



HEALTH, SAFETY, ENVIRONMENT, PRODUCT STEWARDSHIP AND SUSTAINABILITY

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April 10, 2024

Honorable Robert G. Torricelli
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Subject: 2023 Integrated Groundwater Monitoring Report
Study Area 5, 6 & 7

Dear Senator Torricelli:

We are submitting the 2023 Integrated Groundwater Monitoring Report for Study Areas 5, 6 & 7 prepared by our hydrogeology consultant, Cornerstone.

Please contact me at 973-455-2877 should you have any questions or comments on this submittal.

Sincerely,

Eric Christodoulatos
Senior Remediation Manager

Enclosures:

2023 Integrated Groundwater Monitoring Report
Study Area 5, 6 & 7

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**INTEGRATED ANNUAL GROUNDWATER
PERFORMANCE REPORT
FOR 2023**

**STUDY AREAS 5, 6, AND 7
JERSEY CITY, NEW JERSEY**

Prepared for

**HONEYWELL
Morris Plains, New Jersey**

April 2024

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Project 209-4233711

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1 INTRODUCTION

1.1 General

The Long Term Monitoring Plan (LTMP) for the Study Area 7 (SA-7) Deep Overburden and Bedrock groundwater remedy was originally developed in 2008 to monitor groundwater conditions relative to the Groundwater Extraction and Treatment (GWET) system. Annual progress reports have been prepared in accordance with this plan since the startup of the GWET system in December 2008 and thus this document represents the fifteenth such annual performance report. In 2011, the GWET LTMP was expanded to integrate groundwater monitoring requirements for Study Areas 5, 6 and 7 (Project Area). Sampling and analysis within this integrated plan were performed consistent with the requirements set forth in the *Integrated Groundwater Sampling and Analysis Plan (SAP) for Study Areas 5, 6 and 7* revised September 17, 2020. The SAP has been updated to reflect recently approved Remedial Action (RA) Permit modifications discussed below.

Groundwater monitoring in the Project Area is also governed by RA Permits issued by the NJDEP in 2018 for the Shallow, Deep Overburden, and Bedrock groundwater zones, and site-specific LTMPs applicable to SA-5 and SA-6 sites. RA Groundwater Permit modifications were submitted to NJDEP in 2021 including changes consistent with the revised SAP and are discussed further in Section 6. The modifications were approved by the NJDEP in February 2022 and May and June 2023, respectively.

Site-specific LTMPs include:

- LTMP for SA-5 New Jersey City University (NJCU) (Sites 090 and 184) November 2016, updated May 2019 and Shallow Groundwater Monitoring and Extraction System Operation Plan (Appendix L of the LTMP)
- Draft LTMP for SA-5 Shallow Groundwater, June 2018;
- LTMP for SA-6 North and SA-6 South; February 2018, revised December 2020.

1.2 Purpose and Objectives

The purpose of this document is to provide an integrated annual reporting format that characterizes regional groundwater conditions and documents compliance with area-specific remedial objectives. The specific objectives of this approach are to:

- Improve consistency and efficiency in field procedures including sample collection and scheduling.
- Provide a central database for monitoring well specifications and status.

- Compile groundwater data in one annual report.
- Provide regional groundwater flow interpretations that consider the impact of features such as subsurface barrier walls, drains, caps, and drawdown from pumping.
- Provide localized groundwater flow maps consistent with the regional contour maps.

1.3 Status of Integrated Monitoring Requirements for 2023

The two primary elements of groundwater monitoring within the Project Area are water level measurements and water quality sampling and analysis. Groundwater level monitoring is conducted in available monitoring wells and piezometers to fulfill various reporting requirements as shown on **Table 1-1**. Groundwater quality sampling is conducted in a subset of designated wells in accordance with the requirements of the various monitoring plans. The status of groundwater sample collection for laboratory analysis in 2023 is shown on **Table 1-2**.

1.4 Document Organization

In accordance with the SAP, this report is organized in terms of its three primary elements: groundwater extraction (Section 3), groundwater elevations and flow direction (Section 4), and groundwater quality (Section 5). These sections are prefaced by a discussion of overall site conditions and events during the reporting period (Section 2). Conclusions and recommendations for modifications to the GWET LTMP and related monitoring and reporting operations in the project area are provided in Section 6.

2 GENERAL CONDITIONS

The GWET system was operated at its design rate throughout the year. Long term monitoring of the SA-6 Chromium Remedy continued at SA-6 South and SA-6 North in 2023. Groundwater pumping of the contingent groundwater extraction systems (CGWES) was conducted on an as-needed basis consistent with the requirements of the LTMP in the SA-6 North and South Open Space Areas. At NJCU, the contingent groundwater pumping system was operated throughout 2023 with the exception of a few days for maintenance.

2.1 Annual Precipitation

Monthly precipitation data recorded at Newark Airport, approximately 2.5 miles southwest of SA-7, are provided in **Table 2-1** and shown on **Figure 2-1**. Precipitation was 2.24 inches below the 30-year average for the first half of 2023 and 10 inches above the 30-year average for the second half of 2023. The months of April and September were especially wet with monthly rainfall for both months in excess of 8 inches. Total precipitation in 2023 was 54.01 inches or 7.76 inches above the annual average of 46.25 inches.

2.2 Tidal Monitoring

Tidal fluctuations in the Hackensack River were monitored relative to the National Geodetic Vertical Datum of 1929 (NGVD-29) vertical datum. This datum is used for all reported groundwater elevation data in this report. The datalogger is programmed to record river stage at 6-minute intervals. These data are used to correct groundwater levels for tidal impacts based on tidal lag and efficiency values previously determined for monitoring wells screened in the Intermediate, Deep, and Bedrock Zones. With the exception of wells installed directly adjacent to the Hackensack River, there are no tidal influences in the Shallow Zone monitoring wells. Wells containing dataloggers do not have the data tidally corrected.

2.3 Monitoring Well Inventory

A list of the groundwater monitoring wells in service within the Project Area during 2023 is provided in **Table 2-2**. The wells are organized by hydrogeologic zone and provide information regarding their location, total depth, screen interval, and reference point elevation. There were two monitoring wells replaced in 2023 due to obstructions in the well casing that were discovered during attempts at sampling. Deep well 124-MW-106T at SA-6S was abandoned and replaced with well 124-MW-106TR on October 3, 2023 and deep well 090-MW-09 on the NJCU property was abandoned and replaced on October 5, 2023 with well 090-MW-09R.

3 GROUNDWATER EXTRACTION

3.1 GWET System Operation

The Deep Overburden GWET system was in operation throughout 2023. The GWET system consists of three extraction wells pumping at a combined rate of 54.5 gallons per minute (gpm) with discharge via independent force mains to the groundwater treatment plant located on SA-6 North. Wells 087-PW-1 and 087-PW-3 are located on the DiFeo property to the north of SA-6 North and are screened in the Deep and Intermediate Zones, respectively. Well 115-MW-215BR is located on the northwest side of Site 115 (SA-7) and pumps from the upper Bedrock zone.

3.1.1 Pumping Rates

Flow rate monitoring was conducted on each of the three force mains using flow meters located within the treatment plant. The flow rates are controlled using manually-operated valves as necessary to maintain design rates of 40 gpm for PW-1, 7.5 gpm for PW-3 and 7 gpm for the bedrock extraction well 115-MW-215BR. The total system rate of 54.5 gpm was maintained throughout the period with the exception of occasional downtime for O&M activities. **Table 3-1** identifies the events that resulted in a shutdown lasting more than 8 hours. The shutdown is illustrated on **Figure 3-1**.

3.1.2 Force Main Acid Flushing

Acid flushing of the force main line from PW-1 and PW-3 to the treatment plant was conducted on September 26, 2023. Total downtime of the GWET pumping system was 26 hours as documented in **Table 3-1**.

3.1.3 Well Redevelopment

GWET extraction well redevelopment activities were not required in 2023.

3.2 SA-6 North Contingent Groundwater Pumping System

The SA-6 North contingent groundwater pumping system design consists of a horizontal perforated drain located close to the centerline of the soil containment area. The drain consists of two sections extending from near Route 440 to the western barrier wall. In 2023, the eastern portion (pump PS-2N) was operated throughout the majority of the year with the exception of occasional down time for routine maintenance, the longest of which was from March 18 to April 26, 2023. Operation of the western portion of the drain (pump PS-1N) occurred during two periods; February 7 through March 31 and November 11 through December 31, 2023. The average daily pumping rate of PS-2N generally ranged

from 1 to 2 gpm whereas the pumping rate of PS-1N generally ranged from 3.5 to 4 gpm during the spring event and 1.5 to 2 gpm during the fall event. **Figure 3-2** compares these average daily rates with interior groundwater levels at SA-6 North. Since pumping was relatively uniform throughout the year, interior heads do not reflect the large duration cycles that are evident at SA-6 South. The decline of head in the western piezometers throughout the Spring is directly related to the pumping of PS-1N whereas the rise in heads shown in early May and early October are due to above average precipitation in the preceding months as discussed in Section 2.1.

3.3 SA-6 South Contingent Groundwater Pumping System

The SA-6 South contingent groundwater pumping system consists of a single horizontal perforated drain located close to the centerline of the soil containment area, which extends from near Route 440 to the western barrier wall in a continuous length. Two pumping cycles were conducted during 2023 to lower heads within the containment area. These were from April 6 to June 6, and from November 27 to December 31, 2023. Average pumping rates were 5.0 gpm during the first pumping cycle and 4.0 gpm during the second. **Figure 3-3** shows the response in head at the five piezometers inside of the soil containment cell to the two pumping cycles. Pumping is shown to lower heads approximately three feet during the Spring cycle and one foot during the late Fall cycle.

3.4 SA-5 NJCU Contingent Groundwater Pumping System

The contingent groundwater pumping system at the NJCU site was operated throughout 2023 with the exception of November 4 to 6 during which the system was off for 55.7 hours due to a level sensor malfunction. All pumping was conducted using extraction Sump B only; Sump A was not operated in 2023. The Sump B pump cycles on and off based on a water level probe set to an elevation of approximately 4.5 feet mean sea level (msl) just below the drain line. When pumping, the discharge rate of the pump is 2.5-3.0 gpm; however, the average steady-state, long-term net yield of the drain was 0.26 gpm in 2023.

4 HYDRAULIC MONITORING

Hydraulic monitoring in 2023 consisted of four quarterly rounds of groundwater elevation measurements in available wells in March, June, September, and December. The measured depth to groundwater was subtracted from the reference point elevation to determine the elevation of the groundwater surface. For those wells that are tidally influenced, the measured values were adjusted using a time-series method developed by the U.S. Geological Survey (Halford, 2006). The results for the four quarterly rounds are provided in **Table 4-1**. Groundwater elevations from the June 2023 round are plotted for the Shallow, Intermediate, Deep, and Bedrock Zones on **Figures 4-1B through 4-4** respectively, and on **Figure 4-5** in cross section. Groundwater elevation data are reported in units of feet of water relative to mean sea level in the NGVD-29 vertical datum.

4.1 Regional Groundwater Flow

4.1.1 Shallow Zone

Due to the close spacing of monitoring wells and piezometers screened in the Shallow Zone, well location IDs are shown separately on **Figure 4-1A** to improve the readability of the groundwater elevations and contours provided on **Figure 4-1B**. Groundwater elevations in the Shallow Zone range from nearly 12 feet msl on Site 154 to less than 3 feet msl near the Hackensack River. As shown on **Figure 4-1B**, shallow groundwater flow is generally from east to west across the region but is locally impacted by subsurface features such as the barrier walls installed at SA-5, SA-6, and SA-7, and deep sewer lines that run beneath JCMUA and Route 440. These barriers cause the groundwater flow direction to be more southerly south of Site 117.

Data loggers are installed in the piezometers along the barrier walls of SA-6 North, SA-6 South, and the four monitoring wells within SA-7. The loggers record the water level within each well at 6-hour intervals to aid in the determination of head gradients across the barrier walls as further discussed in Sections 4.5 and 4.6.

At the NJCU site in Study Area 5, groundwater flow is generally from east to west, however the north-south oriented barrier walls, including the barrier wall extension installed in 2017, cause groundwater to be diverted to the north, generally parallel to the barrier wall.

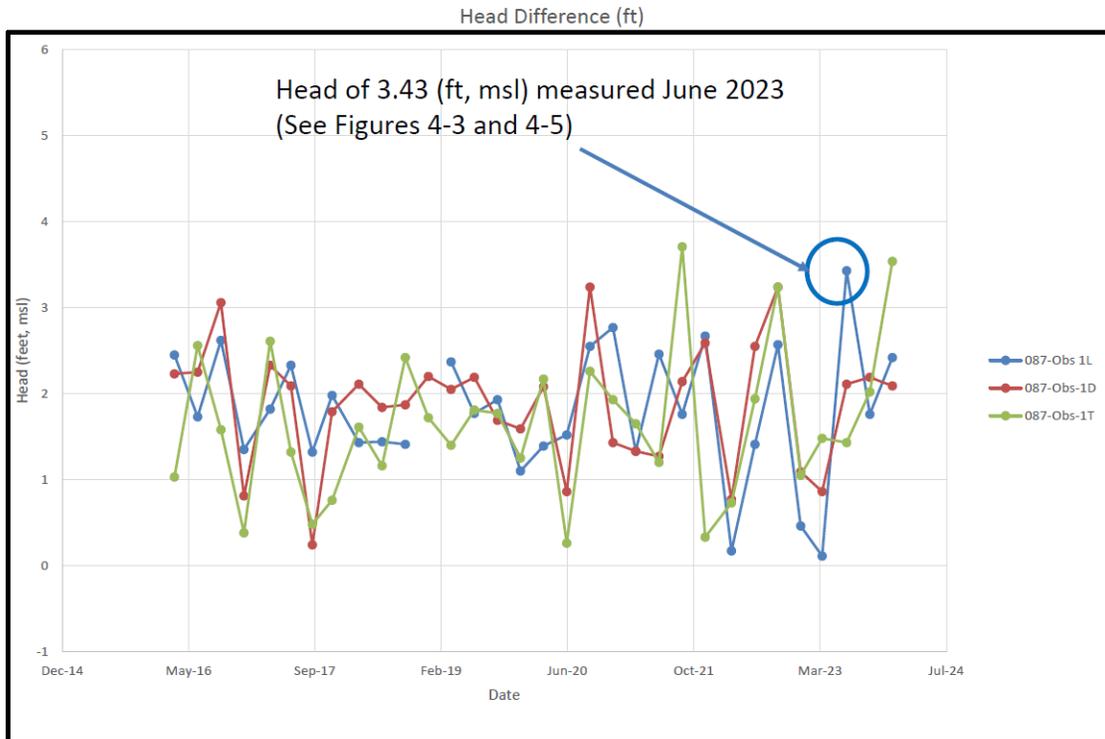
4.1.2 Intermediate Zone

Groundwater elevations in the Intermediate Zone are shown on **Figure 4-2** and range from nearly 6 feet msl at SA-5 to less than mean sea level near the GWET pumping wells. Groundwater is diverted around the SA-7 barrier wall but is not impacted by near-surface features on SA-6 North to the same degree as in the Shallow Zone. Vertically, heads within

the Intermediate Zone are generally 1 to 3 feet lower than in the Shallow Zone, which indicates a downward vertical gradient across Stratum D. At the 087-MW-136D location in SA-6 North for example, the vertical head difference in June was approximately 2 feet based on a comparison of **Figures 4-1B and 4-2**. Locally however, vertical gradients can be lessened or even reversed to upwards in areas of pumping, such as within the soil containment cells of SA-6 North and South. **Figures 4-2 and 4-5** also illustrate that the combined groundwater depression in the vicinity of the GWET pumping wells fully encompasses the Deep Overburden plume and provides effective capture in the upper lacustrine soils.

4.1.3 Deep Zone

Groundwater elevations in the Deep Zone (**Figure 4-3**) are similar to those in the overlying Intermediate Zone, although the influence of the SA-7 barrier wall is not as prominent. As noted in prior reports, groundwater flow in the Deep Zone is, to a degree, able to move beneath the SA-7 barrier wall through gravel lenses in the underlying glacial till/ice contact deposits. At SA-5, the barrier wall does not extend down to the Deep Zone and thus does not influence flow. The area of influence of the GWET pumping wells on groundwater flow in the Deep Zone is also illustrated on **Figures 4-3 and 4-5**. It is noted that the head reported in observation well OBS-1L for the June 2023 measurement round is elevated with respect to the adjacent wells, which has happened before. The chart below illustrates this anomaly relative to heads in the screen intervals above and below OBS-1L at the same location with water levels plotted from 2016 to 2023. A review of the stratigraphy suggests that this well is screened in a relatively thin lens of sand which may not be in good hydraulic communication with the more regional strata above and below. As such, the reported head in this well of (3.43) has not been included in the contouring process for this measurement round. As noted in Cornerstone's March 28, 2023 Memorandum in response to Plaintiffs' comments on the 2021 Integrated Groundwater Monitoring Report, anomalous heads such as these are unlikely to persist for any significant length of time due to the dynamic nature of tides and precipitation, and certainly not long enough to impact the capture zone of the GWET system.



4.1.4 Bedrock Zone

Groundwater elevation contours in the Upper Bedrock Zone are shown on **Figure 4-4**. The impact of the GWET pumping well 115-MW-215BR on groundwater flow is evident from the closely-spaced closed contours along the western border of SA-7. This area is characterized by the southwest-northeast trending high-permeability fracture zone which aids in the propagation of the capture zone parallel to the bulkhead as shown on **Figure 4-4**.

4.2 GWET System Capture Zone

Figure 4-5 illustrates that pumping from PW-1 and PW-3 created a combined zone of influence causing groundwater to flow both laterally and vertically into the capture zone of the wells. The drawdown associated with both wells during the startup of PW-3 was documented in Cornerstone’s technical memorandum dated February 23, 2016. On-going discussions regarding the extent of the capture zone and chromium plume occurred during 2023 as documented in Cornerstone’s Memorandum dated March 28, 2023 (noted above). Based on these results and data provided in both plan view on **Figures 4-2 and 4-3** and in cross section on **Figure 4-5**, the combined groundwater depression in the vicinity of the GWET pumping wells fully encompasses the Deep Overburden plume and provides effective capture that meets its design objectives.

4.3 New Jersey City University

Quarterly groundwater elevation data for the NJCU property are compiled in **Table 4-2** and mapped on **Figures 4-6 through 4-9**. A barrier wall extension, connecting the open-ended wing-wall west of Building 5 and the Building 6 sheet pile wall, was constructed during May-June 2017. This wall completed the perimeter wall in the Shallow Zone around the capped portion of the Commercial AOC. This was followed by the installation of four monitoring wells (MW-105 through MW-108) that, along with the four existing wells MW-101 through MW-104, provide four well pairs along the barrier wall extension. As noted in previous reports, the screened interval in MW-106 was at a lower position than in the adjacent well MW-102 and thus MW-106 was replaced with MW-106R in August 2021. The replacement well was constructed with a screened interval comparable to that of MW-102.

Data loggers placed in the four well pairs, as well as in Sumps A and B and wells 090-PZ-05 and 184-MW-05, were used to monitor groundwater elevation trends on a 6-hour interval. Hydrographs developed from these data were provided in the quarterly reports and indicate that groundwater elevations generally varied throughout the year in response to precipitation. For each piezometer equipped with an automatic datalogger, the arithmetic mean of the recorded values was calculated over a nominal one-month period and is plotted for 2023 in **Appendix B**. These averages were then used to determine if the head gradient across the barrier wall meets the performance criterion of an inward gradient of 0.1-foot or greater as defined in Appendix L of the LTMP. These comparisons are provided in **Table 4-3** and graphed for the year on **Figure 4-10**.

For the two southernmost well pairs (MW-103/107 and MW-104/108), heads were higher outside of the barrier wall throughout most of 2023. At the northernmost well pair (MW-101/105), **Figure 4-10** shows much greater variability in gradient throughout the year with all but one month having heads greater outside of the barrier wall than on the inside. These variations correlate with changes in monthly precipitation, especially in the outboard well MW-101. During most of the year, the above average rainfall allowed heads in MW-101 to remain elevated which resulted in inward gradients. However, during the dry period from May through mid-June, heads declined in MW-101 and an outward gradient was recorded in June.

At well pair MW-106R/102, heads inside of the barrier wall were consistently higher than those outside of the wall. These conditions at the two northern well pairs are likely due to presence of the Meadow Mat (Stratum D) on the inside of the barrier wall and the lack of Meadow Mat on the outside of the wall. This difference in the Meadow Mat allows groundwater to preferentially build up on top of the Meadow Mat inside of the barrier wall and allows a localized downward gradient in the Shallow Groundwater Zone outside of the barrier wall due to the lower heads of the underlying Intermediate Zone. This difference in Meadow Mat location also explains why the replacement of well MW-106 with MW-106R was not able to allow heads to build up to match those in well MW-102, despite its shallower screen.

Additional surface improvements and land use changes are expected in the future as part of NJCU's Phase 2 roadway and infrastructure project that may impact recharge and therefore groundwater levels. Thus, these levels should be evaluated during and after such surface modifications are conducted. For further details regarding groundwater levels, including monthly average head differences from logger data, refer to the quarterly reports. Finally, it is noted that each of the well pairs are separated by a steel sheet-pile wall constructed with sealed joints and that groundwater quality data indicates that hexavalent chromium has only been detected in one of the monitoring wells (MW-107) along the inside of the barrier wall in 2021, during one occasion (March Sampling Event), and the hexavalent chromium concentration was below 70 parts per billion (ppb) as discussed in Section 5.5.

Groundwater elevation maps are provided on **Figures 4-6 through 4-9** and indicate that groundwater flow is generally to the northwest as it moves onto Sites 90 and 184 from the east, but then turns north, parallel to the barrier walls that block flow to the south and west. In addition, downward vertical gradients continue to be present as documented by the reported head in the Deep Zone well 090-MW-09/090-MW-09R, located between 184-MW-05 and Sump B in the Commercial AOC. These data suggest that groundwater bypasses the capped portion of the Commercial AOC and moves vertically downward into the underlying zones; a conclusion that is supported by groundwater quality data from the sentinel wells as further discussed in Section 5.5.

4.4 Eastern SA-7 Perimeter Pools

The LTMP program includes monitoring of the hydraulic gradients across the soil-cement bentonite (SCB) barrier at the eastern perimeter of SA-7. This is accomplished through monitoring of the head in the eastern perimeter pools E-1 and E-2 and comparing these data to groundwater elevations in adjacent shallow piezometers E3-SO and E2-SO, respectively, located just outside of the SA-7 SCB. The location of the eastern pools, the design pool elevations, and water level trends are provided in **Appendix C**. Overall, the data indicate that water levels within the SA-7 eastern pools are greater than those outside of the SCB and thus outward gradients are occurring relative to the SA-7 SCB.

4.5 SA-6 North Containment Cell

Shallow groundwater elevations within the SA-6 North containment cell, as measured in June 2023, are illustrated on **Figure 4-1B** and include data from the ten piezometers installed around the perimeter of the soil containment cell and the six wells on the border of SA-7 and SA-6 North which includes wells 115-PZ-502 and 115-PZ-503 installed in the backfill of the SA-7 interior pool. At the time of the measurements, groundwater elevations within the cell ranged from approximately 2 to 4 feet above msl but varied during the year with pumping from the contingent drain system. Data from automatic loggers placed in each of the wells were used to construct the hydrographs provided in monthly data submittals and quarterly reports to assess the impact of precipitation events on heads in the

short term. The logger data were also used to calculate monthly average heads for the longer-term assessment of hydraulic gradients across the barrier walls. The monthly average heads are provided on **Table 4-4** and plotted in **Appendix A** for the year. Head differences across the barrier walls for these well pairs are also provided in **Table 4-4** and plotted on **Figure 4-11**. Gradient determinations include the five piezometer pairs around the east, north, and west soil containment cell walls, and four well pairs that have been identified along the SA-7 SCB using wells 115-PZ-502 and 115-PZ-503.

A review of these data indicates that (with one minor exception) the performance standard requiring at least 0.1 foot of inward gradient, as defined by the SA-6 LTMP, was met in four of the five piezometer pairs throughout each of the 12 months in 2023. The exception was during the dry period of May and June in which the inward gradient at the PZ-1/PZ2 location fell to 0.08 foot, which is just below the 0.1-foot criterion. An outward gradient was present throughout the year along the western SA-6 North soil containment cell wall at the PZ-9/PZ-10 well pair due to the influence of the Hackensack River. As discussed in the 2019 annual performance report, groundwater elevations in PZ-10 remain relatively high following periods of heavy precipitation which is likely the result of water buildup on the cap that increases the head beneath the cap. In accordance with the SA-6 LTMP, the quality of groundwater along the inside of the barrier wall at this western end was determined through laboratory analysis of samples from PZ-10 as further discussed in Section 5.3

With respect to the SA-7 SCB wall along SA-6 North, gradients were inward during the entire year at the 115-MW-502/E4-SO pair, the 115-MW-503/W1-SO pair, and the 115-PZ-503/W6-SO pair. Head differences at the 115-MW-502/E5-SO pair were inward for 10 of the 12 months with an annual monthly average of 0.90 feet inward. Thus, although two of the months for this pair did not meet the 0.1-foot criteria as defined by the SA-6 LTMP, the net direction of groundwater flow through the wall was inward in 2023. The cause of these occasional outward gradients was investigated in January 2021 and as discussed in the 2021 IGWMR, was determined to be temporary ponding of water above the cap within the utility corridor depression in which 115-E5-SO is located. During the first quarter 2023, Honeywell improved the subsurface drainage of the SA-6 North cap in this area. On March 9th and March 10th, 2023, WSP's subcontractor, HEPACO, excavated an area approximately 15'x15' on SA-7 to expose the end of the SA-6 North Open Space drain line and to create a drainage gallery to improve the drainage from this line. In addition to the drainage gallery, a 24" diameter standpipe was installed at the terminal end of the drain line to observe the flow from the drain line. Since the improvements were made in March 2023, inward gradients were observed throughout the rest of the year. Further details of this activity are described in the technical memo dated April 17, 2023 and sent to All Parties on April 17, 2023.

4.6 SA-6 South Containment Cell

Shallow groundwater elevations within the SA-6 South containment area, as measured in June 2023, are illustrated on **Figure 4-1B** and include data from the ten piezometers

installed around the perimeter of the soil containment cell and the five wells on the border of SA-7 and SA-6 South which includes wells 115-PZ-500 and 115-PZ-501 installed in the backfill of SA-7. At the time of measurement, groundwater elevations were approximately 2 to 3 feet above msl within the cell but varied throughout the year in response to pumping of the contingent drain system as discussed in Section 3.3.

Data from automatic loggers placed in each of the wells were used to construct the hydrographs provided in monthly data submittals and quarterly reports and to assess the impact of precipitation events on heads in the short term. The logger data were also used to calculate monthly average heads for the longer-term assessment of hydraulic gradients across the barrier walls. The monthly average heads are provided on **Table 4-4** and plotted in **Appendix A** for the year. Head differences across the barrier walls for these well pairs are also provided in **Table 4-4** and plotted on **Figure 4-12**. Gradient determinations include the 5 piezometer pairs around the east, south, and west soil containment cell wall, and three well pairs that have been identified along the SA-7 SCB using wells 115-PZ-500 and 115-PZ-501.

A review of these data indicates that the performance standard requiring at least 0.1 foot of inward gradient, as defined by the SA-6 LTMP, was met in four of the five piezometer pairs along the outside perimeter of the soil containment cell. Outward gradients were reported in 7 of the 12 months in the PZ-19R/PZ-20R well pair. With respect to the SA-7 SCB wall, gradients at each of the three well pairs were inward during the entire year.

In accordance with the SA-6 LTMP, the quality of groundwater along the inside of the barrier wall at selected locations was determined through laboratory analysis as further discussed in Section 5.4

4.7 SA-5 Sites 117 and 153

Groundwater movement beneath Sites 117 and 153 is generally from northeast to southwest as illustrated on **Figures 4-1B through 4-3**. In the Shallow Zone, the 48-inch diameter Interceptor Sewer beneath Route 440 serves as a groundwater sink and together with the prevalent reducing conditions associated with the Meadow Mat, limits the further movement of groundwater to the south and west. This is supported by shallow groundwater quality in this area as well as the absence of chromium detections in the underlying Intermediate Zone in well 117-MW-I1 located between SA-5 and the Interceptor Sewer. Additional detail regarding Honeywell's position on the impact of this sewer was provided in Memoranda dated December 7, 2018, January 23, 2019, March 2, 2020, August 10, 2020, December 14, 2020, March 2, 2021, and September 6, 2023.

On September 3, 2022, a sample of the bedding associated with the Jersey City Municipal Utility Authority (JCMUA) Combined Sewer Outfall (CSO) pipe at the intersection of NJ Route 440 & Danforth Avenue in Jersey City, New Jersey, was collected by WSP field personnel. The sample was analyzed for various geotechnical properties by SOR Analytical Laboratories. The sample results were transmitted to the Parties on November

4, 2022 by Arnold and Porter via a memo prepared by WSP USA on behalf of Honeywell. The sample was found to consist of 77.3% sand, 14.8% gravel, and 7.9% silt and have a permeability ranging from 0.009 to 0.028 per day (ft/day). As discussed in WSP's memo, these results show that the permeability of the bedding material for the CSO pipeline collected from the Danforth Ave project is well below that for even sandy material and thus would not promote preferential flow of shallow groundwater within the bedding towards the river. The results indicate that the bedding material used beneath the CSO pipes consisted primarily of sand rather than coarse gravel, and that the relatively large silt content suggests that the sand was either not a clean, washed material, or has accumulated silt during the estimated 100+ years since it was placed.

4.8 Miscellaneous Events

There were no miscellaneous events to be reported for 2023.

5 GROUNDWATER QUALITY MONITORING

Groundwater quality monitoring within the project area was conducted in 2023 in accordance with the GWET LTMP and the other applicable area-specific monitoring plans as discussed in Section 1.3 and listed on **Table 1-2**.

5.1 Deep Overburden Regional Plume Monitoring

The NJDEP Groundwater RA permits require regional monitoring to be on a 2-year frequency which would have required sampling in 2021, as the previous sampling was conducted in July 2019. Honeywell submitted a permit modification application on June 14, 2021 to have the frequency changed to 5 years to match the SAP and had expected NJDEP approval of that change in 2021. When the proposed change in frequency was not received in 2021, the regional sampling event was conducted in 2022. Per request of Plaintiffs, it was agreed to sample the Deep Overburden and bedrock wells to coincide with the shallow wells listed on each respective Groundwater Remedial Action Permit during a November 2023 sampling event. NJDEP issued the revised RA Permits for the Deep Overburden and Bedrock groundwater zones in May and June 2023, respectively, agreeing to the sampling frequency increase to every 5 years. Thus, the next scheduled Deep Overburden regional plume sampling event is planned for 2028.

Data from the November 2023 sampling round are summarized on **Table 5-1** and shown in plan-view for the Bedrock, Deep Overburden, and Intermediate Zones on **Figures 5-1 through 5-3**, respectively. Groundwater sampling procedures were in accordance with EPA low-flow sampling protocol as documented in the SAP. Both filtered and unfiltered samples were collected from each well for the analysis of total and hexavalent chromium.

The objective of the sampling program is to determine if the Deep Overburden chromium plume in each of the three water-bearing zones has expanded beyond the horizontal extent documented in the Final Groundwater Investigation Report (FGIR) [HydroQual 2007]. During this sampling event, a total of 25 monitoring wells were sampled. These included six wells which were added to the program in accordance with NJDEP Groundwater Permits for the site. These include monitoring wells 090-MW-09 (now 090-MW-09R), 117-MW-I4, and 117-MW-D2, screened in the Deep Zone; well 087-MW-136D, screened in the Intermediate Zone as a replacement for well 087-MW-O19D at SA-6 North; and wells 115-MW-203BR and 090-MW-7BR, screened in the Upper Bedrock. Each of these wells are located within the central portions of the chromium plume as originally delineated in the FGIR. Well 115-MW-203BR served as the original Upper Bedrock extraction well prior to being replaced by the current extraction well 115-MW-215BR in 2012.

5.1.1 Bedrock Zone

Table 5-1a provides total and hexavalent chromium data from filtered and unfiltered samples collected from nine Upper Bedrock Zone monitoring wells during the November 2023 monitoring event. Data from prior events are also provided in the table for historic reference. Hexavalent chromium results from the unfiltered samples collected during the November 2023 monitoring event have been plotted on **Figure 5-1** and iso-concentration contours from the May 2019 event are shown for reference. The June 28, 2023 analytical result from a discharge sample of the current GWET bedrock extraction well 115-MW-215BR has been added to the map and is used in the contouring. The results indicate that groundwater around the east and south edges of the plume remains non-detect for both hexavalent and total chromium in filtered samples.

Well 090-MW-7BR, located in the central portion of the bedrock plume, had a reported hexavalent chromium concentration of 128 ppm which is higher than the 86.7 ppm concentration reported in 2022, but lower than the results of the 2019 sampling event of 139 ppm. Former groundwater GWET extraction well 115-MW-203BR was non-detect for hexavalent chromium and total chromium was reported in the unfiltered sample from this well at 0.067 ppm which is down from 0.103 ppm in 2022. Yield testing during the evaluation of well 115-MW-215BR as a replacement extraction well confirmed that MW-203BR is screened within the same highly-transmissive fracture zone as well MW-215BR. Thus, this non-detect result for hexavalent chromium suggests that pumping from extraction well MW-215BR has been successful at pulling the bedrock plume back from its former southern extent as shown by the contours on **Figure 5-1**.

5.1.2 Deep Overburden Zone

Table 5-1b provides total and hexavalent chromium data from filtered and unfiltered samples collected from 10 Deep Overburden Zone monitoring wells during the November 2023 monitoring event. Data from prior events are also provided in the table for historic reference. Hexavalent chromium results from the unfiltered samples collected during the November 2023 monitoring event have been plotted on **Figure 5-2** and iso-concentration contours from the May 2019 event are shown for reference. The June 28, 2023 analytical result from a discharge sample of the current GWET Deep Overburden extraction well 087-PW-1 has been added to the map and is used in the contouring.

The results indicate that groundwater quality around the east and west edges of the plume remain non-detect for hexavalent chromium. Well 117-MW-I4, located in the central portion of the Deep Zone plume, reported a hexavalent chromium concentration of 7,560 ppm, which is similar to that reported in 2022 of 7,860 ppm. The hexavalent chromium concentration in the Deep Overburden Zone GWET extraction well 087-PW-1 was reported to be 13.5 ppm, down slightly from that in 2022 of 14.8 ppm.

Groundwater monitoring in the Plume Diversion or “L-well” area consists of three monitoring wells: 124-MW-106TR, 119-MW-01T and 119-MW-02T located generally downgradient of the plume. Hexavalent chromium concentrations in the unfiltered samples

in wells 119-MW-01T and 119-MW-02T were reported as non-detect and 0.034 ppm, respectively which represent a continuation of a generally declining trend relative to the 2019 event and are below the NJDEP GWQS of 0.070 ppm.

5.1.3 Intermediate Overburden Zone

Table 5-1c provides total and hexavalent chromium data from filtered and unfiltered samples collected from six Intermediate Zone monitoring wells during the November 2023 monitoring event. Data from prior events are also provided in the table for historic reference. Hexavalent chromium results from the unfiltered samples collected during the November 2023 monitoring event have been plotted on **Figure 5-3** and iso-concentration contours from the May 2019 event are shown for reference. The June 28, 2023 analytical result from a discharge sample of the current GWET Intermediate Zone extraction well 087-PW-3 has been added to the map and is used in the contouring. The results indicate that groundwater quality is similar to previous events and below the GWQS in five of the six wells including the replacement well 087-MW-136D at SA-6. Although total chromium in well 087-MW-136D was reported at 0.078 ppm in the unfiltered sample, the filtered sample reported total chromium at 0.0273 ppm. Well 117-MW-15 had a hexavalent chromium concentration of 0.096 ppm in the unfiltered sample which is not unexpected given its location in the plume. However, as shown in **Table 5-1c**, this result is in line with a steadily decreasing trend in concentrations since 2010.

5.2 GWET Extraction Wells

In accordance with recommendations in Section 6.5 of the 2020 Integrated Annual Groundwater Performance Report and Plaintiffs' written concurrence in their letter of September 9, 2021, sampling of the GWET extraction wells is now conducted annually and does not include analysis of VOCs (unless one of the extraction wells is replaced). The 2023 annual round of groundwater discharge samples was collected from the three GWET pumping wells on June 28 as shown on **Table 5-2**.

The samples were collected from the discharge sampling ports for extraction wells PW-1, PW-3 and bedrock well 115-MW-215BR without filtering. The results for hexavalent chromium are plotted on **Figure 5-4** and indicate that concentrations in the Deep Zone (PW-1) have declined in an asymptotic fashion since 2009 to approximately 14 ppm. Concentrations in the Intermediate Zone extraction well discharge initially increased significantly from 10 ppm to 90 ppm when PW-3 came online in January 2016 but since then have also declined in an asymptotic fashion to approximately 13 ppm. Hexavalent chromium concentrations in the bedrock have been generally stable in the range of approximately 10 to 11 ppm since December 2021.

5.3 SA-6 North

As noted in Section 4.5 and shown on **Table 5-3**, shallow groundwater samples were collected from perimeter piezometer PZ-10 located inside of the SA-6 North soil

containment area. The samples were collected on May 11, 2023. Hexavalent chromium was not detected in either the filtered or unfiltered samples and total chromium was not reported in either the filtered or unfiltered sample above the NJDEP GWQS of 0.07 ppm.

5.4 SA-6 South

As noted in Section 4.6 and shown on **Table 5-3**, shallow groundwater samples were collected from perimeter piezometer PZ-20R located inside of the SA-6 South soil containment area on May 11, 2023. Hexavalent chromium was not detected in either the filtered or unfiltered samples and total chromium was not reported in either the filtered or unfiltered sample above the NJDEP GWQS of 0.07 ppm.

5.5 New Jersey City University

In accordance with the Shallow Groundwater Monitoring and Extraction System Operation Plan and modified NJDEP Groundwater Permit for the NJCU Commercial AOC, the four monitoring wells along the interior of the barrier wall extension were sampled quarterly in 2023. These wells are 184-MW-102, 184-MW-105, 184-MW-107, and 184-MW-108. The results are provided on **Table 5-4** and plotted on **Figure 5-5**. The results indicate that hexavalent chromium was not detected above the reporting limit of 0.0055 ppm in any of the samples in 2023. Total chromium was only reported above the NJCU GWQS of 0.07 ppm in one sample; 0.185 ppm in the unfiltered sample in well 184-MW-107 during the September sampling round. However, the corresponding filtered sample reported total chromium at non-detect with a reporting limit of 0.010 ppm. **Table 1** in **Appendix D** provides historical groundwater quality data for the wells at NJCU. A review of these data indicates that although total chromium concentrations from unfiltered samples in well 184-MW-107 have historically been quite variable, ranging from over 1 ppm to non-detect, none of the filtered sample results have exceeded 0.07 ppm.

5.6 Plume Diversion Area Monitoring

Based on the results of groundwater monitoring in 2017, groundwater sampling of the Plume Diversion Area is no longer required.

5.7 SA-5 Site 117

In accordance with the SAP and NJDEP RA Groundwater Permit, sampling of shallow monitoring wells at Site 117 is required every two years with the previous event conducted in 2021. Thus, the six listed monitoring wells were sampled on November 28, 2023. The results are provided in **Table 5-5** and **Figure 5-6**. The results show that hexavalent chromium was reported above the reporting limit in two of the six locations; 117-MW-A89 and 117-MW-I4S. The elevated chromium concentrations in well MW-I4S are consistent with prior results and with its screened location within the Deep Overburden source area. The results for 117-MW-A89 continue to show a decreasing trend in concentrations relative to the two sampling dates in 2021. This generally supports Honeywell's theory

that spikes due to high groundwater levels are followed by a slower decline in concentrations

5.8 SA-5 Sites 079/153

Groundwater quality sampling of the shallow monitoring wells is not required at Site 079. In accordance with the SAP, groundwater quality monitoring of the bedrock monitoring well 079-MW-13BR is part of the regional groundwater monitoring plan and was sampled in November 2023 as discussed in Section 5.1.1.

In accordance with the SAP and NJDEP RA Groundwater Permit, sampling of the two shallow monitoring wells at Site 153 is required every two years. The last sampling event was in 2021 and thus the wells were sampled on November 29, 2023. The results are provided in **Table 5-5** and show that hexavalent chromium was not reported above the NJDEP GWQS of 0.07 ppm in the filtered sample of either well. The detection of elevated hexavalent chromium in the unfiltered sample in well 153-MW-A13 is “J”-qualified due to a pre-digestion spike recovery of less than 75%.

Total chromium in the unfiltered samples of wells 153-MW-A13 and 153-MW-A15 were reported at concentrations of 0.719 ppm and 0.098 ppm, respectively, but were reported at 0.253 ppm and 0.063 ppm, respectively in the filtered samples. The total chromium results in 153-MW-A13 were higher than in 2021, but lower than that in 2019 and generally not out of range compared to historical data. As noted in prior correspondence, large swings in total chromium concentrations are not uncommon in wells that are installed in or adjacent to COPR or chromium-impacted soils due to variations in turbidity and/or fluctuating groundwater levels, but hexavalent chromium does not migrate outside of these areas due to the reducing capacity of the meadow mat. As stated in previous IGWMRs: *In this scenario, the impacted soils become temporarily saturated and chromium is mobilized into the well screen. As groundwater levels subside, the hexavalent chromium is subsequently reduced by the surrounding reductive environment resulting in low or non-detect concentrations.* As a result, resampling of this well is not recommended at this time.

