Wood Environment & Infrastructure Solutions, Inc.
200 American Metro Boulevard
Suite 113
Hamilton, NJ 08619
USA
T: 609-689-2829
www.woodplc.com

April 20, 2022

Honorable Robert G. Torricelli
Office of the Special Master
RGTspecialmaster@aol.com

Subject: 2021 Integrated Groundwater Monitoring Report (IGWMR)
Study Area 5, 6 & 7

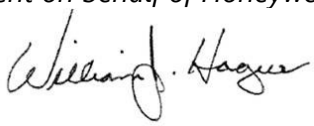
Dear Senator Torricelli:

We are submitting on behalf of Honeywell the 2021 Integrated Groundwater Monitoring Report (IGWMR) for Study Areas 5, 6 & 7 prepared by our groundwater consultant, Cornerstone.

Please contact the undersigned at 973-896-9366 should you have any questions or comments on this submittal.

Sincerely,

Wood Environment & Infrastructure Solutions, Inc.
sent on behalf of Honeywell



William Hague
Principal Consultant

Enclosures:

2021 Integrated Groundwater Monitoring Report (IGWMR)
Study Area 5, 6 & 7

cc: (electronic copy)
Michael Daneker – Arnold & Porter LLP
Jeremy Karpatkin – Arnold & Porter LLP
Peter Baker – City Hall
Nicholas Strasser – City Hall
Frank Borin – DeCotiis, Fitzpatrick & Cole, LLP
Kevin Kinsella – DeCotiis, Fitzpatrick & Cole, LLP
Dr. Benjamin Ross – Disposal Safety, Inc.
Chuck Anthony – Honeywell
Benny Dehghi – Honeywell
George Pfeiffer – Honeywell
Kim Hosea
Joseph P. Baumann Jr. – McManimon, Scotland & Baumann, LLC
Eric Tomaszewski – McManimon, Scotland & Baumann, LLC
Alicia Clark Alcorn – Terris, Pravlik & Millian, LLP
Kathleen Millian – Terris, Pravlik & Millian, LLP
Mary Hogan – Walsh Pizzi O'Reilly Falanga LLP
Hector Ruiz – Walsh Pizzi O'Reilly Falanga LLP
Liza Walsh – Walsh Pizzi O'Reilly Falanga LLP
Dennis Nagg – Wood Environment & Infrastructure, Inc.
Steve Egnaczyk – WSP
Thomas Lewis – WSP

INTEGRATED ANNUAL GROUNDWATER PERFORMANCE REPORT FOR 2021

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

Prepared for

HONEYWELL
Morris Plains, New Jersey

April 2022

Prepared by

cornerstone
A TETRA TECH COMPANY

100 Crystal Run Road, Suite 101
Middletown, NY 10941

Project 209-4223066

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

APPENDICES

LIST OF TABLES AND FIGURES

TABLES

FIGURES

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 thirteenth 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.

Groundwater monitoring in the Project Area is also governed by Remedial Action (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. 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; review in progress
- LTMP for SA-6 North and SA-6 South; 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 2021

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 wells at various times in accordance with the requirements of the various monitoring plans. The status of groundwater sample collection for laboratory analysis in 2021 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 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 2021. 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 2021.

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 slightly below the 30-year average for the first, second, and fourth quarters but nearly 14 inches above the average for the third quarter of 2021. Total precipitation in 2021 was 55.57 inches or 9.32 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 will not have the data tidally corrected. The mean tidal elevation is approximately +1.2 feet above mean sea level (msl) in the NGVD-29 vertical datum.

2.3 Monitoring Well Inventory

A list of the groundwater monitoring wells in service within the Project Area during 2021 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. One monitoring well (184-MW-106) was abandoned at NJCU and replaced with a well (184-MW-106R) screened at a depth consistent with adjacent wells.

3 GROUNDWATER EXTRACTION

3.1 GWET System Operation

The Deep Overburden Groundwater Extraction and Treatment (GWET) system was in operation throughout 2021. 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 wastewater 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 by a manually-operated valves and adjusted 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. Since none of these downtimes exceeded 8 hours in duration during 2021, the associated table and figure for GWET outages have not been provided in this report.

3.1.2 Force Main Acid Flushing

Force main cleaning for the GWET system was not required in 2021.

3.1.3 Well Redevelopment

GWET extraction well redevelopment activities were not required in 2021.

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 2021, the western portion of the contingent system (pump PS-1N) was operated from June 4 to June 24, July 3 to July 15, September 22 to October 20, and December 8 to December 31, 2021. The eastern portion (pump PS-2N) was operated more routinely throughout the year with the exception of approximately 30 days from mid-October to mid-November. In mid-November, the PS-2N pump was turned back on to lower the water level in the PS-2N manhole so that solids accumulated in the bottom of the manhole could be removed.

Average daily pumping rates ranged from 1 to 15 gpm with an average of 3.8 gpm for the combined flow from both pumps. **Figure 3-1** compares the average daily flow rate of the contingent pumping system to interior groundwater levels at SA-6 North. Since pumping was relatively uniform during the year, interior heads do not reflect large duration cycles, although a rise in heads due to the cessation of pumping in mid-October is evident. The two relatively sharp increases in groundwater elevations in August and September coincide with higher regional groundwater levels due to the precipitation events from hurricanes Henri and Ida, respectively.

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. Three pumping cycles were conducted during 2021 to lower heads within the containment area. These were from March 10 to March 26, April 13 to June 3, and August 9 to September 20. Average pumping rates ranged from 3.3 gpm during the March pumping cycle to 4.3 gpm during each of the other two cycles. **Figure 3-2** shows the response in head at the five piezometers inside of the soil containment cell to the three pumping cycles. Pumping is shown to lower heads approximately 2 feet during the May cycle and one foot during the September cycle. The drawdown was less in September since it was 10 days shorter than in May and occurred during a period of above average precipitation. After the cessation of pumping, heads within the soil containment cell rose to an average elevation of 3.5 to 4.0 feet msl.

3.4 SA-5 NJCU Contingent Groundwater Pumping System

The contingent groundwater pumping system at the NJCU site was operated continuously throughout 2021 with the exception of February 26 to March 23 during which time it was operated manually during business hours until the level sensor was replaced in sump B. The system was then operated continuously during 2021, with the exception of the period from November 21 to December 15 during which the pump was operated manually due to a malfunction of the vault overflow sensor. During that period, the pump did not operate throughout weekend periods. All pumping was conducted using extraction Sump B only; Sump A was not operated in 2021. The Sump B pump cycles on and off based on a water level probe set to an elevation of approximately 4.5 feet msl just below the drain line. When pumping, the discharge rate of the pump is 2.5-3.5 gpm; however, the average steady-state, long-term net yield of the drain was 0.30 gpm in 2021.

4 HYDRAULIC MONITORING

Hydraulic monitoring in 2021 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 2021 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 approximately 12 feet msl on Site 154 to less than 3 feet msl near the Hackensack River. As a point of reference, the river has a mean tide elevation of approximately +1.2 feet msl relative to the NGVD-29 datum. 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. The depression around the active groundwater extraction Sump B is also evident and further discussed in Section 4.3.

4.1.2 Intermediate Zone

Groundwater elevations in the Intermediate Zone are shown on **Figure 4-2** and range from over 6 feet msl in 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 one to three 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 2.6 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**. The resulting combined groundwater depression in the vicinity of the GWET pumping wells fully encompasses the deep overburden plume and provides effective capture in this deeper flow zone.

