURE 1: HYDROGRAPH

Daily Groundwater Elevation Deviation from Normal v. Precipitation
01/18/19 - 04/25/21
Twin Pines Minerals - St. George, Charlton County, Georgia

TTL



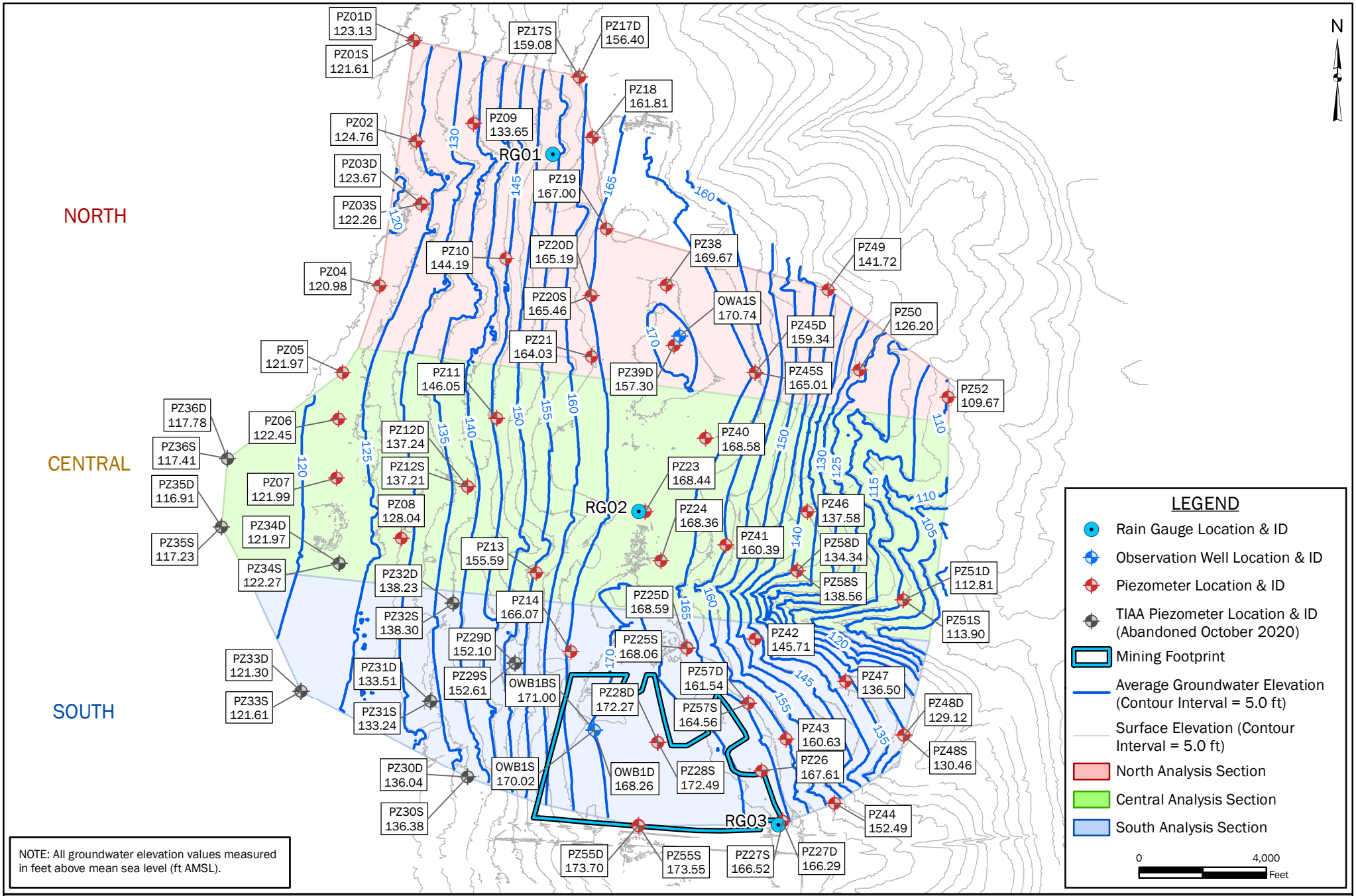


FIGURE 2: MEAN GROUNDWATER ELEVATIONS, OBSERVATION WELL & PIEZOMETER LOCATIONS & ANALYZED SECTIONS MAP

TWIN PINES MINERALS

ST. GEORGE, CHARLTON COUNTY, GEORGIA

DRAWN BY:	DEK
CHECKED BY:	JRS
DRAWING DATE:	6/25/2021
REVISION DATE:	N/A
TTL JOB NO.:	000180200804.00
APPROX. SCALE:	1 in = 4,000 ft