5.9 In-Situ Sampling Beneath Riverbed Sediments

In accordance with Section 3.3 of the SA-7 Deep Overburden and Bedrock Groundwater Remedy Long-term Monitoring Plan, in-situ groundwater from within the lacustrine deposits directly beneath the soft riverbed sediments in the Hackensack River is to be sampled every five years until chromium concentrations are below the GWQS. The most recent sampling event took place in 2019 during which location PW-09-450 was sampled. Results of this investigation were provided in the July 23, 2019 Technical Memorandum. Based on these results, and in accordance with the SAP, location PW-09-450 will be resampled in the spring of 2024.

5.10 Miscellaneous Groundwater Quality

The mass of hexavalent chromium removed from the Deep Overburden Plume through pumping has been calculated for reference. As shown on **Figure 5-7**, historic pumping includes operation of the two depressurization wells, 115-DP-1 and 115-DP-2, during the SA-7 soil excavation remedy, and the GWET system pumping that has been ongoing since December 2008. The mass removed was calculated by multiplying the pumping rate of each well by the hexavalent chromium concentration of the discharge. The results indicate that over 100 tons of hexavalent chromium have been removed through groundwater extraction alone through the end of 2023 and does not include the 50 tons of chromium treated during the mass removal injection program conducted from 2011 to 2016.

6 CONCLUSIONS AND RECOMMENDATIONS

6.1 Compliance with Monitoring Requirements

Hydraulic and groundwater quality monitoring conducted in 2023 have fulfilled the various monitoring plan requirements in accordance with **Tables 1-1 and 1-2**.

6.2 Status of Groundwater Remedial Action Permits

Groundwater Classification Exception Areas (CEAs) were approved by NJDEP on February 16, 2012 for the three principal water bearing zones in the Project Area (Shallow Zone, Deep Overburden, and Bedrock). In 2014, NJDEP notified Honeywell that CEA biennial certifications are not due until the applicable Groundwater Remediation Permits were issued. Honeywell submitted Groundwater Remedial Action (RA) Permit Applications to NJDEP in December 2017 and RA Permits were issued by the NJDEP in 2018. The Groundwater RA Permits included one permit for the regional Deep Overburden Zone, one permit for the regional Bedrock Zone, and five permits for the shallow zone as follows: SA-5 NJCU, Site 117, Site 153, SA-6 North and SA-6 South Open Space Cap areas. Biennial certification reports were submitted during July and August of 2020 and 2022. Applications for various permit modifications are discussed in Section 6.3.

6.3 Recommendations for Monitoring Well Network

A Remedial Action Groundwater Permit modification application was submitted to NJDEP in June 2021 for Site 117 Shallow Groundwater that included a request to discontinue groundwater quality sampling at well 117-MW-I4S and to change groundwater level measurements from annually to quarterly to be consistent with the SAP. In the May 23, 2023 NJDEP-approved modified RA Permit for Site 117 Shallow Groundwater, NJDEP did not approve abandonment of Well 117-MW-I4S, but agreed to a five year sampling frequency. This well was originally installed in the source area of the Deep Overburden plume to provide samples for treatability sampling and not for long term monitoring. This well is located along a roadway between Site 117 and adjacent Sites 090/184 (NJCU property).

A Remedial Action Groundwater Permit modification application was submitted to NJDEP in June 2021 for Site 117 Deep Overburden and Bedrock zones to be consistent with the SAP as follows:

Deep Overburden Zone (RAP 170002)

- Addition of well (087-MW-136D) for groundwater quality sampling.

- Addition of two wells (088-MW-15R; 124-MW-G02D) for depth-to-water measurements.
- Change in frequency of groundwater quality sampling from biennial to every 5 years and depth-to-water measurements from quarterly to annually.

Bedrock Zone (RAP 170003)

- Change in frequency of groundwater quality sampling from biennial to every 5 years and depth-to-water measurements from quarterly to annually.

The NJDEP approved the permit modifications for the Deep Overburden and Bedrock Zone on May 23, 2023 and June 9, 2023, respectively.

A Remedial Action Groundwater Permit modification application was submitted to NJDEP in December 2021 for Study Area 5 NJCU to discontinue groundwater sampling of four wells on the outside of the barrier wall including 184-MW-101, 184-MW-103, 184-MW-104, and 184-MW-106R to be consistent with the SAP. The NJDEP issued a Remedial Action Groundwater Permit modification for NJCU reflecting this modification on February 11, 2022.

Based on review of the 2023 analytical data and sampling events, no recommendations for modifications are proposed.

6.4 Recommendations for Water Level Monitoring Frequency

The frequency of regional groundwater level monitoring has been changed to annually beginning January 2024 in accordance with the SAP. Groundwater level monitoring frequency at specific sites will continue to be conducted in accordance with frequencies specified in the various site-specific LTMPs as indicated in **Table 1-1**. As noted in Section 6.3, a Remedial Action Groundwater Permit modification application was submitted to NJDEP in June 2021 for Site 117 Shallow Groundwater that included a request to change groundwater level measurements from annually to quarterly to be consistent with the SAP.

Based on review of the 2023 water level data, no recommendations for changes to the monitoring frequency are proposed.

6.5 Recommendations for Groundwater Quality Monitoring Frequency

As noted in Section 6.3, a Remedial Action Groundwater Permit modification application was submitted to NJDEP in June 2021 to change the frequency of groundwater quality sampling of the Deep Overburden and Bedrock Zones from biennial to every 5 years to be consistent with the SAP and approved on May 23, 2023 and June 9, 2023, respectively.

The frequency of groundwater quality monitoring, well selection, and parameters for analysis are established in the site-specific LTMPs and the NJDEP RA Groundwater Permits for the various sub-areas. Any additional future proposed changes to the

monitoring program that differ from the requirements of RA Groundwater Permits will require approval from the NJDEP via permit modification prior to implementation. Following review and approval of any future recommendations by the Parties, Honeywell will submit required permit modifications to the NJDEP for approval prior to proceeding with implementation.

6.6 Other Recommendations

There are no further recommendations.

LIMITATIONS

The work product included in the attached was undertaken in full conformity with generally accepted professional consulting principles and practices and to the fullest extent as allowed by law we expressly disclaim all warranties, express or implied, including warranties of merchantability or fitness for a particular purpose. The work product was completed in full conformity with the contract with our client and this document is solely for the use and reliance of our client (unless previously agreed upon that a third party could rely on the work product) and any reliance on this work product by an unapproved outside party is at such party's risk.

The work product herein (including opinions, conclusions, suggestions, etc.) was prepared based on the situations and circumstances as found at the time, location, scope and goal of our performance and thus should be relied upon and used by our client recognizing these considerations and limitations. Cornerstone shall not be liable for the consequences of any change in environmental standards, practices, or regulations following the completion of our work and there is no warrant to the veracity of information provided by third parties, or the partial utilization of this work product.

TABLES

**TABLE 1-1
GROUNDWATER LEVEL MONITORING REQUIREMENTS
for Integrated Groundwater Monitoring Plan**

<u>Location</u>	<u>Monitoring Plan</u>	<u>Consent Decree</u>	<u>Depth</u>	<u>Frequency</u>	<u># Wells</u>
Regional ¹	GWET Long Term Monitoring Plan June 10, 2008	Deep Overburden and Bedrock Groundwater Remedies Consent Order	All Zones	Annually	115
Study Area 7	SA-7 Perimeter Pools	Final Judgement, ICO v Honeywell	Shallow	Monthly	2
Study Area 7 - Site 115	SA-6 Long Term Monitoring Plan (February 2018, revised December 2020)	Final Judgement	Shallow	Monthly manual readings; logger readings every 6 hours-averaged monthly	6
SA-6 South ⁴	SA-6 Long Term Monitoring Plan (February 2018, revised December 2020)	First Amended Consent Decree Regarding Remediation and Redevelopment of SA-6 South	Shallow	Annual manual readings; logger readings every 6 hours-averaged monthly	15
SA-6 North ⁴	SA-6 Long Term Monitoring Plan (February 2018, revised December 2020)	First Amended Consent Decree Regarding Remediation and Redevelopment of Study Area 6 North	Shallow	Annual manual readings; logger readings every 6 hours-averaged monthly	14
SA-5 (NJCU) Sites 90 & 184 ⁴	Long Term Monitoring Plan ² (November 2016)	Consent Decree Regarding Remediation of the New Jersey City University Redevelopment Area	Shallow	Quarterly manual readings; logger readings every 6 hours-averaged monthly	13 wells and 2 sumps
SA-5: Site 079	Long Term Monitoring Plan for Sites 079 and 153 South	Consent Decree Regarding Remediation of the Study Area 5 Shallow Groundwater and the Site 79 Residential Properties	Shallow	Quarterly	3
SA-5: Site 153 ⁴	Long Term Monitoring Plan for SA-5 Shallow GW ³	Consent Decree Regarding Remediation of the Study Area 5 Shallow Groundwater and the Site 79 Residential Properties	Shallow	Quarterly	2
SA-5 Site 117 ⁴	Long Term Monitoring Plan for SA-5 Shallow GW ³	Consent Decree Regarding Remediation of the Study Area 5 Shallow Groundwater and the Site 79 Residential Properties	Shallow	Quarterly	5

¹Includes available wells on SA-5, SA-6, SA-7, and surrounding areas historically considered part of the Deep Overburden Plume investigation.

²SA-5 NJCU LTMP (November 2016; updated May 2019); Shallow Groundwater Monitoring and Extraction System Operation Plan (Appendix L of the LTMP).

³Draft LTMP for SA-5 Shallow Groundwater includes Sites 117 and 153 in progress; pending ongoing technical discussions and correspondence with Plaintiffs.

⁴Remedial Action Groundwater Permits were issued in 2018 for the Deep Overburden; Bedrock; and Shallow groundwater zones at SA-5 Sites 90/184, 117, 153, SA-6 North and South Open Space Cap Areas; Various permit modification applications submitted 2021 were approved by the NJDEP in May and June 2023. SA-5 Sites 90/184 permit modified February 2022.

**TABLE 1-2
GROUNDWATER QUALITY MONITORING REQUIREMENTS
for Integrated Groundwater Monitoring Plan**

<u>Location</u>	<u>Monitoring Plan</u>	<u>Consent Decree</u>	<u>Depth</u>	<u>Frequency</u>	<u># Wells</u>	<u>Estimated Start Date</u>
Regional	Integrated Sampling and Analysis Plan; April 2014, revised October 2019	Deep Overburden and Bedrock Groundwater Remedies Consent Order	Intermediate	Every 5 years ³	6	On-going future events TBD
			Deep	Every 5 years ³	10	
			Bedrock	Every 5 years ³	9	
			Beneath River	Every 5 years	1	
SA-5 (NJCU) Sites 90 & 184	Long Term Monitoring Plan / Shallow Groundwater Monitoring Document ¹	Consent Decree Regarding Remediation of the New Jersey City University Redevelopment Area	Shallow	Quarterly; Future TBD per Appendix L of LTMP ⁴	4	On-going
SA-5 Site 117	Long Term Monitoring Plan for SA-5 Shallow GW ²	Consent Decree Regarding Remediation of the Study Area 5 Shallow Groundwater and the Site 79 Residential Properties	Shallow	Biennial ²	6	On-going
SA-5: Site 153	Long Term Monitoring Plan for SA-5 Shallow GW ²	Consent Decree Regarding Remediation of the Study Area 5 Shallow Groundwater and the Site 79 Residential Properties	Shallow	Biennial ²	2	On-going
SA-6 South	SA-6 Long Term Monitoring Plan (February 2018, revised December 2020)	First Amended Consent Decree Regarding Remediation and Redevelopment of SA-6 South	Shallow	As required by gradients across wall	5	On-going
SA-6 North	SA-6 Long Term Monitoring Plan (February 2018, revised December 2020)	First Amended Consent Decree Regarding Remediation and Redevelopment of SA-6 North	Shallow	As required by gradients across wall	5	On-going

Biennial = every two years

¹SA-5 NJCU LTMP (November 2016, updated May 2019); Shallow Groundwater Monitoring and Extraction System Operation Plan (Appendix L of the LTMP).

²Draft LTMP for SA-5 Shallow Groundwater includes Sites 117 and 153 in progress; pending ongoing technical discussions and correspondence with Plaintiffs. 117-MW-I4S is on a 5-year sampling frequency per May 2023 Remedial Action Permit modification.

³Remedial Action Groundwater Permits were issued in 2018 for the Deep Overburden; Bedrock; and Shallow groundwater zones at SA-5 Sites 90/184, 117, 153, SA-6 North and South Open Space Cap Areas; Various permit modification applications submitted 2021 were approved by the NJDEP in May and June 2023. SA-5 Sites 90/184 permit modified 2/11/2022.

⁴Per NJDEP Groundwater Remedial Action Permit Modification dated February 11, 2022, only the four inboard wells along the barrier wall are now required to be sampled on a quarterly basis.

Table 2-1
2023 Monthly Precipitation Data

Month	2023 Precipitation	Average Precipitation
January	4.31	3.98
February	1.41	2.96
March	3.33	4.21
April	8.07	3.92
May	0.90	4.46
June	2.67	3.4
July	6.26	4.68
August	4.26	4.02
September	8.31	4.01
October	4.02	3.16
November	2.91	3.88
December	7.56	3.57
Annual Total	54.01	46.25

Data Source: [Search | Climate Data Online \(CDO\) | National Climatic Data Center \(NCDC\) \(noaa.gov\)](#)
Station name: Newark International Airport
Station ID: GHCND:USW00014734

**Table 2-2
Groundwater Monitoring Well Inventory**

<u>Well ID</u>	<u>Screen Zone</u>	<u>Ref. Pt. Elev.</u> (ft msl)	<u>Well Depth</u> (ft)	<u>Screen Length</u> (ft)	<u>Comments</u>
087-MW-08	Deep	12.98	99.0	10	
087-MW-34	Deep	12.73	70.0	5	
087-MW-A26T	Deep	9.92	56.0	15	
087-MW-W25T	Deep	19.06	91.0	15	
087-OBS-1L	Deep	15.27	67.1	5	
087-OBS-1T	Deep	15.23	105.0	10	
087-OBS-3L	Deep	12.68	65.0	5	
087-OBS-4T	Deep	11.60	75.5	5	
087-OBS-5T	Deep	12.62	81.9	10	
087-PW-1	Deep	10.27	69.0	10	
088-MW-G19T	Deep	13.25	93.0	15	
090-MW-09	Deep	10.59	75.0	5	Abandoned October 2023
090-MW-09R	Deep	11.24	75.0	10	Installed October 2023
117-MW-D1	Deep	11.08	41.0	10	
117-MW-D2	Deep	17.62	48.0	10	
117-MW-D3	Deep	18.85	80.0	10	
117-MW-I4	Deep	15.49	75.0	10	
119-MW-01T	Deep	10.78	62.0	10	
119-MW-02T	Deep	8.80	70.0	10	
124-MW-106T	Deep	17.70	86.5	10	Abandoned October 2023
124-MW-106TR	Deep	13.55	82.0	10	Installed October 2023
153-MW-A13T	Deep	9.34	58.0	15	
SA6-MW-AA1T	Deep	15.31	70.0	10	
087-MW-136D	Intermediate	13.18	36.0	10	Installed July 2018, replaced 087-MW-O19D
087-MW-13	Intermediate	12.93	40.0	10	
087-MW-A26D	Intermediate	10.35	28.0	10	
087-MW-O29D	Intermediate	10.32	56.0	NA	
087-MW-W25D	Intermediate	16.98	66.0	10	
087-OBS-07	Intermediate	12.59	30.0	5	
087-OBS-1D	Intermediate	15.13	42.8	10	
087-OBS-2D	Intermediate	12.68	54.0	10	
087-OBS-5D	Intermediate	12.72	39.8	10	
087-PW-2	Intermediate	13.02	48.0	20	
087-PW-3	Intermediate	12.40	50.0	20	
088-MW-15R	Intermediate	12.83	35.0	10	
090-MW-07	Intermediate	17.20	40.0	10	
117-MW-I1	Intermediate	11.08	22.0	10	
117-MW-I2	Intermediate	17.59	28.0	10	
117-MW-I3	Intermediate	15.59	28.0	10	
117-MW-I5	Intermediate	18.76	37.0	15	
124-MW-G02D	Intermediate	16.80	34.5	10	
SA6-MW-AA1D	Intermediate	19.36	32.0	10	
DP-1	Intermediate	12.92	38.5	10	Temporary depressurization well in SA-6 South Deferred Area, abandoned November 18, 2020
DP-2	Intermediate	13.80	38.5	10	Temporary depressurization well in SA-6 South Deferred Area, abandoned November 18, 2020
DP-3	Intermediate	13.20	38.5	10	Temporary depressurization well in SA-6 South Deferred Area, abandoned November 18, 2020
DP-4	Intermediate	12.20	38.5	10	Temporary depressurization well in SA-6 South Deferred Area, abandoned November 18, 2020
OW-1	Intermediate	11.10	32.5	10	Temporary observation well in SA-6 South Deferred Area, abandoned November 18, 2020
OW-2	Intermediate	11.10	32.5	10	Temporary observation well in SA-6 South Deferred Area, abandoned November 18, 2020
OW-3	Intermediate	11.20	32.5	10	Temporary observation well in SA-6 South Deferred Area, abandoned November 18, 2020
OW-4	Intermediate	15.00	19.0	10	Temporary observation well in SA-6 South Deferred Area, abandoned November 19, 2020

**Table 2-2
Groundwater Monitoring Well Inventory**

<u>Well ID</u>	<u>Screen Zone</u>	<u>Ref. Pt. Elev.</u>	<u>Well Depth</u>	<u>Screen Length</u>	<u>Comments</u>
		(ft msl)	(ft)	(ft)	
073-MW-1BR	Rock	20.39	144.0	15	
079-MW-13BR-1	Rock	13.08	121.0	10	
079-MW-13BR-2	Rock	13.08	214.0	15	
079-MW-13BR-3	Rock	13.08	284.0	15	
090-MW-7BR-1	Rock	16.99	134.0	15	
090-MW-7BR-2	Rock	16.99	177.0	15	
090-MW-7BR-3	Rock	16.99	233.0	15	
115-MW-203BR	Rock	6.61	162.0	20	
115-MW-215BR	Rock	8.82	143.0	20	
117-MW-3BR-1	Rock	12.34	155.0	15	
117-MW-3BR-2	Rock	12.34	263.0	15	
117-MW-8BR	Rock	12.94	125.0	10	
119-MW-2BR-1	Rock	8.43	163.0	15	
119-MW-2BR-2	Rock	8.43	245.0	15	
119-MW-2BR-3	Rock	8.43	315.0	15	
119-MW-16BR-1	Rock	8.61	151.0	15	
119-MW-16BR-2	Rock	8.61	187.0	15	
119-MW-16BR-3	Rock	8.61	247.0	15	
124-MW-8BR	Rock	17.24	140.5	15	
SA6-MW-5BR-1	Rock	17.06	106.0	15	
SA6-MW-5BR-2	Rock	17.06	154.0	15	
SA6-MW-5BR-3	Rock	17.06	204.0	15	
SA6-MW-5BR-4	Rock	17.06	236.0	15	
SA6-MW-5BR-5	Rock	17.06	281.0	15	
SA6-MW-14BR	Rock	9.99	85.0	10	
SA6-MW-15BR	Rock	8.08	103.0	20	
079-MW-01	Shallow	8.80	8.9	5	
079-MW-A2	Shallow	8.10	11.5	10	
079-MW-C6	Shallow	11.00	13.0	10	
087-PZ-1	Shallow	10.04	11.0	5	Installed June 2016
087-PZ-2	Shallow	10.35	8.0	5	Installed June 2016
087-PZ-3	Shallow	13.28	13.0	5	Installed June 2016
087-PZ-4	Shallow	13.65	12.0	5	Installed June 2016
087-PZ-5	Shallow	19.49	13.0	5	Installed June 2016
087-PZ-6	Shallow	21.01	13.0	5	Installed June 2016
087-PZ-7	Shallow	16.24	26.0	5	Installed June 2016
087-PZ-8	Shallow	16.54	14.0	5	Installed June 2016
087-PZ-9	Shallow	17.19	12.0	5	Installed June 2016
087-PZ-10	Shallow	17.06	12.0	5	Installed June 2016
090-PZ-05	Shallow	18.08	16.4	NA	
090-PZ-06	Shallow	18.20	18.0	NA	
115-E1A-SO	Shallow	16.48	7.0	NA	Replaced 115-E1A-SO in 2015
115-E2-SO	Shallow	10.33	10.0	5	
115-E3-SO	Shallow	12.57	20.7	5	

**Table 2-2
Groundwater Monitoring Well Inventory**

<u>Well ID</u>	<u>Screen Zone</u>	<u>Ref. Pt. Elev.</u>	<u>Well Depth</u>	<u>Screen Length</u>	<u>Comments</u>
		(ft msl)	(ft)	(ft)	
115-E4-SO	Shallow	14.04	13.5	10	
115-E5-SO	Shallow	17.39	21.4	8	
115-PZ-500	Shallow	6.68	11.0	9	
115-PZ-501	Shallow	14.47	16.5	8.5	
115-PZ-502	Shallow	14.51	16.0	8	
115-PZ-503	Shallow	7.32	10.0	8	
115-W1-SO	Shallow	18.84	24.7	10	
115-W3-SO	Shallow	14.96	14.0	10	
115-W5-SO	Shallow	21.68	16.0	NA	
115-W6-SO	Shallow	14.76	18.2	NA	
117-MW-A05	Shallow	18.48	16.0	10	
117-MW-A14	Shallow	17.33	17.0	10	
117-MW-I4S	Shallow	16.70	11.2	10	
117-MW-A85	Shallow	17.40	15.0	10	
117-MW-A89	Shallow	13.17	16.0	10	
117-MW-A99	Shallow	15.95	14.0	10	
124-MW-10	Shallow	10.06	11.0	8	
124-MW-11	Shallow	9.05	8.0	6	
124-PZ-11	Shallow	9.69	9.5	5	Installed 2015
124-PZ-12	Shallow	10.63	9.5	5	Installed 2015
124-PZ-13	Shallow	19.34	18.4	5	Installed 2015
124-PZ-14	Shallow	15.15	14.1	5	Installed 2015
124-PZ-15	Shallow	24.41	21.2	5	Installed 2015
124-PZ-16	Shallow	17.70	19.6	5	Installed 2015
124-PZ-17	Shallow	15.15	12.0	5	Installed 2015
124-PZ-18	Shallow	18.28	16.2	5	Installed 2015
124-PZ-19	Shallow	17.91	10.4	5	Installed 2015, abandoned Q2 2020
124-PZ-20	Shallow	18.38	17.3	5	Installed 2015, abandoned Q3 2020
124-PZ-19R	Shallow	18.30	24.6	5	Installed Q4 2020
124-PZ-20R	Shallow	20.41	27.6	5	Installed Q4 2020
153-MW-A13	Shallow	9.62	10.0	6	
153-MW-A15	Shallow	11.19	12.2	10	
154-MW-A06	Shallow	19.87	15.1	NA	
154-MW-A5A	Shallow	19.16	14.0	NA	
184-MW-04	Shallow	8.87	6.8	NA	
184-MW-05	Shallow	14.71	13.0	NA	
184-MW-06	Shallow	18.75	15.0	NA	
184-MW-101	Shallow	14.85	13.0	5	
184-MW-102	Shallow	13.16	12.0	5	
184-MW-103	Shallow	14.71	14.0	5	
184-MW-104	Shallow	15.47	13.0	5	
184-MW-105	Shallow	15.10	12.0	5	
184-MW-106	Shallow	12.72	14.0	5	Abandoned August 12, 2021
184-MW-106R	Shallow	12.68	9.5	5	Installed August 12, 2021
184-MW-107	Shallow	13.41	11.0	5	
184-MW-108	Shallow	15.32	15.0	5	
Sump A	Shallow	15.98	21.0	NA	
Sump B	Shallow	13.08	15.0	NA	

NA - information not available

Table 3-1

GWET Pumping Outages in 2023

Well ID	Start Date	End Date	Duration Days and Hours		Comment
087-PW-1, 087-PW-3, 087-MW-215BR	26-Sep-23	27-Sep-23	1	2.00	Acid soaking of all lines

Only outages over 8 hours are noted.

TABLE 4-1
GROUNDWATER ELEVATION DATA FROM QUARTERLY ROUNDS IN 2023

Well ID	Screen Zone	Ref. Pt. Elev.	Well Depth	Screen Length	Groundwater Elevation (NGVD-29)			
					3/23/23	6/28/23	9/28/23	12/26/23
		(ft msl)	(ft)	(ft)	(ft msl)	(ft msl)	(ft msl)	(ft msl)
087-MW-08	Deep	12.98	99	10	0.89	1.05	1.69	1.17
087-MW-34	Deep	12.73	70	5	-0.83	-0.60	0.00	-0.30
087-MW-A26T	Deep	9.92	56	15	3.54	2.99	3.41	3.63
087-MW-W25T	Deep	19.06	91	15	0.84	1.52	2.20	1.77
087-OBS-1L	Deep	15.27	67.05	5	0.11	3.43	1.76	2.42
087-OBS-1T	Deep	15.23	105	10	1.48	1.43	2.02	3.54
087-OBS-3L	Deep	12.68	65	5	-0.14	1.42	1.43	0.94
087-OBS-4T	Deep	11.60	75.5	5	0.76	1.07	1.42	1.19
087-OBS-5T	Deep	12.62	81.9	10	-0.12	-0.24	0.69	0.24
087-PW-1	Deep	10.27	69	10	-44.13	-45.23	-43.42	-45.84
088-MW-G19T	Deep	13.25	93	15	2.89	2.79	3.36	3.14
090-MW-09	Deep	18.81	75	5	5.24	4.83	5.42	AB
090-MW-09R	Deep	11.24	75	10	--	--	--	5.57
117-MW-D1	Deep	11.08	41	10	3.10	2.88	3.16	3.49
117-MW-D2	Deep	17.62	48	10	4.55	4.27	4.57	4.99
117-MW-D3	Deep	18.85	80	10	5.84	5.18	5.77	6.19
117-MW-I4	Deep	15.49	75	10	4.76	4.53	4.74	5.04
119-MW-01T	Deep	10.78	62	10	2.80	2.67	3.05	3.16
119-MW-02T	Deep	8.80	70	10	3.00	2.85	2.98	3.30
124-MW-106T	Deep	17.70	86.5	10	2.90	2.85	3.13	AB
124-MW-106TR	Deep	13.55	82	10	--	--	--	2.93
153-MW-A13T	Deep	9.34	58	15	3.09	3.05	3.97	3.29
SA6-MW-AA1T	Deep	15.31	70	10	0.58	1.03	1.78	1.35
087-MW-136D	Intermediate	13.18	36	10	N/A	2.21	2.78	1.91
087-MW-13	Intermediate	12.93	40	10	-0.52	1.90	0.02	0.61
087-MW-A26D	Intermediate	10.35	28	10	3.61	3.37	3.47	3.74
087-MW-O29D	Intermediate	10.32	56	NA	1.28	1.45	2.11	1.69
087-MW-W25D	Intermediate	16.98	66	10	1.02	2.98	2.75	1.87
087-OBS-07	Intermediate	12.59	30	5	0.17	-0.98	1.64	1.13
087-OBS-1D	Intermediate	15.13	42.8	10	0.86	2.11	2.19	2.09
087-OBS-2D	Intermediate	12.68	54	10	-2.15	-1.97	-1.23	-1.63
087-OBS-5D	Intermediate	12.72	39.83	10	-0.43	-0.11	1.20	0.69
087-PW-2	Intermediate	13.02	48	20	1.80	0.50	3.57	3.02
087-PW-3	Intermediate	12.40	50	20	-6.63	-7.80	-5.12	-5.88
088-MW-15R	Intermediate	12.83	35	10	2.82	2.57	2.97	3.17
090-MW-07	Intermediate	17.20	40	10	5.81	5.42	5.78	6.09
117-MW-I1	Intermediate	11.08	22	10	4.19	4.25	4.65	3.85
117-MW-I2	Intermediate	17.59	28	10	5.06	4.62	4.88	5.49
117-MW-I3	Intermediate	15.59	28	10	5.22	4.69	5.02	5.41
117-MW-I5	Intermediate	18.76	37	15	6.18	5.95	6.03	6.46
124-MW-G02D	Intermediate	16.80	34.5	10	2.79	2.71	3.06	3.12
SA6-MW-AA1D	Intermediate	19.36	32	10	0.45	1.06	1.95	1.43
073-MW-1BR	Rock	20.39	144	15	-0.97	-2.06	-0.75	-0.29
079-MW-13BR-1	Rock	13.08	121	10	7.35	7.31	7.64	7.73
079-MW-13BR-2	Rock	13.08	214	15	7.75	7.23	7.71	8.07
079-MW-13BR-3	Rock	13.08	284	15	7.62	7.37	7.50	7.83
090-MW-7BR-1	Rock	16.99	134	15	5.17	4.98	5.39	5.51
090-MW-7BR-2	Rock	16.99	177	15	5.37	5.16	5.53	5.49
090-MW-7BR-3	Rock	16.99	233	15	5.45	5.24	5.59	5.83
115-MW-203BR	Rock	6.61	162	20	-0.74	-0.75	-0.28	-0.42
115-MW-215BR	Rock	8.82	143	20	-4.66	-4.05	-3.06	-3.90
117-MW-3BR-1	Rock	12.34	155	15	6.79	5.54	6.61	6.31
117-MW-3BR-2	Rock	12.34	263	15	6.52	6.15	5.86	6.98
117-MW-8BR	Rock	12.94	125	10	6.21	5.69	5.82	6.04
119-MW-2BR-1	Rock	8.43	163	15	-0.96	-1.09	-0.03	-0.55
119-MW-2BR-2	Rock	8.43	245	15	-0.42	-0.43	0.40	-0.58
119-MW-2BR-3	Rock	8.43	315	15	0.17	-0.04	N/A	N/A
119-MW-16BR-1	Rock	8.61	151	15	4.89	6.90	5.56	5.36
119-MW-16BR-2	Rock	8.61	187	15	4.78	4.42	4.83	4.97
119-MW-16BR-3	Rock	8.61	247	15	4.75	4.53	N/A	N/A
124-MW-8BR	Rock	17.24	140.5	15	3.97	3.77	4.19	4.16
SA6-MW-5BR-1	Rock	17.06	106	15	N/A	2.10	2.85	N/A
SA6-MW-5BR-2	Rock	17.06	154	15	2.77	2.68	3.48	3.19
SA6-MW-5BR-3	Rock	17.06	204	15	3.30	3.34	3.09	3.68
SA6-MW-5BR-4	Rock	17.06	236	15	3.37	3.23	3.77	3.63
SA6-MW-5BR-5	Rock	17.06	281	15	3.41	3.22	3.70	3.60
SA6-MW-14BR	Rock	9.99	85	10	3.54	3.27	3.97	3.75
SA6-MW-15BR	Rock	8.08	103	20	1.82	0.60	2.43	1.68

TABLE 4-1
GROUNDWATER ELEVATION DATA FROM QUARTERLY ROUNDS IN 2023

Well ID	Screen Zone	Ref. Pt. Elev.	Well Depth	Screen Length	Groundwater Elevation (NGVD-29)			
					3/23/23	6/28/23	9/28/23	12/26/23
079-MW-01	Shallow	8.80	8.88	5	3.71	3.29	3.23	3.98
079-MW-A2	Shallow	8.10	11.48	10	3.34	3.05	3.36	3.53
079-MW-C6	Shallow	11.00	13	10	4.95	4.76	5.23	5.11
087-PZ-1	Shallow	10.04	11.03	5	4.61	3.31	5.39	5.51
087-PZ-2	Shallow	10.35	8	5	3.74	3.27	2.99	3.45
087-PZ-3	Shallow	13.28	13	5	4.98	4.25	5.20	5.81
087-PZ-4	Shallow	13.65	12	5	4.03	3.28	3.27	3.65
087-PZ-5	Shallow	19.49	13	5	5.87	4.97	6.69	6.08
087-PZ-6	Shallow	21.01	13	5	3.46	3.46	2.95	3.24
087-PZ-7	Shallow	16.24	26	5	6.78	5.35	7.04	8.04
087-PZ-8	Shallow	16.54	14	5	2.80	3.34	3.45	4.05
087-PZ-9	Shallow	17.19	12	5	2.71	2.57	3.69	2.98
087-PZ-10	Shallow	17.06	12	5	3.07	3.37	4.16	4.73
090-PZ-05	Shallow	18.08	16.41	NA	7.27	6.38	7.98	7.56
090-PZ-06	Shallow	18.20	18	NA	8.98	8.56	9.89	9.46
115-E1A-SO	Shallow	16.48	7	NA	4.90	2.19	3.85	3.86
115-E2-SO	Shallow	10.33	10	5	6.33	6.46	6.55	6.55
115-E3-SO	Shallow	12.57	20.73	5	6.50	6.25	6.72	6.87
115-E4-SO	Shallow	14.04	13.45	10	3.39	2.77	DRY	2.74
115-E5-SO	Shallow	17.39	21.39	8	4.18	3.33	2.92	4.32
115-PZ-500	Shallow	6.68	11	9	4.61	4.49	4.98	4.88
115-PZ-501	Shallow	14.47	16.5	8.5	5.18	4.53	5.14	5.16
115-PZ-502	Shallow	14.51	16	8	4.92	4.40	5.34	5.03
115-PZ-503	Shallow	7.32	10	8	4.63	4.29	5.09	4.64
115-W1-SO	Shallow	18.84	24.66	10	2.74	3.32	3.43	3.14
115-W3-SO	Shallow	14.96	14	10	4.42	2.49	3.05	3.98
115-W5-SO	Shallow	21.68	16	NA	4.86	2.24	3.98	4.59
115-W6-SO	Shallow	14.76	18.15	NA	2.83	3.33	3.57	4.16
117-MW-A05	Shallow	18.48	16	10	N/A	6.29	N/A	5.16
117-MW-A14	Shallow	17.33	17	10	4.86	4.94	N/A	5.24
117-MW-A85	Shallow	17.40	15	10	5.31	4.78	4.89	4.59
117-MW-A89	Shallow	13.17	16	10	4.27	4.29	4.78	4.63
117-MW-A99	Shallow	15.95	14	10	5.51	5.32	5.20	5.63
117-MW-I45	Shallow	16.70	11.17	10	5.68	5.57	5.58	6.01
124-MW-10	Shallow	10.06	11	8	4.76	4.41	4.71	5.08
124-MW-11	Shallow	9.05	8	6	4.49	4.34	3.93	4.77
124-PZ-11	Shallow	9.69	9.5	5	6.57	5.99	6.98	6.76
124-PZ-12	Shallow	10.63	9.5	5	4.96	3.78	3.68	5.04
124-PZ-13	Shallow	19.34	18.35	5	7.43	5.53	6.90	7.83
124-PZ-14	Shallow	15.15	14.1	5	5.07	2.40	3.40	4.15
124-PZ-15	Shallow	24.41	21.21	5	5.55	3.77	4.23	5.89
124-PZ-16	Shallow	17.70	19.6	5	4.98	2.49	3.23	4.69
124-PZ-17	Shallow	15.15	12	5	5.03	4.03	4.66	5.32
124-PZ-18	Shallow	18.28	16.2	5	4.99	2.35	3.52	4.18
124-PZ-19R	Shallow	18.30	24.55	5	7.15	7.14	7.82	7.25
124-PZ-20R	Shallow	20.41	27.55	5	5.64	3.06	3.97	4.51
153-MW-A13	Shallow	9.62	10	6	3.70	3.80	4.02	4.04
153-MW-A15	Shallow	11.00	12.15	10	3.04	2.96	3.49	3.66
154-MW-A06	Shallow	19.87	15.12	NA	13.34	11.93	13.95	13.79
154-MW-A5A	Shallow	19.16	14	NA	12.22	11.77	12.37	12.35
184-MW-04	Shallow	8.70	6.8	NA	3.65	3.69	3.75	3.67
184-MW-05	Shallow	14.71	13	NA	5.91	5.35	6.19	6.22
184-MW-06	Shallow	18.75	15	NA	8.13	7.69	8.64	8.53
184-MW-101	Shallow	14.85	13	5	6.24	5.56	6.77	6.33
184-MW-102	Shallow	13.12	12	5	6.58	5.97	6.71	6.69
184-MW-103	Shallow	14.71	14	5	6.80	6.24	7.12	7.08
184-MW-104	Shallow	15.47	13	5	6.13	6.72	7.60	7.42
184-MW-105	Shallow	15.10	12	5	5.74	5.47	6.08	5.85
184-MW-106R	Shallow	12.68	9.5	5	6.31	5.52	6.49	6.55
184-MW-107	Shallow	13.41	11	5	6.71	6.09	7.08	6.96
184-MW-108	Shallow	15.32	15	5	7.09	6.51	7.52	7.34
SUMP A	Shallow	15.98	21	NA	5.84	5.77	6.15	5.94
SUMP B	Shallow	13.08	15	NA	2.46	5.07	5.05	4.96

NA- information not available
N/A-no access or issue with well
AB- Well abandoned

Table 4-2
Summary of Groundwater Elevations Near NJCU
2023

Location	3/23/2023		6/28/2023		9/28/2023		12/26/2023		
	10/31/2023								
	Ref. pt. Elev. (ft. msl)	Depth to GW (ft.)	GW Elev. (ft., msl)						
079-MW-A02	8.10	4.73	3.37	5.05	3.05	4.74	3.36	4.57	3.53
Sump A (North)	15.98	10.14	5.84	10.21	5.77	9.83	6.15	10.04	5.94
Sump B (South)	13.08	10.62	2.46	8.01	5.07	8.03	5.05	8.12	4.96
090-PZ-5	18.08	10.81	7.27	11.7	6.38	10.1	7.98	10.52	7.56
090-PZ-6	18.20	9.22	8.98	9.64	8.56	8.31	9.89	8.74	9.46
184-MW-4	8.87	5.22	3.65	5.18	3.69	5.12	3.75	5.20	3.67
184-MW-5	14.71	8.8	5.91	9.36	5.35	8.52	6.19	8.49	6.22
184-MW-6	18.751	10.62	8.13	11.06	7.69	10	8.75	10.22	8.53
090-MW-09/09R	10.59/11.24	5.35	5.24	5.76	4.83	5.17	5.42	5.67	5.57
090-MW-07	17.20	11.39	5.81	11.78	5.42	11.42	5.78	11.11	6.09
117-MW-I4S	16.70	11.02	5.68	11.13	5.57	11.12	5.58	10.69	6.01
117-MW-I5	18.76	12.58	6.18	12.81	5.95	12.73	6.03	12.3	6.46
184-MW-101 (outside)	14.85	8.61	6.24	9.29	5.56	8.08	6.77	8.52	6.33
184-MW-105 (inside)	15.1	9.36	5.74	9.63	5.47	9.02	6.08	9.25	5.85
184-MW-106R (outside)	12.68	6.37	6.31	7.16	5.52	6.19	6.49	6.13	6.55
184-MW-102 (inside)	13.16	6.58	6.58	7.19	5.97	6.45	6.71	6.47	6.69
184-MW-103 (outside)	14.71	7.91	6.80	8.47	6.24	7.59	7.12	7.63	7.08
184-MW-107 (inside)	13.41	6.70	6.71	7.32	6.09	6.33	7.08	6.45	6.96
184-MW-104 (outside)	15.47	8.34	7.13	8.75	6.72	7.87	7.60	8.05	7.42
184-MW-108 (inside)	15.32	8.23	7.09	8.81	6.51	7.8	7.52	7.98	7.34

090-MW-09 Abandoned in October 2023.
090-MW-09R Installed in October 2023.