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. 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 3-hour interval. Due to construction and regrading activities for NJCU's Phase 2 roadway and infrastructure project, data loggers were removed from wells 184-MW-102, 103, 104, 106, 107, and 108 on November 6, 2020. Subsequently, manual readings were collected weekly from each of these 6 wells to determine hydraulic gradient through April 16, 2021. 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 and that this response is often amplified in some locations due to ongoing construction. 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 2021 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**.

The trends on **Figure 4-10** show that the two southernmost well pairs (MW-103/107 and MW-104/108) have head differences close to zero throughout most of 2021, with the exception of the MW-104/108 pair during September. The logger plots provided in quarterly reports show that this period of outward gradients occurred soon after the above-average rainfall that occurred during the third quarter. This relatively long duration of excessive recharge raised heads regionally in both the Shallow and Intermediate zones both outside and inside of the barrier walls. However, as recharge returns to normal, groundwater levels decline to normal more quickly outside of the barrier wall than inside. This is due to the ability of groundwater to flow horizontally outside of the wall whereas water within the barrier wall must exit vertically, which takes more time, resulting in a temporary outward head gradient across the wall.

At the northernmost well pairs (MW-101/105 and MW-106R/102), **Figure 4-10** shows a similar decline in the head difference across the barrier wall during the third and fourth quarters. This is likely related to the excessive rainfall in the third quarter as noted above,

however, at these pairs, the disparity in groundwater drainage on either side of the barrier is exacerbated by the 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 as illustrated on **Figure 1** in **Appendix B**. This figure has the footprint and top surface elevation of the Meadow Mat superimposed on a base map showing the barrier wall and monitoring wells. This map was taken from Drawing CG-1 of the Subsurface Investigation Report of Study Area 5 (December 21, 2007). As shown, the two wells located inside of the barrier wall (MW-105 and MW-102) are underlain by the Meadow Mat whereas the two outside wells (MW-101 and MW-106R) are not. This difference allows groundwater to preferentially build up on top of the Meadow Mat inside of the barrier wall and to be more easily influenced by the lower heads of the underlying Intermediate Zone outside of the barrier wall. 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.

As noted in previous correspondence and reports, 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 its 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 as it is forced around 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, 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 scenario 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 boundary 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 2021, 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 3 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 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 with the exception of December 2021 at the PZ-1/PZ-2 well pair in which the head difference was 0.13 foot outward. This was likely caused by declining heads outside of the soil containment cell as a result of below average rainfall during the fourth quarter. 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, gradients were inward during the entire year at the 115-MW-502/E4-SO pair and at the 115-MW-503/W1-SO pair with the exception of May when the head difference was zero. Head differences at the 115-PZ-503/W6-SO pair were inward for 9 of the 12 months and at the 115-MW-502/E5-SO pair were inward for 7 of the 12 months. As a result, an investigation was conducted on January 14, 2021 to evaluate a drainage pipe that was installed above the liner during the SA-6 Chromium Remedy which drains the utility corridor depression near 115-E5-SO. Upon removal of the soil in SA-7 at the end of this drainpipe, it was observed that the drainage line was broken, allowing stormwater to collect in the utility corridor depression and thus increasing the

head on top of the cap in the vicinity of 115-E5-SO. The line was repaired and drainage from the cap has improved. However, temporary ponding of water above the cap has occurred during periods of heavy rainfall in 2021. In accordance with the SA-6 LTMP, the quality of groundwater along the inside of the barrier wall was determined through laboratory analysis as further discussed in Section 5.3.

4.6 SA-6 South Containment Cell

Shallow groundwater elevations within the SA-6 South containment area, as measured in June 2021, 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 with the exception of December 2021 at the PZ-17/PZ-18 well pair in which the head difference was 0.06 foot outward. This was likely caused by declining heads outside of the soil containment cells as a result of below average rainfall during the fourth quarter. Inward gradients were present during 7 of the 12 months along the western SA-6 South soil containment cell wall at the PZ-19R/PZ-20R well pair which is similar to that in 2019. The effectiveness of the clay plug installed as part of the SA-6 South Deferred Area Remedy, into which replacement piezometer PZ-19R was installed, continues to be evaluated. With respect to the SA-7 SCB wall, gradients at each of the three well pairs were inward during the entire year with the exception of December at the 115-PZ-500/W3-SO pair when the average head difference was outward at 0.01 foot.

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 sample results in this area as discussed in Section 5.7 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, and August 10, 2020. The most recent technical call between Honeywell and Plaintiffs was held September 14, 2021. The parties agreed to postpone further discussions on this issue pending investigation of bedding material associated with the JCMUA interceptor sewer beneath the Route 440 median strip, to be coordinated with future Route 440 road improvements (as discussed in the letter from the Special Master to the New Jersey Department of Transportation dated October 27, 2021).

4.8 Miscellaneous Events

There were no miscellaneous events to be reported for 2021.

5 GROUNDWATER QUALITY MONITORING

Groundwater quality monitoring within the project area was conducted in 2021 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

In accordance with the SAP, the next round of regional ground water quality monitoring is scheduled for May 2024. Therefore, regional ground water quality monitoring was not conducted in 2021. As a result, the related tables and figures as provided in the SAP have not been included in this report.

5.2 GWET Extraction Wells

Groundwater discharge from the three GWET pumping wells was sampled quarterly in 2021 as shown in **Table 5-1.** 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 will be on an annual frequency going forward and will not include analysis of VOCs unless one of the extraction wells is replaced. Samples for VOC analysis were not collected during the fourth quarter 2021 sampling event.

The groundwater 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 5-1** and indicate that concentrations in the Deep Zone (PW-1) have declined in an asymptotic fashion since 2009 to approximately 15 parts per million (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 17 ppm. Hexavalent chromium concentrations in the bedrock have been generally stable at approximately 15 ppm.

The Intermediate Zone pumping well, PW-3, contains the highest concentrations of VOCs with the most prevalent compounds being chlorinated volatile organics such as trichloroethene **(Figure 5-2)** and its daughter products cis-dichloroethene and vinyl chloride. Carbon Tetrachloride was also detected as shown in **Figure 5-3** and follows the same general asymptotic trend as the other VOCs. With the exception of carbon tetrachloride, VOCs have not been detected in the bedrock pumping well. As previously reported, the source of the VOCs in the groundwater is not related to historical Honeywell operations.

5.3 SA-6 North

As noted in Section 4.5 and shown on **Table 5-2**, shallow groundwater samples were collected from perimeter piezometer PZ-10 located inside of the SA-6 North soil containment area on May 20, 2021. Hexavalent chromium was not detected in the filtered and unfiltered samples. Total chromium was also not detected in the filtered sample and was reported just above the reporting limit at 4.3 ppb in the unfiltered sample.

5.4 SA-6 South

As noted in Section 4.6 and shown on **Table 5-2**, shallow groundwater samples were collected from perimeter piezometer PZ-20R located inside of the SA-6 South soil containment area on May 20, 2021. Hexavalent chromium was not detected in the filtered and unfiltered samples. Total chromium was detected in both the filtered and unfiltered samples at concentrations of 10.3 and 22.0 ppb, respectively, which are below the NJGWQS of 70 ppb.