FIGURE 3: HYDROGRAPH

Daily Groundwater Elevation Deviation from Normal, 30-Day Running Mean & 3x Standard Deviation
01/18/19 - 04/25/21
Twin Pines Minerals - St. George, Charlton County, Georgia

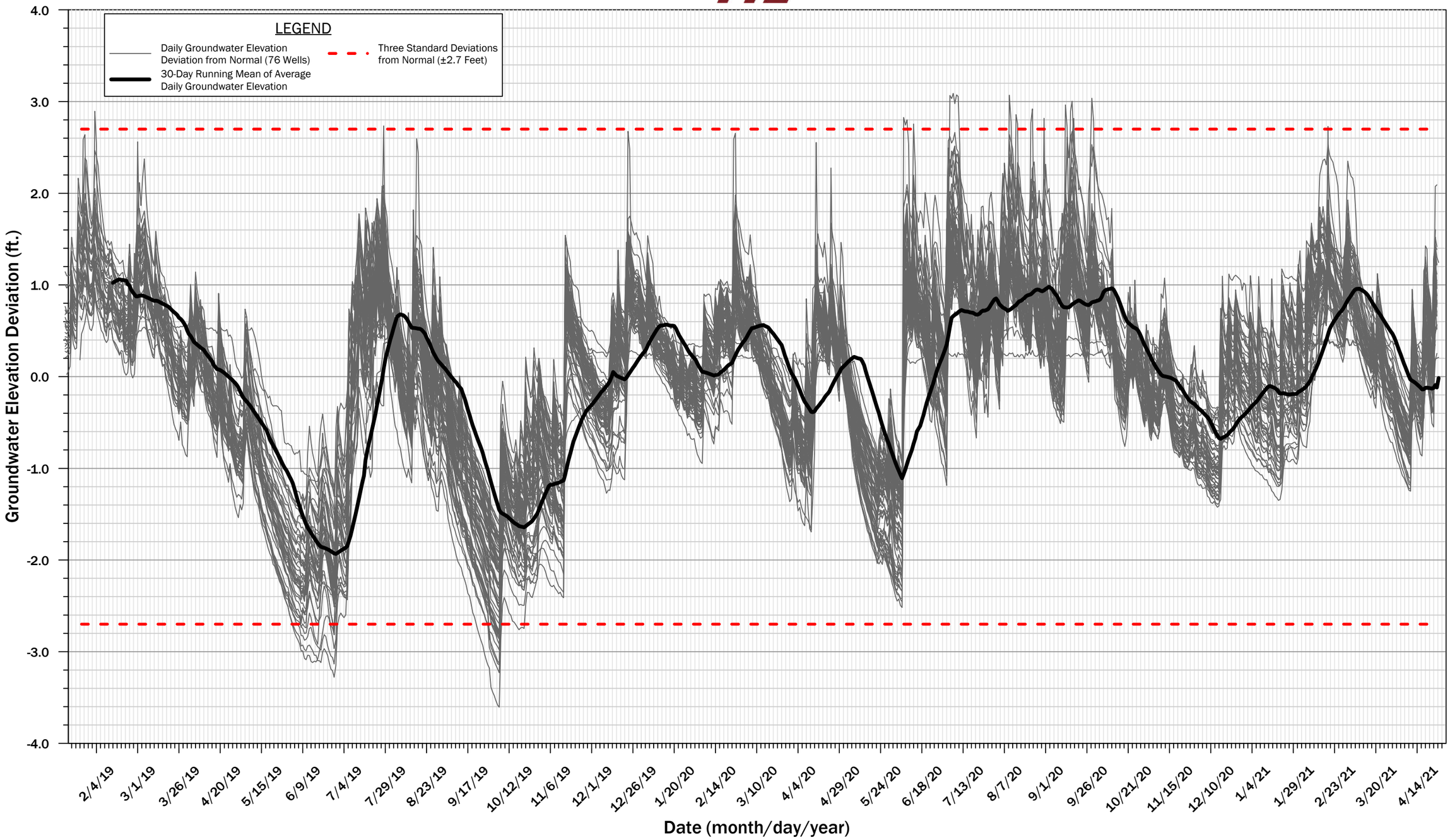


FIGURE 3: HYDROGRAPH (SECTION MEANS)