Table 4-3
Monthly Average Heads and Gradients Across Barrier Walls - NJCU

	184-MW-101/184-MW-105			184-MW-106R/184-MW-102		
	Exterior Piezometer/Monitoring Well Average Head (ft. msl) ¹	Interior Piezometer/Monitoring Well Average Head (ft. msl) ¹	Average Head Difference (ft) ²	Exterior Piezometer/Monitoring Well Average Head (ft. msl) ¹	Interior Piezometer/Monitoring Well Average Head (ft. msl) ¹	Average Head Difference (ft) ²
2023 - Month	184-MW-101	184-MW-105		184-MW-106R	184-MW-102	
January	6.24	5.57	0.67	6.11	6.39	-0.28
February	5.88	5.61	0.27	6.02	6.30	-0.28
March	6.32	5.66	0.66	6.09	6.40	-0.31
April	5.75	5.71	0.04	5.84	6.25	-0.41
May	6.27	6.03	0.24	6.43	6.73	-0.30
June	5.39	5.97	-0.58	5.96	6.40	-0.44
July	5.67	5.57	0.10	5.63	6.03	-0.40
August	5.67	5.64	0.03	5.68	6.07	-0.39
September	5.87	5.63	0.24	5.76	6.13	-0.37
October	6.68	6.13	0.55	6.57	6.73	-0.16
November	6.12	#N/A ³	N/A	6.17	6.55	-0.38
December	6.39	5.78	0.61	6.33	6.51	-0.18

Notes:

1. Average monthly head from data logger
2. Average monthly gradient across barrier wall. Bold values do not meet the LTMP criterion of inward gradient (>0.1 ft)
3. Logger malfunction

Table 4-3
Monthly Average Heads and Gradients Across Barrier Walls - NJCU

	184-MW-103/184-MW-107			184-MW-104/184-MW-108		
	Exterior Piezometer/Monitoring Well Average Head (ft. msl) ¹	Interior Piezometer/Monitoring Well Average Head (ft. msl) ¹	Average Head Difference (ft) ²	Exterior Piezometer/Monitoring Well Average Head (ft. msl) ¹	Interior Piezometer/Monitoring Well Average Head (ft. msl) ¹	Average Head Difference (ft) ²
	2023 - Month	184-MW-103	184-MW-107	184-MW-104	184-MW-108	
January	6.67	6.59	0.08	7.21	6.98	0.23
February	6.56	6.48	0.08	7.18	6.83	0.35
March	6.67	6.57	0.10	7.35	7.02	0.33
April	6.41	6.34	0.07	6.80	6.72	0.08
May	7.00	7.07	-0.07	7.27	7.23	0.04
June	6.39	6.36	0.03	6.74	6.77	-0.03
July	6.30	6.22	0.08	6.66	6.67	-0.01
August	6.33	6.26	0.07	6.75	6.69	0.06
September	6.42	6.37	0.05	6.72	6.73	-0.01
October	7.20	7.06	0.14	7.62	7.51	0.11
November	6.88	6.75	0.13	7.26	7.16	0.10
December	N/A ³	6.72	N/A	7.53	7.27	0.26

Notes:

1. Average monthly head from data logger
2. Average monthly gradient across barrier wall. Bold values do not meet the LTMP criterion of inward gradient (>0.1 ft)
3. Logger malfunction

Table 4-4
Monthly Average Heads and Gradients Across Barrier Walls - SA-6

	087-PZ-1/087-PZ-2			087-PZ-3/087-PZ-4		
	Exterior Piezometer/Monitoring Well Average Head (ft, msl) ¹	Interior Piezometer/Monitoring Well Average Head (ft, msl) ¹	Average Head Difference (ft) ^{2,3}	Exterior Piezometer/Monitoring Well Average Head (ft, msl) ¹	Interior Piezometer/Monitoring Well Average Head (ft, msl) ¹	Average Head Difference (ft) ^{2,3}
	2023 - Month	PZ-1	PZ-2	PZ-3	PZ-4	
January	5.48	3.69	1.79	5.17	4.00	1.17
February	4.78	3.71	1.07	4.98	3.93	1.05
March	5.22	3.64	1.58	4.92	3.97	0.95
April	4.03	3.71	0.32	4.55	3.72	0.83
May	5.35	4.33	1.02	5.59	4.05	1.54
June	3.58	3.50	0.08	4.52	3.21	1.31
July	3.55	3.09	0.46	4.35	3.08	1.27
August	3.39	3.03	0.36	4.36	2.97	1.39
September	3.92	2.91	1.01	4.62	2.93	1.69
October	5.19	3.53	1.66	5.81	3.53	2.28
November	4.96	3.16	1.80	5.24	3.18	2.06
December	5.82	3.23	2.59	5.61	3.40	2.21

1. Average monthly head from datalogger
2. Average monthly gradient across barrier wall. **Bold** values do not meet the LTMP criterion of inward gradient (>0.1ft)
3. Positive value indicates inward gradient towards SA-6 North soil containment cell.

Table 4-4
Monthly Average Heads and Gradients Across Barrier Walls - SA-6

	087-PZ-5/087-PZ-6			087-PZ-7/087-PZ-8		
	Exterior Piezometer/Monitoring Well Average Head (ft, msl) ¹	Interior Piezometer/Monitoring Well Average Head (ft, msl) ¹	Average Head Difference (ft) ^{2,3}	Exterior Piezometer/Monitoring Well Average Head (ft, msl) ¹	Interior Piezometer/Monitoring Well Average Head (ft, msl) ¹	Average Head Difference (ft) ^{2,3}
	2023 - Month	PZ-5	PZ-6	PZ-7	PZ-8	
January	6.45	3.39	3.06	6.78	3.85	2.93
February	6.17	3.63	2.54	6.47	4.04	2.43
March	6.01	3.64	2.37	6.61	3.06	3.55
April	5.56	3.61	1.95	5.93	2.52	3.41
May	6.39	3.72	2.67	6.93	3.19	3.74
June	5.21	3.64	1.57	5.49	3.31	2.18
July	5.35	3.49	1.86	5.73	3.41	2.32
August	5.25	3.35	1.90	5.69	3.37	2.32
September	5.98	3.17	2.81	6.21	3.50	2.71
October	6.67	3.25	3.42	7.36	3.89	3.47
November	6.05	3.26	2.79	6.60	4.09	2.51
December	6.69	3.31	3.38	7.35	3.90	3.45

1. Average monthly head from datalogger
2. Average monthly gradient across barrier wall. **Bold** values do not meet the LTMP criterion of inward gradient (>0.1ft)
3. Positive value indicates inward gradient towards SA-6 North soil containment cell.

Table 4-4
Monthly Average Heads and Gradients Across Barrier Walls - SA-6

	087-PZ-9/087-PZ-10			124-PZ-11/124-PZ-12		
	Exterior Piezometer/Monitoring Well Average Head (ft, msl) ¹	Interior Piezometer/Monitoring Well Average Head (ft, msl) ¹	Average Head Difference (ft) ^{2,3}	Exterior Piezometer/Monitoring Well Average Head (ft, msl) ¹	Interior Piezometer/Monitoring Well Average Head (ft, msl) ¹	Average Head Difference (ft) ^{2,4}
	2023 - Month	PZ-9	PZ-10	PZ-11	PZ-12	
January	2.85	4.86	-2.01	7.08	3.79	3.29
February	2.60	4.30	-1.70	6.59	4.35	2.24
March	3.01	3.40	-0.39	6.93	4.68	2.25
April	2.72	2.76	-0.04	6.31	4.84	1.47
May	2.99	3.80	-0.81	6.68	4.79	1.89
June	2.72	3.60	-0.88	5.85	4.01	1.84
July	2.85	3.66	-0.81	6.10	3.53	2.57
August	2.76	3.68	-0.92	6.02	3.38	2.64
September	3.01	3.89	-0.88	6.41	3.41	3.00
October	3.30	4.78	-1.48	6.97	4.28	2.69
November	3.03	4.55	-1.52	6.46	4.56	1.90
December	3.08	4.77	-1.69	7.01	4.82	2.19

1. Average monthly head from datalogger
2. Average monthly gradient across barrier wall. **Bold** values do not meet the LTMP criterion of inward gradient (>0.1ft)
3. Positive value indicates inward gradient towards SA-6 North soil containment cell.
4. Positive value indicates inward gradient towards SA-6 South soil containment cell.

Table 4-4
Monthly Average Heads and Gradients Across Barrier Walls - SA-6

2023- Month	124-PZ-13/124-PZ-14			124-PZ-15/124-PZ-16		
	Exterior Piezometer/Monitoring Well Average Head (ft, msl) ¹	Interior Piezometer/Monitoring Well Average Head (ft, msl) ¹	Average Head Difference (ft) ^{2,3}	Exterior Piezometer/Monitoring Well Average Head (ft, msl) ¹	Interior Piezometer/Monitoring Well Average Head (ft, msl) ¹	Average Head Difference (ft) ^{2,3}
	PZ-13	PZ-14		PZ-15	PZ-16	
January	7.68	3.64	4.04	6.53	4.06	2.47
February	7.20	4.27	2.93	6.35	4.48	1.87
March	7.38	4.68	2.70	6.24	4.75	1.49
April	6.55	4.13	2.42	5.49	4.47	1.02
May	7.40	3.12	4.28	6.36	3.61	2.75
June	6.04	2.32	3.72	5.14	2.45	2.69
July	5.93	2.48	3.45	4.78	2.63	2.15
August	5.87	2.84	3.03	4.65	2.96	1.69
September	6.20	3.13	3.07	4.86	3.27	1.59
October	7.61	4.17	3.44	6.44	4.24	2.20
November	6.91	4.64	2.27	5.69	4.60	1.09
December	7.81	4.16	3.65	6.66	5.20	1.46

1. Average monthly head from datalogger
2. Average monthly gradient across barrier wall. **Bold** values do not meet the LTMP criterion of inward gradient (>0.1ft)
3. Positive value indicates inward gradient towards SA-6 South soil containment cell.

Table 4-4
Monthly Average Heads and Gradients Across Barrier Walls - SA-6

	124-PZ-17/124-PZ-18			124-PZ-19R/124-PZ-20R		
	Exterior Piezometer/Monitoring Well Average Head (ft, msl) ¹	Interior Piezometer/Monitoring Well Average Head (ft, msl) ¹	Average Head Difference (ft) ^{2,3}	Exterior Piezometer/Monitoring Well Average Head (ft, msl) ¹	Interior Piezometer/Monitoring Well Average Head (ft, msl) ¹	Average Head Difference (ft) ^{2,3}
	2023 - Month	PZ-17	PZ-18	PZ-19R	PZ-20R	
January	5.18	3.90	1.28	3.32	3.36	-0.04
February	4.92	4.45	0.47	3.08	3.96	-0.88
March	5.03	4.86	0.17	3.47	4.51	-1.04
April	4.55	4.14	0.41	3.25	4.01	-0.76
May	5.13	2.99	2.14	3.39	2.69	0.70
June	4.33	1.94	2.39	3.49	1.86	1.63
July	4.43	2.57	1.86	3.58	2.53	1.05
August	4.27	2.93	1.34	3.50	2.86	0.64
September	4.44	3.29	1.15	3.68	3.09	0.59
October	5.21	4.24	0.97	3.74	3.78	-0.04
November	4.80	4.66	0.14	3.54	4.48	-0.94
December	5.17	4.32	0.85	3.53	3.91	-0.38

1. Average monthly head from datalogger
 2. Average monthly gradient across barrier wall. **Bold** values do not meet the LTMP criterion of inward gradient (>0.1ft)
 3. Positive value indicates inward gradient towards SA-6 South soil containment cell.
- NA - data logger malfunctioned.

Table 4-4
Monthly Average Heads and Gradients Across Barrier Walls - SA-6

	115-PZ-500/115-W3-SO			115-PZ-501/115-E1A-SO		
	Exterior Piezometer/Monitoring Well Average Head (ft, msl) ¹	Interior Piezometer/Monitoring Well Average Head (ft, msl) ¹	Average Head Difference (ft) ^{2,3}	Exterior Piezometer/Monitoring Well Average Head (ft, msl) ¹	Interior Piezometer/Monitoring Well Average Head (ft, msl) ¹	Average Head Difference (ft) ^{2,3}
	2023 - Month	PZ-500	W3-SO	PZ-501	E1A-SO	
January	4.38	3.03	1.35	4.92	3.59	1.33
February	4.30	3.67	0.63	4.93	4.18	0.75
March	4.48	4.19	0.29	5.03	4.67	0.36
April	4.52	4.27	0.25	4.76	4.09	0.67
May	4.23	3.41	0.82	5.02	3.17	1.85
June	4.26	2.47	1.79	4.64	2.14	2.50
July	4.38	2.56	1.82	4.64	2.42	2.22
August	4.39	2.77	1.62	4.70	2.80	1.90
September	4.51	2.97	1.54	4.79	3.24	1.55
October	4.63	3.44	1.19	5.22	4.17	1.05
November	4.44	4.08	0.36	4.86	4.56	0.30
December	4.62	4.09	0.53	4.87	4.26	0.61

1. Average monthly head from datalogger
 2. Average monthly gradient across barrier wall. **Bold** values do not meet the LTMP criterion of inward gradient (>0.1ft)
 3. Positive value indicates inward gradient towards SA-6 South soil containment cell.
- NA - data logger malfunctioned.

Table 4-4
Monthly Average Heads and Gradients Across Barrier Walls - SA-6

	115-PZ-501/115-W5-SO			115-PZ-502/115-E4-SO		
	Exterior Piezometer/Monitoring Well Average Head (ft, msl) ¹	Interior Piezometer/Monitoring Well Average Head (ft, msl) ¹	Average Head Difference (ft) ^{2,3}	Exterior Piezometer/Monitoring Well Average Head (ft, msl) ¹	Interior Piezometer/Monitoring Well Average Head (ft, msl) ¹	Average Head Difference (ft) ^{2,4}
	2023 - Month	PZ-501	W5-SO	PZ-502	E4-SO	
January	4.92	4.03	0.89	4.72	3.58	1.14
February	4.93	4.44	0.49	4.72	3.66	1.06
March	5.03	4.87	0.16	4.91	3.56	1.35
April	4.76	4.43	0.33	4.81	3.68	1.13
May	5.02	3.53	1.49	4.91	3.77	1.14
June	4.64	2.23	2.41	4.50	3.24	1.26
July	4.64	2.57	2.07	4.64	3.13	1.51
August	4.70	2.96	1.74	4.65	2.87	1.78
September	4.79	3.43	1.36	4.79	2.59	2.20
October	5.22	4.38	0.84	5.05	2.59	2.46
November	4.86	4.73	0.13	4.47	2.59	1.88
December	4.87	4.76	0.11	4.82	2.52	2.30

1. Average monthly head from datalogger
2. Average monthly gradient across barrier wall. **Bold** values do not meet the LTMP criterion of inward gradient (>0.1ft)
3. Positive value indicates inward gradient towards SA-6 South soil containment cell.
4. Positive value indicates inward gradient towards SA-6 North soil containment cell.

Table 4-4
Monthly Average Heads and Gradients Across Barrier Walls - SA-6

	115-PZ-502/115-E5-SO			115-PZ-503/115-W6-SO		
	Exterior Piezometer/Monitoring Well Average Head (ft, msl) ¹	Interior Piezometer/Monitoring Well Average Head (ft, msl) ¹	Average Head Difference (ft) ^{2,3}	Exterior Piezometer/Monitoring Well Average Head (ft, msl) ¹	Interior Piezometer/Monitoring Well Average Head (ft, msl) ¹	Average Head Difference (ft) ^{2,3}
	2023 - Month	PZ-502	E5-SO	PZ-503	W6-SO	
January	4.72	5.47	-0.75	4.31	4.25	0.06
February	4.72	5.07	-0.35	4.15	3.99	0.16
March	4.91	4.44	0.47	4.41	2.98	1.43
April	4.81	3.68	1.13	4.33	2.58	1.75
May	4.91	4.51	0.40	4.46	3.27	1.19
June	4.50	3.53	0.97	4.27	3.39	0.88
July	4.64	3.19	1.45	4.30	3.43	0.87
August	4.65	3.07	1.58	4.29	3.49	0.80
September	4.79	2.94	1.85	4.38	3.75	0.63
October	5.05	3.31	1.74	4.58	4.31	0.27
November	4.47	3.12	1.35	4.37	4.36	0.01
December	4.82	3.86	0.96	4.50	4.41	0.09

1. Average monthly head from datalogger
2. Average monthly gradient across barrier wall. **Bold** values do not meet the LTMP criterion of inward gradient (>0.1ft)
3. Positive value indicates inward gradient towards SA-6 North soil containment cell.

Table 4-4
Monthly Average Heads and Gradients Across Barrier Walls - SA-6

	115-PZ-503/115-W1-SO		
	Exterior Piezometer/Monitoring Well Average Head (ft, msl) ¹	Interior Piezometer/Monitoring Well Average Head (ft, msl) ¹	Average Head Difference (ft) ^{2,3}
	2023 - Month	PZ-503	W1-SO
January	4.31	3.87	0.44
February	4.15	3.76	0.39
March	4.41	2.83	1.58
April	4.33	2.15	2.18
May	4.46	2.49	1.97
June	4.27	2.88	1.39
July	4.30	2.99	1.31
August	4.29	3.07	1.22
September	4.38	3.05	1.33
October	4.58	3.27	1.31
November	4.37	3.55	0.82
December	4.50	3.50	1.00

1. Average monthly head from datalogger
2. Average monthly gradient across barrier wall. **Bold** values do not meet the LTMP criterion of inward gradient (>0.1ft)
3. Positive value indicates inward gradient towards SA-6 North soil containment cell.

Table 5-1a
Groundwater Quality Data from Regional LTMP Sampling

Upper Bedrock Zone

Monitoring Well ID	Sample Date	Sample Notes	Total Chromium (Unfiltered)		Total Chromium (Filtered)		Hexavalent Chromium (Unfiltered)		Hexavalent Chromium (Filtered)	
			Conc.	Q	Conc.	Q	Conc.	Q	Conc.	Q
079-MW-13BR	12/2008	N	10	U	10	U	10	U	10	U
	12/2009	N	10	U	10	U	10	U	10	U
	12/2010	N	10	U	10	U	10	U	10	U
	12/2011	N	10	U	10	U	10	U	10	U
	12/2013	N	10	U	10	U	10	U	10	U
	11/2015	N	10	U	10	U	10	U	10	U
	5/1/2019	N	10	U	10	U	5.5	U	5.5	U
	7/5/2022	N	4	U	4	U	5.5	U	5.5	U
11/28/2023	N	10	U	10	U	5.5	U	5.5	U	
117-MW-8BR	11/12/2008	N	10	U	10	U	10	U	10	U
	11/17/2009	N	10	U	10	U	10	U	10	U
	12/13/2010	N	10	U	10	U	10	U	10	U
	12/9/2011	N	10	U	10	U	10	U	10	U
	12/12/2013	N	10	U	10	U	10	U	10	U
	11/17/2015	N	10	U	10	U	10	U	10	U
	4/30/2019	N	10	U	10	U	5.5	U	5.5	U
	7/5/2022	N	4	U	4	U	5.5	U	5.5	U
11/29/2023	N	10	U	10	U	5.5	U	5.5	U	
119-MW-2BR	12/2008	N	10	U	10	U	10	U	10	U
	12/2009	N	10	U	10	U	10	U	10	U
	12/2010	N	NA		NA		NA		NA	
	12/9/2011	N	10	U	10	U	10	U	10	U
	12/20/2013	N	10	U	10	U	10	U	10	U
	11/21/2015	N	10	U	10	U	10	U	10	U
	4/30/2019	N	10	U	10	U	5.5	U	5.5	U
	7/5/2022	N	4	U	4	U	5.5	U	5.5	U
11/28/2023	N	10	U	10	U	5.5	U	5.5	U	
119-MW-16BR	11/11/2008	N	10	U	10	U	10	U	10	U
	11/19/2009	N	10	U	10	U	10	U	10	U
	12/2010	N	10	U	10	U	10	U	10	U
	12/9/2011	N	10	U	10	U	10	U	10	U
	12/12/2013	N	10	U	10	U	10	U	10	U
	11/17/2015	N	10	U	10	U	10	U	10	U
	5/1/2019	N	10	U	10	U	5.5	U	5.5	U
	7/5/2022	N	4	U	4	U	5.5	U	5.5	U
11/28/2023	N	10	U	10	U	5.5	U	5.5	U	
124-MW-8BR	11/20/2009	N	10	U	10	U	10	U	10	U
	12/8/2010	N	10	U	10	U	10	U	10	U
	12/9/2011	N	10	U	10	U	10	U	10	U
	12/12/2013	N	10	U	174		10	U	10	U
	11/17/2015	N	10	U	10	U	10	U	10	U
	5/2/2019	N	25.7		10	U	5.5	U	5.5	U
	7/7/2022	N	4.9		4	U	5.5	U	5.5	U
11/30/2023	N	11.9		10	U	5.5	U	5.5	U	
090-MW-7BR	5/1/2019	N	106000		89100		139000		122000	
	7/5/2022	N	76300		67700		86700		90500	
	11/28/2023	N	88500		82700		128000		113000	
115-MW-203BR	12/12/2008	N	7490		7540		7600		7200	
	12/21/2009	N	13700		NA		15100		NA	
	12/15/2010	N	15900		15700		16300		16500	
	11/17/2011	N	17000		NA		16300		NA	
	6/6/2019	N	304		10	U	5.5	U	5.5	U
	7/7/2022	N	103		4	U	5.5	U	5.5	U
11/30/2023	N	67.2		10	U	5.5	U	5.5	U	

Table 5-1a
Groundwater Quality Data from Regional LTMP Sampling

Upper Bedrock Zone

Monitoring Well ID	Sample Date	Sample Notes	Total Chromium (Unfiltered)		Total Chromium (Filtered)		Hexavalent Chromium (Unfiltered)		Hexavalent Chromium (Filtered)	
SA6-MW-14BR	12/2008	N	10	U	10	U	10	U	10	U
	12/2009	N	10	U	10	U	10	U	10	U
	12/2010	N	10	U	10	U	10	U	10	U
	12/9/2011	N	10	U	10	U	10	U	10	U
	12/12/2013	N	10	U	10	U	10	U	10	U
	11/17/2015	N	10	U	10	U	10	U	10	U
	4/29/2019	N	10	U	10	U	5.5	U	5.5	U
	7/5/2022	N	4	U	4	U	5.5	U	5.5	U
11/29/2023	N	10	U	10	U	5.5	U	5.5	U	
SA6-MW-15BR	11/14/2008	N	10	U	10	U	10	U	10	U
	11/16/2009	N	10	U	10	U	10	U	10	U
	12/16/2010	N	10	U	10	U	10	U	10	U
	12/9/2011	N	10	U	10	U	10	U	10	U
	12/12/2013	N	10	U	10	U	10	U	10	U
	11/17/2015	N	22		10	U	10	U	10	U
	4/29/2019	N	18.8		10	U	5.5	U	5.5	U
	7/6/2022	N	4	U	4	U	5.5	U	5.5	U
11/29/2023	N	10	U	10	U	5.5	U	5.5	U	

General Notes:

Bold and underlined values exceed the NJDEP Ground Water Quality Standards (Chromium - 70 µg/L)
 Concentrations measured in micrograms per liter

Abbreviations:

- N: Normal sample
- NA: Not sampled
- Q: Qualifiers

Table 5-1b
Groundwater Quality Data from Regional LTMP Sampling

Deep Overburden Zone

Monitoring Well ID	Sample Date	Sample Notes	Total Chromium (Unfiltered)		Total Chromium (Filtered)		Hexavalent Chromium (Unfiltered)		Hexavalent Chromium (Filtered)	
			Conc.	Q	Conc.	Q	Conc.	Q	Conc.	Q
087-MW-A26T	11/14/2008	N	10	U	10	U	10	U	10	U
	11/18/2009	N	10	U	10	U	10	UJ	10	UJ
	12/14/2010	N	10	U	10	U	10	U	10	U
	12/2/2011	N	10	U	10	U	10	U	10	U
	12/22/2013	N	10	U	10	U	10	U	10	U
	11/17/2015	N	10	U	10	U	10	U	10	U
	5/1/2019	N	23.3		10	U	5.5	U	5.5	U
	7/7/2022	N	4	U	4	U	5.5	U	5.5	U
11/27/2023	N	10	U	10	U	5.5	U	5.5	U	
087-MW-W25T	11/14/2008	N	10	U	10	U	10	U	10	U
	11/18/2009	N	10	U	10	U	10	UJ	10	UJ
	12/14/2010	N	25.8		10	U	10	U	10	U
	12/2/2011	N	10	U	10	U	10	U	10	U
	12/22/2013	N	10	U	10	U	10	U	10	U
	11/17/2015	N	NA		NA		NA		NA	
	5/2/2019	N	31.4		10.4		5.5	U	5.5	U
	7/6/2022	N	55.5		4	U	5.5	U	5.5	U
11/27/2023	N	44.9		10	U	5.5	U	5.5	U	
090-MW-09	4/30/2019	N	2240000		2520000		1940000		2240000	
	7/7/2022	well obstructed	NA		NA		NA		NA	
090-MW-09R	11/30/2023	N	74900		70000		94200		88100	
117-MW-D2	4/30/2019	N	12.2		10	U	5.5	U	5.5	U
	7/5/2022	N	5.5		4	U	5.5	U	5.5	U
	11/30/2023	N	170		12.4		5.5	U	5.5	U
117-MW-D3	11/12/2008	N	10	U	10	U	10	U	10	U
	11/17/2009	N	10	U	33.6		10	U	10	U
	12/15/2010	N	14.2		10	U	10	U	10	U
	12/2/2011	N	14		10	U	10	U	10	U
	12/22/2013	N	10		10	U	10	U	10	U
	11/17/2015	N	24		10	U	10	U	10	U
	4/29/2019	N	66.2		10	U	5.5	U	5.5	U
	7/5/2022	N	21		4	U	5.5	U	5.5	U
11/29/2023	N	48.7		10	U	5.5	U	5.5	U	
117-MW-I4	4/30/2019	N	6550000		6340000		6080000		6010000	
	7/6/2022	N	624000		673000		7860000		9790000	
	11/29/2023	N	553000		557000		7560000	J	5650000	J
119-MW-01T	11/11/2008	N	32.5		10	U	10	U	10	U
	11/19/2009	N	32.5		10	U	10	U	10	U
	12/9/2010	N	19.7		10	U	10	U	10	U
	12/2/2011	N	10	U	10	U	10	U	10	U
	12/22/2013	N	20		10	U	10	U	10	U
	11/17/2015	N	40		10	U	10	U	10	U
	5/1/2019	N	140		34.7		26		28	
	7/6/2022	N	35.8		21.3		10		13	
11/28/2023	N	25.1		10	U	5.5	U	5.5	U	

**Table 5-1b
Groundwater Quality Data from Regional LTMP Sampling**

Deep Overburden Zone

Monitoring Well ID	Sample Date	Sample Notes	Total Chromium (Unfiltered)		Total Chromium (Filtered)		Hexavalent Chromium (Unfiltered)		Hexavalent Chromium (Filtered)	
119-MW-02T	11/11/2008	N	10	U	10	U	10	U	10	U
	11/16/2009	N	10	U	10	U	10	U	10	U
	12/9/2010	N	14.3		10	U	10	U	10	U
	12/2/2011	N	10	U	10	U	10	U	10	U
	12/22/2013	N	10	U	10	U	10	U	10	U
	11/17/2015	N	22.9		10	U	10	U	10	U
	5/1/2019	N	<u>141</u>		<u>86.7</u>		62		57	
	7/6/2022	N	<u>80.8</u>		21.1		56		<u>73</u>	
11/28/2023	N	44.7		40.4		34		33		
124-MW-106T	11/17/2008	N	10	U	10	U	10	U	10	U
	11/20/2009	N	12.6		10	U	10	U	10	U
	12/7/2010	N	12.9		10	U	10	U	10	U
	12/2/2011	N	24		10	U	10	U	10	U
	12/22/2013	N	13		10	U	10	U	10	U
	11/17/2015	N	NA		NA		NA		NA	
	5/2/2019	N	<u>110</u>		14.9		5.5	U	5.5	U
	7/7/2022	well obstructed	NA		NA		NA		NA	
124-MW-106TR	11/28/2023	N	24.3		10	U	5.5	U	5.5	U
SA6-MW-AA1T	11/13/2008	N	21.2		10	U	10	U	10	U
	11/16/2009	N	10	U	10	U	10	U	10	U
	12/10/2010	N	12.8		10	U	10	U	10	U
	12/2/2011	N	14		10	U	10	U	10	U
	12/22/2013	N	35		10	U	10	U	10	U
	11/17/2015	N	10	U	10	U	10	U	10	U
	5/2/2019	N	10	U	10	U	5.5	U	5.5	U
	7/7/2022	well obstructed	NA		NA		NA		NA	
11/27/2023	N	13		10	U	5.5	U	5.5	U	

General Notes:

Bold and underlined values exceed the NJDEP Ground Water Quality Standards (Chromium - 70 µg/L).

Concentrations reported in micrograms per liter

Abbreviations:

N: Normal Sample

NA: Not sampled

Q: Qualifiers

Table 5-1c
Groundwater Quality Data from Regional LTMP Sampling

Intermediate Zone

Monitoring Well ID	Sample Date	Sample Notes	Total Chromium (Unfiltered)		Total Chromium (Filtered)		Hexavalent Chromium (Unfiltered)		Hexavalent Chromium (Filtered)	
			Conc.	Q	Conc.	Q	Conc.	Q	Conc.	Q
087-MW-A26D	11/14/2008	N	10	U	10	U	10	U	10	U
	11/18/2009	N	10	U	10	U	10	U	10	U
	12/14/2010	N	10	U	10	U	10	U	10	U
	12/2/2011	N	10	U	10	U	10	U	10	U
	12/22/2013	N	10	U	10	U	10	U	10	U
	11/17/2015	N	10	U	10	U	10	U	10	U
	5/1/2019	N	18.9		10	U	5.5	U	5.5	U
	7/7/2022	N	4	U	4	U	5.5	U	5.5	U
11/27/2023	N	10	U	10	U	5.5	U	5.5	U	
087-MW-W25D	11/14/2008	N	10	U	10	U	10	U	10	U
	11/18/2009	N	10	U	10	U	10	U	10	U
	12/14/2010	N	10	U	10	U	10	U	10	U
	12/2/2011	N	10	U	10	U	10	U	10	U
	12/22/2013	N	10	U	10	U	10	U	10	U
	11/17/2015	N	NA		NA		NA		NA	
	5/2/2019	N	49.1		10	U	5.5	U	5.5	U
	7/6/2022	N	4	U	4	U	5.5	U	5.5	U
11/27/2023	N	10	U	10	U	5.5	U	5.5	U	
087-MW-136D	5/2/2019	N	41.3		35		5.5	U	5.5	U
	7/6/2022	N	24.7		23.7		5.5	U	5.5	U
	11/27/2023	N	77.7		27.3		5.5	U	5.5	U
117-MW-I1	11/12/2008	N	10	U	10	U	10	U	10	U
	11/17/2009	N	22.8		10	U	10	U	10	U
	12/16/2010	N	10	U	10	U	10	U	10	U
	12/2/2011	N	10	U	10	U	10	U	10	U
	12/22/2013	N	13		10	U	10	U	10	U
	11/17/2015	N	10	U	10	U	10	U	10	U
	5/1/2019	N	20.1		14		5.5	U	5.5	U
	7/5/2022	N	4.5		4	U	5.5	U	5.5	U
11/29/2023	N	10	U	10	U	5.5	U	5.5	U	
117-MW-I5	11/18/2008	N	529		593		510		520	
	11/17/2009	N	401		392		370		360	
	12/15/2010	N	605		618		540		560	
	12/15/2010	N	650		627		590		600	
	12/2/2011	N	232		259		240		240	
	12/22/2013	N	209		164		160		160	
	11/17/2015	N	192		178		140		160	
	4/30/2019	N	160		147		140		120	
7/5/2022	N	117		98.2		110		100		
11/29/2023	N	273		106		96	J	98		
SA6-MW-AA1D	11/13/2008	N	17.8		10	U	10	U	10	U
	11/16/2009	N	10	U	10	U	10	U	10	U
	12/10/2010	N	20.1		10	U	10	U	10	U
	12/2/2011	N	10	U	10	U	10	U	10	U
	12/22/2013	N	10	U	10	U	10	U	10	U
	11/17/2015	N	10	U	10	U	10	U	10	U
	4/29/2019	N	10	U	10	U	5.5	U	5.5	U
	7/6/2022	N	4	U	4	U	5.5	U	5.5	U
11/27/2023	N	10	U	10	U	5.5	U	5.5	U	

General Notes:

Bold and underlined values exceed the NJDEP Ground Water Quality Standards (Chromium - 70 µg/L), N.J.A.C 7:9C; last amended 6/1/2020. Concentrations reported in micrograms per liter

Abbreviations:

N: Normal Sample
NA: Not sampled
Q: Qualifiers

Table 5-2
Groundwater Quality Data from GWET Extraction Wells

Parameter	9-Sep-21			28-Dec-21			24-Jun-22			28-Jun-23		
	PW-1 (ug/L)	PW-3 (ug/L)	115-MW- 215BR (ug/L)									
Hexavalent Chromium	16,200	19,100	13,900	15,900	18,600	10,700	14,800	16,100	11,700	13,500	13,100	9,700
Total Chromium	16,700	20,100	13,600	15,400	17,200	10,600	14,600	15,500	10,700	14,200	11,900	9,660

ND = Not detected above reporting limit.

Volatile Organic Compounds no longer analyzed as of fourth quarter 2021.

Hexavalent Chromium and Total Chromium sampled annually as of 2022.

Table 5-3
Summary of Groundwater Quality Monitoring Results - SA-6 and SA-7

Sample Location	Sample Date	Total Chromium µg/l	Total Chromium µg/l (Filtered)	Hexavalent Chromium µg/l	Hexavalent Chromium µg/l (Filtered)
087-PZ-10	5/11/2023	4.1	4.0	5.5 U	5.5 U
124-PZ-20R	5/11/2023	15.8	8.4	5.5 U	5.5 U

Notes:

Bold Exceeds GWQS 70 µg/l

GWQS - Highest of NJDEP Ground Water Quality Standards, N.J.A.C 7:9C; last amended 6/20/2020

U - Not detected above reporting limit

J - Estimated value

µg/l - micrograms/liter

Table 5-4
Summary of Groundwater Quality Monitoring Results - NJCU

Sample Location	Sample Date	Total Chromium ug/l	Total Chromium ug/l (Filtered)	Hexavalent Chromium ug/l	Hexavalent Chromium ug/l (Filtered)
184-MW-102	3/8/2023	5.4 J	4.3 J	5.5 U	5.5 U
	6/22/2023	10 U	10 U	5.5 U	5.5 U
	9/14/2023	39.8	10 U	5.5 U	5.5 U
	12/19/2023	10 U	10 U	5.5 U	5.5 U
184-MW-105	3/8/2023	4 UJ	4 UJ	5.5 U	5.5 U
	3/8/2023 DUP	4 U	4 U	5.5 U	5.8
	6/22/2023	10 U	10 U	5.5 U	5.5 U
	6/22/2023 DUP	10 U	10 U	5.5 U	5.5 U
	9/14/2023	10 U	10 U	5.5 U	5.5 U
	9/14/2023 DUP	10 U	10 U	5.5 U	5.5 U
	12/19/2023	10 U	10 U	5.5 U	5.5 U
	12/19/2023 DUP	10 U	10 U	5.5 U	5.5 U
184-MW-107	3/8/2023	4 U	4 U	5.5 U	5.5 U
	6/22/2023	10 U	10 U	5.5 U	5.5 U
	9/14/2023	185	10 U	5.5 U	5.5 U
	12/19/2023	51.5	60.8	5.5 U	5.5 U
184-MW-108	3/8/2023	4 U	4 U	5.5 U	5.5 U
	6/22/2023	10 U	10 U	5.5 U	5.5 U
	9/14/2023	10 U	10 U	5.5 U	5.5 U
	12/19/2023	10 U	10 U	5.5 U	5.5 U

BOLD - sample exceeds the GWQS of 70 ug/l for Total Chromium

U - Value not detected above reporting limit

J- Estimated value

Table 5-5
Summary of Groundwater Quality Monitoring Results - Sites 117 and 153

Sample Location	Sample Date	Total Chromium ug/l	Total Chromium ug/l (Filtered)	Hexavalent Chromium ug/l	Hexavalent Chromium ug/l (Filtered)
117-MW-A05	11/28/2023	10 U	10 U	5.5 UJ	5.5 UJ
117-MW-A014	11/28/2023	23.8	267	5.5 UJ	5.5 UJ
	11/28/2023 DUP	17.3	14.8	5.5 UJ	5.5 UJ
117-MW-A085	11/28/2023	1370	1360	5.5 UJ	5.5 UJ
117-MW-A089	11/28/2023	199	144	180 J	170 J
117-MW-A099	11/28/2023	11.5	10 U	5.5 UJ	5.5 UJ
117-MW-I4S	11/28/2023	158000	155000	161000 J	190000 J
153-MW-A13	11/29/2023	719	253	250 J	43 J
153-MW-A15	11/29/2023	98.1	62.6	5.5 UJ	5.5 UJ
	11/29/2023 DUP	104	51	5.5 UJ	5.5 UJ

Bold - sample exceeds the GWQS of 70 ug/l for Total Chromium

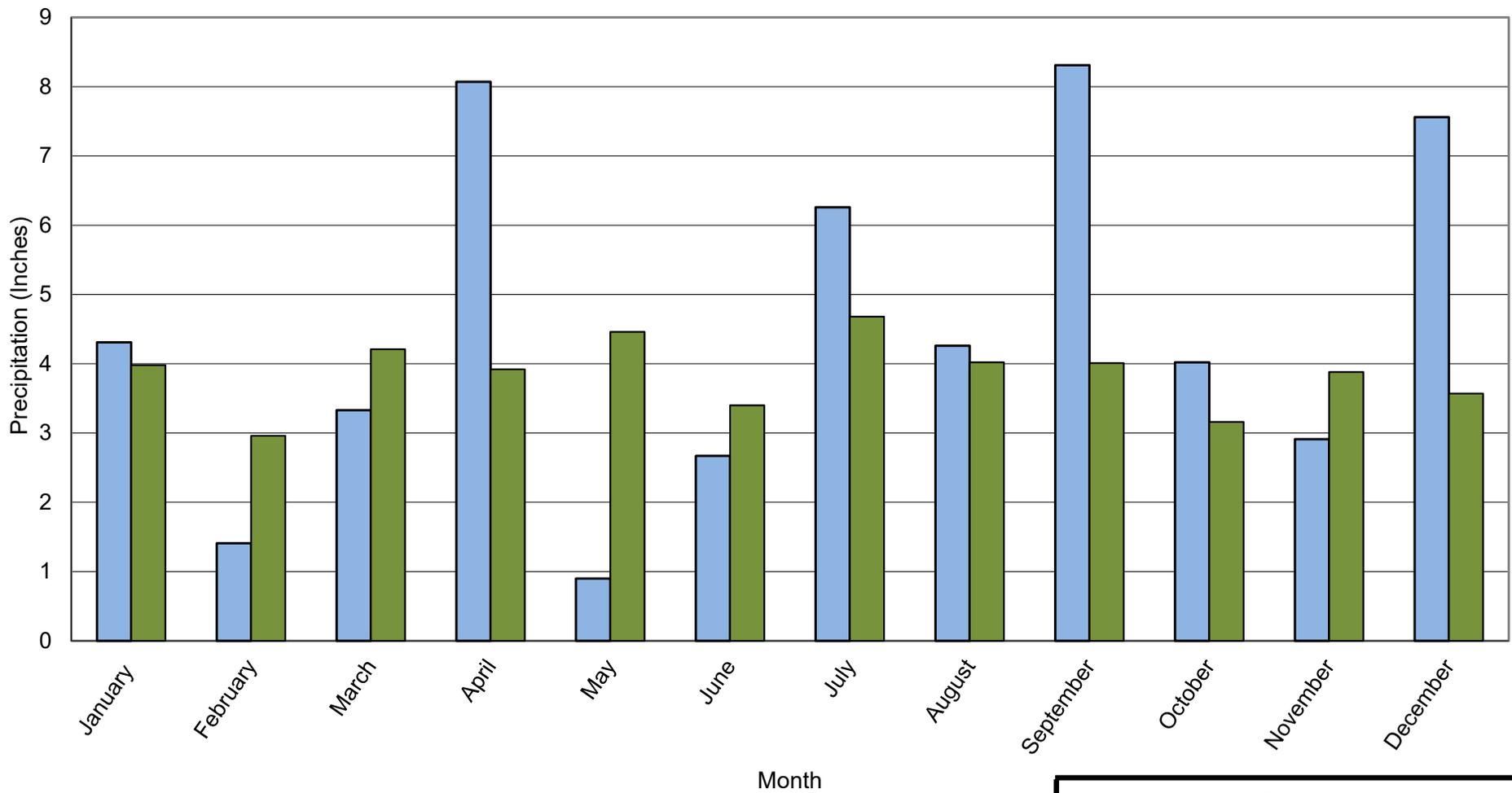
U - compound was not detected

J - approximate value

ug/l - micrograms per liter

DUP - field duplicate

FIGURES



■ 2023 Precipitation
 ■ Average Precipitation

FIGURE 2-1
 2023 Monthly Precipitation

Integrated Annual Groundwater Performance Report
 2023



Figure 3-1
GWET Pumping Rates and Downtimes in 2023

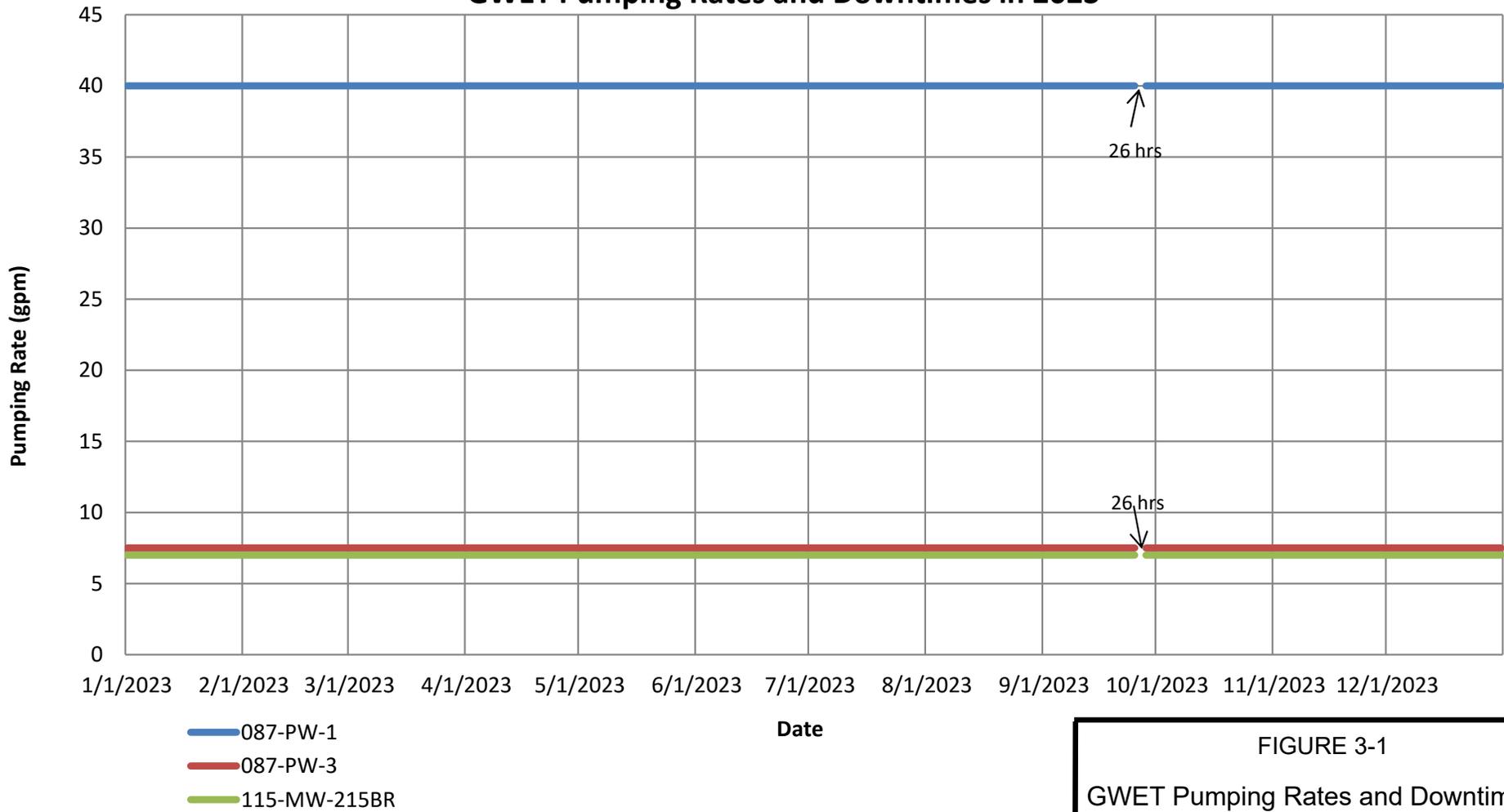
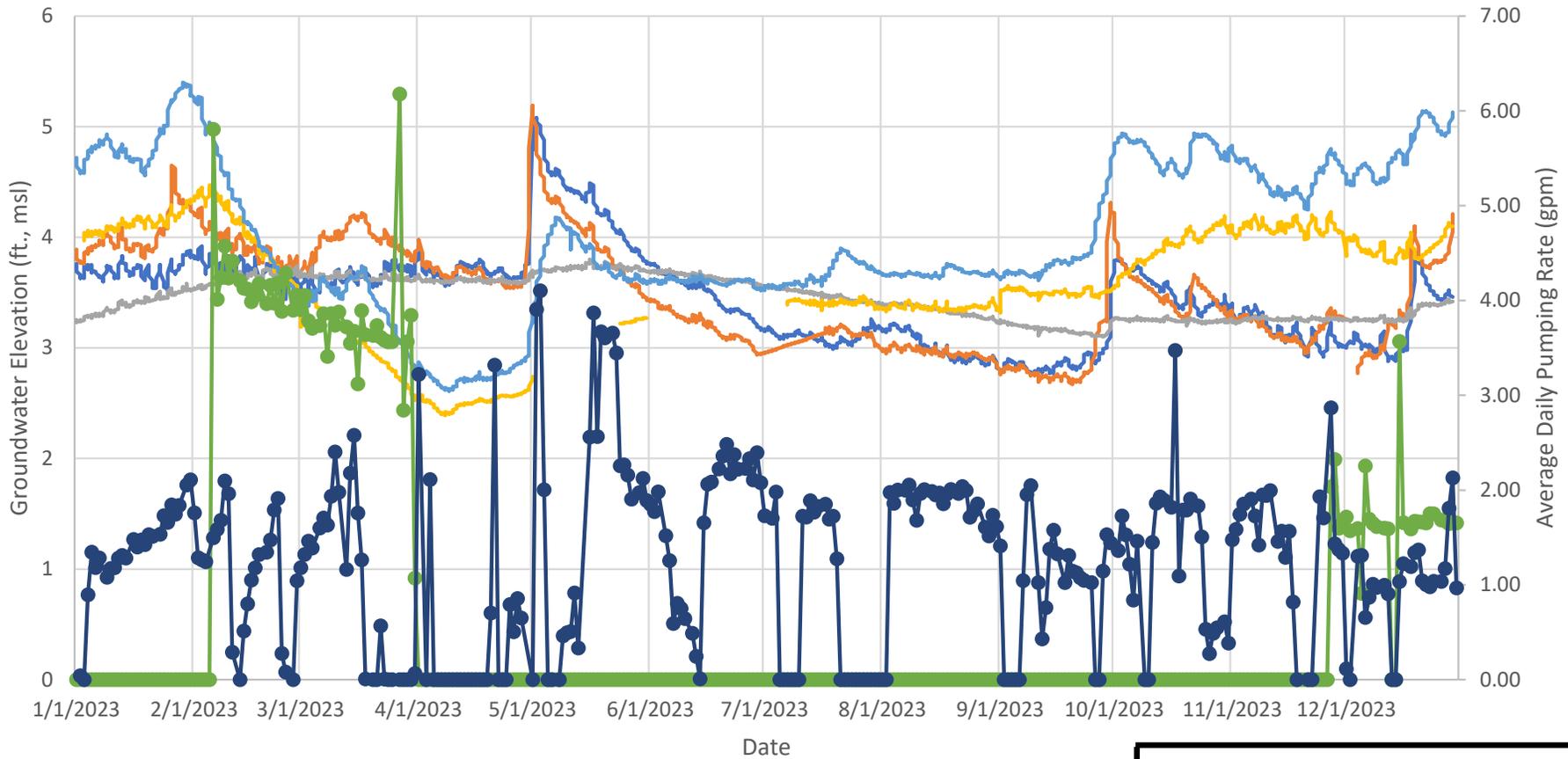