5.5 New Jersey City University

In accordance with the Shallow Groundwater Monitoring and Extraction System Operation Plan for the NJCU Commercial AOC, monitoring wells along the barrier wall extension (184-MW-101 through 184-MW-108) were sampled quarterly in 2021. The results are provided on **Table 5-3** and plotted on **Figure 5-4**. The results indicate that hexavalent chromium was only detected above the reporting limit of 5.5 ppb in two wells; 184-MW-103 during the March and June sampling rounds, and at 184-MW-107 during the March event. All hexavalent chromium concentrations were below 70 ppb. Well 184-MW-103 is located outside (upgradient) of the barrier wall. Total chromium was detected above the reporting limit of 4 ppb at least once in all wells with the exception of 184-MW-105 and 184-MW-108. With one exception, the concentration of total chromium in filtered and unfiltered samples was below the GWQS of 70 ppb. The single exception is a concentration of 656 ppb in the unfiltered sample from 184-MW-107 on March 8, 2021. The associated filtered sample reported a total chromium concentration of 21.1 ppb, indicating the majority of the total chromium in the unfiltered sample was in the trivalent form and likely associated with sample turbidity. **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 1,000 ppb to non-detect, none of the filtered sample results have exceeded 70 ppb.

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 2019. Thus, the six listed monitoring wells were sampled in early November 2021 with the next sampling event scheduled for 2023. The results for 2021 are provided on **Table 5-4** and are shown along with previous results on **Figure 5-5**.

In monitoring well 117-MW-A85, total chromium was reported above the GWQS of 70 ppb in both the unfiltered and filtered samples, however hexavalent chromium was not detected above the reporting limit of 5.5 ppb which is generally consistent with prior results. The results for wells 117-MW-A05 were non detect. 117-MW-A14 had detections of total chromium and hexavalent chromium in both the filtered and unfiltered sample below the GWQS of 70 ppb. Well 117-MW-A99 only had a detection in the unfiltered total chromium sample below the GWQS. Well 117-MW-I4S is located in the source area of the Deep Overburden plume and thus the highly elevated concentrations of both total and hexavalent chromium detected in this well are not unexpected and consistent with prior results. This well was installed for the collection of samples for treatability testing and is planned to be discontinued from water quality sampling pending NJDEP approval of the RA Groundwater Permit modification application.

The results of the unfiltered sample from well 117-MW-A89 indicate elevated concentrations of total and hexavalent chromium of 1,420 ppb and 1,600 ppb, respectively. Concentrations in the filtered sample were slightly lower at 1,370 ppb and 1,500 ppb, respectively. Based on these results, an additional round of sampling was conducted at this well on December 21, 2021. Chromium concentrations in the December sampling round ranged from 256 ppb to 286 ppb, substantially lower than the previous round for both total and hexavalent chromium, indicating a high degree of variability over a relatively short period of time. Although the 2021 results are elevated compared to the two prior rounds in 2018 and 2019 as shown on **Figure 5-5**, they are on par with concentrations reported from 1997 through 2009 during which total chromium was as high as 1,870 ppb and hexavalent chromium as high as 1,720 ppb. These historic data also demonstrate the highly variable nature of water quality in this well with hexavalent chromium being essentially non-detect in 1998 and 1999. Large swings in concentration such as this are not uncommon where COPR impacted soils are present just above the water table (as is noted in the boring log for this location) and are often the result of short-term fluctuations (rises) of the groundwater table. 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. The elevated chromium concentrations detected in samples collected from monitoring well 117-MW-A89 in early November for example, may be associated with higher water table conditions from significantly above- average rainfall during September-October (more than 15 inches compared to historical average of 7 inches as indicated on Figure 2-1). This potential for the temporary migration of chromium into well 117-MW-A89 is enhanced due to its 10 foot-long well screen that

extends from below the meadow mat and into the unsaturated zone where chromium impacted soils were encountered. However, the migration of chromium away from well 117-MW-A89 has not been observed based on the non-detect sample results from well 117-MW-I1 screened in the Intermediate Zone approximately 19 feet west (downgradient) of 117-MW-A89 and shallow wells at Site 153 (153-MW-A13 and -A15) located south of 117-MW-A89 (as discussed in the following section). Correlation between groundwater levels and groundwater quality in well 117-MW-A89 is not feasible due to the sporadic nature of the historic data.

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 required every five years. Sampling of this well last took place in May 2019 and is therefore scheduled for sampling in 2024.

In accordance with the SAP and NJDEP RA Groundwater Permit, sampling of shallow monitoring wells at Site 153 is required every two years. The last sampling event was in 2019 and thus samples were collected in 2021 from wells 153-MW-A13 and 153-MW-A15. The results are provided on **Table 5-4** and **Figure 5-5** and indicate that total chromium was detected above the reporting limit of 10 ppb in unfiltered samples from both wells and the filtered sample from 153-MW-A15. The concentrations were well below the GWQS of 70 ppb. Hexavalent chromium was not detected in either well. The next sampling event is scheduled for 2023.

Site 153 is located along the southwestern down-gradient perimeter of Site 117. As indicated on Figure 4-1b, the direction of shallow groundwater flow south of Site 117 is to the south. Sampling results for Site 153 shallow wells (located south of 117-MW-A89) provide data that support the lack of chromium migration in groundwater to the south of Site 117.

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 5 years, during 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 5-6**, 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 97 tons of hexavalent chromium have been removed through groundwater extraction alone through the end of 2021 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 2021 have fulfilled the various monitoring plan requirements in accordance with **Tables 1-1 and 1-2**.

6.2 Status of Groundwater Classification Exception Areas

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 RA Groundwater Permits include one permit for the Deep Overburden Zone, one permit for the 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 are due every 2 years thereafter.

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. Well 117-MW-I4S 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) and will be retained for water level monitoring only as part of the Integrated SAP until such time that the well is abandoned, which is expected following completion of NJCU's roadway/infrastructure project.

A Remedial Action Groundwater Permit modification application was submitted to NJDEP in June 2021 for Site 117 Regional 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 annual.

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 annual.

As of December 2021, Honeywell has not received a reply from NJDEP on the above requested permit modifications.

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.

6.4 Recommendations for Water Level Monitoring Frequency

The frequency of regional groundwater level monitoring has been changed to annually beginning January 2022 in accordance with the SAP. However, quarterly groundwater level monitoring will continue until such time that the NJDEP groundwater permit has been approved to reflect this change. 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.

6.5 Recommendations for Groundwater Quality Monitoring Frequency

As noted in Section 5.2, the frequency of sampling of the GWET pumping well discharge will be changed from quarterly to annually in 2022 and VOCs will no longer be analyzed. 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. Also, as noted in Section 6.3, a Remedial Action Groundwater Permit modification for Study Area 5 NJCU was issued by NJDEP in February 2022 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 consistent with the SAP.

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 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 the above 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

Location	Monitoring Plan	Consent Decree	Depth	Frequency	# Wells
Regional[1]	GWET Long Term Monitoring Plan June 10, 2008	Deep Overburden and Bedrock Groundwater Remedies Consent Order	All Zones	Quarterly through 2021; Annually thereafter	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)	Not Applicable	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	13
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: Site153[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

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

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

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

[4]Remedial Action Groundwater Permits were issued in 2018 for the Deep Overbuden; 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; pending NJDEP review and approval.