Groundwater Elevation Deviations from Normal in the North, Central & South Sections
01/18/19 - 04/25/21
Twin Pines Minerals - St. George, Charlton County, Georgia

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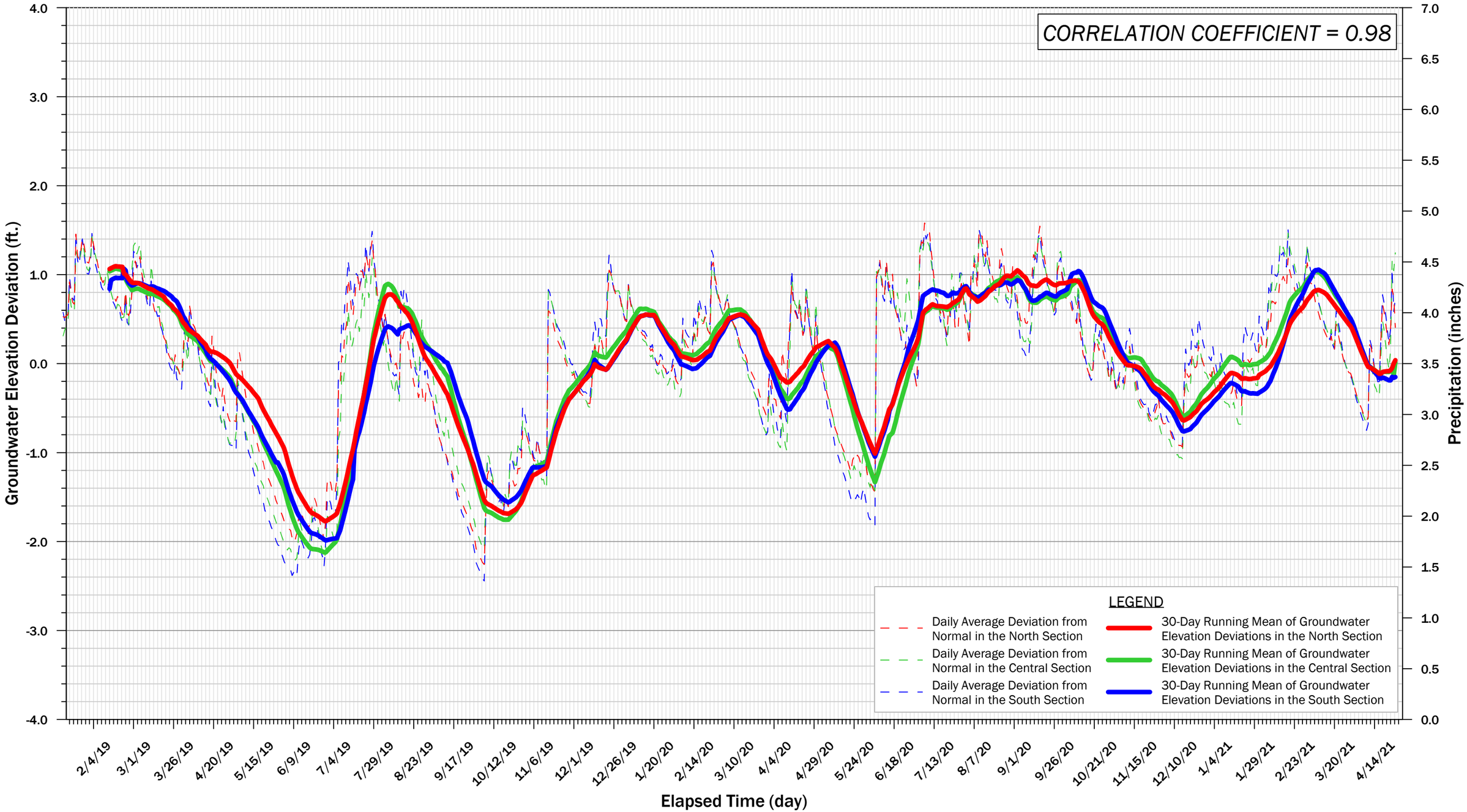