FIGURE 3-1
 GWET Pumping Rates and Downtimes
 In 2023

Integrated Annual Groundwater Performance Report
 2023



Contingent Pumping vs. Interior Heads - SA-6 North



—●— PZ-2 (Inside)
 —●— PZ-4 (Inside)
 —●— PZ-6 (Inside)
 —●— PZ-8 (Inside)
 —●— PZ-10 (Inside)
 —●— PS-1N
 —●— PS-2N

Gap in data = data logger malfunction

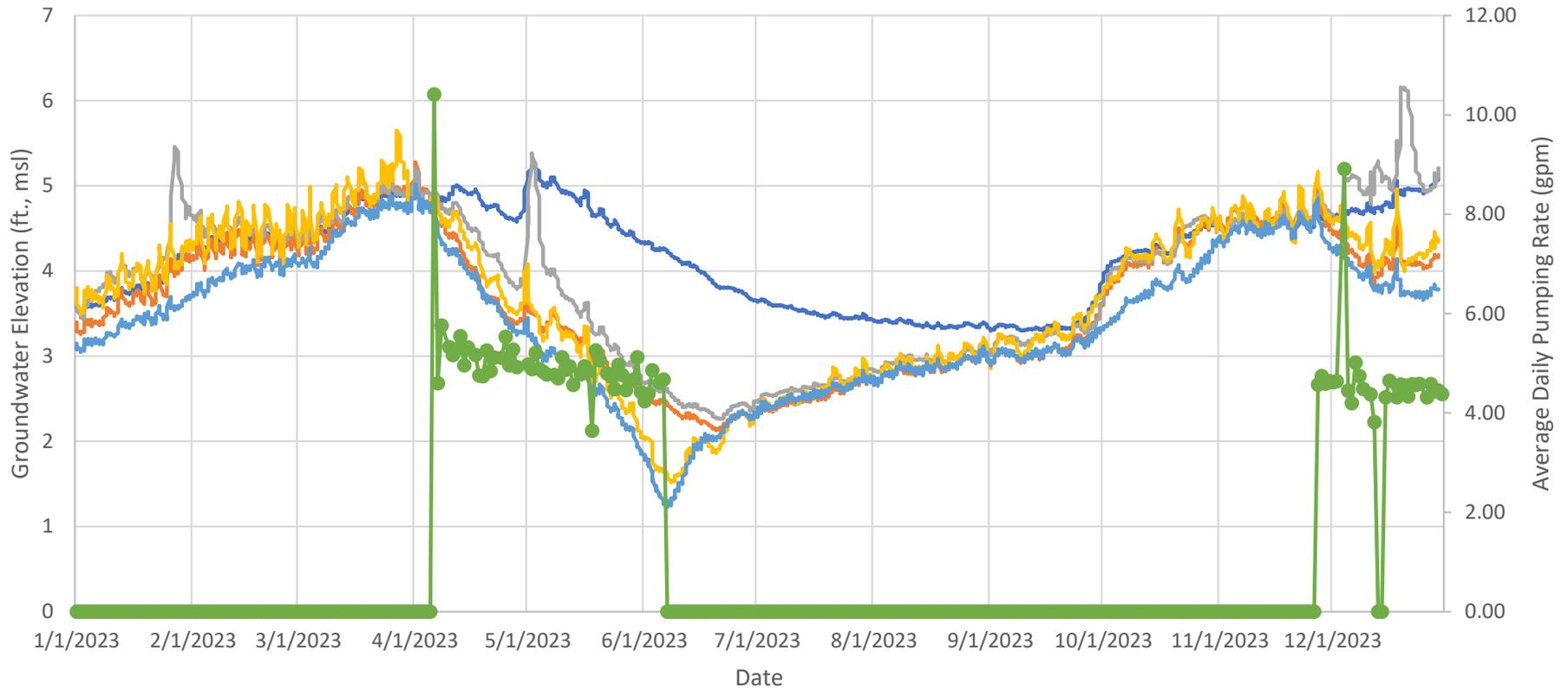
FIGURE 3-2

**Contingent Pumping vs.
Interior Heads – SA6 North**

Integrated Annual Groundwater Performance Report
2023



Contingent Pumping vs. Interior Heads - SA-6 South



— PZ-12 (Inside) — PZ-14 (Inside) — PZ-16 (Inside) — PZ-18 (Inside) — PZ-20R (Inside) —● PS-15

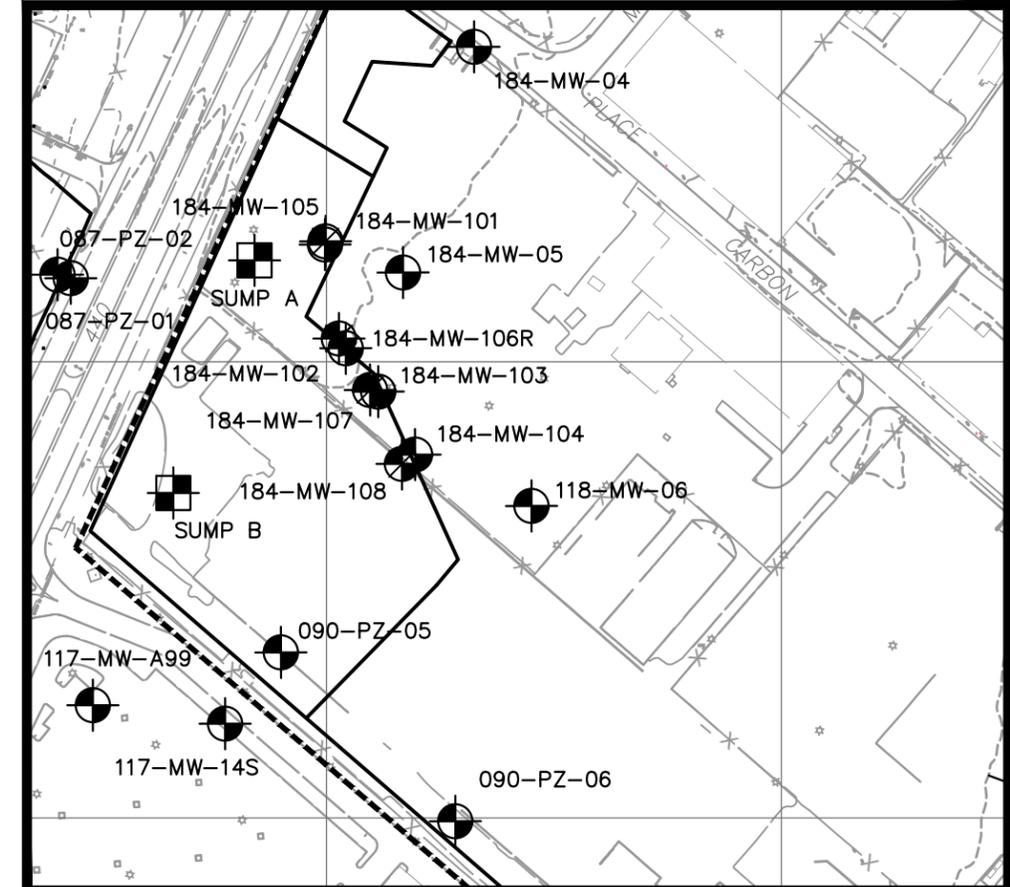
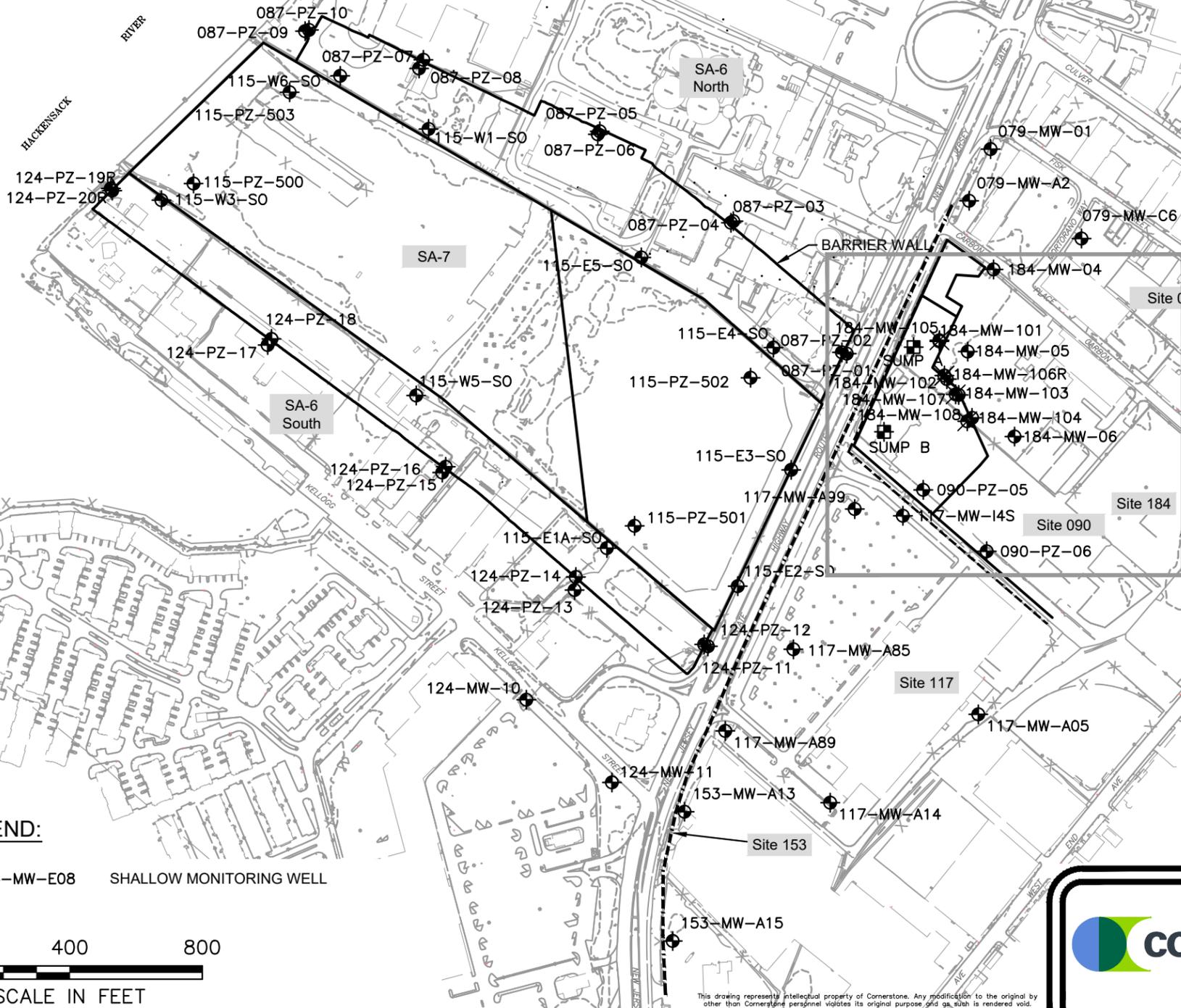
Gap in data = data logger malfunction

FIGURE 3-3

**Contingent Pumping vs.
Interior Heads - SA6 South**

Integrated Annual Groundwater Performance Report
2023





ENLARGED AREA OF SITE
 0 200 400
 SCALE IN FEET

LEGEND:
 ◆ 154-MW-E08 SHALLOW MONITORING WELL

0 400 800
 SCALE IN FEET

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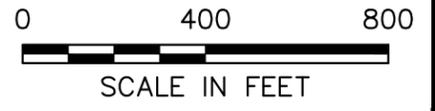
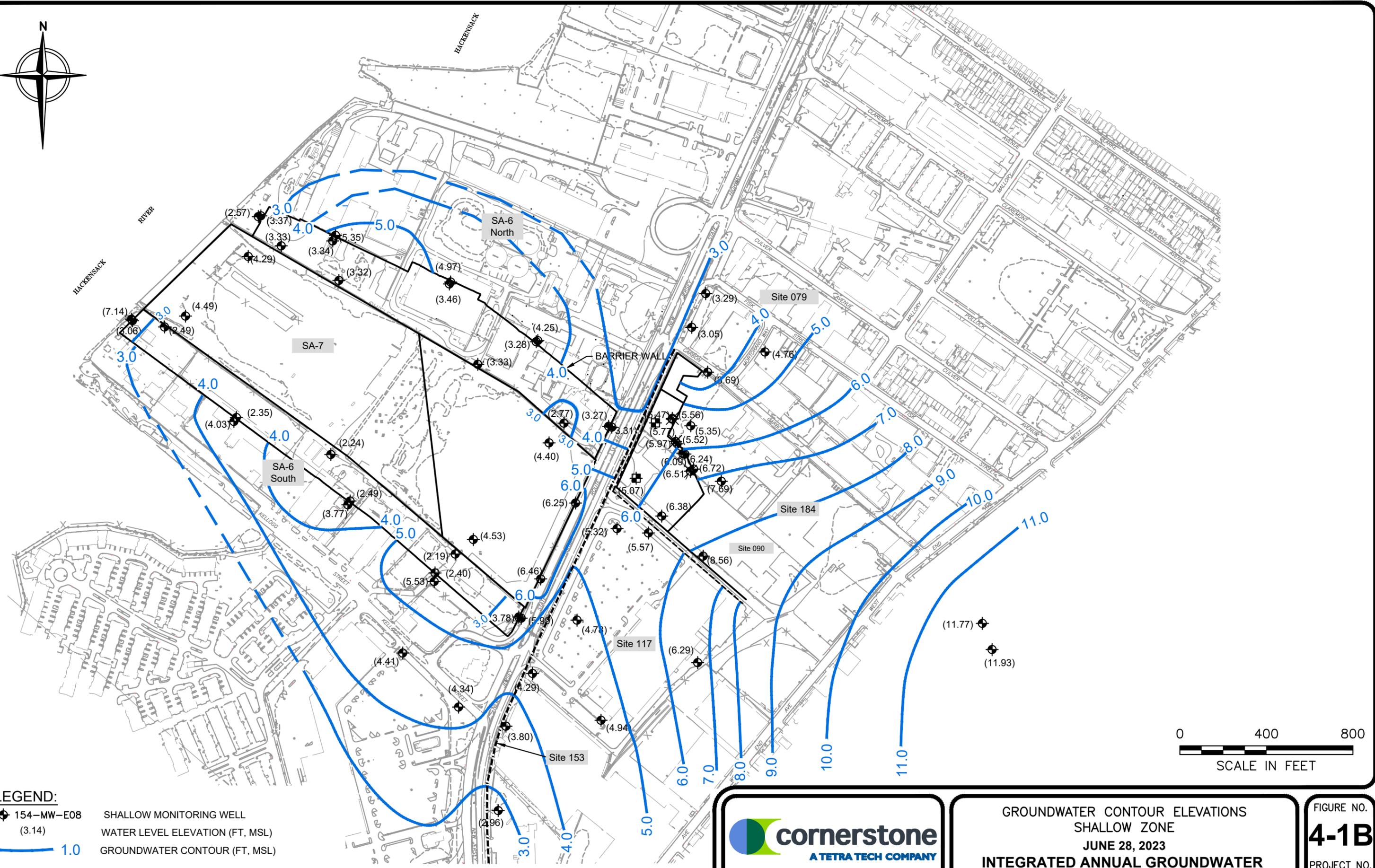
WELL LOCATION PLAN
 SHALLOW ZONE
 JUNE 28, 2023
**INTEGRATED ANNUAL GROUNDWATER
 PERFORMANCE REPORT - 2023**

FIGURE NO.
4-1A
 PROJECT NO.
 4233163

FIG: A:\PROJECTS\SPRINGWELL\30109 - SKY\PROJECT\DRAWINGS\2023-Annual Figures\113031-3-SITE-4-1A.dwg Layout: FIGURE 4-1A User: jomaguiano Jul 14, 2023 - 1:23:00pm



File: X:\PROJECTS\HONEYWELL\130109 -- SAK7\PROJECT DRAWINGS\2023\Annual Figures\H15WSF-S-SITE-4-1B.dwg Layout: FIGURE 4-1B User: JOHN.GUILLANO Jan 09, 2024 - 12:04pm



LEGEND:

-  154-MW-E08 SHALLOW MONITORING WELL
- (3.14) WATER LEVEL ELEVATION (FT, MSL)
-  1.0 GROUNDWATER CONTOUR (FT, MSL)

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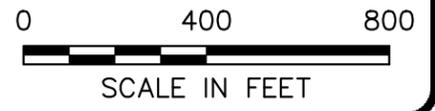
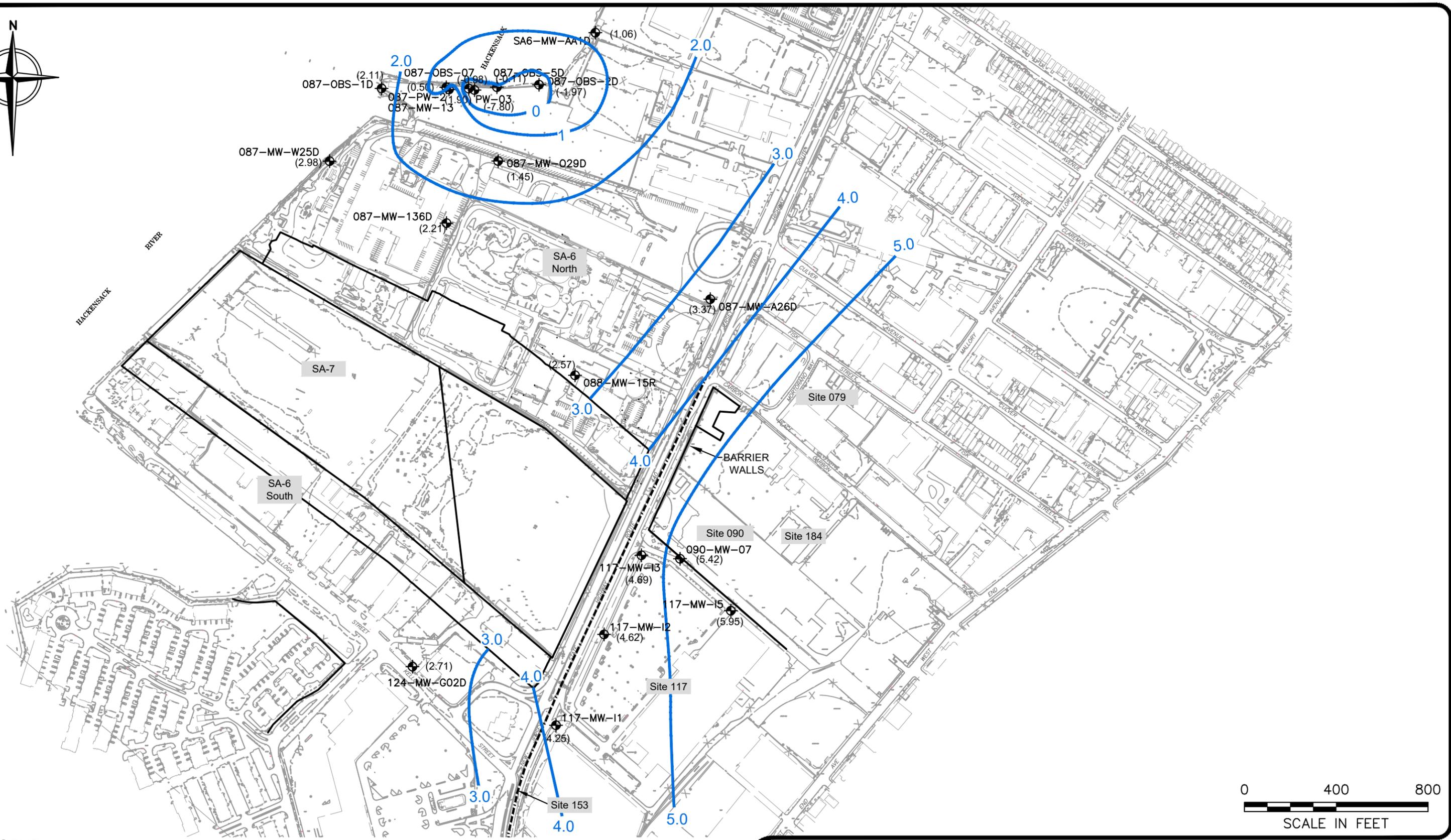


GROUNDWATER CONTOUR ELEVATIONS
SHALLOW ZONE
JUNE 28, 2023
INTEGRATED ANNUAL GROUNDWATER
PERFORMANCE REPORT- 2023

FIGURE NO.
4-1B
PROJECT NO.
4233163



File: X:\PROJECTS\HONEYWELL\130109 - SA7\PROJECT DRAWINGS\2023-Annual Figures\H15WSP-S-SITE-4-2.dwg Layout: FIGURE 4-2 User: JOHN.GIULIANO Jan 09, 2024 - 12:08pm



LEGEND:

 087-MW-029D
 (3.45)
 INTERMEDIATE ZONE MONITORING WELL
 WATER LEVEL ELEVATION (FT, MSL)

 1.0
 GROUNDWATER CONTOUR (FT, MSL)

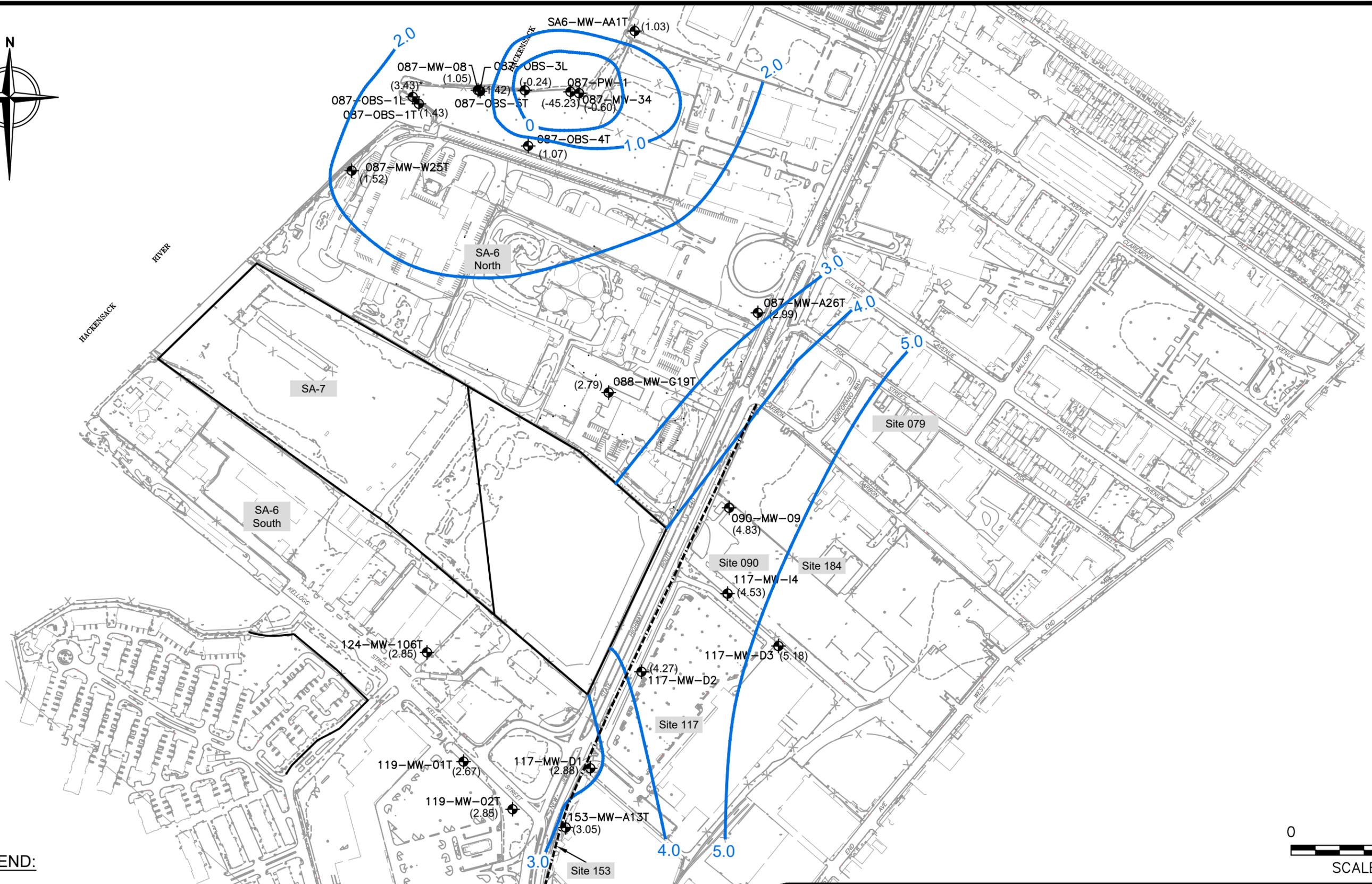
FIGURE REVISED JANUARY 2020
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GROUNDWATER ELEVATION CONTOURS
 INTERMEDIATE ZONE
 JUNE 28, 2023
**INTEGRATED ANNUAL GROUNDWATER
 PERFORMANCE REPORT- 2023**

FIGURE NO.
4-2
 PROJECT NO.
 4233163

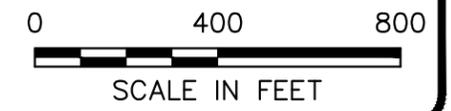
File: X:\PROJECTS\HONEYWELL\130109 - SA7\PROJECT DRAWINGS\2023-Annual Figures\H15WSF-S-SITE-4_3.dwg Layout: FIGURE 4-3 User: john.giuliano Mar 21, 2024 - 11:36am



LEGEND:

-  087-MW-029D DEEP ZONE MONITORING WELL
- (2.25) WATER LEVEL ELEVATION (FT, MSL)
-  1.0 GROUNDWATER CONTOUR (FT, MSL)

* OBS-1L NOT USED IN CONTOURING. SEE REPORT SECTION 4.2.

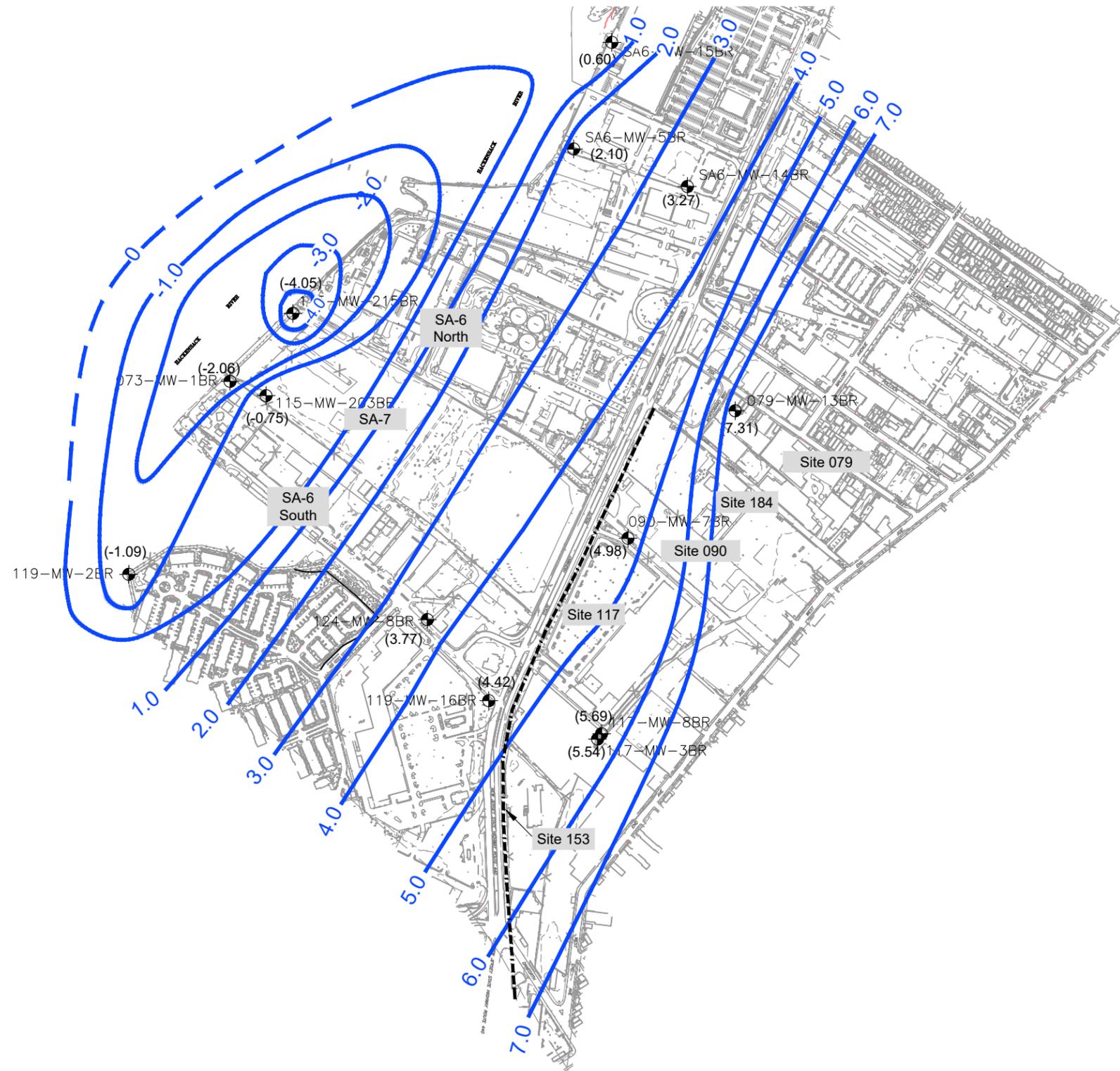
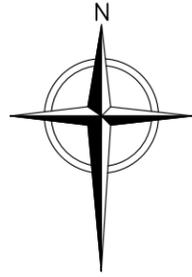


GROUNDWATER ELEVATION CONTOURS
 DEEP ZONE
 JUNE 28, 2023
 INTEGRATED ANNUAL GROUNDWATER
 PERFORMANCE REPORT- 2023

FIGURE NO.
4-3
 PROJECT NO.
 4233163

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File: X:\PROJECTS\HONEYWELL\130109 - SA7\PROJECT DRAWINGS\2023-Annual Figures\H15WSF-S-SITE-4.dwg Layout: FIGURE 4-4 User: john.guiliano Jul 12, 2023 - 3:21pm



LEGEND:

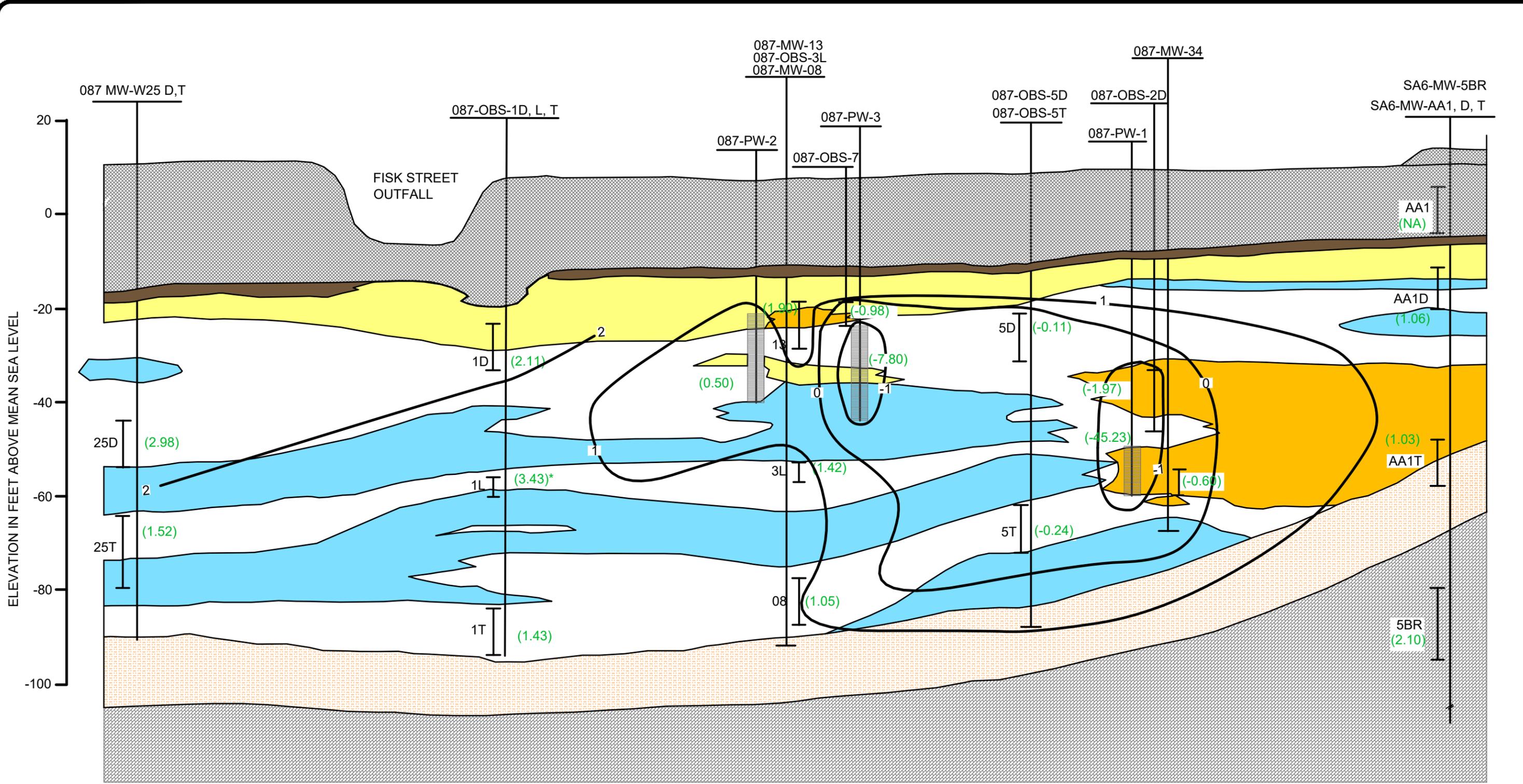
- 119-MW-11BR  BEDROCK ZONE MONITORING WELL
- (5.04) WATER LEVEL ELEVATION (FT, MSL)
-  1.0 GROUNDWATER CONTOUR (FT, MSL)



GROUNDWATER ELEVATION CONTOURS
BEDROCK ZONE
JUNE 28, 2023
**INTEGRATED ANNUAL GROUNDWATER
PERFORMANCE REPORT- 2023**

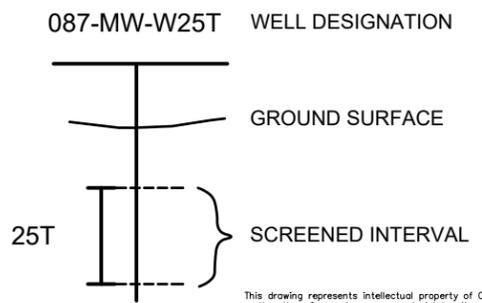
FIGURE NO.
4-4
PROJECT NO.
4233163

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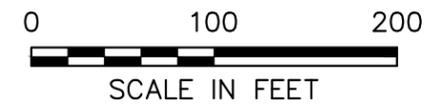


LEGEND:

- | | | | |
|--|-----------------------------|--|--------------------------|
| | FILL | | INTERBED SILTS AND CLAYS |
| | MEADOW MAT | | GLACIAL TILL |
| | FINE TO MEDIUM SAND | | PASSAIC FORMATION |
| | FINE, MEDIUM TO COARSE SAND | | FINE TO VERY FINE SAND |



* OBS-1L NOT USED IN CONTOURING.
SEE REPORT SECTION 4.2.