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

Location	Monitoring Plan	Consent Decree	Depth	Frequency	# Wells	Estimated Start Date
Regional	Integrated Sampling and Analysis Plan; April 2014, revised October 2019	Deep Overburden and Bedrock Groundwater Remedies Consent Order	Intermediate Deep Bedrock Beneath River	Every 5 years[3] Every 5 years[3] Every 5 years[3] Every 5 years	6 10 9 1	On-going; future events TBD
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]	5	On-going
SA-5: Site153	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 inward 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 inward gradients across wall	5	On-going

Biennial = every two years

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

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

[3]The current frequency in the Remedial Action Groundwater Permits issued in 2018 for the Deep Overbuden; Bedrock; and Shallow groundwater zones is every 2 years, thus a reduced frequency to every 5 years is subject to NJDEP approval of RA GW permit modifications submitted in 2021.

[4]Per 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
2021 Monthly Precipitation Data

Month	2021 Precipitation (inches)	Average Precipitation (inches)
January	2.50	3.98
February	4.65	2.96
March	2.92	4.21
April	2.18	3.92
May	4.55	4.46
June	4.36	3.4
July	8.91	4.68
August	7.19	4.02
September	10.50	4.01
October	5.65	3.16
November	0.88	3.88
December	1.28	3.57
Annual Total	55.57	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

Well ID	Screen Zone	Ref. Pt. Elev.	Well Depth	Screen Length	Comments
		(ft msl)	(ft)	(ft)	
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	18.81	75.0	5	
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	9.31/17.70	78/86.5	10	
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	10.47/18.83	28/36.5	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

Well ID	Screen Zone	Ref. Pt. Elev.	Well Depth	Screen Length	Comments
		(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	9.71/19.67	133/143	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

Well ID	Screen Zone	Ref. Pt. Elev.	Well Depth	Screen Length	Comments
		(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	10.62/21.49	9.5/20.5	5	Installed 2015
124-PZ-14	Shallow	15.15	14.1	5	Installed 2015
124-PZ-15	Shallow	13.34/34.34	10.1/31.1	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	11.00	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	8.70	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	13.12	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

Wells showing two Ref. Pt. Elev. and Well Depth values had casings extended upward in fall 2021 (prior/current).

TABLE 4-1
GROUNDWATER ELEVATION DATA FROM QUARTERLY ROUNDS IN 2021

Well ID	Screen Zone	Ref. Pt. Elev.	Well Depth	Screen Length	Groundwater Elevation (NGVD-29)			
					3/29/21	6/29/21	9/9/21	12/28/21
		(ft msl)	(ft)	(ft)	(ft msl)	(ft msl)	(ft msl)	(ft msl)
087-MW-08	Deep	12.98	99	10	0.94	1.42	2.16	0.89
087-MW-34	Deep	12.73	70	5	-0.48	-0.13	0.55	-0.75
087-MW-A26T	Deep	9.92	56	15	3.47	3.05	4.56	2.74
087-MW-W25T	Deep	19.06	91	15	1.50	1.38	1.81	0.72
087-OBS-1L	Deep	15.27	67.05	5	1.33	3.61	1.76	2.67
087-OBS-1T	Deep	15.23	105	10	1.65	1.20	3.71	0.33
087-OBS-3L	Deep	12.68	65	5	0.18	N/A	1.61	0.58
087-OBS-4T	Deep	11.60	75.5	5	0.99	1.15	1.93	1.00
087-OBS-5T	Deep	12.62	81.9	10	0.08	0.31	1.12	-0.35
087-PW-1	Deep	10.27	69	10	-39.55	-40.64	-39.97	-42.08
088-MW-G19T	Deep	13.25	93	15	3.18	2.39	3.58	2.51
090-MW-09	Deep	18.81	75	5	5.59	5.82	6.09	4.55
117-MW-D1	Deep	11.08	41	10	3.53	2.97	3.88	2.89
117-MW-D2	Deep	17.62	48	10	4.85	4.37	5.71	4.44
117-MW-D3	Deep	18.85	80	10	6.10	5.63	6.83	6.00
117-MW-I4	Deep	15.49	75	10	4.71	4.51	5.24	4.58
119-MW-01T	Deep	10.78	62	10	3.18	2.59	3.90	2.66
119-MW-02T	Deep	8.80	70	10	4.15	3.26	3.20	3.09
124-MW-106T	Deep	9.31/17.70	78/86.5	10	2.89	2.83	4.04	2.69
153-MW-A13T	Deep	9.34	58	15	3.77	3.10	4.01	2.97
SA6-MW-AA1T	Deep	15.31	70	10	1.12	1.59	2.17	0.91
087-MW-136D	Intermediate	13.18	36	10	1.48	1.44	2.36	1.58
087-MW-13	Intermediate	12.93	40	10	0.49	2.30	0.60	2.85
087-MW-A26D	Intermediate	10.35	28	10	3.55	3.11	4.65	2.81
087-MW-O29D	Intermediate	10.32	56	NA	1.59	1.59	1.94	N/A
087-MW-W25D	Intermediate	16.98	66	10	1.60	1.25	2.31	2.00
087-OBS-07	Intermediate	12.59	30	5	-0.34	-1.51	0.87	-0.83
087-OBS-1D	Intermediate	15.13	42.8	10	1.33	1.27	2.14	2.59
087-OBS-2D	Intermediate	12.68	54	10	-1.72	-1.48	-0.67	-2.19
087-OBS-5D	Intermediate	12.72	39.83	10	N/A	0.17	1.19	1.22
087-PW-2	Intermediate	13.02	48	20	1.07	-0.67	2.22	0.72
087-PW-3	Intermediate	12.40	50	20	-6.52	-7.57	-5.57	-7.30
088-MW-15R	Intermediate	12.83	35	10	2.92	2.56	4.00	2.28
090-MW-07	Intermediate	17.20	40	10	6.05	5.52	6.65	5.50
117-MW-I1	Intermediate	11.08	22	10	4.94	4.47	4.73	3.97
117-MW-I2	Intermediate	17.59	28	10	5.47	4.89	6.31	4.99
117-MW-I3	Intermediate	15.59	28	10	5.40	4.86	6.07	4.79
117-MW-I5	Intermediate	18.76	37	15	6.40	6.12	6.93	6.18
124-MW-G02D	Intermediate	10.47/1.83	28/36.5	10	2.93	N/A	3.97	2.55
SA6-MW-AA1D	Intermediate	19.36	32	10	1.19	1.67	2.28	0.87
073-MW-1BR	Rock	20.39	144	15	-0.59	-1.17	0.40	-2.31
079-MW-13BR-1	Rock	13.08	121	10	7.63	7.47	8.58	7.14
079-MW-13BR-2	Rock	13.08	214	15	7.89	7.80	8.79	7.21
079-MW-13BR-3	Rock	13.08	284	15	7.70	6.76	8.29	6.99
090-MW-7BR-1	Rock	16.99	134	15	5.24	4.90	6.19	4.73
090-MW-7BR-2	Rock	16.99	177	15	5.42	5.12	6.41	4.93
090-MW-7BR-3	Rock	16.99	233	15	5.51	N/A	7.45	5.04
115-MW-203BR	Rock	6.61	162	20	-0.53	-1.13	0.41	-2.09
115-MW-215BR	Rock	8.82	143	20	-3.90	-3.37	-3.05	-4.89
117-MW-3BR-1	Rock	12.34	155	15	5.82	N/A	6.83	5.49
117-MW-3BR-2	Rock	12.34	263	15	6.38	8.89	8.94	6.69
117-MW-8BR	Rock	12.94	125	10	5.93	5.49	N/A	N/A
119-MW-2BR-1	Rock	8.43	163	15	-2.11	-1.96	-0.31	N/A
119-MW-2BR-2	Rock	8.43	245	15	-1.21	-0.58	0.25	N/A
119-MW-2BR-3	Rock	8.43	315	15	-0.69	-0.19	0.79	N/A
119-MW-16BR-1	Rock	8.61	151	15	5.84	7.04	8.56	6.16
119-MW-16BR-2	Rock	8.61	187	15	4.86	4.83	5.48	4.36
119-MW-16BR-3	Rock	8.61	247	15	4.91	4.56	7.63	4.45
124-MW-8BR	Rock	9.71/19.67	133/143	15	4.08	3.97	4.50	3.65
SA6-MW-5BR-1	Rock	17.06	106	15	2.26	2.13	3.21	2.00
SA6-MW-5BR-2	Rock	17.06	154	15	3.00	2.68	3.78	2.75
SA6-MW-5BR-3	Rock	17.06	204	15	3.45	3.06	4.38	3.08
SA6-MW-5BR-4	Rock	17.06	236	15	3.49	3.16	4.58	3.21
SA6-MW-5BR-5	Rock	17.06	281	15	3.61	3.26	4.55	3.29
SA6-MW-14BR	Rock	9.99	85	10	3.73	3.33	4.43	3.21
SA6-MW-15BR	Rock	8.08	103	20	1.56	1.06	1.79	1.12