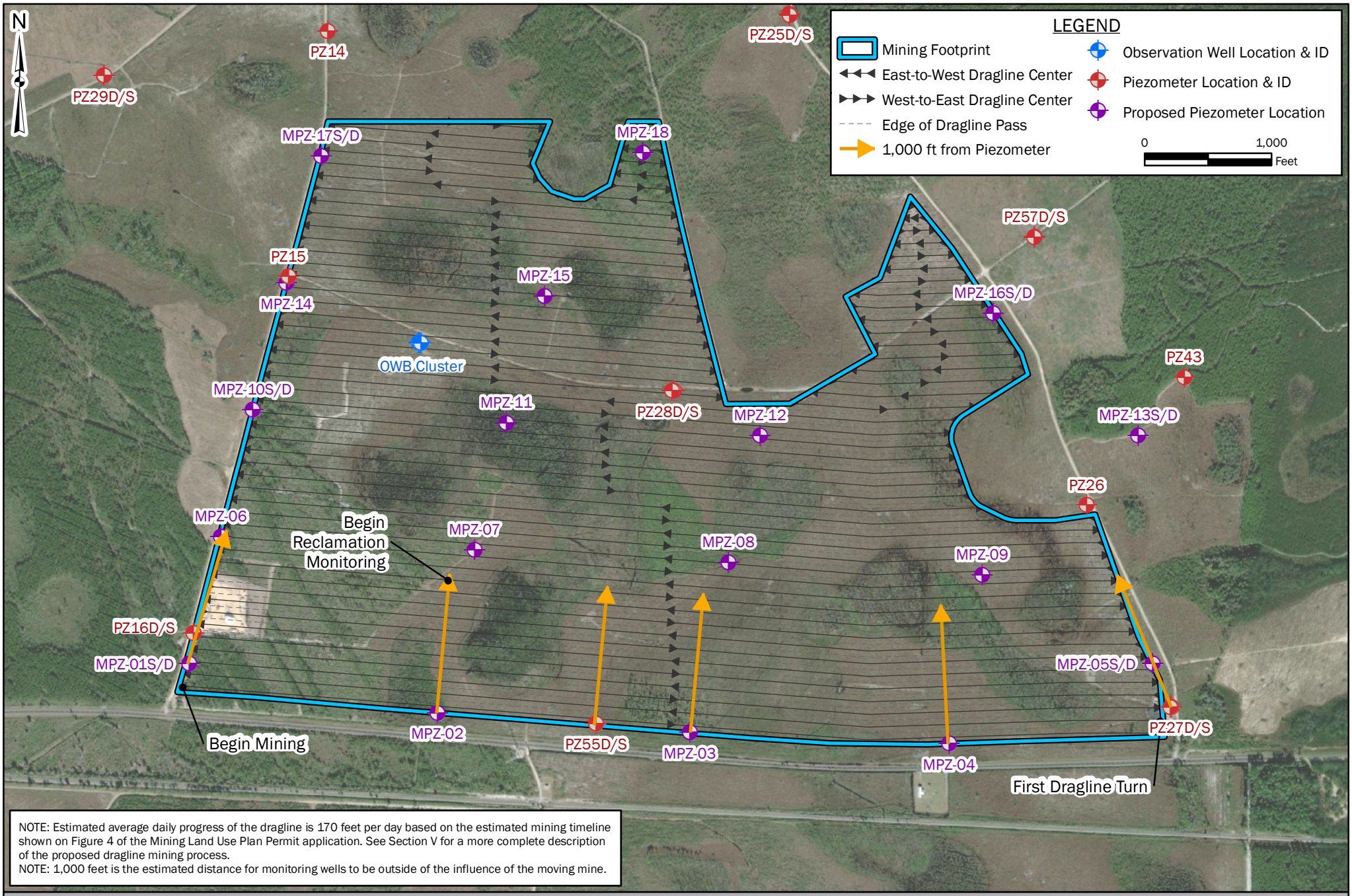

NOTE: Estimated average daily progress of the dragline is 170 feet per day based on the estimated mining timeline shown on Figure 4 of the Mining Land Use Plan Permit application. See Section V for a more complete description of the proposed dragline mining process.
NOTE: 1,000 feet is the estimated distance for monitoring wells to be outside of the influence of the moving mine.

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FIGURE 5: ESTIMATED TIMING OF GROUNDWATER MONITORING MAP

TWIN PINES MINERALS, LLC SAUNDERS DEMONSTRATION MINE

ST. GEORGE, CHARLTON COUNTY, GEORGIA

BASEMAP: Maxar Technologies, Vivid Imagery, 11/20/2019 (0.5 m Resolution).

DRAWN BY:	DEK
CHECKED BY:	JRS
DRAWING DATE:	6/24/2021
REVISION DATE:	N/A
TTL JOB NO.:	000180200804.00
APPROX. SCALE:	1 in = 1,000 ft