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GROUNDWATER ELEVATIONS (FT, MSL)
IN CROSS-SECTION
JUNE 28, 2023
INTEGRATED ANNUAL GROUNDWATER
PERFORMANCE REPORT- 2023

FIGURE NO.
4-5
PROJECT NO.
4233163

⊕079-MW-A02
(3.37)

⊕(3.65) 184-MW-04

(5.91) ⊕184-MW-05

⊕(6.24) 184-MW-101
⊕(5.74) 184-MW-105

■ SUMP A
(5.84)

(6.31) ⊕184-MW-106R
(6.58) ⊕184-MW-102
(6.71) ⊕184-MW-107
(6.80) ⊕184-MW-103

⊕184-MW-06
(8.13)

N.J.S.H. ROUTE 440

(5.24) ⊕090-MW-09
(7.09) ⊕184-MW-108

■ SUMP B
(2.46)

(7.27) ⊕090-PZ-05
(5.81) ⊕090-MW-07

⊕090-PZ-06
(8.98)

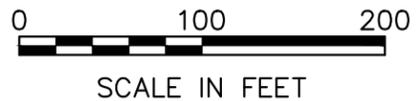
(5.68) ⊕117-MW-14S

⊕117-MW-15
(6.18)

LEGEND

- ⊕ MONITORING WELL
- ⊕ PIEZOMETER
- SUMP
- SHEET PILE WALL
- ▨ CAP AREA

- ⊕ ■ SHALLOW MONITORING LOCATION WITH DATA LOGGER INSTALLED
- ⊕ INDICATES INTERMEDIATE OR DEEP ZONE MONITORING WELL
- GROUNDWATER ELEVATION CONTOUR
- TCE WELLS AS OF MAY 2019 ARE NO LONGER MEASURED

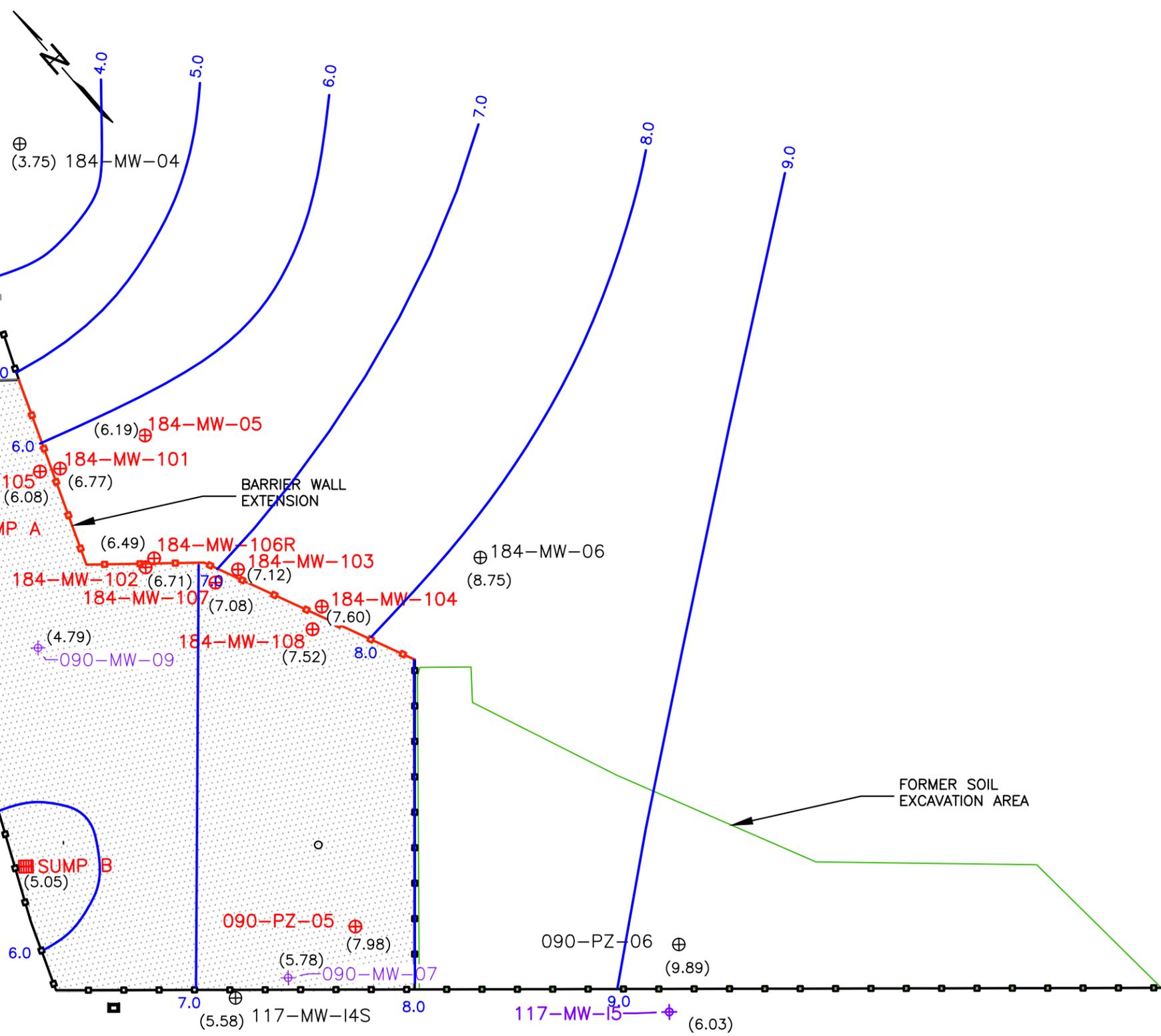


GROUNDWATER ELEVATION CONTOURS (ft.,msl)
MARCH 23, 2023
STUDY AREA 5 - NJCU
INTEGRATED ANNUAL GROUNDWATER
PERFORMANCE REPORT- 2023

FIGURE NO.
4-6
PROJECT NO.
4233711

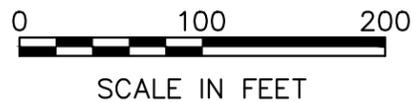
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⊕079-MW-A02
(3.36)



LEGEND

- ⊕ MONITORING WELL
 - ⊕ MONITORING WELL WITH DATA LOGGER INSTALLED
 - ⊕ INDICATES INTERMEDIATE OR DEEP ZONE MONITORING WELL
 - SUMP
 - SHEET PILE WALL
 - SHALLOW MONITORING LOCATION WITH DATA LOGGER INSTALLED
 - GROUNDWATER ELEVATION CONTOUR
 - CAP AREA
- TCE WELLS AS OF MAY 2019 ARE NO LONGER MEASURED



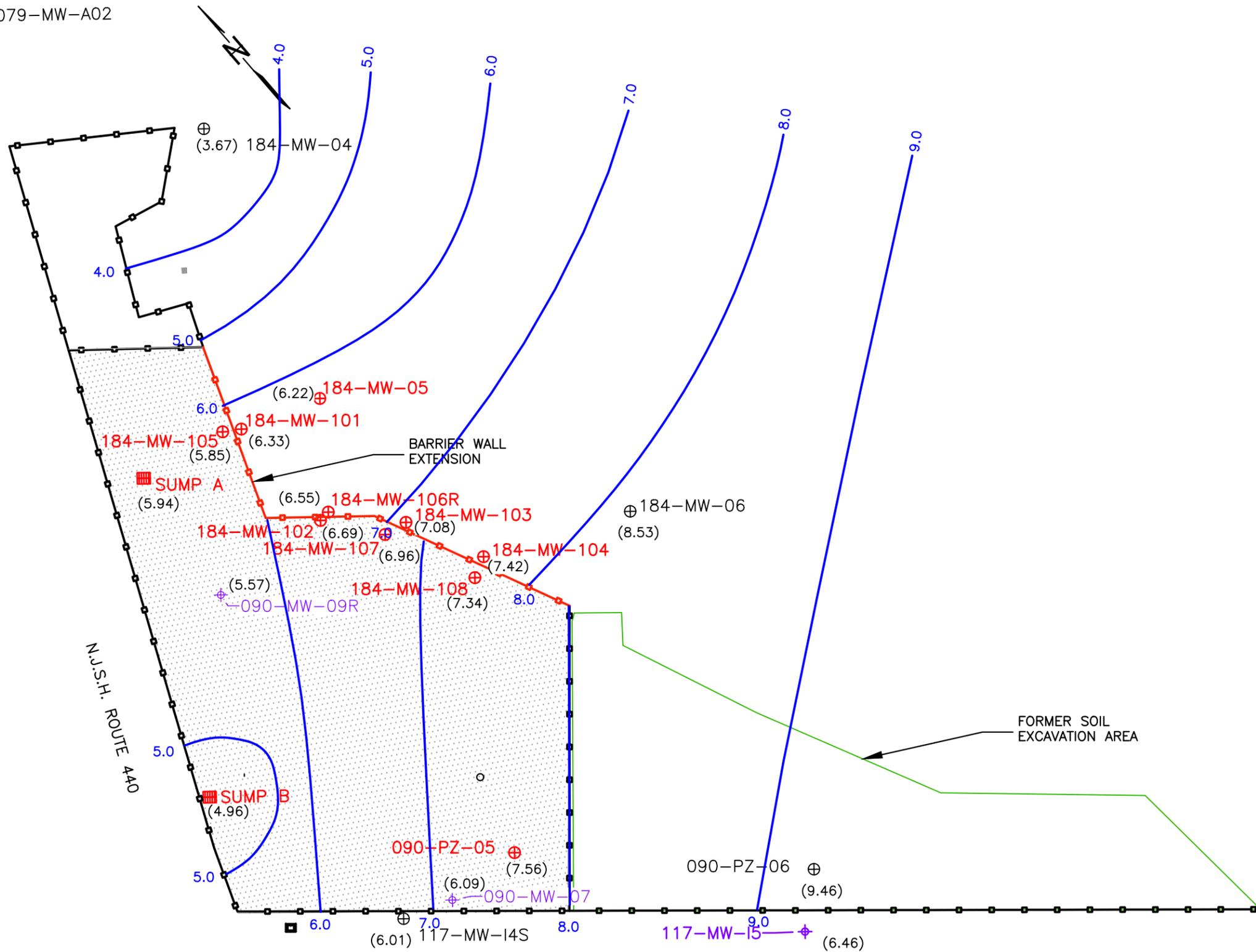
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GROUNDWATER ELEVATION CONTOURS (ft.,msl)
 SEPTEMBER 28, 2023
 STUDY AREA 5 - NJCU
 INTEGRATED ANNUAL GROUNDWATER
 PERFORMANCE REPORT - 2023

FIGURE NO.
4-8
 PROJECT NO.
 4233711

⊕ 079-MW-A02
(3.53)



LEGEND

- ⊕ MONITORING WELL
- ⊕ MONITORING WELL WITH DATA LOGGER
- ⊕ PIEZOMETER
- ⊕ INDICATES INTERMEDIATE OR DEEP ZONE MONITORING WELL
- SUMP
- GROUNDWATER ELEVATION CONTOUR
- SHEET PILE WALL
- ⊕ TCE WELLS AS OF MAY 2019 ARE NO LONGER MEASURED
- ⊕ CAP AREA

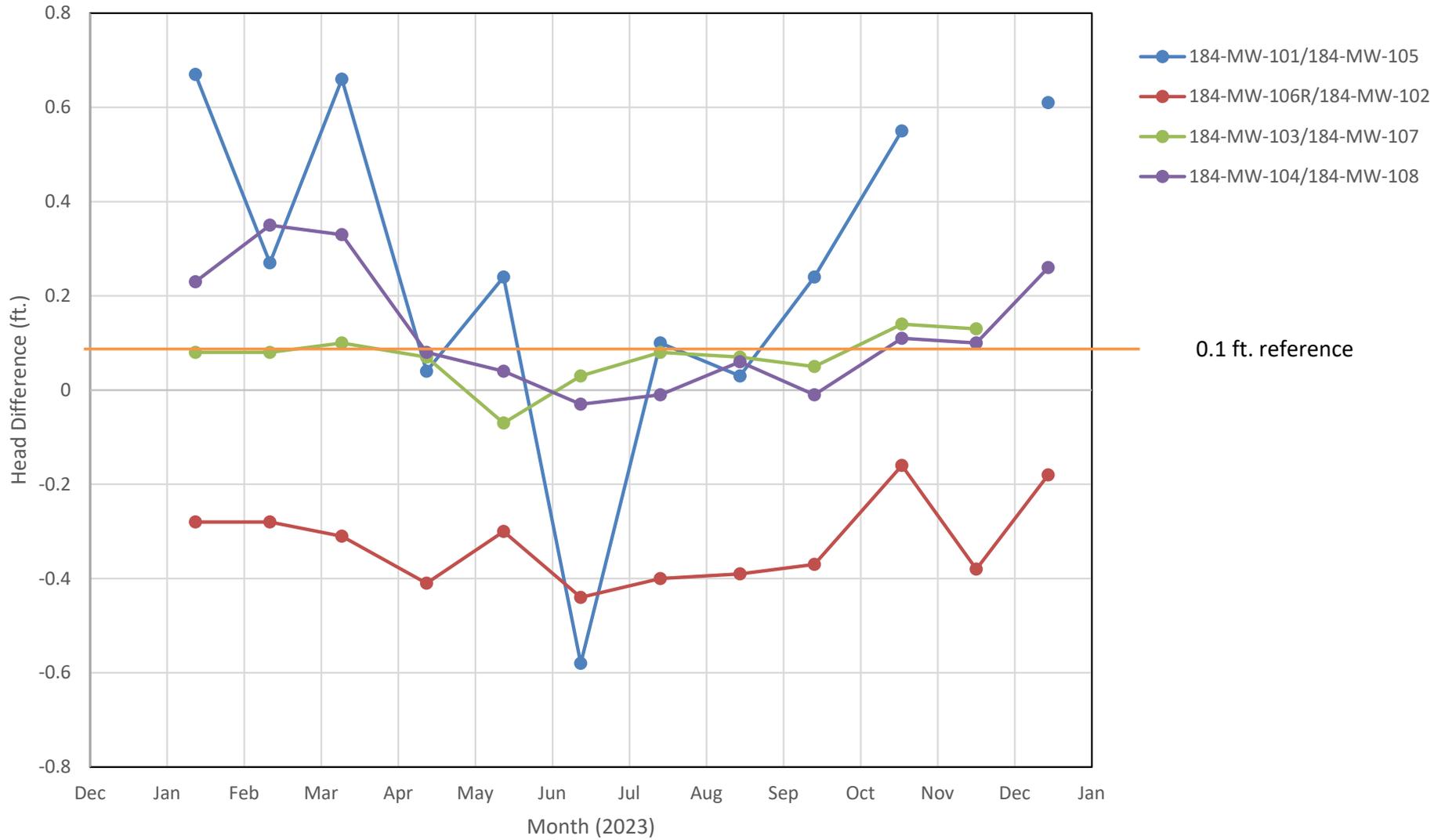


GROUNDWATER ELEVATION CONTOURS (ft.,msl)
DECEMBER 26, 2023
STUDY AREA 5 - NJCU
INTEGRATED ANNUAL GROUNDWATER
PERFORMANCE REPORT- 2023

FIGURE NO.
4-9
PROJECT NO.
4233711

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Head Differences NJCU Piezometers



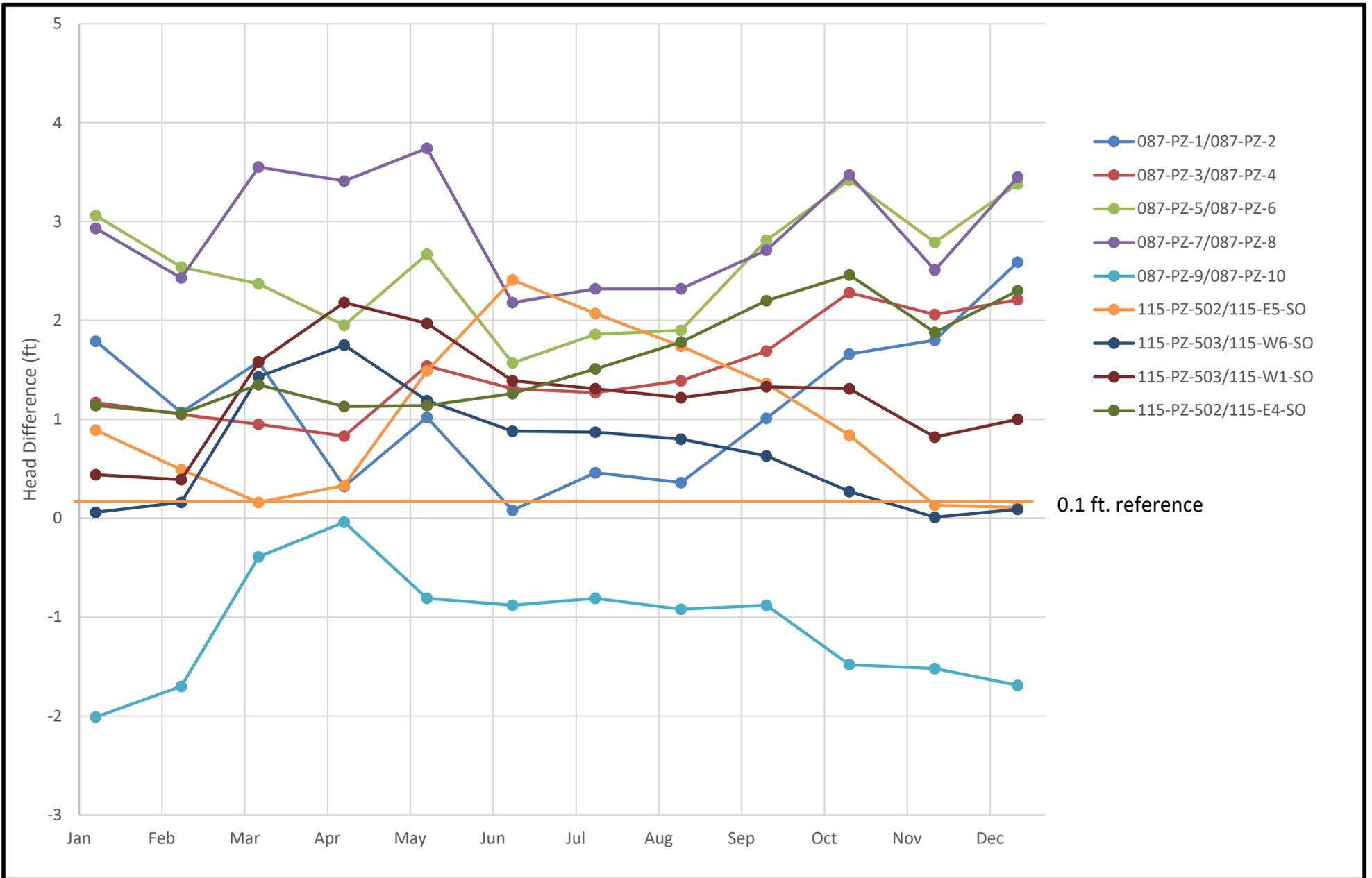
Note:
Positive head difference = inward gradient
Negative head difference = outward gradient
Gap in data = data logger malfunction



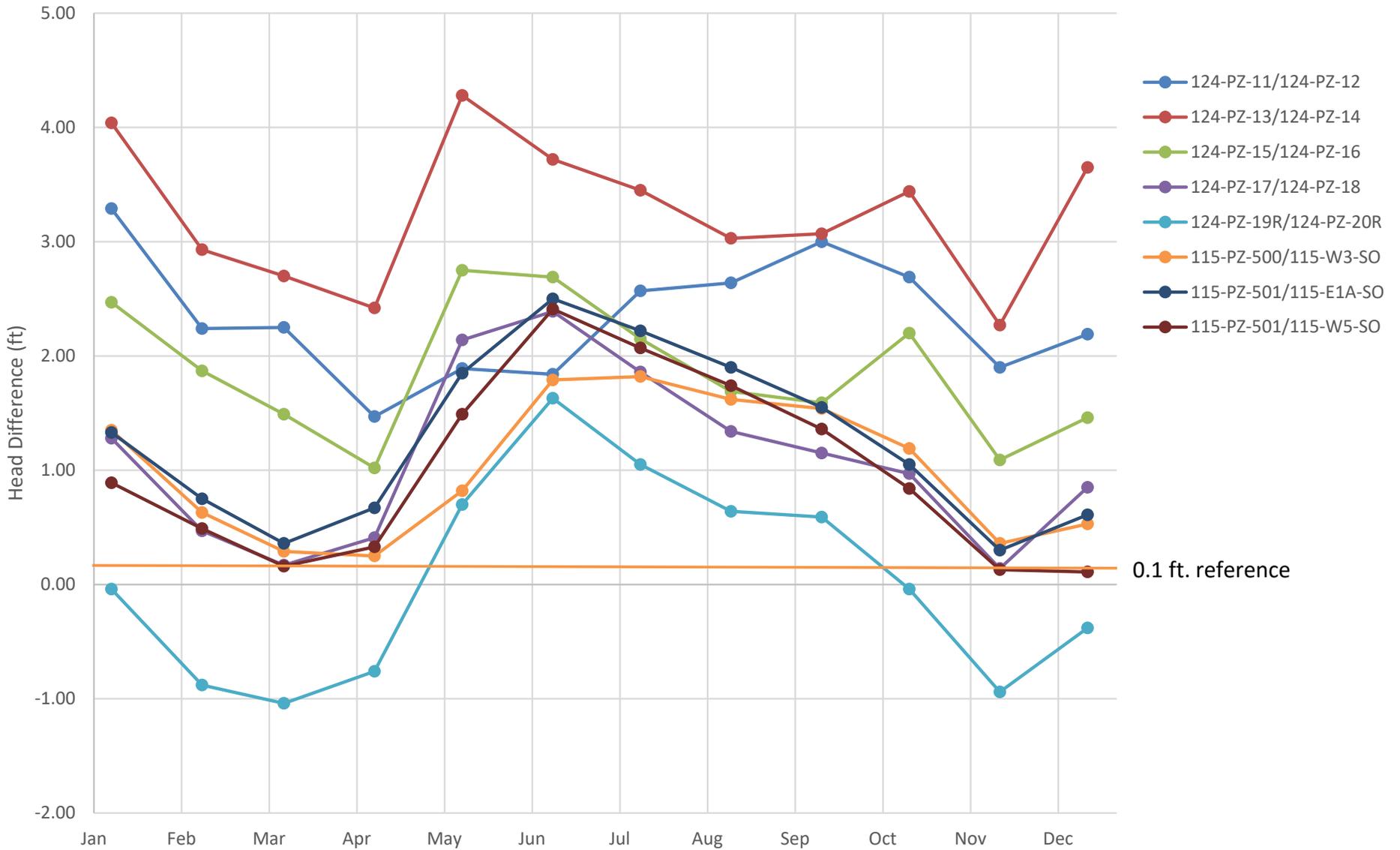
Integrated Annual Groundwater
 Performance Report 2023

Monthly Average Head Differences Across
 NJCU Barrier Wall

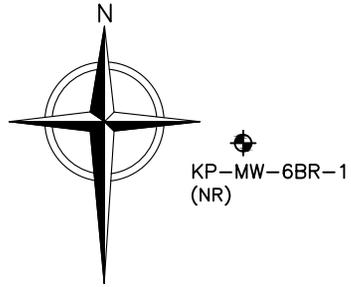
Figure
 4-10



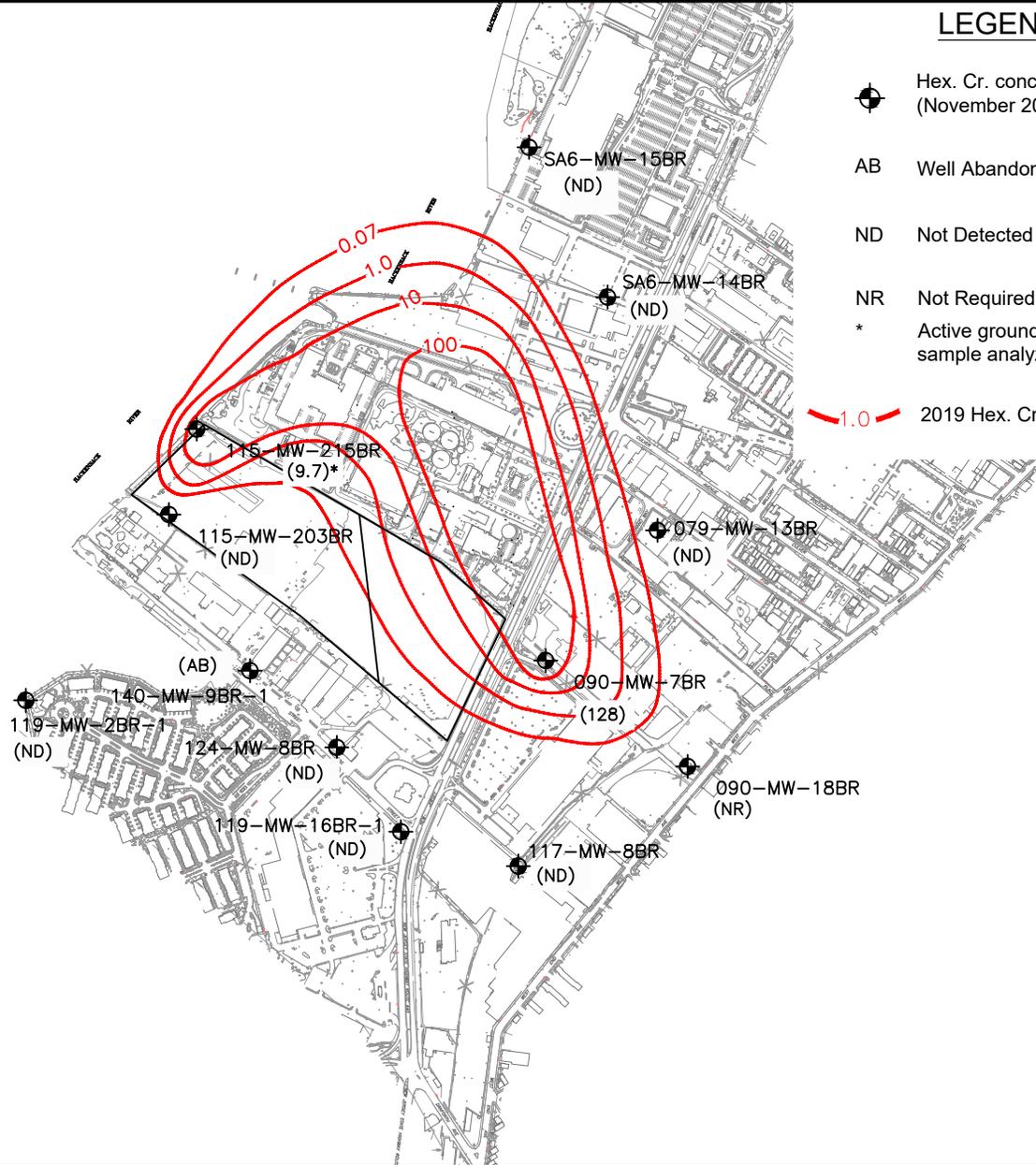
Note:
Positive head difference = inward gradient
Negative head difference = outward gradient



Note:
Positive head difference = inward gradient
Negative head difference = outward gradient

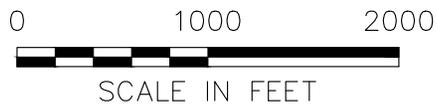


KP-MW-6BR-1
(NR)



LEGEND:

- Hex. Cr. concentrations in unfiltered sample (ppm) (November 2023) (ND)
- AB Well Abandoned
- ND Not Detected
- NR Not Required
- * Active ground water extraction well sample analyzed June 28, 2023
- 1.0 2019 Hex. Cr. contours (shown for reference)



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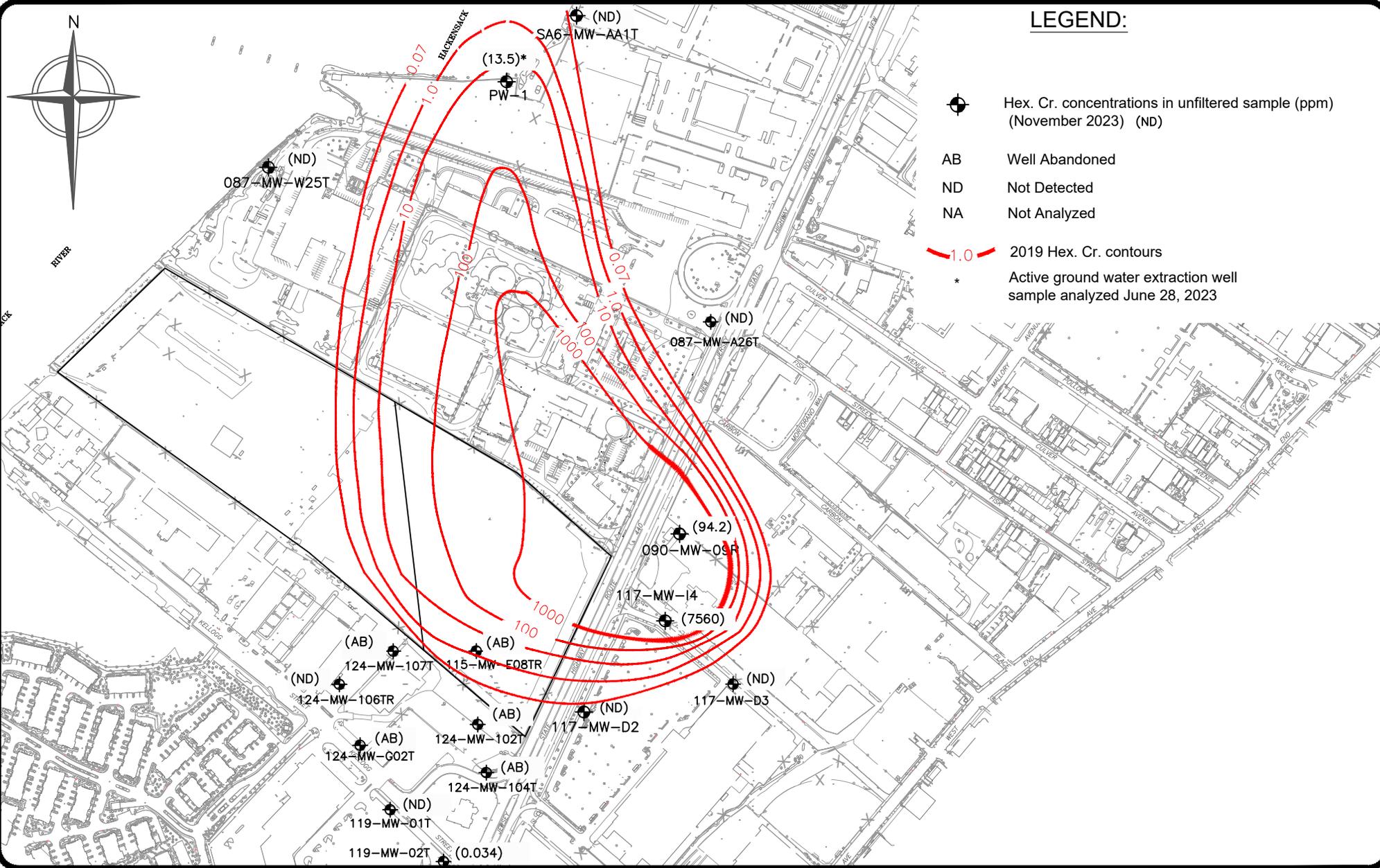
Hexavalent Chromium Concentrations in Bedrock Groundwater

INTEGRATED ANNUAL GROUNDWATER PERFORMANCE REPORT-2023

FIGURE NO.

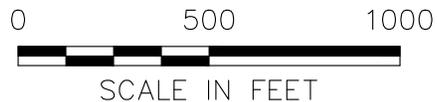
5-1

PROJECT NO.
4233711



LEGEND:

- Hex. Cr. concentrations in unfiltered sample (ppm) (November 2023) (ND)
- AB Well Abandoned
- ND Not Detected
- NA Not Analyzed
- 1.0 2019 Hex. Cr. contours
- * Active ground water extraction well sample analyzed June 28, 2023



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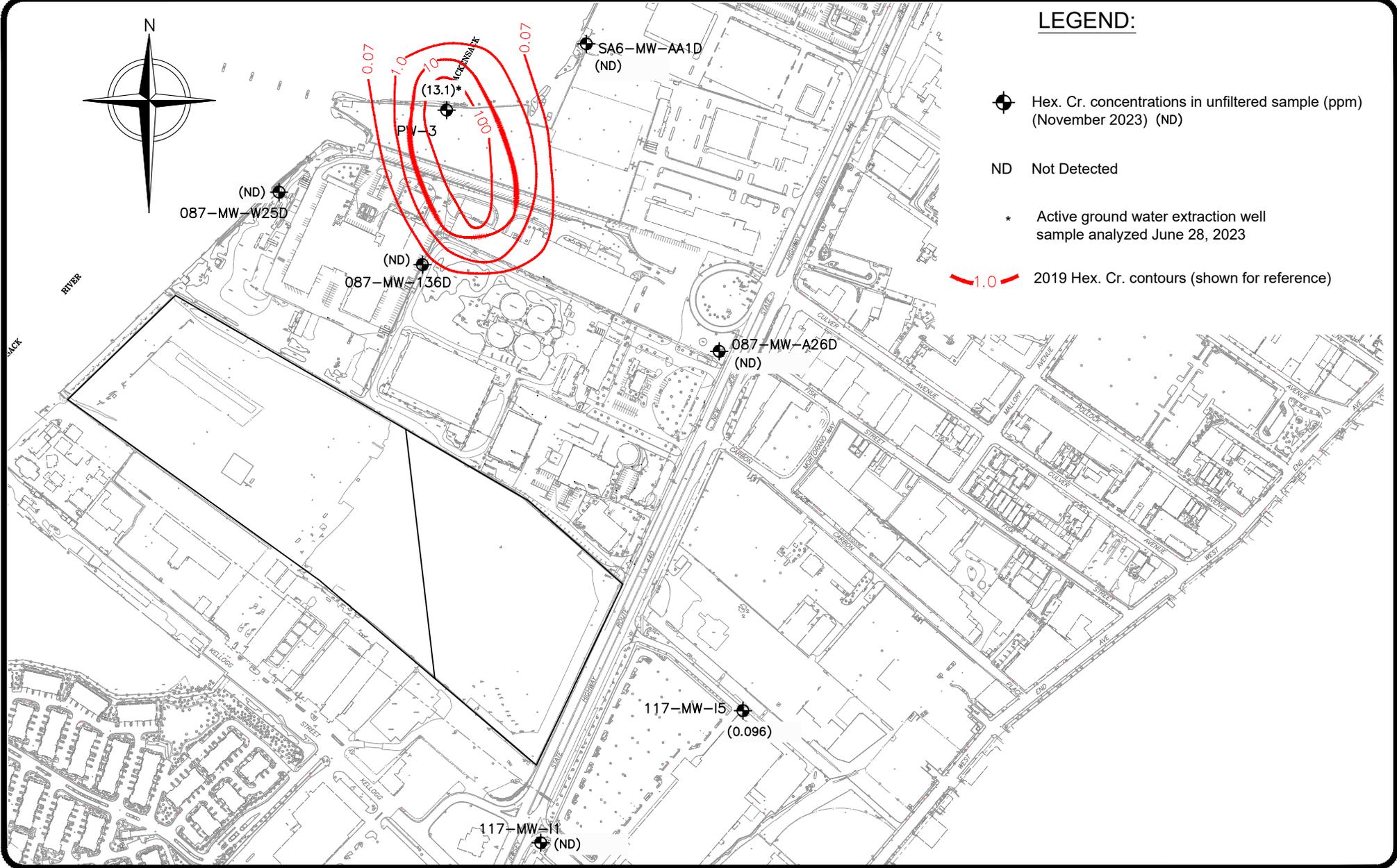
Hexavalent Chromium Concentrations in Deep Groundwater

INTEGRATED ANNUAL GROUNDWATER PERFORMANCE REPORT-2023

FIGURE NO.

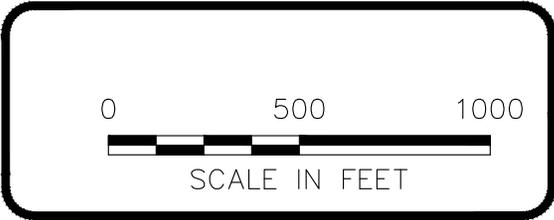
5-2

PROJECT NO.
4233711



LEGEND:

- Hex. Cr. concentrations in unfiltered sample (ppm) (November 2023) (ND)
- ND Not Detected
- * Active ground water extraction well sample analyzed June 28, 2023
- 1.0 2019 Hex. Cr. contours (shown for reference)



cornerstone
A TETRA TECH COMPANY

PREPARED BY:
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Hexavalent Chromium Concentrations in Intermediate Zone Groundwater

INTEGRATED ANNUAL GROUNDWATER PERFORMANCE REPORT-2023

FIGURE NO.
5-3

PROJECT NO.
4233711

Hexavalent Chromium in GWET Extraction Wells

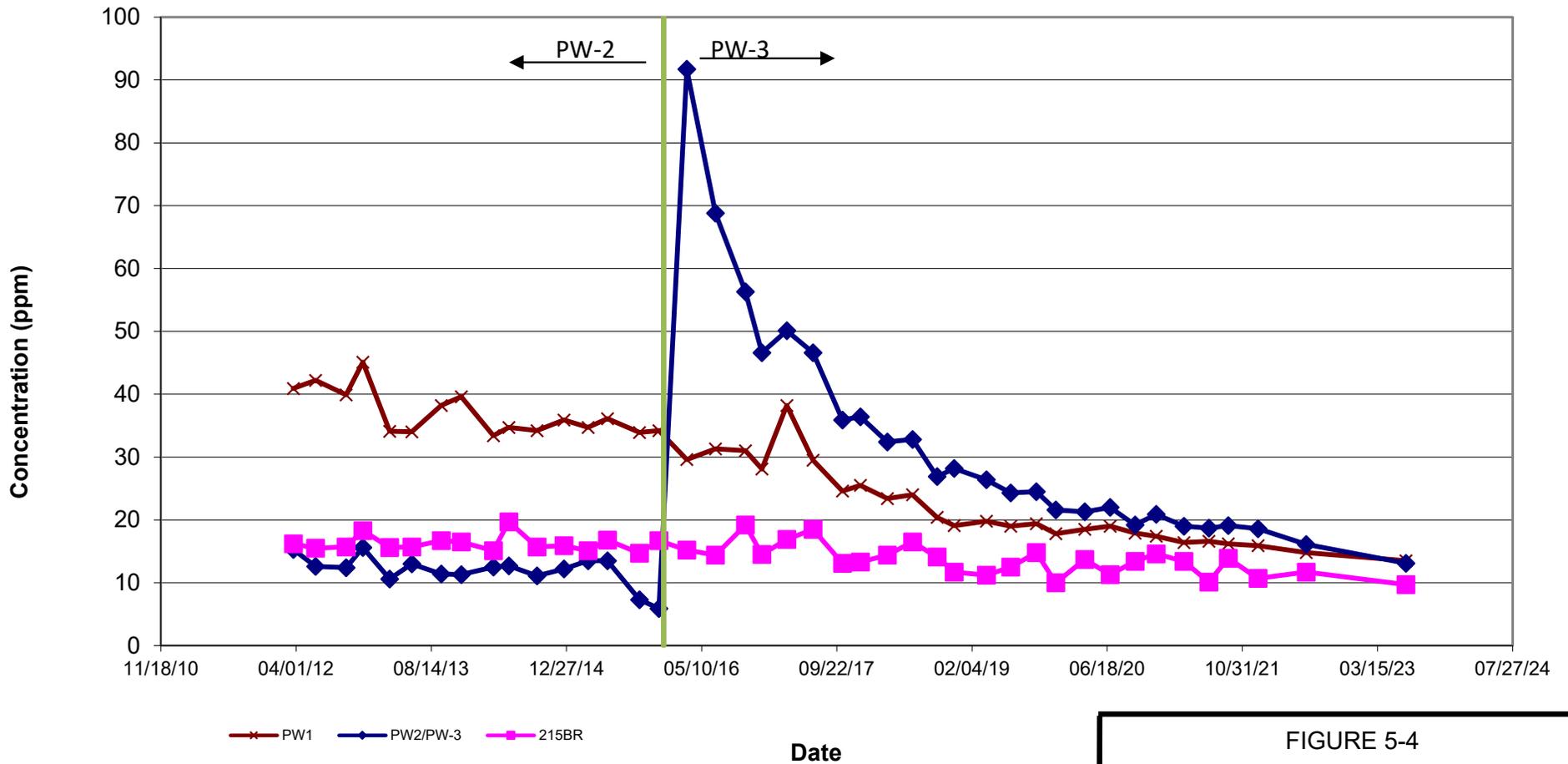


FIGURE 5-4
Hexavalent Chromium Trends in
GWET Extraction Wells

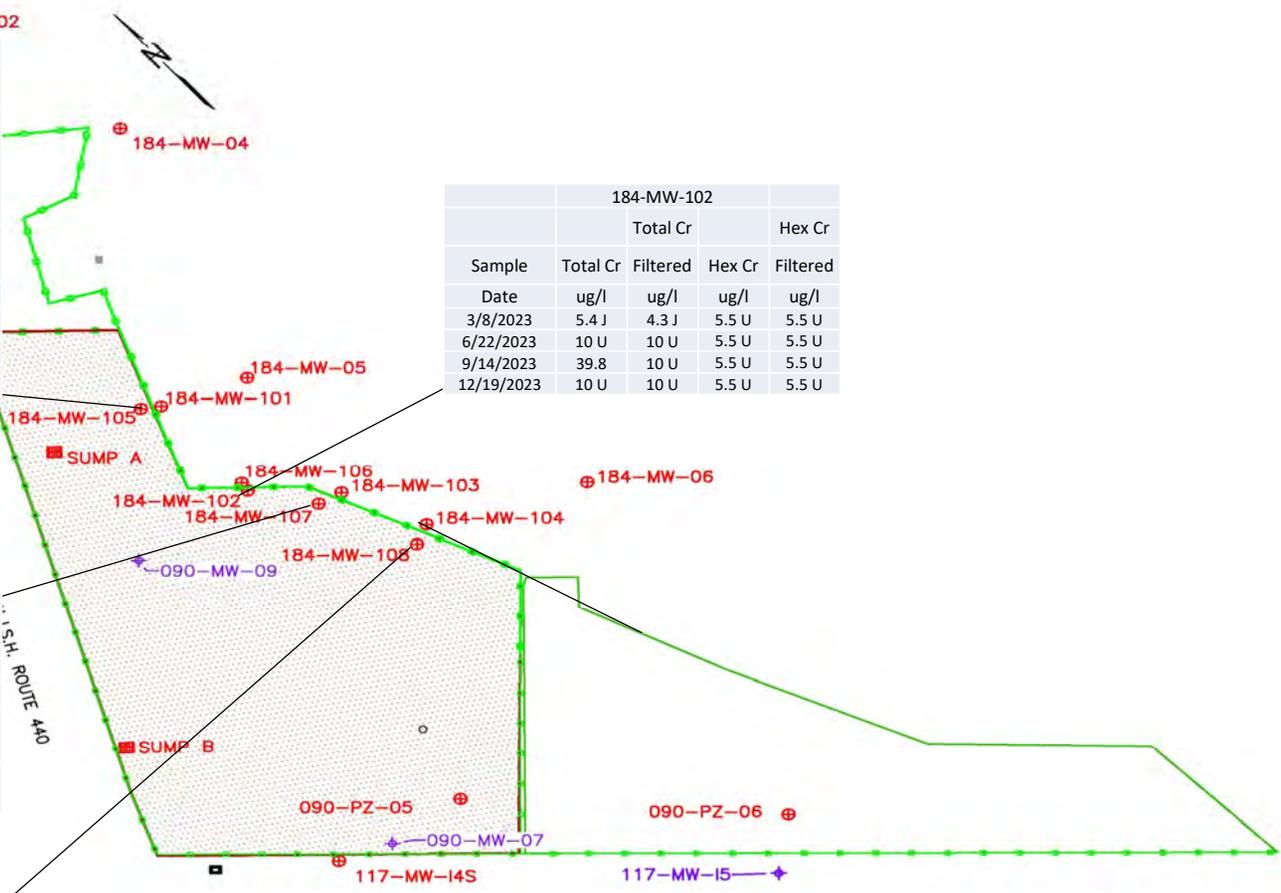
Integrated Annual Groundwater Performance Report
2023