TABLE 4-1
GROUNDWATER ELEVATION DATA FROM QUARTERLY ROUNDS IN 2021

Well ID	Screen Zone	Ref. Pt. Elev.	Well Depth	Screen Length	Groundwater Elevation (NGVD-29)			
					3/29/21	6/29/21	9/9/21	12/28/21
079-MW-01	Shallow	8.80	8.88	5	3.91	N/A	5.15	3.02
079-MW-A2	Shallow	8.10	11.48	10	3.55	3.10	4.44	2.62
079-MW-C6	Shallow	11.00	13	10	7.16	4.71	5.75	4.43
087-PZ-1	Shallow	10.04	11.03	5	5.36	3.53	6.02	2.94
087-PZ-2	Shallow	10.35	8	5	4.29	3.93	5.10	3.44
087-PZ-3	Shallow	13.28	13	5	5.24	4.52	6.66	3.70
087-PZ-4	Shallow	13.65	12	5	4.13	3.63	3.61	2.50
087-PZ-5	Shallow	19.49	13	5	5.98	5.19	6.81	4.41
087-PZ-6	Shallow	21.01	13	5	3.59	3.59	3.33	2.89
087-PZ-7	Shallow	16.24	26	5	6.59	5.72	7.80	5.50
087-PZ-8	Shallow	16.54	14	5	4.21	3.30	4.26	2.90
087-PZ-9	Shallow	17.19	12	5	2.69	2.33	3.24	2.37
087-PZ-10	Shallow	17.06	12	5	4.89	3.28	4.92	2.65
090-PZ-05	Shallow	18.08	16.41	NA	7.78	6.37	8.33	6.23
090-PZ-06	Shallow	18.20	18	NA	9.39	10.65	9.77	8.31
115-E1A-SO	Shallow	16.48	7	NA	3.76	2.42	3.34	3.90
115-E2-SO	Shallow	10.33	10	5	6.70	6.46	7.22	5.92
115-E3-SO	Shallow	12.57	20.73	5	7.93	6.56	7.26	6.05
115-E4-SO	Shallow	14.04	13.45	10	3.93	3.49	3.49	3.16
115-E5-SO	Shallow	17.39	21.39	8	5.12	3.77	5.38	3.00
115-PZ-500	Shallow	6.68	11	9	4.71	4.40	4.47	4.10
115-PZ-501	Shallow	14.47	16.5	8.5	5.46	4.96	4.93	4.09
115-PZ-502	Shallow	14.51	16	8	5.14	4.58	4.58	4.01
115-PZ-503	Shallow	7.32	10	8	4.63	4.29	4.38	4.07
115-W1-SO	Shallow	18.84	24.66	10	4.09	3.36	3.94	2.98
115-W3-SO	Shallow	14.96	14	10	3.53	2.33	3.05	3.72
115-W5-SO	Shallow	21.68	16	NA	4.09	2.44	3.64	3.88
115-W6-SO	Shallow	14.76	18.15	NA	4.24	2.12	4.31	2.66
117-MW-A05	Shallow	18.48	16	10	N/A	6.87	N/A	N/A
117-MW-A14	Shallow	17.33	17	10	5.40	4.91	6.18	4.98
117-MW-A85	Shallow	17.40	15	10	N/A	6.10	N/A	6.81
117-MW-A89	Shallow	13.17	16	10	5.53	4.27	5.48	4.12
117-MW-A99	Shallow	15.95	14	10	5.62	5.47	7.11	5.47
117-MW-I4S	Shallow	16.70	11.17	10	5.89	5.55	6.62	5.60
124-MW-10	Shallow	10.06	11	8	5.21	4.56	5.26	3.88
124-MW-11	Shallow	9.05	8	6	5.13	3.94	5.23	3.75
124-PZ-11	Shallow	9.69	9.5	5	7.05	5.89	6.68	5.32
124-PZ-12	Shallow	10.63	9.5	5	4.50	3.73	5.27	4.13
124-PZ-13	Shallow	10.62/21.49	9.5/20.5	5	7.92	6.40	8.10	5.92
124-PZ-14	Shallow	15.15	14.1	5	3.93	2.56	3.79	4.02
124-PZ-15	Shallow	13.34/34.34	10.1/31.1	5	6.80	5.63	7.07	4.74
124-PZ-16	Shallow	17.70	19.6	5	4.09	2.49	3.65	4.06
124-PZ-17	Shallow	15.15	12	5	5.11	4.25	5.53	3.63
124-PZ-18	Shallow	18.28	16.2	5	3.87	2.50	3.38	3.99
124-PZ-19R	Shallow	18.30	24.55	5	6.83	6.55	7.37	6.69
124-PZ-20R	Shallow	20.41	27.55	5	4.31	3.19	3.76	4.61
153-MW-A13	Shallow	9.62	10	6	4.19	3.67	4.38	4.47
153-MW-A15	Shallow	11.00	12.15	10	2.98	2.70	4.00	2.42
154-MW-A06	Shallow	19.87	15.12	NA	14.22	12.02	13.60	11.73
154-MW-A5A	Shallow	19.16	14	NA	12.22	11.61	12.83	11.43
184-MW-04	Shallow	8.70	6.8	NA	N/A	3.56	3.83	3.45
184-MW-05	Shallow	14.71	13	NA	5.10	5.30	6.52	4.95
184-MW-06	Shallow	18.75	15	NA	8.23	7.61	8.47	7.23
184-MW-101	Shallow	14.85	13	5	6.68	5.23	6.50	5.10
184-MW-102	Shallow	13.12	12	5	6.62	6.14	7.01	5.76
184-MW-103	Shallow	14.71	14	5	6.89	6.26	7.36	5.82
184-MW-104	Shallow	15.47	13	5	7.34	6.66	7.72	6.24
184-MW-105	Shallow	15.10	12	5	5.96	5.88	6.30	5.51
184-MW-106	Shallow	12.72	14	5	6.40	5.68	N/A	N/A
184-MW-106R	Shallow	12.68	9.5	5	N/A	N/A	6.91	5.23
184-MW-107	Shallow	13.41	11	5	6.71	6.20	7.30	5.73
184-MW-108	Shallow	15.32	15	5	7.22	6.59	7.75	6.17
SUMP A	Shallow	15.98	21	NA	N/A	5.98	6.47	5.53
SUMP B	Shallow	13.08	15	NA	3.67	5.06	4.75	5.16

NA- information not available
N/A - well abandoned or no access
Wells showing two Ref. Pt. Elev. and Well Depth values had casings extended upward in fall 2021 (prior/current).