184-MW-105				
	Total Cr		Hex Cr	
Sample	Total Cr	Filtered	Hex Cr	Filtered
Date	ug/l	ug/l	ug/l	ug/l
3/8/2023	4 U	4 U	5.5 U	5.5 U
3/8/2023 DUP	4 U	4 U	5.5 U	5.8
6/22/2023	10 U	10 U	5.5 U	5.5 U
6/22/2023 DUP	10 U	10 U	5.5 U	5.5 U
9/14/2023	10 U	10 U	5.5 U	5.5 U
9/14/2023 DUP	10 U	10 U	5.5 U	5.5 U
12/19/2023	10 U	10 U	5.5 U	5.5 U
12/19/2023 DUP	10 U	10 U	5.5 U	5.5 U

184-MW-102				
	Total Cr		Hex Cr	
Sample	Total Cr	Filtered	Hex Cr	Filtered
Date	ug/l	ug/l	ug/l	ug/l
3/8/2023	5.4 J	4.3 J	5.5 U	5.5 U
6/22/2023	10 U	10 U	5.5 U	5.5 U
9/14/2023	39.8	10 U	5.5 U	5.5 U
12/19/2023	10 U	10 U	5.5 U	5.5 U

184-MW-107				
	Total Cr		Hex Cr	
Sample	Total Cr	Filtered	Hex Cr	Filtered
Date	ug/l	ug/l	ug/l	ug/l
3/8/2023	4 U	4 U	5.5 U	5.5 U
6/22/2023	10 U	10 U	5.5 U	5.5 U
9/14/2023	185	10 U	5.5 U	5.5 U
12/19/2023	51.5	60.8	5.5 U	5.5 U

184-MW-108				
	Total Cr		Hex Cr	
Sample	Total Cr	Filtered	Hex Cr	Filtered
Date	ug/l	ug/l	ug/l	ug/l
3/8/2023	4 U	4 U	5.5 U	5.5 U
6/22/2023	10 U	10 U	5.5 U	5.5 U
9/14/2023	10 U	10 U	5.5 U	5.5 U
12/19/2023	10 U	10 U	5.5 U	5.5 U



LEGEND

- ⊕ MONITORING WELL
- ⊕ MONITORING WELL
- PIEZOMETER
- SUMP
- SHEET PILE WALL
- ▨ CAP AREA

FIGURE 5-5
Groundwater Quality Monitoring Well
Results 2023 - NJCU

Integrated Annual Groundwater Performance Report
 2023

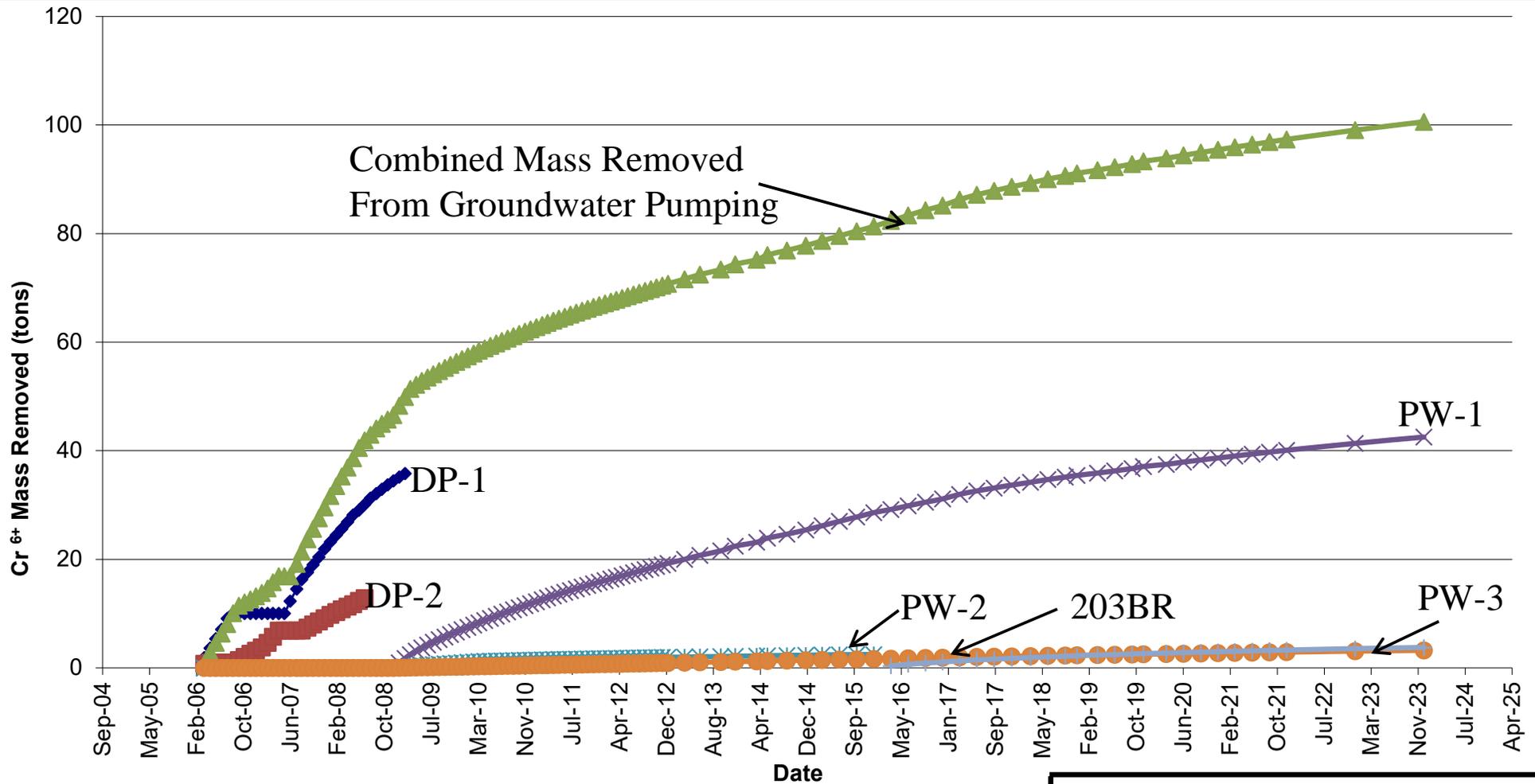
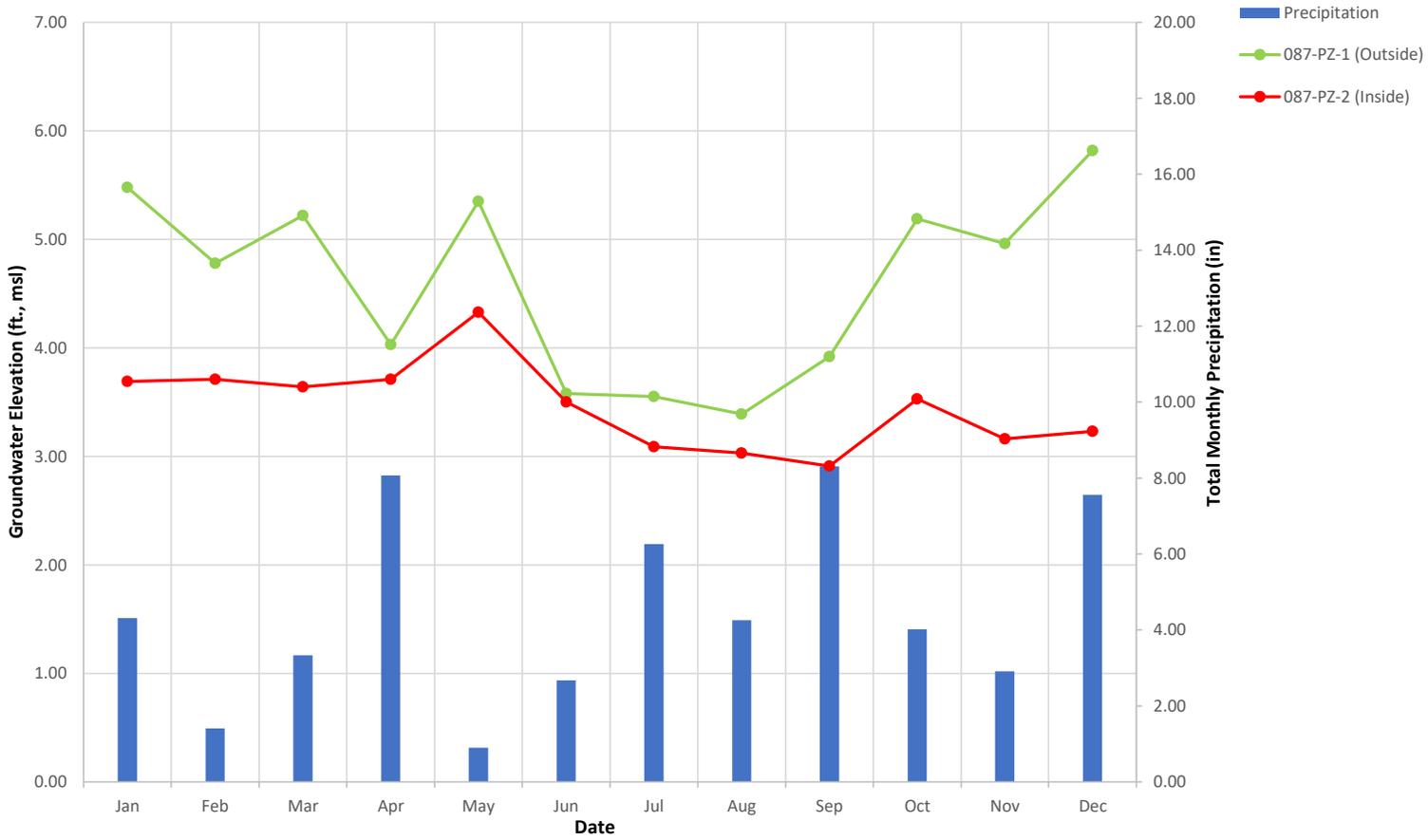


FIGURE 5-7
 Cumulative Mass of Chromium Removed From
 Groundwater by Pumping
 Integrated Annual Groundwater Performance Report
 2023

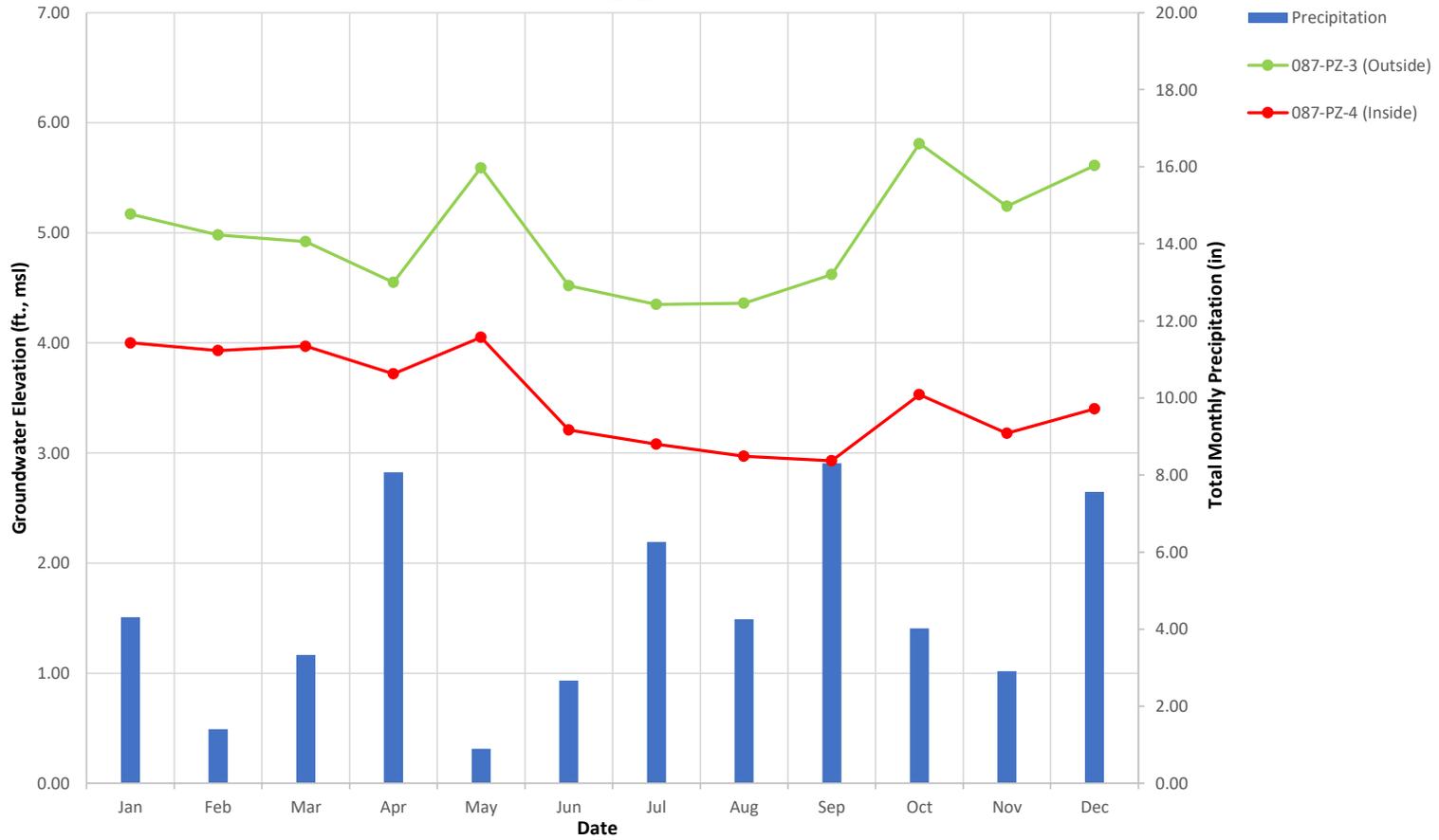
APPENDIX A

HYDROGRAPHS OF AVERAGE MONTHLY HEADS FROM SA-6 AND SA-7

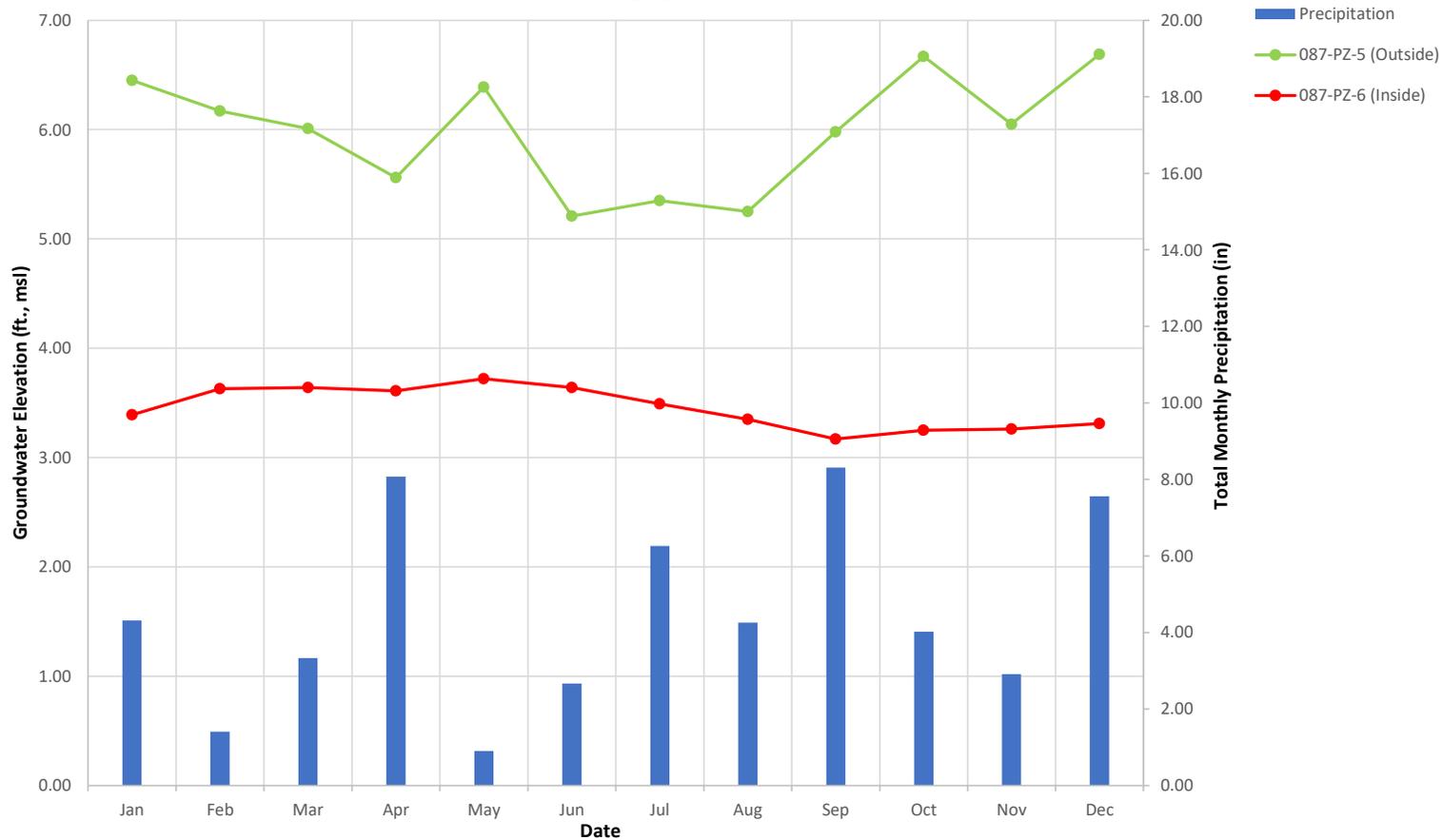
087-PZ-1 and 087-PZ-2
 Monthly Average Groundwater Elevations vs. Total Monthly Precipitation
 2023



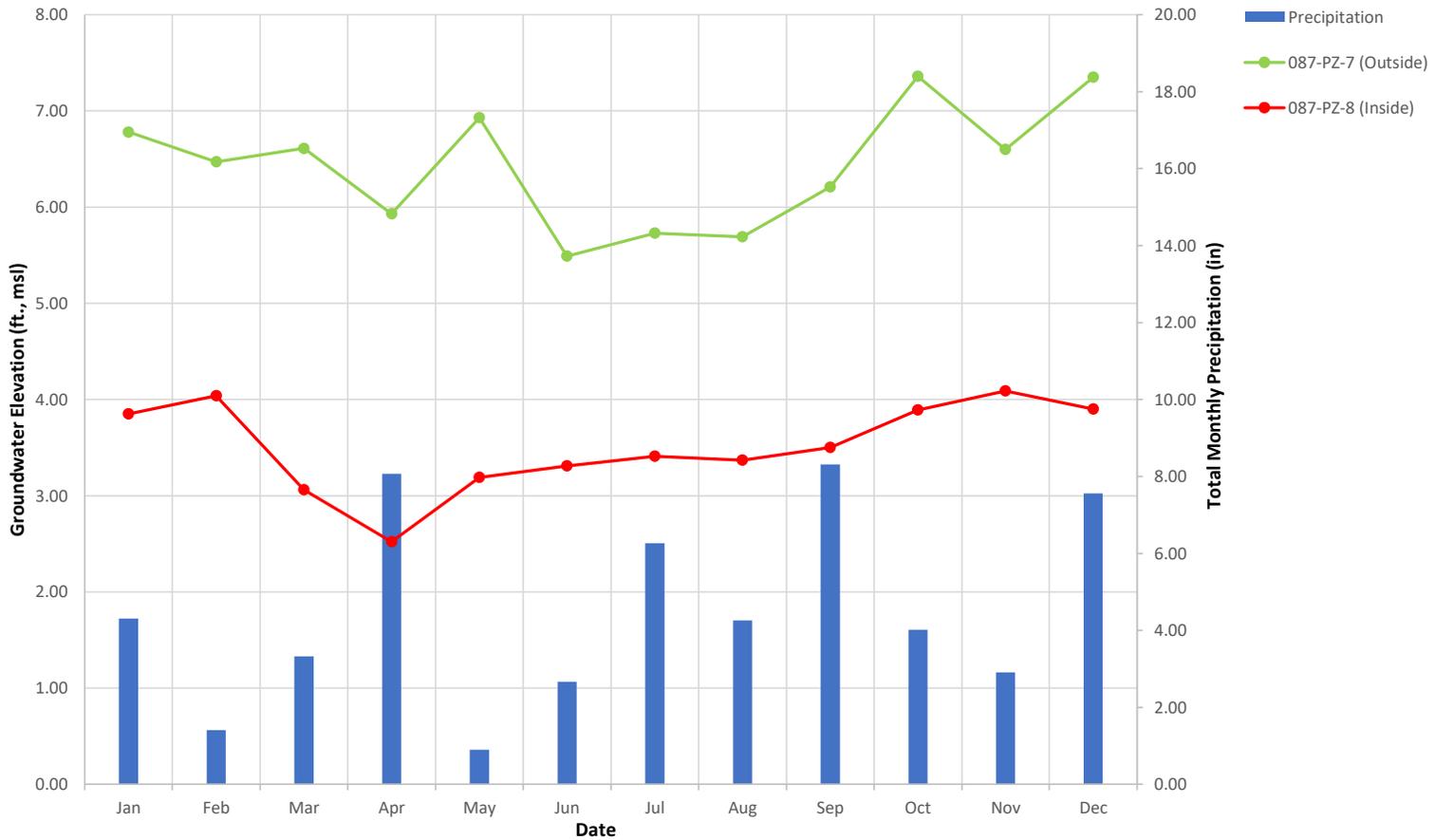
087-PZ-3 and 087-PZ-4
 Monthly Average Groundwater Elevations vs. Total Monthly Precipitation
 2023



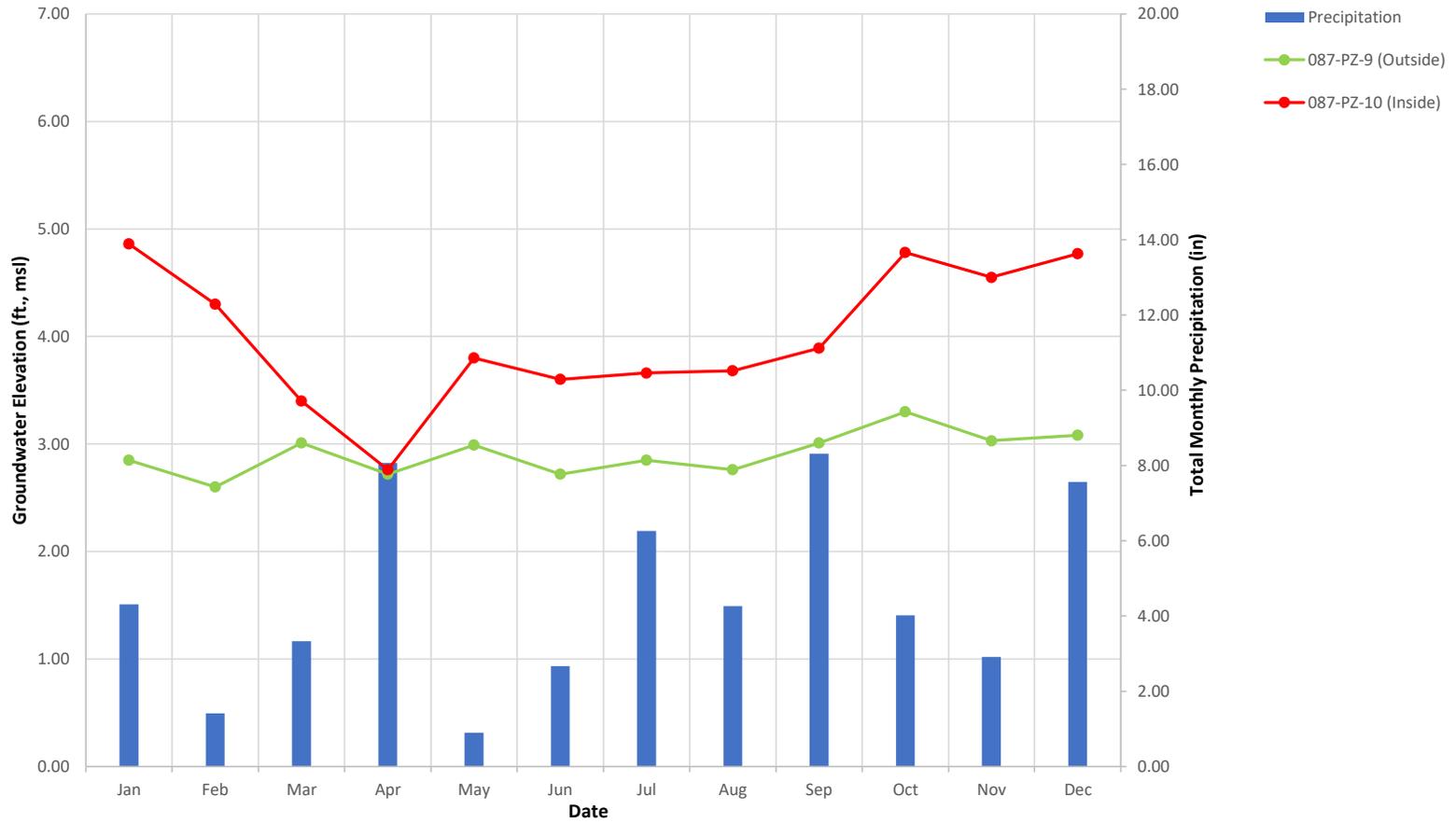
087-PZ-5 and 087-PZ-6
 Monthly Average Groundwater Elevations vs. Total Monthly Precipitation
 2023



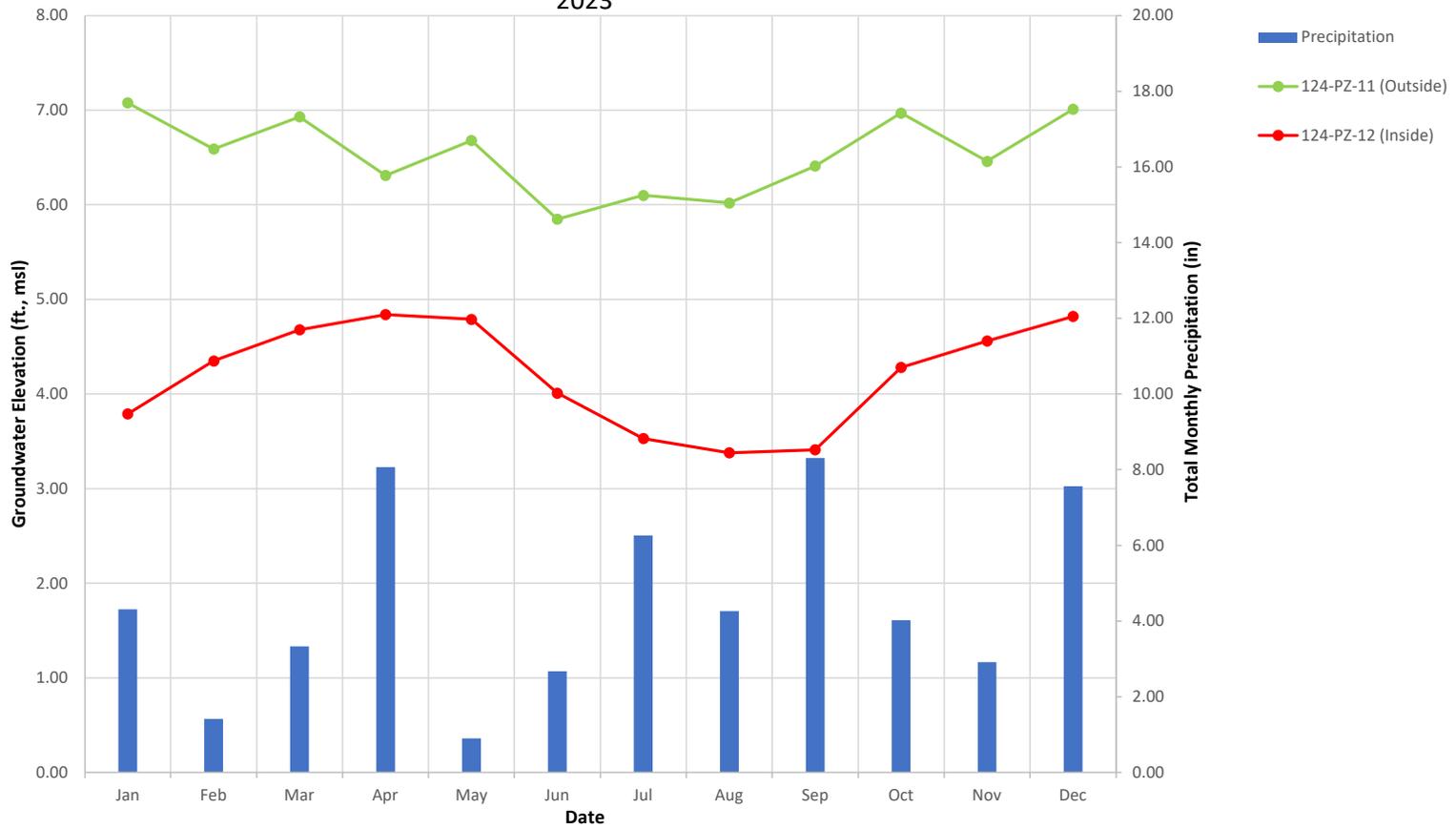
087-PZ-7 and 087-PZ-8
 Monthly Average Groundwater Elevations vs. Total Monthly Precipitation
 2023



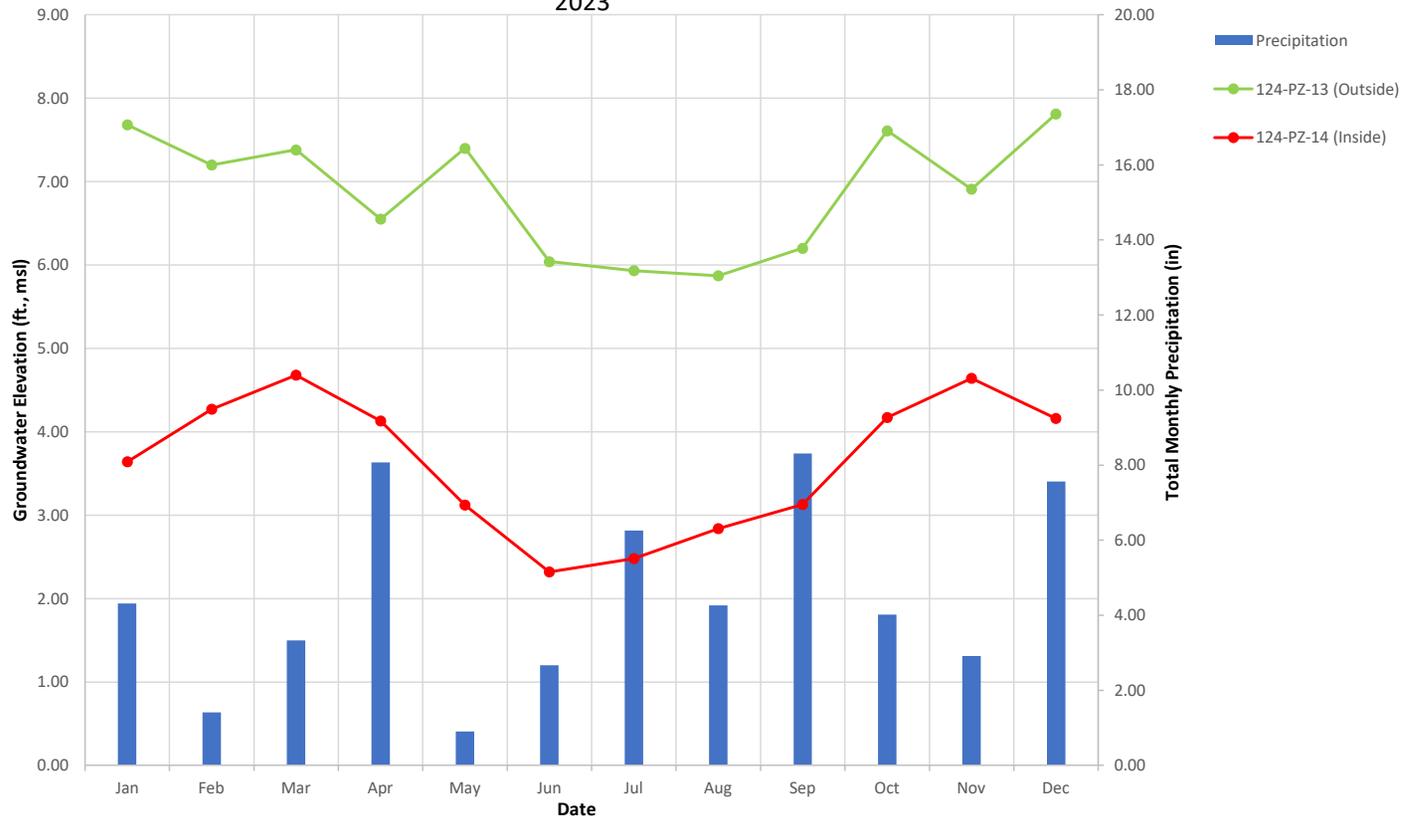
087-PZ-9 and 087-PZ-10
Monthly Average Groundwater Elevations vs Total Monthly Precipitation
2023



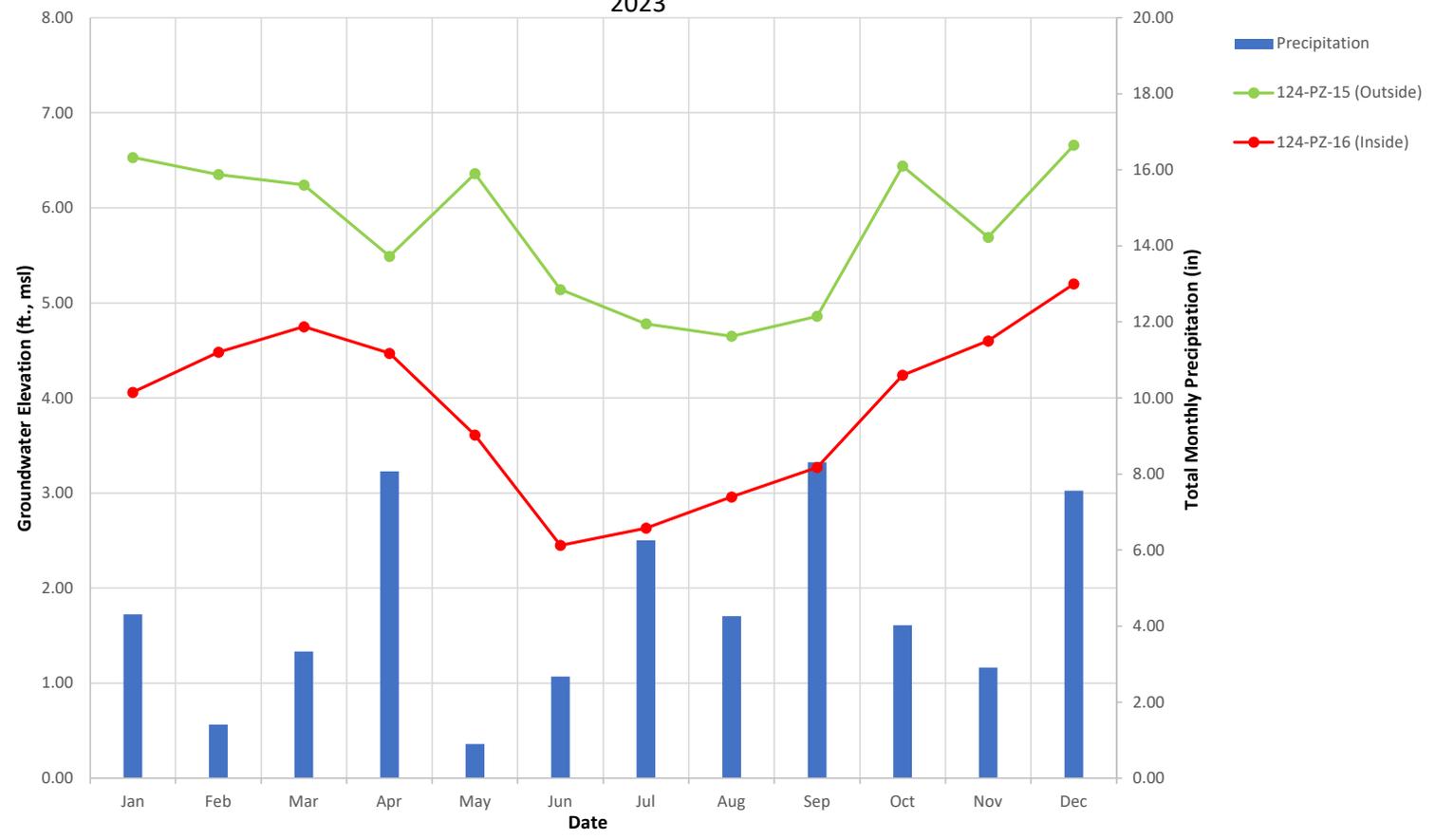
124-PZ-11 and 124-PZ-12
Monthly Average Groundwater Elevations vs. Total Monthly Precipitation
2023



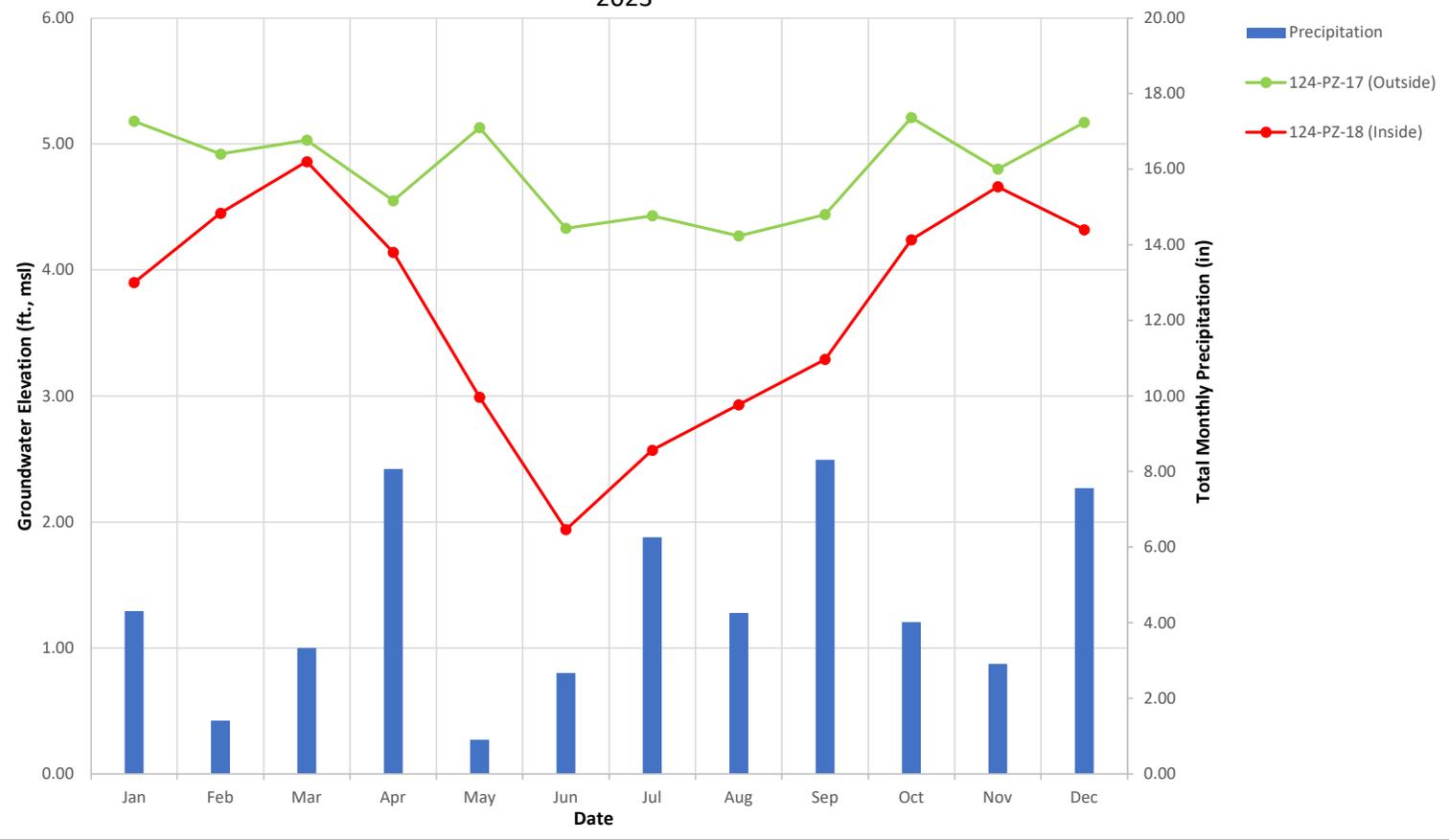
124-PZ-13 and 124-PZ-14
Monthly Average Groundwater Elevations vs. Total Monthly Precipitation
2023



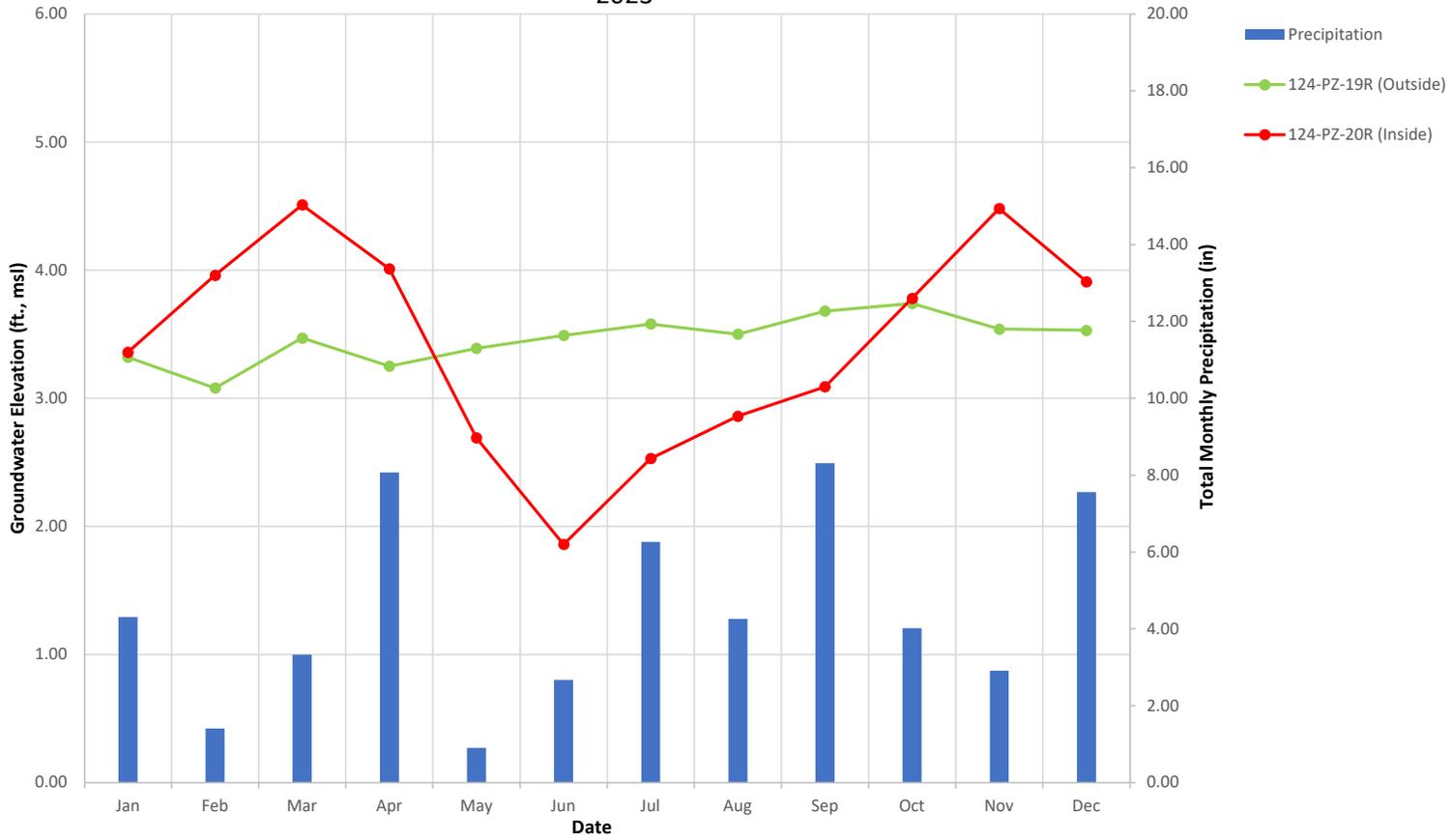
124-PZ-15 and 124-PZ-16
 Monthly Average Groundwater Elevations vs. Total Monthly Precipitation
 2023



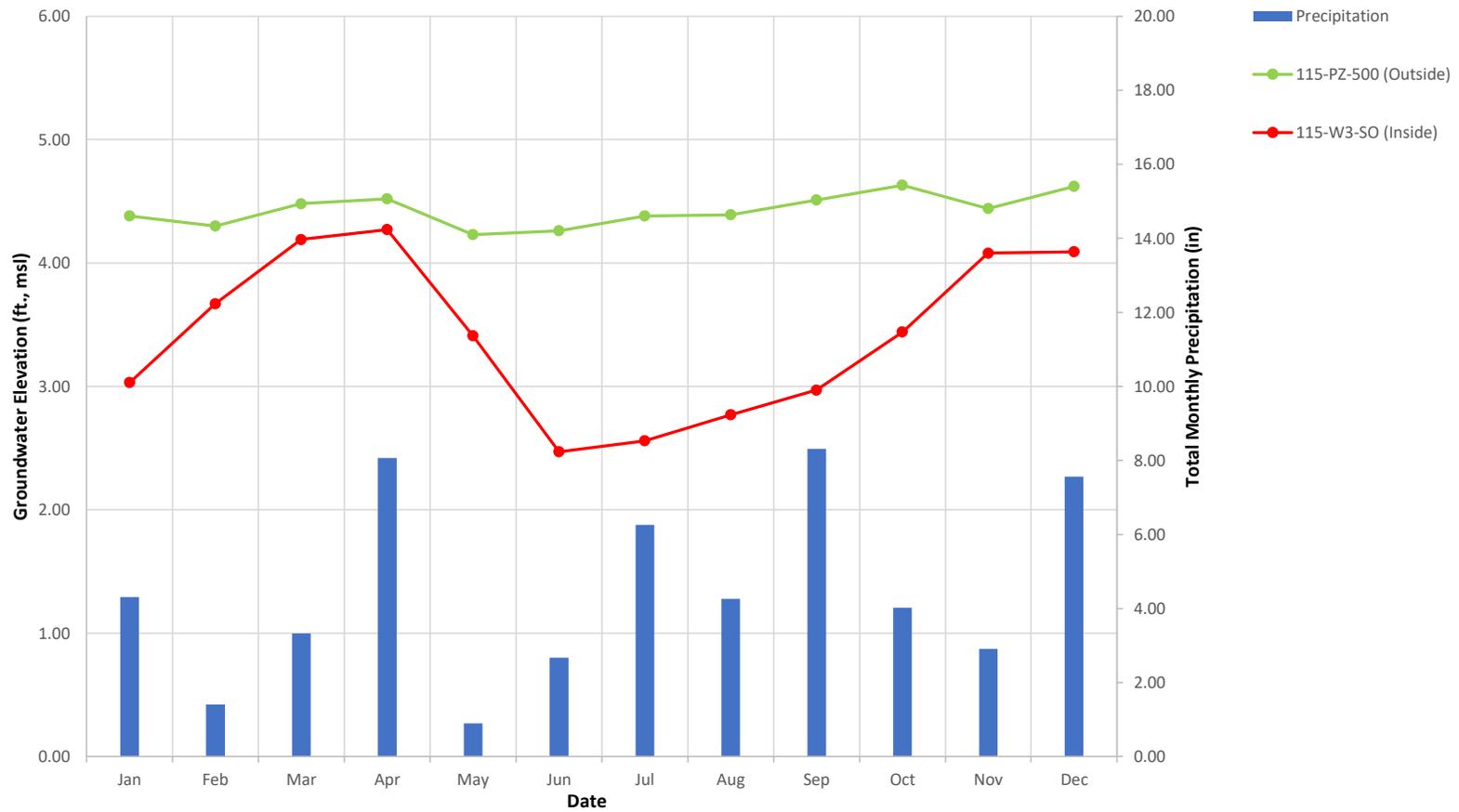
124-PZ-17 and 124-PZ-18
Monthly Average Groundwater Elevations vs. Total Monthly Precipitation
2023



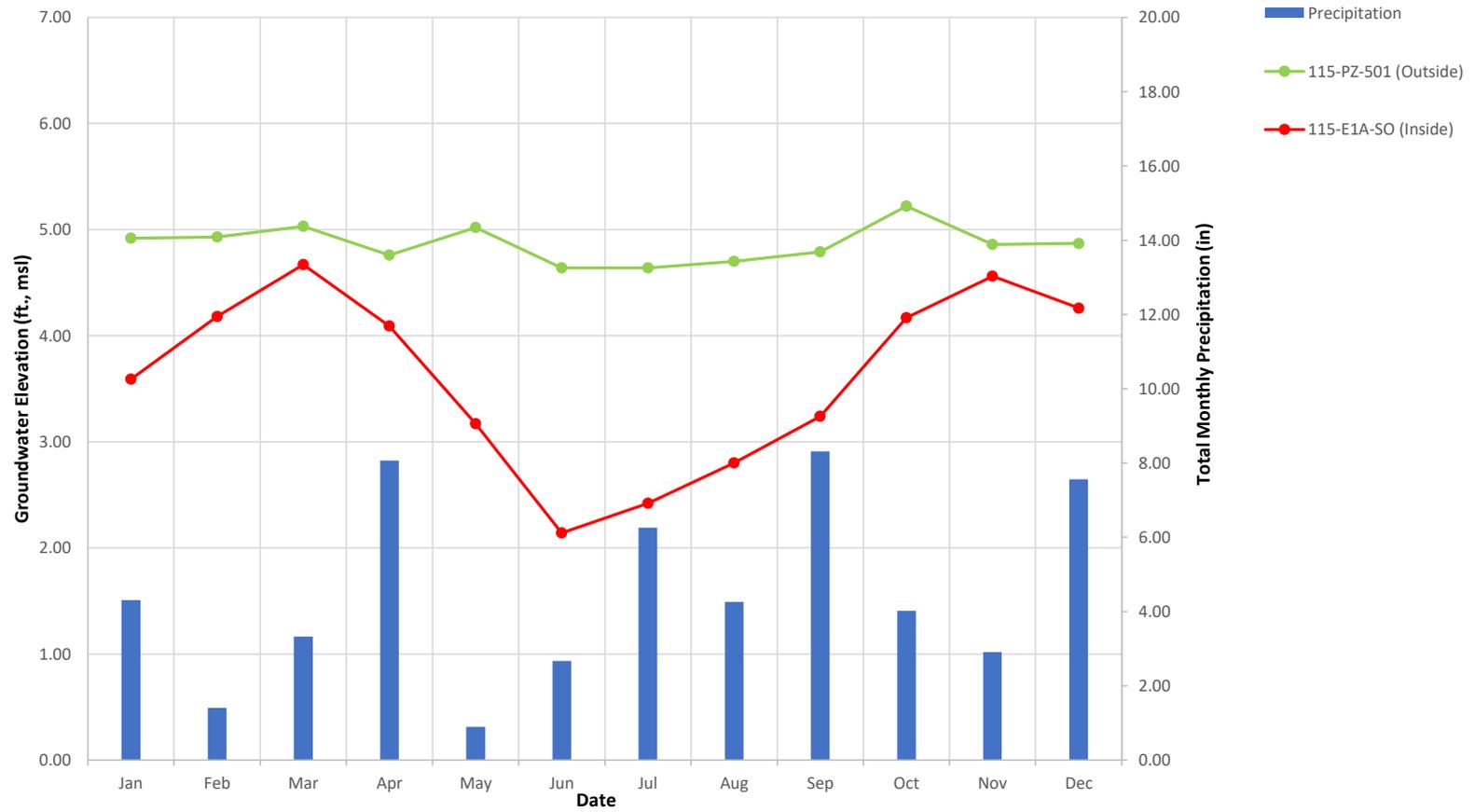
124-PZ-19R and 124-PZ-20R
Monthly Average Groundwater Elevations vs. Total Monthly Precipitation
2023



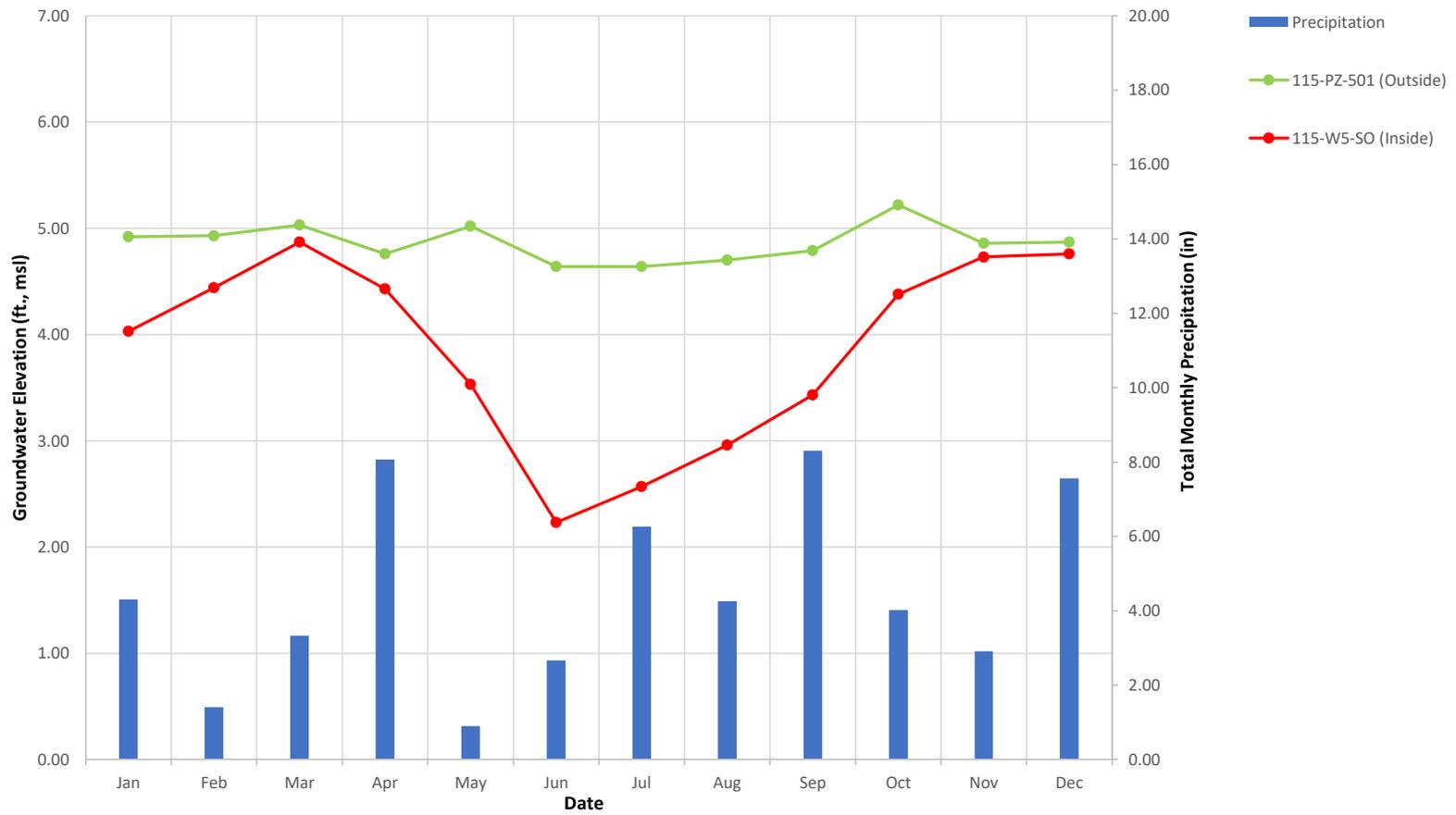
115-PZ-500 and 115-W3-SO
 Monthly Average Groundwater Elevations vs. Total Monthly Precipitation
 2023



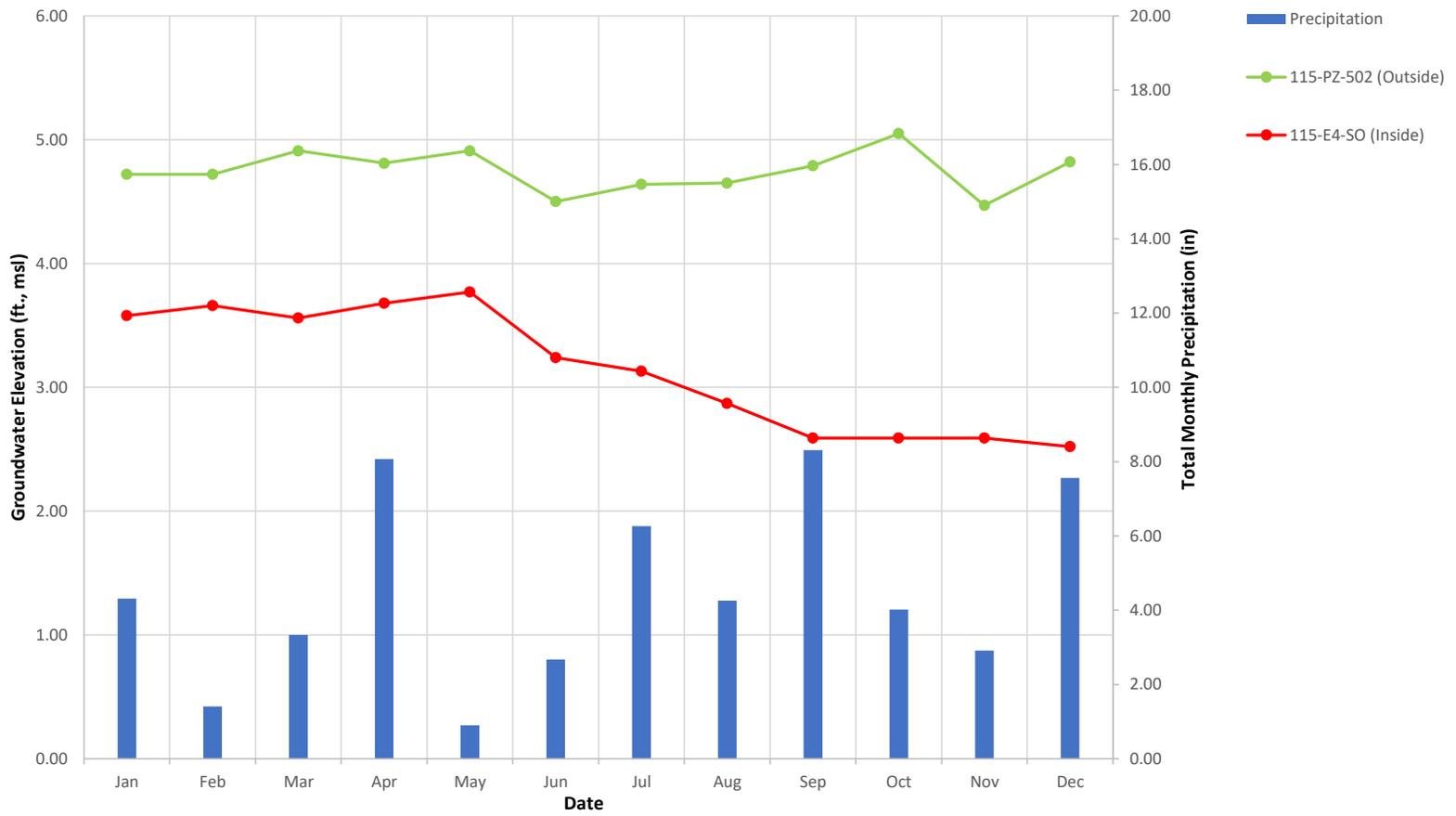
115-PZ-501 and 115-E1A-SO
 Monthly Average Groundwater Elevations vs. Total Monthly Precipitation
 2023



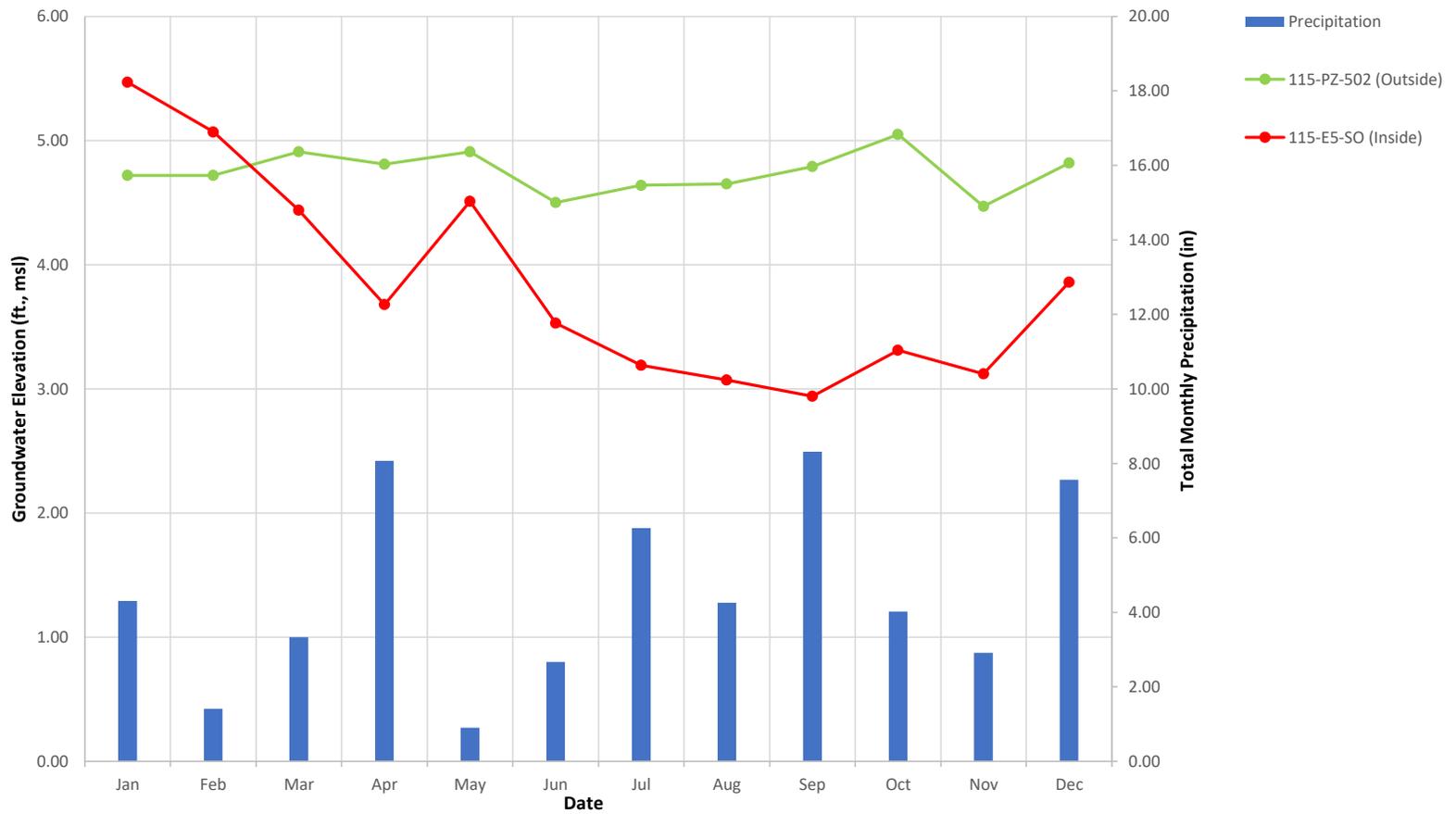
115-PZ-501 and 115-W5-SO
 Monthly Average Groundwater Elevations vs. Total Monthly Precipitation
 2023



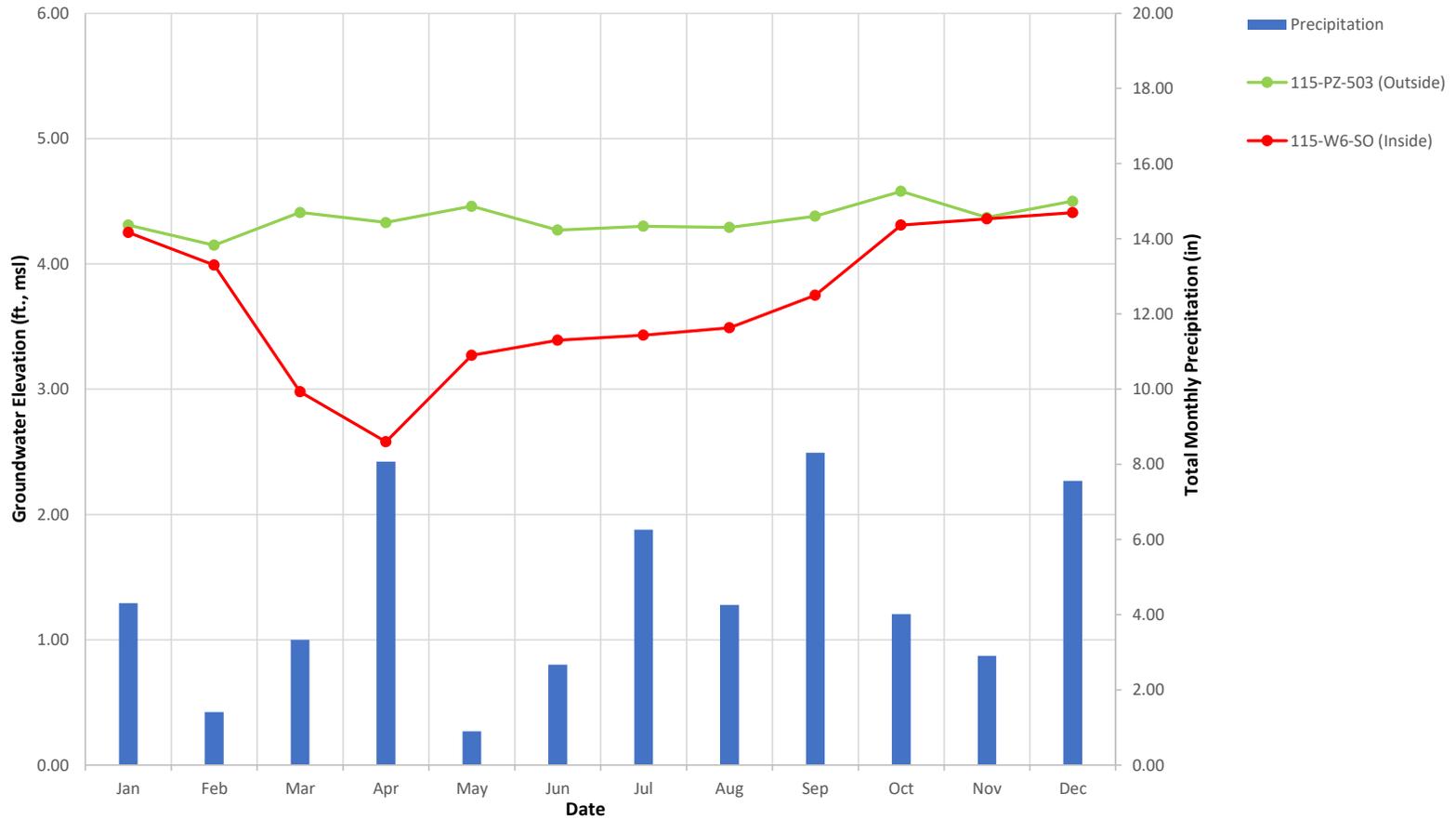
115-PZ-502 and 115-E4-SO
Monthly Average Groundwater Elevations vs. Total Monthly Precipitation
2023



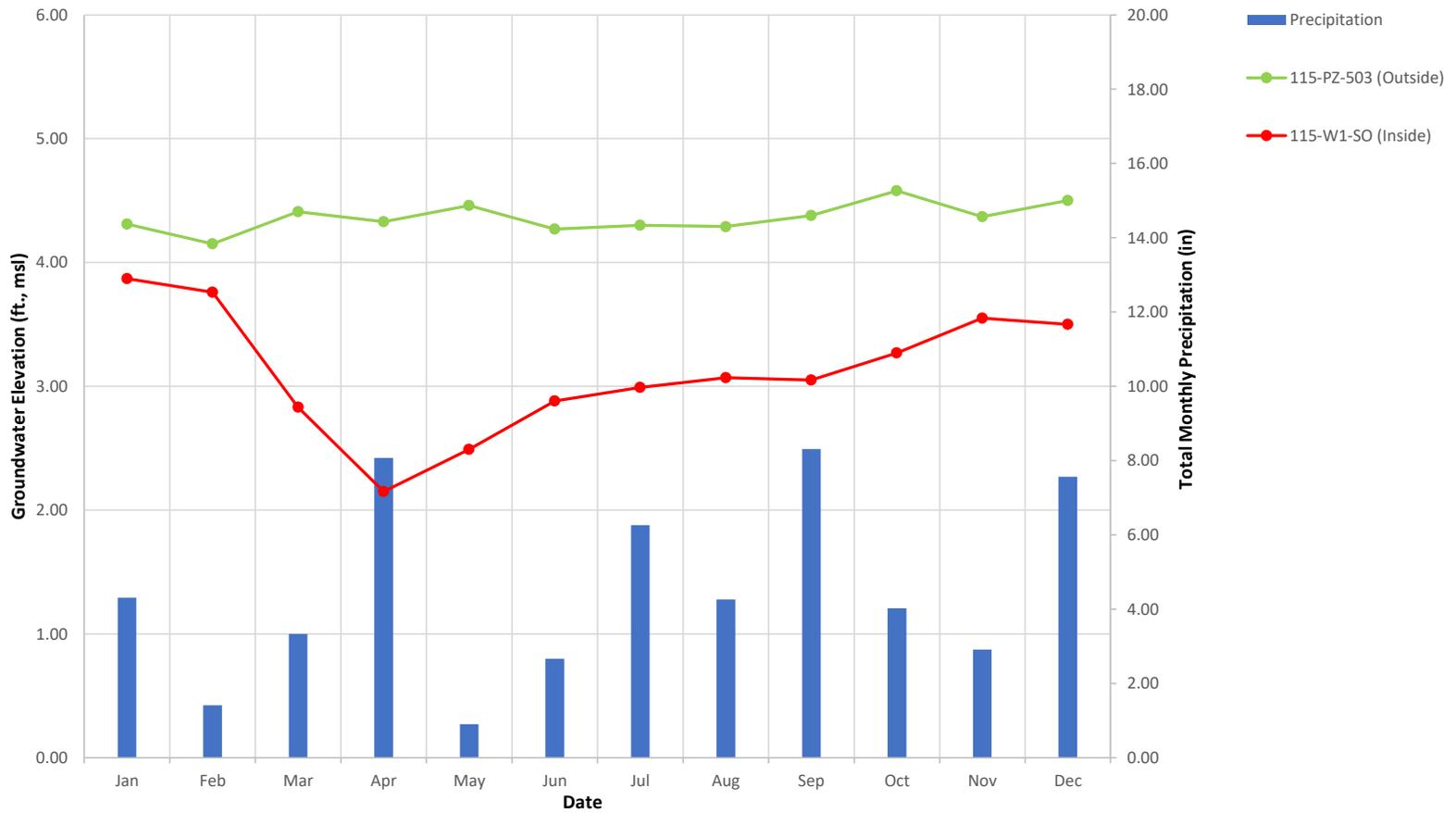
115-PZ-502 and 115-E5-SO
Monthly Average Groundwater Elevations vs. Total Monthly Precipitation
2023



115-PZ-503 and 115-W6-SO
Monthly Average Groundwater Elevations vs. Total Monthly Precipitation
2023



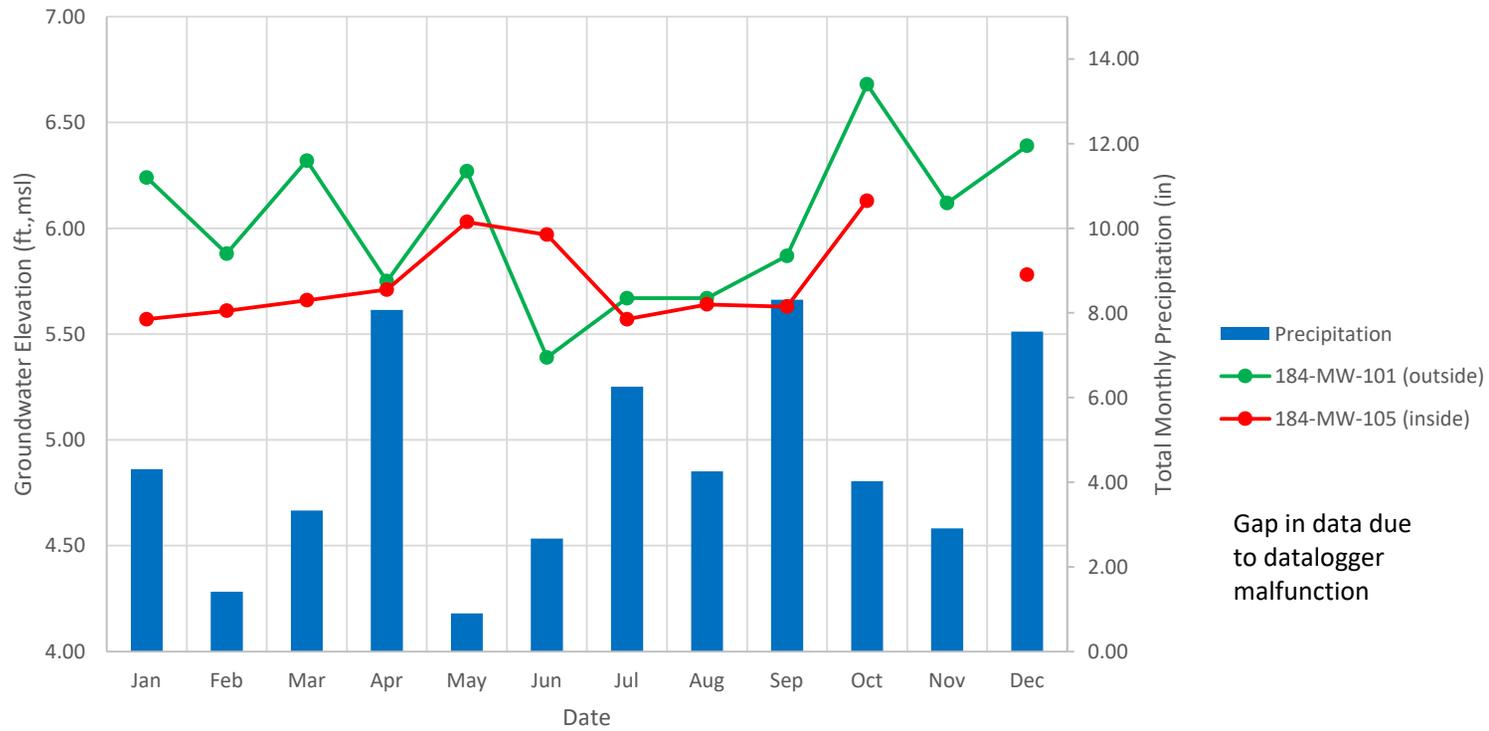
115-PZ-503 and 115-W1-SO
Monthly Average Groundwater Elevations vs. Total Monthly Precipitation
2023



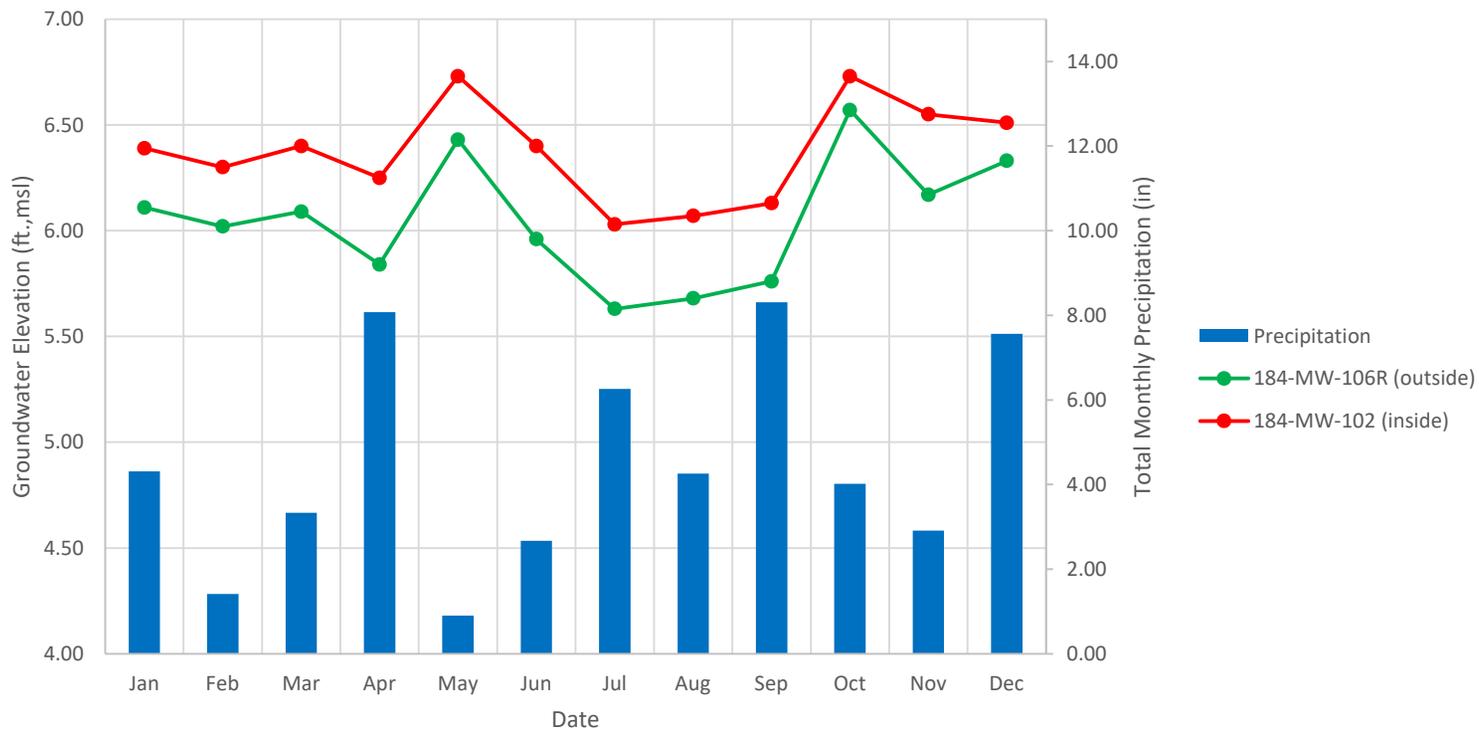
APPENDIX B

HYDROGRAPHS OF AVERAGE MONTHLY HEADS FROM SA-5 NJCU

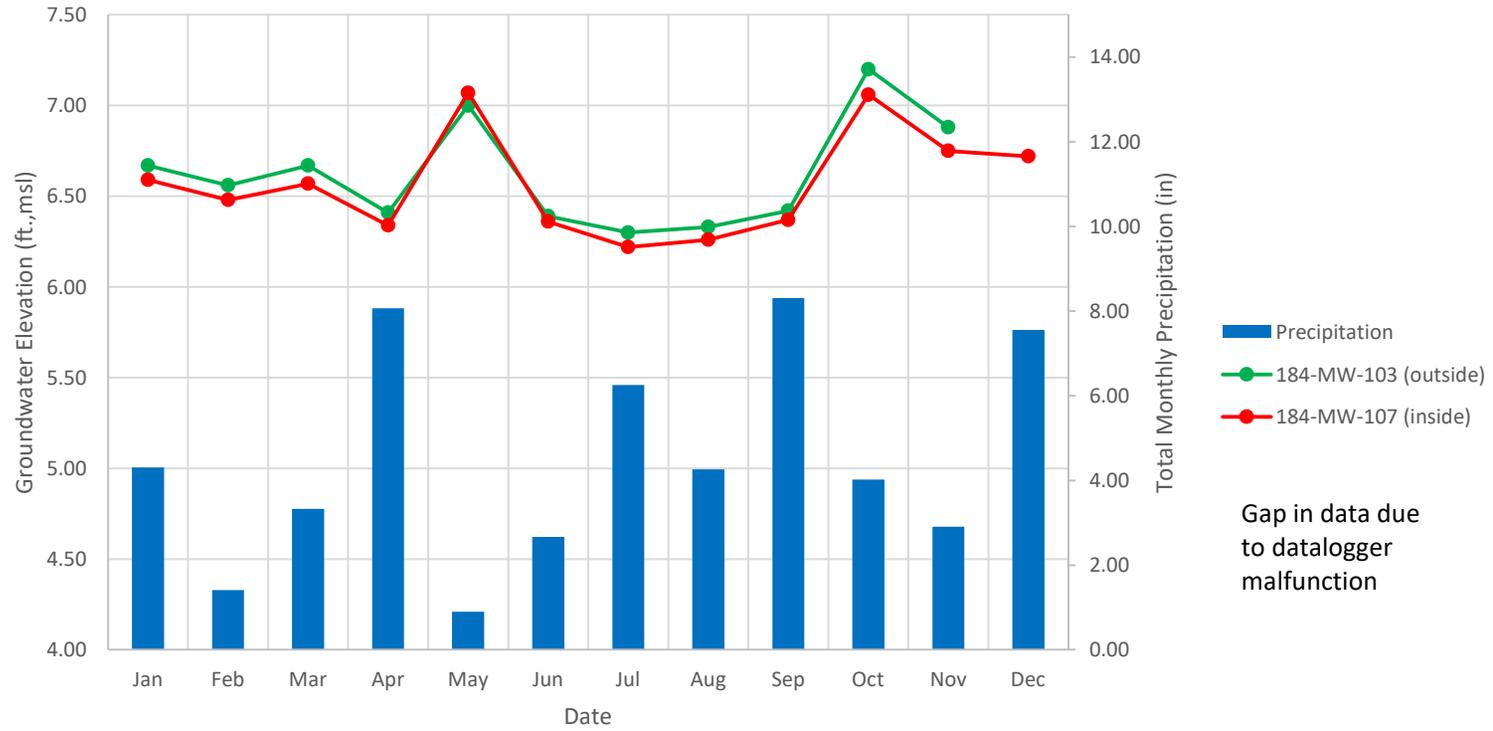
184-MW-101 and 184-MW-105
Monthly Average Groundwater Elevations vs. Total Monthly Precipitation
2023