Table 4-2
Summary of Groundwater Elevations Near NJCU
2021

		3/29/2021		6/29/2021		9/29/2021		12/28/2021	
Location	8/31/2021 Ref. pt. Elev. (ft, msl)	Depth to GW (ft,)	GW Elev. (ft., msl)	Depth to GW (ft,)	GW Elev. (ft., msl)	Depth to GW (ft,)	GW Elev. (ft., msl)	Depth to GW (ft,)	GW Elev. (ft., msl)
079-MW-A02	8.10	4.55	3.55	5.00	3.10	4.35	3.75	5.48	2.62
Sump A (North)	15.98	N/A	N/A	10.00	5.98	9.82	6.16	10.45	5.53
Sump B (South)	13.08	9.41	3.67	8.02	5.06	8.04	5.04	7.92	5.16
090-PZ-5	18.08	10.3	7.78	11.71	6.37	10.61	7.47	11.85	6.23
090-PZ-6	18.20	8.81	9.39	7.55	10.65	8.52	9.68	9.89	8.31
184-MW-4	8.87	N/A	N/A	5.31	3.56	5.07	3.80	5.42	3.45
184-MW-5	14.71	8.61	6.10	9.41	5.30	8.69	6.02	9.76	4.95
184-MW-6	18.751	10.52	8.23	11.14	7.61	10.59	8.16	11.52	7.23
090-MW-09	10.59	5.22	5.37	4.77	5.82	5.05	5.54	6.04	4.55
090-MW-07	17.20	11.15	6.05	11.68	5.52	10.86	6.34	11.7	5.50
117-MW-I4S	16.70	10.81	5.89	11.15	5.55	10.29	6.41	11.1	5.60
117-MW-I5	18.76	12.36	6.40	12.64	6.12	11.91	6.85	12.58	6.18
184-MW-101 (outside)	14.85	8.17	6.68	9.62	5.23	8.74	6.11	9.75	5.10
184-MW-105 (inside)	15.1	9.14	5.96	9.22	5.88	9.09	6.01	9.59	5.51
184-MW-106R (outside)	12.68	9.07	6.40	7.04	5.68	6.43	6.25	7.49	5.19
184-MW-102 (inside)	13.12	9.04	6.62	7.02	6.10	6.53	6.59	7.4	5.72
184-MW-103 (outside)	14.71	8.96	6.89	8.45	6.26	7.87	6.84	8.89	5.82
184-MW-107 (inside)	13.41	9.18	6.71	7.21	6.20	6.60	6.81	7.68	5.73
184-MW-104 (outside)	15.47	9.01	7.34	8.81	6.66	8.24	7.23	9.23	6.24
184-MW-108 (inside)	15.32	9.39	7.22	8.73	6.59	8.12	7.20	9.15	6.17

184-MW-106R installed on August 12, 2021. Reference point elevation revised accordingly.

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

	184-MW-101/184-MW-105			184-MW-106/184-MW-102		
	Exterior Piezometer/Monitoring Well Average Head (ft. msl)[1]	Interior Piezometer/Monitoring Well Average Head (ft. msl)[1]	Average Gradient (ft)[2]	Exterior Piezometer/Monitoring Well Average Head (ft. msl)[1]	Interior Piezometer/Monitoring Well Average Head (ft. msl)[1]	Average Gradient (ft)[2]
2021 - Month	184-MW-101	184-MW-105		184-MW-106[3]	184-MW-102[3]	
January	6.21	5.63	0.58	6.23	6.40	**-0.17**
February	5.83	5.47	0.36	5.75	6.08	**-0.33**
March	6.59	5.78	0.81	6.57	6.81	**-0.24**
April	6.41	6.05	0.36	6.27	6.58	**-0.31**
May	5.98	5.98	**0.00**	6.04	6.35	**-0.31**
June	6.12	6.11	**0.01**	6.18	6.49	**-0.31**
July	6.35	6.07	0.28	6.41	6.61	**-0.20**
August	5.98	6.16	**-0.18**	6.29	6.61	**-0.32**
September	6.29	6.10	0.19	6.62	6.79	**-0.17**
October	5.45	5.90	**-0.45**	5.88	6.29	**-0.41**
November	5.60	5.77	**-0.17**	5.82	6.19	**-0.37**
December	4.89	5.41	**-0.52**	5.23	5.72	**-0.49**

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. Data loggers removed from wells 184-MW-106,102,103,107, 104, and 108 on November 6, 2020 and reinstalled on April 16, 2021. Monthly average gradients determined from weekly manual data through March 2021.

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 Gradient (ft)[2]	Exterior Piezometer/Monitoring Well Average Head (ft. msl)[1]	Interior Piezometer/Monitoring Well Average Head (ft. msl)[1]	Average Gradient (ft)[2]
2021 - Month	184-MW-103[3]	184-MW-107[3]		184-MW-104[3]	184-MW-108[3]	
January	6.71	6.56	0.15	7.10	7.06	**0.04**
February	6.28	5.96	0.32	6.73	6.66	**0.07**
March	7.07	7.23	**-0.16**	7.46	7.43	**0.03**
April	6.77	6.66	0.11	7.12	7.19	**-0.07**
May	6.49	6.65	**-0.16**	6.97	6.91	**0.06**
June	6.61	6.50	0.11	7.08	7.07	**0.01**
July	7.00	6.88	0.12	7.37	7.33	**0.04**
August	6.86	6.89	**-0.03**	7.14	7.28	**-0.14**
September	7.12	7.11	**0.01**	7.18	7.56	**-0.38**
October	6.42	6.44	**-0.02**	6.71	6.83	**-0.12**
November	6.39	6.37	**0.02**	6.94	6.95	**0.10**
December	5.77	5.76	**0.01**	6.37	6.26	**0.09**

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. Data loggers removed from wells 184-MW-106,102,103,107, 104, and 108 on November 6, 2020 and reinstalled on April 16, 2021. Monthly average gradients determined from weekly manual data through March 2021.