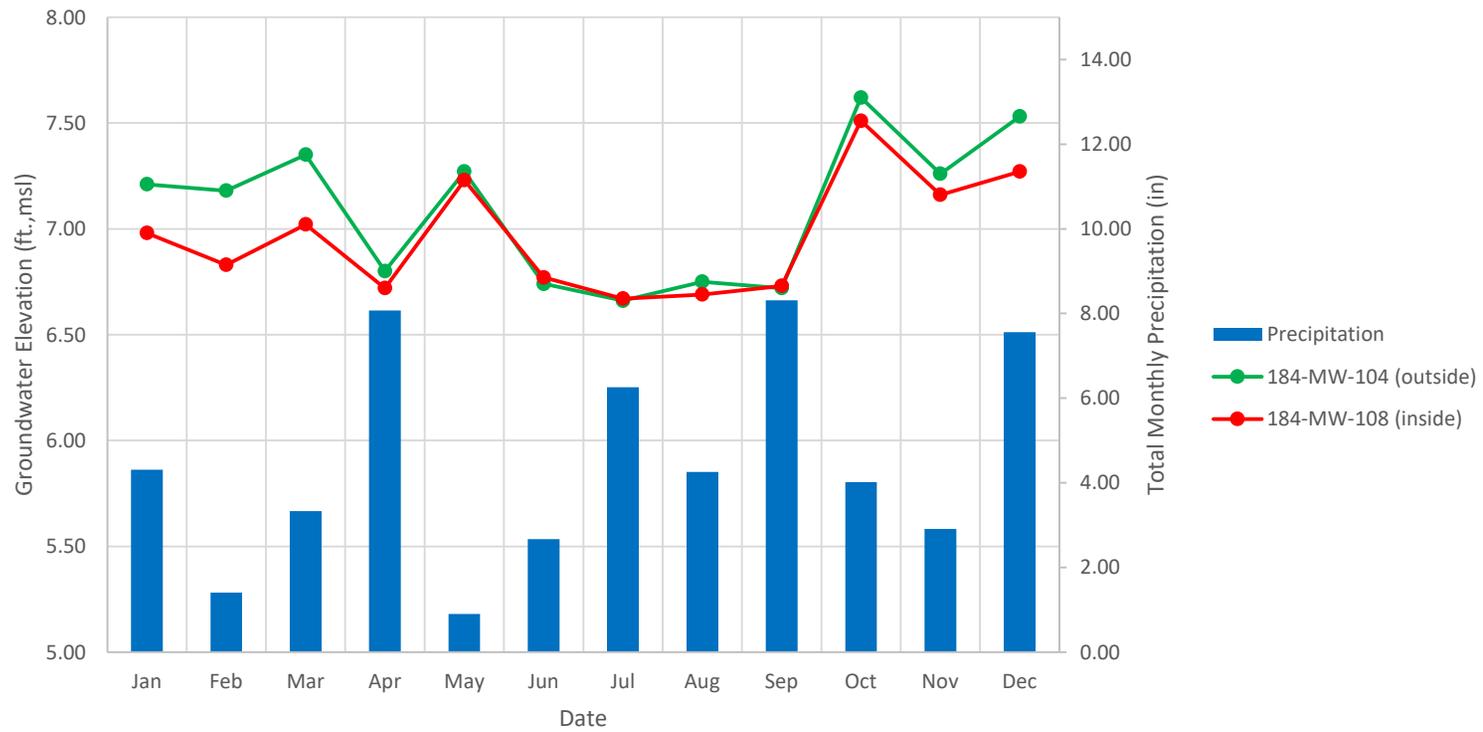
184-MW-106R and 184-MW-102
Monthly Average Groundwater Elevations vs. Total Monthly Precipitation
2023



184-MW-103 and 184-MW-107
Monthly Average Groundwater Elevations vs. Total Monthly Precipitation
2023

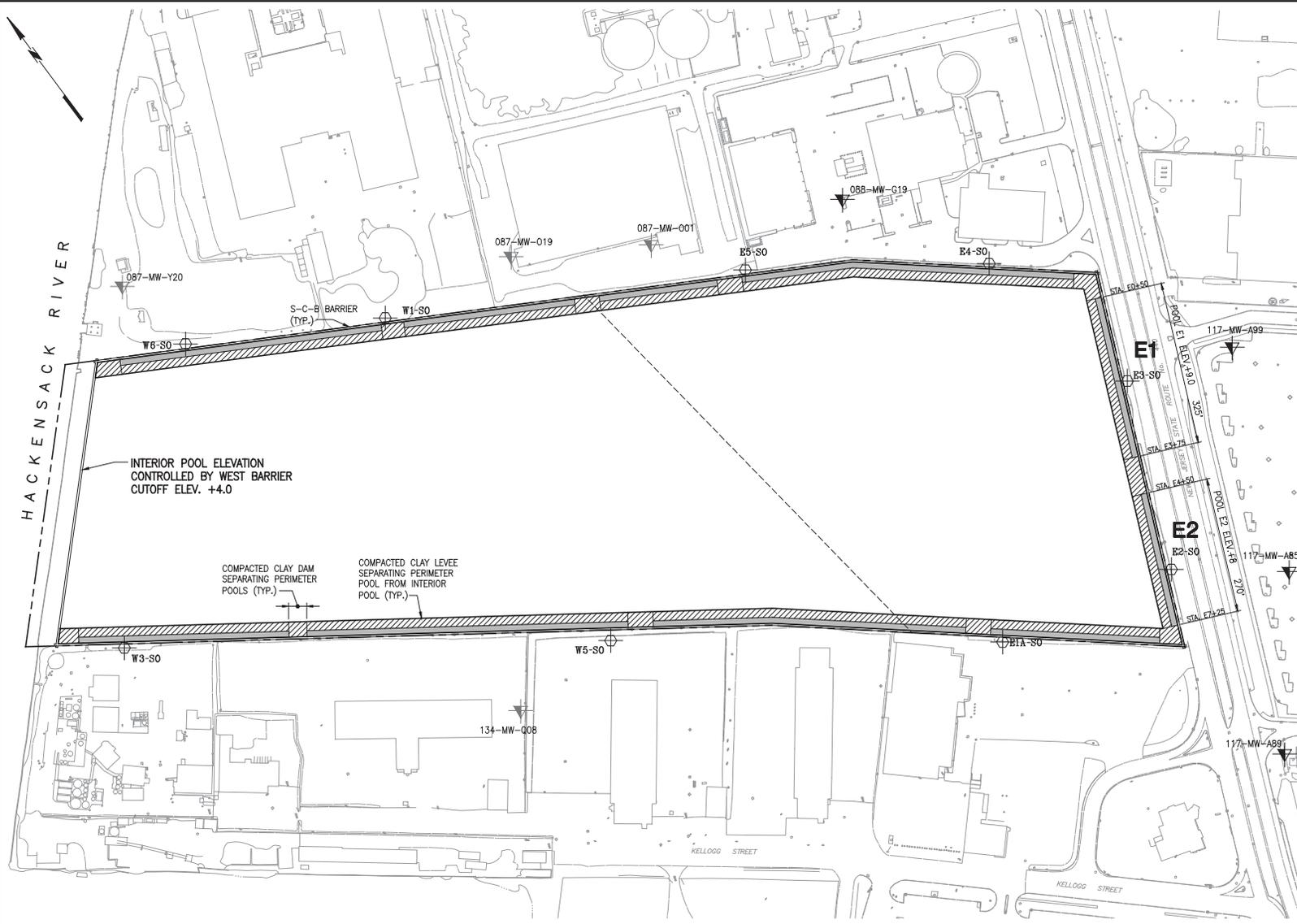


184-MW-104 and 184-MW-108
Monthly Average Groundwater Elevations vs. Total Monthly Precipitation
2023



APPENDIX C

SA-7 EASTERN PERIMETER POOL HYDROGRAPHS



NOTES:

- THE FOLLOWING WERE REMOVED FROM THIS DRAWING ON OCTOBER 15, 2018, AT THE REQUEST OF HONEYWELL:
 WELLS NORTH FS-1, NORTH FS-2, NORTH FS-3, NORTH FS-4, NORTH FS-5, NORTH FS-6, NORTH FS-7, NORTH FS-8, NORTH FS-9, NORTH FS-13, 087-MW-S19, 088-MW-G19, 090-MW-E1, 115-PZ-4, 115-PZ-5, 115-PZ-6, 073-MW-BB11, 073-MW-Y10, SOUTH-FS-1, SOUTH-FS-3, SOUTH-FS-4, SOUTH-FS-5, SOUTH-FS-6, SOUTH-FS-7, 134-MW-V09, 140-MW-06, 140-MW-07, 125-MW-L03, E1-S0, MW-124-103L, MW-124-103D, MW-124-103, MW-102D, MW-124-102T,
 PERIMETER POOL CALLOUTS N1, N2, N3, N4, S1, S2, S3, S4.

- LEGEND**
- FILL TYPE A CLAY
 - FILL TYPE B GRANULAR FILL
 - SHALLOW WELL INSTALLED BY OTHERS
 - SHALLOW WELL ABANDONED IN 2014 IN ACCORDANCE WITH STUDY AREA 6 100% DESIGN
 - SHALLOW WELL INSTALLED FOR STUDY AREA 7 REMEDIATION



NOTE: BEGINNING MARCH 1, 2018, PERIMETER POOLS DESIGNATED N1, N2, N3, N4, S1, S2, S3 AND S4 ARE NO LONGER MONITORED. PERIMETER POOLS E1 AND E2 WILL CONTINUE TO BE MONITORED AND WATER LEVEL DATA FOR THE REPORTING PERIOD IS ATTACHED.

IN PROGRESS
10-16-2018

**STUDY AREA 7
PERIMETER POOL DESIGN ELEVATIONS**

NEW JERSEY

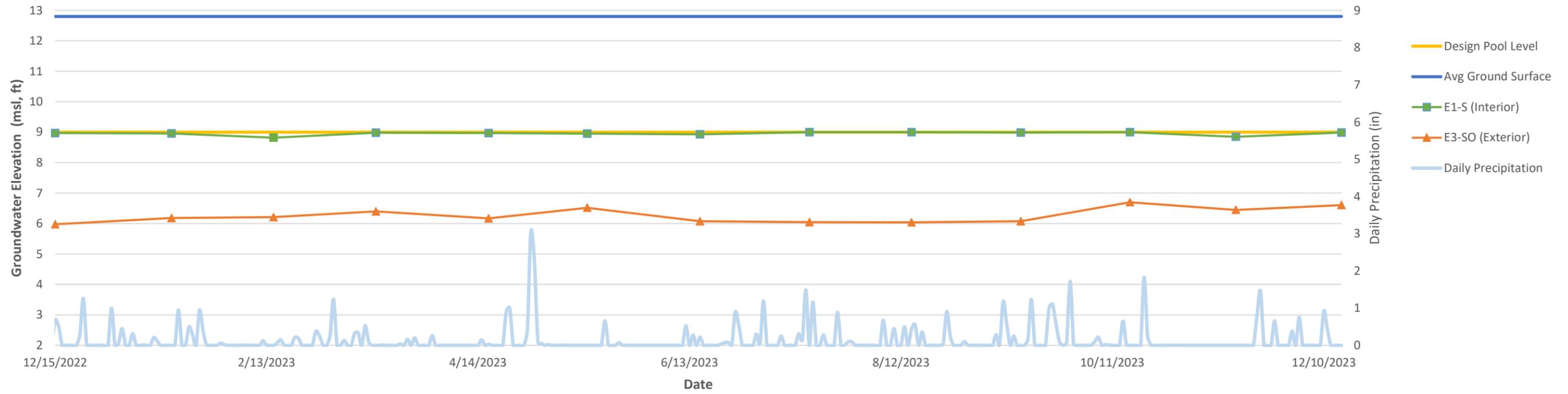
MUESER RUTLEDGE CONSULTING ENGINEERS

14 PENN PLAZA - 225 WEST 34th STREET

FILE NO. 10210
DRAWING NO. PP-1

Oct. 16, 2018 at 11:22am
 C:\DWGSET\10210\Drawing\PP-1.dwg
 bboscaino

E1 Perimeter Pool



E2 Perimeter Pool

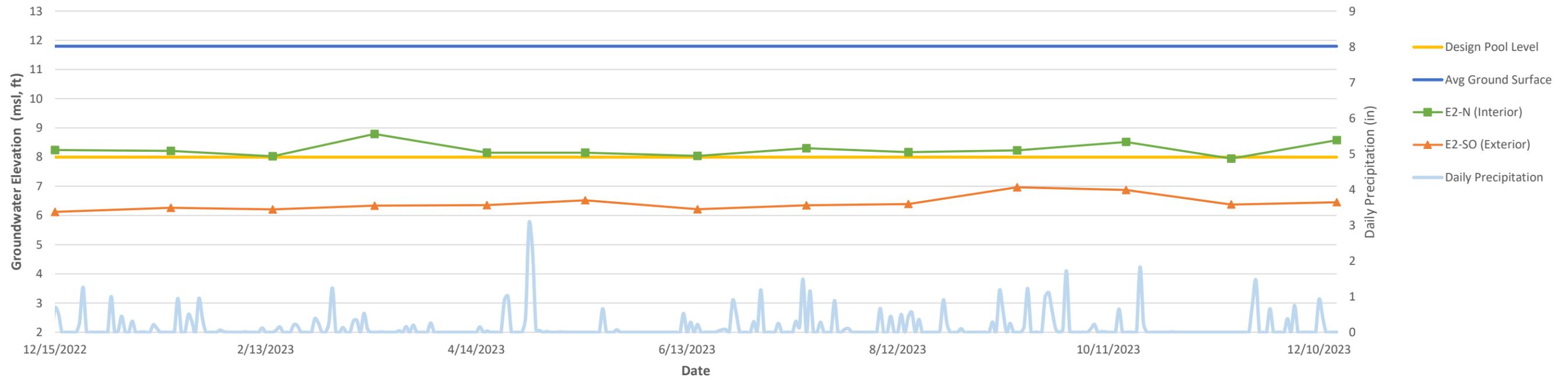


Table 1		
Exterior Shallow Groundwater Data		
Date	E2-SO	E3-SO
12/15/2022	6.12	5.98
1/17/2023	6.26	6.18
2/15/2023	6.20	6.21
3/16/2023	6.33	6.40
4/17/2023	6.35	6.17
5/15/2023	6.52	6.52
6/16/2023	6.21	6.08
7/17/2023	6.34	6.05
8/15/2023	6.39	6.04
9/15/2023	6.96	6.08
10/16/2023	6.87	6.70
11/15/2023	6.37	6.45
12/15/2023	6.45	6.61

APPENDIX D

HISTORICAL GROUNDWATER QUALITY MONITORING RESULTS

Table 1
Historical Groundwater Quality Monitoring Results - NJCU

Monitoring Well ID	Sample Date	Sample Duplicate (Y/N)	Total Chromium (Unfiltered)		Total Chromium (Filtered)		Hexavalent Chromium (Unfiltered)		Hexavalent Chromium (Filtered)	
			Conc.	Q	Conc.	Q	Conc.	Q	Conc.	Q
184-MW-04	4/8/2014	N	6		4	U	5.5	U	5.5	U
	6/24/2014	N	16.4		4	U	5.5	U	5.5	U
	9/23/2014	N	12.4		5.8		5.5	U	5.5	U
	12/4/2014	N	27.2		5.7		5.5	U	5.5	U
	3/18/2015	N	23.6		4	U	6	U	6	U
	6/3/2015	N	10.6		4	U	5.5	UJ	5.5	UJ
	9/9/2015	N	22.3		4.3		5.5	U	5.5	U
	12/10/2015	N	<u>527</u>		5.6		5.5	U	5.5	U
	3/31/2016	N	17.6		4.2		5.5	U	5.5	U
	6/10/2016	N	16		4.3		5.5	U	5.5	U
	9/7/2016	N	18.2		7.8		5.5	U	5.5	U
	12/8/2016	N	14.6		4.5		5.5	UJ	5.5	UJ
	3/9/2017	N	12.1		4.6		5.5	U	5.5	UJ
	6/22/2017	N	9.8		4	U	5.5	U	5.5	UJ
	9/15/2017	N	<u>80.3</u>		7		5.5	UJ	5.5	UJ
	12/8/2017	N	24.6		4.7		5.5	UJ	5.5	UJ
	3/30/2018	N	4	U	4	U	5.5	U	5.5	U
	6/6/2018	N	6.5		4.1		6	U	6	U
9/7/2018	N	50.9		8		5.5	U	5.5	U	
12/4/2018	N	6.5		4	U	5.5	U	5.5	UJ	

Table 1
Historical Groundwater Quality Monitoring Results - NJCU

Monitoring Well ID	Sample Date	Sample Duplicate (Y/N)	Total Chromium (Unfiltered)		Total Chromium (Filtered)		Hexavalent Chromium (Unfiltered)		Hexavalent Chromium (Filtered)	
			Conc.	Q	Conc.	Q	Conc.	Q	Conc.	Q
184-MW-05	4/8/2014	N	45.1		4.3		5.5	U	5.5	U
	4/8/2014	Y	43.7		4.3		5.5	U	5.5	U
	6/24/2014	N	26.6		5.7		5.5		5.5	U
	6/24/2014	Y	20.6		13.2		10		5.5	
	9/23/2014	N	15.4		4	U	5.5	U	5.5	U
	9/23/2014	Y	20	U	20	U	5.5	U	5.5	U
	12/4/2014	N	18.8		4	U	5.5	U	5.5	U
	12/4/2014	Y	32.5		4	U	5.5	U	5.5	U
	3/18/2015	N	<u>396</u>		4	U	6	U	6	U
	3/18/2015	Y	<u>399</u>		4	U	6	U	6	U
	6/3/2015	N	63		4		5.5	UJ	5.5	UJ
	6/3/2015	Y	21.8		4.5		5.5	UJ	5.5	UJ
	9/9/2015	N	36.3		5.6		5.5	U	5.5	U
	9/9/2015	Y	22.5		5.7		5.5	U	5.5	U
	12/10/2015	N	56.3		6.4		5.5	U	5.5	U
	12/10/2015	Y	<u>120</u>		6.8		5.5	U	5.5	U
	3/31/2016	N	<u>996</u>		4	U	5.5	U	5.5	U
	3/31/2016	Y	<u>707</u>		4	U	5.5	U	5.5	U
	6/10/2016	N	48.3		5.6		5.5	U	5.5	U
	6/10/2016	Y	41.3		5.7		5.5	U	5.5	U
	9/7/2016	N	33.9		7.1		5.5	U	5.5	U
	9/7/2016	Y	12.1		7.2		5.5	U	5.5	U
	12/7/2016	N	7.6		4	U	5.5	UJ	5.5	UJ
	12/7/2016	Y	7.5		4.3		5.5	UJ	5.5	UJ
	3/9/2017	N	4.9		4	U	5.5	U	5.5	UJ
	3/9/2017	Y	4		4	U	5.5	U	5.5	UJ
	6/22/2017	N	12.5		5.3		5.5	U	5.5	UJ
	6/22/2017	Y	25.5		5.5		5.5	U	5.5	UJ
	9/14/2017	N	10	J	4.7	J	6	U	6	U
	9/14/2017	Y	9.5	J	5.1	J	6	U	6	U
	12/7/2017	N	10.4		10.3		5.5	U	5.5	U
	12/7/2017	Y	10.4		10.6		5.5	U	5.5	U
	3/29/2018	N	<u>91.3</u>		8	U	5.5	UJ	5.5	UJ
3/29/2018	Y	<u>84.1</u>		8	U	5.5	UJ	5.5	UJ	
6/5/2018	N	17.3		7.7		5.5	UJ	5.5	U	
6/5/2018	Y	23.3		6.7		5.5	UJ	5.5	U	
9/6/2018	N	7.3		5.7		5.5	U	5.5	U	
9/6/2018	Y	7.7		6		5.5	U	5	U	
12/4/2018	N	16.1		6.8		5.5	U	5.5	UJ	
12/4/2018	Y	13.3		6.8		5.5	U	5.5	UJ	

Table 1
Historical Groundwater Quality Monitoring Results - NJCU

Monitoring Well ID	Sample Date	Sample Duplicate (Y/N)	Total Chromium (Unfiltered)		Total Chromium (Filtered)		Hexavalent Chromium (Unfiltered)		Hexavalent Chromium (Filtered)	
			Conc.	Q	Conc.	Q	Conc.	Q	Conc.	Q
184-MW-06	4/8/2014	N	30.9		28.8		20		20	
	6/24/2014	N	81.4		5.1		5.5	U	10	
	9/23/2014	N	12.9		11.8		7.7		9.9	
	12/4/2014	N	9.9		9.8		8.8		8.8	
	3/18/2015	N	10.9		8		9.1		9.2	
	6/3/2015	N	21.6		20.3		20	J	20	J
	9/9/2015	N	36.2		30.7		30		30	
	12/10/2015	N	10.3		8.9		9.8		9.6	
	3/31/2016	N	15.6		13.1		10		10	
	6/10/2016	N	28.6		26.3		20		20	
	9/7/2016	N	28		8		9.3		9.1	
	12/7/2016	N	9.4		9.1		9	J	8.6	J
	3/9/2017	N	20.8		19.8		20		20	J
	6/22/2017	N	17.2		12.1		10		10	J
	9/14/2017	N	14.4	J	12.1	J	10		10	
	12/7/2017	N	6.2		5.3		7.3		8.3	
	3/30/2018	N	8.1		7.6		7.6		6.4	
6/6/2018	N	9.2		7.8		6	U	6.3		
9/7/2018	N	5.6		4.9		5.5	U	5.5	U	
12/5/2018	N	6.9		5.2		5.5	U	5.5	U	
184-MW-101*	7/20/2016	N	4	U	4	U	5.5	U	5.5	U
	9/7/2016	N	5.4		4.1		5.5	U	5.5	U
	12/7/2016	N	4.3		4	U	5.5	UJ	5.5	UJ
	3/9/2017	N	4	U	4	U	5.5	U	5.5	UJ
	6/22/2017	N	4	U	4	U	5.5	U	5.5	UJ
	9/14/2017	N	4	U	4	U	5.5	U	5.5	U
	12/7/2017	N	4	U	4	U	5.5	U	5.5	U
	3/29/2018	N	4	U	4	U	5.5	UJ	5.5	UJ
	6/5/2018	N	4	U	4	U	5.5	UJ	5.5	U
	9/6/2018	N	4	U	4	U	5.5	U	5.5	U
	12/4/2018	N	6.3		4	U	5.5	U	5.5	UJ
	3/4/2019	N	4.5		4	U	5.5	U	5.5	U
	6/14/2019	N	4	U	4	U	5.5	U	5.5	U
	9/5/2019	N	4	U	4	U	5.5	UJ	5.5	UJ
	12/5/2019	N	4.7		4	U	5.5	U	5.5	UJ
	3/12/2020	N	4	U	4	U	5.5	UJ	5.5	UJ
	6/3/2020	N	4	U	4	U	5.5	U	5.5	U
9/11/2020	N	4.4		4		5.5	U	5.5	U	
12/10/2020	N	4	U	4	U	5.5	U	5.5	U	
3/8/2021	N	4	U	4	U	5.5	U	5.5	U	
6/23/2021	N	4.3		4	U	5.5	U	5.5	U	
9/8/2021	N	4	U	4	U	5.5	U	5.5	U	
12/1/2021	N	4.5		4.3		5.5	U	5.5	U	

Table 1
Historical Groundwater Quality Monitoring Results - NJCU

Monitoring Well ID	Sample Date	Sample Duplicate (Y/N)	Total Chromium (Unfiltered)		Total Chromium (Filtered)		Hexavalent Chromium (Unfiltered)		Hexavalent Chromium (Filtered)	
			Conc.	Q	Conc.	Q	Conc.	Q	Conc.	Q
184-MW-102*	7/20/2016	N	8.5		5		5.5	U	5.5	U
	9/7/2016	N	13.6		4.6		5.5	U	5.5	U
	12/7/2016	N	12.6		4.4		5.5	UJ	5.5	UJ
	3/9/2017	N	7.1		4.3		5.5	U	5.5	UJ
	9/14/2017	N	18.6		4.3		5.5	U	5.5	U
	12/7/2017	N	26.6		5.6		5.5	U	5.5	U
	3/29/2018	N	205		6.1		5.5	UJ	5.5	UJ
	6/5/2018	N	11.5		5.4		5.5	UJ	5.5	U
	9/6/2018	N	8.3		5.7		5.5	U	5.5	U
	12/4/2018	N	13.2		6.5		5.5	U	5.5	UJ
	3/4/2019	N	45.1		6.4		5.5	U	5.5	U
	6/13/2019	N	26.7		5.2		5.5	U	5.5	U
	9/4/2019	N	15.9		5.1		5.5	UJ	5.5	UJ
	12/5/2019	N	13.8		5.7		5.5	U	5.5	UJ
	3/12/2020	N	129		7.5		5.5	UJ	5.5	UJ
	6/3/2020	N	8.3		5.6		5.5	U	5.5	U
	9/9/2020	N	9.6		5.8		5.5	UJ	5.5	UJ
	9/9/2020	Y	9.5		5.6		5.5	UJ	5.5	UJ
	12/11/2020	N	8		5.1		5.5	UJ	5.5	UJ
	12/11/2020	Y	7.1		4.9		5.5	UJ	5.5	UJ
	3/9/2021	N	4		4	U	5.5	U	5.5	UJ
	3/9/2021	Y	4	U	4	U	5.5	U	5.5	UJ
	6/22/2021	N	8.7		5.6		5.5	U	5.5	U
	9/8/2021	N	5.7		5		5.5	U	5.5	U
	12/2/2021	N	5		4.3		5.5	U	5.5	U
	3/16/2022	N	4.9		4.5		5.5	U	5.5	UJ
	6/2/2022	N	5		4.8		5.5	U	5.5	UJ
	9/14/2022	N	6.1		6.1		5.5	U	5.5	UJ
12/6/2022	N	5.6		4.5		5.5	UJ	5.5	UJ	
3/8/2023	N	5.4	J	4.3	J	5.5	U	5.5	U	
6/22/2023	N	10	U	10	U	5.5	U	5.5	U	
9/14/2023	N	39.8		10	U	5.5	U	5.5	U	
12/19/2023	N	10	U	10	U	5.5	U	5.5	U	
184-MW-103*	7/20/2016	N	4		4	U	5.5	U	5.5	U
	7/20/2016	Y	4.3		4	U	5.5	U	5.5	U
	9/7/2016	N	4	U	4	U	5.5	U	5.5	U
	12/7/2016	N	4	U	4	U	5.5	UJ	5.5	UJ
	3/9/2017	N	4	U	4	U	5.5	U	5.5	UJ
	6/22/2017	N	12.8		4	U	5.5	U	5.5	UJ
	9/15/2017	N	4	U	4	U	5.5	UJ	5.5	UJ
	12/7/2017	N	4	U	4	U	5.5	U	5.5	U
	3/29/2018	N	24.8		20		20	J	10	J
	6/6/2018	N	12.2		8.8		6.1		6.8	
	9/7/2018	N	5.4		4	U	5.5	U	5.5	U
	12/5/2018	N	21.2		16.4		5.5	U	5.5	U
	3/4/2019	N	34.2		28.9		30	J	30	J
	6/13/2019	N	34.7		28.1		29		27	
	9/4/2019	N	11.3		4	U	5.5	UJ	5.5	UJ
	12/4/2019	N	20.2		4	U	5.5	UJ	5.5	UJ
	3/11/2020	N	29.5		4	U	5.5	UJ	5.5	UJ
	6/2/2020	N	33.2		4	U	5.5	U	5.5	UJ
	9/9/2020	N	5.9		4	U	5.5	UJ	5.5	UJ
	12/10/2020	N	29.6		27.8		28		27	
3/8/2021	N	30.9		28.6		31		30		
6/22/2021	N	26.1		19		19		18		
9/8/2021	N	6.7		4	U	5.5	U	5.5	U	
12/1/2021	N	4	U	4	U	5.5	U	5.5	U	

Table 1
Historical Groundwater Quality Monitoring Results - NJCU

Monitoring Well ID	Sample Date	Sample Duplicate (Y/N)	Total Chromium (Unfiltered)		Total Chromium (Filtered)		Hexavalent Chromium (Unfiltered)		Hexavalent Chromium (Filtered)	
			Conc.	Q	Conc.	Q	Conc.	Q	Conc.	Q
184-MW-104*	7/20/2016	N	4	U	4	U	5.5	U	5.5	U
	9/7/2016	N	4	U	4	U	5.5	U	5.5	U
	12/7/2016	N	4	U	4	U	5.5	UJ	5.5	UJ
	3/9/2017	N	4	U	4	U	5.5	U	5.5	UJ
	6/22/2017	N	4	U	4	U	5.5	U	5.5	UJ
	9/14/2017	N	4	U	4	U	5.5	U	5.5	U
	12/7/2017	N	4	U	4	U	5.5	U	5.5	U
	3/30/2018	N	4	U	4	U	5.5	U	5.5	U
	6/5/2018	N	4	U	4	U	5.5	UJ	5.5	U
	9/6/2018	N	4	U	4	U	5.5	U	5.5	U
	12/4/2018	N	4	U	4	U	5.5	U	5.5	UJ
	3/5/2019	N	4	U	4	U	5.5	U	5.5	U
	9/4/2019	N	4	U	4	U	5.5	UJ	5.5	UJ
	12/4/2019	N	4	U	4	U	5.5	UJ	5.5	UJ
	3/11/2010	N	4	U	4	U	5.5	UJ	5.5	UJ
	3/11/2020	Y	4	U	4	U	5.5	UJ	5.5	UJ
	6/2/2020	N	4	U	4	U	5.5	U	5.5	UJ
	9/9/2020	N	4	U	4	U	5.5	UJ	5.5	UJ
	12/10/2020	N	4	U	4	U	5.5	U	5.5	U
	3/8/2021	N	4.1		4.2		5.5	U	5.5	U
6/22/2021	N	4	U	4	U	5.5	U	5.5	U	
6/22/2021	Y	4	U	4	U	5.5	U	5.5	U	
9/8/2021	N	4	U	4	U	5.5	U	5.5	U	
9/8/2021	Y	4	U	4	U	5.5	U	5.5	U	
12/1/2021	N	4	U	4	U	5.5	U	5.5	U	
12/1/2021	Y	4	U	4	U	5.5	U	5.5	U	
184-MW-105*	9/14/2017	N	4	U	4	U	5.5	U	5.5	U
	12/7/2017	N	4	U	4	U	5.5	U	5.5	U
	3/29/2018	N	4	U	4	U	5.5	UJ	5.5	UJ
	6/5/2018	N	4	U	4	U	5.5	UJ	5.5	U
	9/6/2018	N	4	U	4	U	5.5	U	5.5	U
	12/4/2018	N	4	U	4	U	5.5	U	5.5	UJ
	3/4/2019	N	4	U	4	U	5.5	U	5.5	U
	6/14/2019	N	4	U	4	U	5.5	U	5.5	U
	9/5/2019	N	4	U	4	U	5.5	UJ	5.5	UJ
	12/5/2019	N	4	U	4	U	5.5	U	5.5	UJ
	3/12/2020	N	4	U	4	U	5.5	UJ	5.5	UJ
	6/3/2020	N	4	U	4	U	5.5	U	5.5	U
	9/11/2020	N	4	U	4	U	5.5	U	5.5	U
	12/10/2020	N	4	U	4	U	5.5	U	5.5	U
	3/8/2021	N	4	U	4	U	5.5	U	5.5	U
	6/23/2021	N	4	U	4	U	5.5	U	5.5	U
	9/8/2021	N	4	U	4	U	5.5	U	5.5	U
	12/1/2021	N	4	U	4	U	5.5	U	5.5	U
	3/16/2022	N	4	U	4	U	5.5	U	5.5	UJ
	6/2/2022	N	4	U	4	U	5.5	U	5.5	U
	9/14/2022	N	4	U	4	U	5.5	U	5.5	U
	12/6/2022	N	4	U	4	U	5.5	UJ	5.5	UJ
	3/8/2023	N	4	UJ	4	UJ	5.5	U	5.5	U
3/8/2023	Y	4	U	4	U	5.5	U	5.8		
6/22/2023	N	10	U	10	U	5.5	U	5.5	U	
6/22/2023	Y	10	U	10	U	5.5	U	5.5	U	
9/14/2023	N	10	U	10	U	5.5	U	5.5	U	
9/14/2023	Y	10	U	10	U	5.5	U	5.5	U	
12/19/2023	N	10	U	10	U	5.5	U	5.5	U	
12/19/2023	Y	10	U	10	U	5.5	U	5.5	U	

Table 1
Historical Groundwater Quality Monitoring Results - NJCU

Monitoring Well ID	Sample Date	Sample Duplicate (Y/N)	Total Chromium (Unfiltered)		Total Chromium (Filtered)		Hexavalent Chromium (Unfiltered)		Hexavalent Chromium (Filtered)	
			Conc.	Q	Conc.	Q	Conc.	Q	Conc.	Q
184-MW-106*	6/22/2017	N	5.8		4.7		5.5	U	5.5	UJ
	9/14/2017	N	6.2		4.8		5.5	U	5.5	U
	12/7/2017	N	6.7		5.8		5.5	U	5.5	U
	3/29/2018	N	13.4		5.9		6	UJ	6	UJ
	6/5/2018	N	6.3		5.6		5.5	UJ	5.5	U
	9/6/2018	N	8.1		7.3		5.5	U	5.5	U
	12/4/2018	N	7.9		7.9		5.5	U	5.5	UJ
	3/4/2019	N	7.2		5.1		5.5	U	5.5	U
	6/13/2019	N	5.7		5		5.5	U	5.5	U
	9/4/2019	N	6.5		6		5.5	UJ	5.5	UJ
	12/4/2019	N	6.8		6.5		5.5	UJ	5.5	UJ
	3/12/2020	N	6.8		6		5.5	UJ	5.5	UJ
	6/2/2020	N	6.3		6		5.5	U	5.5	UJ
	9/9/2020	N	6.9		6.3		5.5	UJ	5.5	UJ
	12/10/2020	N	5.8		5.6		5.5	U	5.5	U
3/8/2021	N	5		4.1		5.5	U	5.5	U	
6/23/2021	N	5.6		4.9		5.5	U	5.5	U	
184-MW-106R*	9/8/2021	N	4	U	4	U	5.5	U	5.5	U
	12/2/2021	N	4	U	4	U	5.5	U	5.5	U
184-MW-107*	9/15/2017	N	5.7		4	U	5.5	UJ	5.5	UJ
	12/8/2017	N	1210		4	U	5.5	UJ	5.5	UJ
	3/29/2018	N	4	U	4	U	5.5	UJ	5.5	UJ
	6/6/2018	N	33.2		4	U	6	U	6	U
	9/7/2018	N	108		4.4		5.5	U	5.5	U
	12/5/2018	N	139		4	U	5.5	U	5.5	U
	3/5/2019	N	40.7		4	U	5.5	U	5.5	U
	3/5/2019	Y	36		4	U	5.5	U	5.5	U
	6/13/2019	N	136		4	U	5.5	U	5.5	U
	6/13/2019	Y	715		4	U	5.5	U	5.5	U
	9/4/2019	N	95.7		4	U	5.5	UJ	5.5	UJ
	9/4/2019	Y	76.3	J	8	UJ	5.5	UJ	5.5	UJ
	12/4/2019	N	49		4	U	5.5	UJ	5.5	UJ
	12/4/2019	Y	34.5		4	U	5.5	UJ	5.5	UJ
	3/11/2020	N	689		4	U	5.5	UJ	5.5	UJ
	6/2/2020	N	2790		4	U	5.5	U	5.5	UJ
	9/9/2020	N	61		4	U	5.5	UJ	5.5	UJ
	12/11/2020	N	84.7		4	U	5.5	UJ	5.5	UJ
	3/8/2021	N	656		21.1		15		22	
	6/23/2021	N	4	U	4	U	5.5	U	5.5	U
	9/7/2021	N	18.9		4	U	5.5	UJ	5.5	U
	12/1/2021	N	4	UJ	4	UJ	5.5	U	5.5	U
	3/16/2022	N	74.9		4	U	5.5	UJ	5.5	UJ
	6/2/2022	N	4	U	4	U	5.5	U	5.5	U
	9/14/2022	N	DRY		DRY		DRY		DRY	
12/6/2022	N	13.6		4	U	5.5	UJ	5.5	UJ	
3/8/2023	N	4	U	4	U	5.5	U	5.5	U	
6/22/2023	N	10	U	10	U	5.5	U	5.5	U	
9/14/2023	N	185		10	U	5.5	U	5.5	U	
12/19/2023	N	51.5		60.8		5.5	U	5.5	U	

Table 1
Historical Groundwater Quality Monitoring Results - NJCU

Monitoring Well ID	Sample Date	Sample Duplicate (Y/N)	Total Chromium (Unfiltered)		Total Chromium (Filtered)		Hexavalent Chromium (Unfiltered)		Hexavalent Chromium (Filtered)	
			Conc.	Q	Conc.	Q	Conc.	Q	Conc.	Q
184-MW-108*	9/14/2017	N	4	UJ	4	UJ	5.5	U	5.5	U
	12/8/2017	N	4	U	4	U	5.5	UJ	5.5	UJ
	3/30/2018	N	4	U	4	U	5.5	U	5.5	U
	6/5/2018	N	4	U	4	U	5.5	UJ	5.5	U
	9/6/2018	N	4	U	4	U	5.5	U	5.5	U
	12/5/2018	N	4.3		4	U	5.5	U	5.5	U
	3/5/2019	N	4.5		4	U	5.5	U	5.5	U
	9/4/2019	N	8	UJ	8	UJ	5.5	UJ	5.5	UJ
	12/4/2019	N	5.3		4	U	5.5	UJ	5.5	UJ
	3/11/2020	N	20	U	4	U	5.5	UJ	5.5	UJ
	6/2/2020	N	4	U	4	U	5.5	U	5.5	UJ
	6/2/2020	Y	4	U	4	U	5.5	U	5.5	UJ
	9/9/2020	N	21.7		4	U	5.5	UJ	5.5	UJ
	12/10/2020	N	4	U	4	U	5.5	U	5.5	U
	3/8/2021	N	4	U	4	U	5.5	U	5.5	U
	6/23/2021	N	4	U	4	U	5.5	U	5.5	U
	9/7/2021	N	4	U	4	U	5.5	UJ	5.5	U
	12/1/2021	N	4	U	4	U	5.5	UJ	5.5	U
	3/16/2022	N	4	U	4	U	5.5	U	5.5	UJ
	3/16/2022	Y	4	U	4	U	5.5	U	5.5	UJ
	6/2/2022	N	4	U	4	U	5.5	U	5.5	U
	6/2/2022	Y	4	U	4	U	5.5	U	5.5	U
	9/14/2022	N	4	U	4	U	5.5	U	5.5	U
	9/14/2022	Y	4	U	9.1		5.5	U	5.5	U
12/6/2022	N	15.3		4	U	5.5	UJ	5.5	UJ	
12/6/2022	Y	3		4	U	5.5	UJ	5.5	UJ	
3/8/2023	N	4	U	4	U	5.5	U	5.5	U	
6/22/2023	N	10	U	10	U	5.5	U	5.5	U	
9/14/2023	N	10	U	10	U	5.5	U	5.5	U	
12/19/2023	N	10	U	10	U	5.5	U	5.5	U	

General Notes:

1. Analysis methods E200.8 used for Total Chromium and SW7199 for Hexavalent Chromium.
2. **Bold and underlined values** exceed the NJDEP Ground Water Quality Standards (Chromium - 70 µg/L), N.J.A.C 7:9C; last amended 6/1/2020.
3. Monitoring well 184-MW-106 abandoned and replaced by 184-MW-106R on August 12, 2021.

*Defined as Sentinel Well in Groundwater Remedial Action Permit

Abbreviations:

Conc.: Concentration measured in micrograms per liter

N: No

Q: Qualifiers

Y: Yes

Data Qualifies:

B: Analyte found in blank and sample

J: Estimated concentration

U: Analyte not detected above method detection limit