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 Gradient (ft)[2,3]	Exterior Piezometer/Monitoring Well Average Head (ft, msl)[1]	Interior Piezometer/Monitoring Well Average Head (ft, msl)[1]	Average Gradient (ft)[2,3]
2021 - Month	PZ-1	PZ-2		PZ-3	PZ-4	
January	5.17	4.23	0.94	5.12	4.12	1.00
February	4.78	3.93	0.85	4.58	3.77	0.81
March	5.41	4.34	1.07	5.32	4.13	1.19
April	4.77	4.21	0.56	4.98	4.06	0.92
May	3.84	3.78	0.06	4.41	3.53	0.88
June	4.53	3.96	0.57	4.73	3.75	0.98
July	6.00	4.69	1.31	5.75	4.15	1.60
August	5.07	4.40	0.67	5.65	3.52	2.13
September	5.76	4.87	0.89	6.24	3.39	2.85
October	4.65	4.04	0.61	5.17	3.05	2.12
November	4.79	4.06	0.73	5.18	3.40	1.78
December	3.53	3.66	**-0.13**	4.12	2.81	1.31

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 Gradient (ft)[2,3]	Exterior Piezometer/Monitoring Well Average Head (ft, msl)[1]	Interior Piezometer/Monitoring Well Average Head (ft, msl)[1]	Average Gradient (ft)[2,3]
2021 - Month	PZ-5	PZ-6		PZ-7	PZ-8	
January	5.83	3.55	2.28	6.63	3.65	2.98
February	5.38	3.51	1.87	5.92	3.84	2.08
March	5.81	3.52	2.29	6.81	4.20	2.61
April	5.82	3.74	2.08	6.40	4.39	2.01
May	5.22	3.68	1.54	5.69	4.34	1.35
June	5.79	3.59	2.20	6.37	3.69	2.68
July	6.86	3.57	3.29	7.43	3.18	4.25
August	6.51	3.44	3.07	6.66	3.39	3.27
September	6.65	3.30	3.35	7.15	4.21	2.94
October	5.92	3.17	2.75	6.36	3.78	2.58
November	5.78	3.17	2.61	6.10	3.77	2.33
December	4.76	3.07	1.69	5.37	3.51	1.86

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 Gradient (ft)[2,3]	Exterior Piezometer/Monitoring Well Average Head (ft, msl)[1]	Interior Piezometer/Monitoring Well Average Head (ft, msl)[1]	Average Gradient (ft)[2,4]
2021 - Month	PZ-9	PZ-10		PZ-11	PZ-12	
January	2.72	4.23	**-1.51**	6.68	3.71	2.97
February	2.65	4.21	**-1.56**	6.87	3.84	3.03
March	2.46	4.86	**-2.40**	6.84	4.56	2.28
April	2.72	4.77	**-2.05**	6.74	4.76	1.98
May	2.51	4.44	**-1.93**	6.32	4.37	1.95
June	2.76	3.89	**-1.13**	6.53	4.04	2.49
July	3.06	4.03	**-0.97**	7.03	4.41	2.62
August	2.97	3.99	**-1.02**	6.73	4.77	1.96
September	3.16	4.75	**-1.59**	6.79	5.02	1.77
October	2.97	3.94	**-0.97**	6.31	4.29	2.02
November	2.83	4.31	**-1.48**	6.59	4.44	2.15
December	2.25	3.54	**-1.29**	5.69	4.22	1.47

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

	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 Gradient (ft)[2,3]	Exterior Piezometer/Monitoring Well Average Head (ft, msl)[1]	Interior Piezometer/Monitoring Well Average Head (ft, msl)[1]	Average Gradient (ft)[2,3]
2021 - Month	PZ-13	PZ-14		PZ-15	PZ-16	
January	7.64	3.55	4.09	6.39	3.39	3.00
February	7.34	3.74	3.60	6.24	3.62	2.62
March	7.90	4.30	3.60	6.70	4.19	2.51
April	7.56	4.05	3.51	6.48	4.09	2.39
May	6.68	2.82	3.86	5.70	2.89	2.81
June	7.15	2.38	4.77	6.36	2.39	3.97
July	8.02	3.46	4.56	7.05	3.31	3.74
August	7.16	3.62	3.54	6.29	3.78	2.51
September	7.50	3.24	4.26	6.58	3.37	3.21
October	6.38	3.01	3.37	N/A*	3.27	N/A*
November	6.91	3.62	3.29	5.55	3.93	1.62
December	5.80	3.65	2.15	4.69	4.10	0.59

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.

* Due to development activities at SA-6 South, logger data was unavlaiable for PZ-15 during October.

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 Gradient (ft)[2,3]	Exterior Piezometer/Monitoring Well Average Head (ft, msl)[1]	Interior Piezometer/Monitoring Well Average Head (ft, msl)[1]	Average Gradient (ft)[2,3]
2021 - Month	PZ-17	PZ-18		PZ-19	PZ-20	
January	4.96	3.57	1.39	3.39	2.86	0.53
February	4.69	N/A	N/A	3.26	3.10	0.16
March	5.17	4.03	1.14	2.76	3.53	**-0.77**
April	5.01	4.01	1.00	2.99	3.64	**-0.65**
May	4.44	2.51	1.93	2.77	2.27	0.50
June	4.76	2.17	2.59	3.05	1.84	1.21
July	5.32	3.40	1.92	3.32	3.11	0.21
August	4.87	3.71	1.16	3.30	3.44	**-0.14**
September	5.22	3.19	2.03	3.40	2.87	0.53
October	4.46	3.29	1.17	3.42	3.06	0.36
November	4.67	3.96	0.71	3.23	3.49	**-0.26**
December	3.98	4.04	**-0.06**	2.81	3.50	**-0.69**

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. Due to suspected logger failure, data for PZ-18 is not available for February. The logger was replaced in March.

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 Gradient (ft)[2,3]	Exterior Piezometer/Monitoring Well Average Head (ft, msl)[1]	Interior Piezometer/Monitoring Well Average Head (ft, msl)[1]	Average Gradient (ft)[2,3]
2021 - Month	PZ-500	W3-SO		PZ-501	E1A-SO	
January	4.64	2.80	1.84	5.23	3.18	2.05
February	4.68	3.25	1.43	5.03	3.54	1.49
March	4.66	3.75	0.91	5.62	3.99	1.63
April	4.58	3.83	0.75	5.51	3.70	1.81
May	4.46	3.02	1.44	5.06	2.55	2.51
June	4.54	2.19	2.35	5.11	2.19	2.92
July	4.55	2.86	1.69	5.27	3.31	1.96
August	4.35	3.40	0.95	4.93	3.59	1.34
September	4.40	3.09	1.31	4.63	3.06	1.57
October	4.16	3.13	1.03	4.33	2.98	1.35
November	4.28	3.53	0.75	4.11	3.76	0.35
December	3.84	3.85	**-0.01**	4.12	3.80	0.32

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

	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 Gradient (ft)[2,3]	Exterior Piezometer/Monitoring Well Average Head (ft, msl)[1]	Interior Piezometer/Monitoring Well Average Head (ft, msl)[1]	Average Gradient (ft)[2,4]
2021 - Month	PZ-501	W5-SO		PZ-502	E4-SO	
January	5.23	3.46	1.77	4.80	4.01	0.79
February	5.03	3.71	1.32	4.85	3.65	1.20
March	5.62	4.20	1.42	5.20	4.03	1.17
April	5.51	3.98	1.53	5.20	3.84	1.36
May	5.06	2.53	2.53	4.90	3.38	1.52
June	5.11	2.34	2.77	5.01	3.52	1.49
July	5.27	3.55	1.72	5.07	3.77	1.30
August	4.93	3.71	1.22	4.83	3.21	1.62
September	4.63	3.25	1.38	4.64	3.51	1.13
October	4.33	3.12	1.21	4.56	3.40	1.16
November	4.11	3.93	0.18	4.43	3.53	0.90
December	4.12	3.88	0.24	4.21	3.34	0.87

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 Gradient (ft)[2,3]	Exterior Piezometer/Monitoring Well Average Head (ft, msl)[1]	Interior Piezometer/Monitoring Well Average Head (ft, msl)[1]	Average Gradient (ft)[2,3]
2021 - Month	PZ-502	E5-SO		PZ-503	W6-SO	
January	4.80	5.25	**-0.45**	4.47	3.73	0.74
February	4.85	4.48	0.37	4.48	3.81	0.67
March	5.20	5.19	**0.01**	4.67	4.28	0.39
April	5.20	4.78	0.42	4.47	4.22	0.25
May	4.90	3.83	1.07	4.34	4.36	**-0.02**
June	5.01	4.12	0.89	4.37	3.73	0.64
July	5.07	5.26	**-0.19**	4.44	3.52	0.92
August	4.83	4.30	0.53	4.28	3.74	0.54
September	4.64	4.72	**-0.08**	4.21	4.46	**-0.25**
October	4.56	3.63	0.93	4.16	3.94	0.22
November	4.43	4.47	**-0.04**	4.08	4.17	**-0.09**
December	4.21	3.32	0.89	3.96	3.41	0.55

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 Gradient (ft)[2,3]
2021 - Month	PZ-503	W1-SO	
January	4.47	3.51	0.96
February	4.48	3.66	0.82
March	4.67	3.96	0.71
April	4.47	4.20	0.27
May	4.34	4.34	**0.00**
June	4.37	3.70	0.67
July	4.44	3.17	1.27
August	4.28	3.26	1.02
September	4.21	3.89	0.32
October	4.16	3.43	0.73
November	4.08	3.65	0.43
December	3.96	3.41	0.55

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 5-1
SUMMARY OF GROUNDWATER QUALITY DATA FROM GWET EXTRACTION WELLS

Parameter	29-Mar-21			29-Jun-21			9-Sep-21			28-Dec-21		
	PW-1 (ug/L)	**PW-3** (ug/L)	**115-MW-215BR** (ug/L)	**PW-1** (ug/L)	**PW-3** (ug/L)	**115-MW-215BR** (ug/L)	**PW-1** (ug/L)	**PW-3** (ug/L)	**115-MW-215BR** (ug/L)	**PW-1** (ug/L)	**PW-3** (ug/L)	**115-MW-215BR** (ug/L)
Benzene	1.3	3.6	ND	1.2	2.8	ND	0.8	2.2	ND	NS	NS	NS
Carbon Tetrachloride	2.4	5.9	2.7	2.2	4.9	2.1	1.2	3.5	2.4	NS	NS	NS
Chloroform	8.5	5.3	ND	7.9	4.2	ND	5	3.3	ND	NS	NS	NS
1,1-Dichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	NS
cis-1,2-Dichloroethene	47.8	29.9	ND	45.4	26.7	ND	31.9	21.8	ND	NS	NS	NS
trans-1,2-Dichloroethene	1.8	1.1	ND	1.6	0.83	ND	0.94	0.88	ND	NS	NS	NS
Toluene	ND	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	NS
Trichloroethene	37.9	45.7	ND	36.2	33.6	ND	22	24.2	ND	NS	NS	NS
1,1-Dichloroethane	1.1	ND	ND	1.0	ND	ND	0.8	ND	ND	NS	NS	NS
Methylene chloride	ND	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	NS
Vinyl chloride	7.7	7.6	ND	9.6	7.1	ND	5.5	4.6	ND	NS	NS	NS
1,2-Dichlorobenzene	0.44	ND	ND	0.39	ND	ND	0.44	ND	ND	NS	NS	NS
Chlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	NS
Ethylbenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	NS
Xylenes (total)	ND	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	NS
Bromodichloromethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	NS
Hexavalent Chromium	16,400	19,000	13,400	16,600	18,700	10,100	16,200	19,100	13,900	15,900	18,600	10,700
Total Chromium	17,700	19,700	13,700	15,400	16,400	8,650	16,700	20,100	13,600	15,400	17,200	10,600

ND = Not detected above reporting limit.

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

Table 5-2
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	5/20/2021	4.3	4 U	5.5 U	5.5 U
124-PZ-20R	5/20/2021	22.0	10.3	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 6/1/2020

U - Not detected above reporting limit

J - Estimated value

µg/l - micrograms/liter

Table 5-3
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-101	3/8/2021	4.0 U	4.0 U	5.5 U	5.5 U
	6/23/2021	4.3	4.0 U	5.5 U	5.5 U
	9/8/2021	4 U	4 U	5.5 U	5.5 U
	12/1/2021	4.3	4.3	5.5 U	5.5 U
184-MW-102	3/9/2021	4	4U	5.5 U	5.5 UJ
	6/22/2021	8.7	5.6	5.5 U	5.5 U
	9/8/2021	5.7	5	5.5 U	5.5 U
	12/2/2021	5	4.3	5.5 U	5.5 U
184-MW-103	3/8/2021	30.9	28.6	31	30
	6/22/2021	26.1	19	19	18
	9/8/2021	6.7	4 U	5.5 U	5.5 U
	12/1/2021	4 U	4 U	5.5 U	5.5 U
184-MW-104	3/8/2021	4.1	4.2	5.5 U	5.5 U
	6/22/2021	4.0 U	4.0 U	5.5 U	5.5 U
	9/8/2021	4 U	4 U	5.5 U	5.5 U
	12/1/2021	4 U	4 U	5.5 U	5.5 U
184-MW-105	3/8/2021	4.0 U	4.0 U	5.5 U	5.5 U
	6/23/2021	4.0 U	4.0 U	5.5 U	5.5 U
	9/8/2021	4 U	4 U	5.5 U	5.5 U
	12/1/2021	4 U	4 U	5.5 U	5.5 U
184-MW-106	3/8/2021	5	4.1	5.5 U	5.5 U
	6/23/2021	5.6	4.9	5.5 U	5.5 U
184-MW-106R	9/8/2021	4 U	4 U	5.5 U	5.5 U
	12/2/2021	4 U	4 U	5.5 U	5.5 U
184-MW-107	3/8/2021	**656**	21.1	15	22
	6/23/2021	4 U	4 U	5.5 U	5.5 U
	9/7/2021	18.9	4 U	5.5 UJ	5.5 U
	12/1/2021	4 U	4 U	5.5 U	5.5 U
184-MW-108	3/8/2021	4.0 U	4.0 U	5.5 U	5.5 U
	6/23/2021	4.0 U	4.0 U	5.5 U	5.5 U
	9/7/2021	4 U	4 U	5.5 UJ	5.5 U
	12/1/2021	4 U	4 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 5-4
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	11/2/2021	10 UJ	10 UJ	5.5 UJ	5.5 UJ
117-MW-A014	11/2/2021	25.1 J	25.4 J	22 J	22 J
	11/2/2021DP	30.1 J	24.6 J	22 J	20 J
117-MW-A085	11/2/2021	**697 J**	**537 J**	5.5 UJ	5.5 UJ
117-MW-A089	11/3/2021	**1420**	**1370**	1,600	1,500
	12/21/2021	**287**	**256**	280	270
117-MW-A099	11/2/2021	23.7 J	10 UJ	5.5 UJ	5.5 UJ
117-MW-I4S	11/2/2021	**251000 J**	**249000 J**	308000 J	400,000
153-MW-A13	11/3/2021	22.7	10 U	5.5 UJ	5.5 UJ
153-MW-A15	11/3/2021	15.4	18.5	5.5 UJ	5.5 UJ
	11/3/2021-DP	15.8	19.1	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
NA - not analyzed
ug/l - mircorgrams per liter
DP - field duplicate

FIGURES

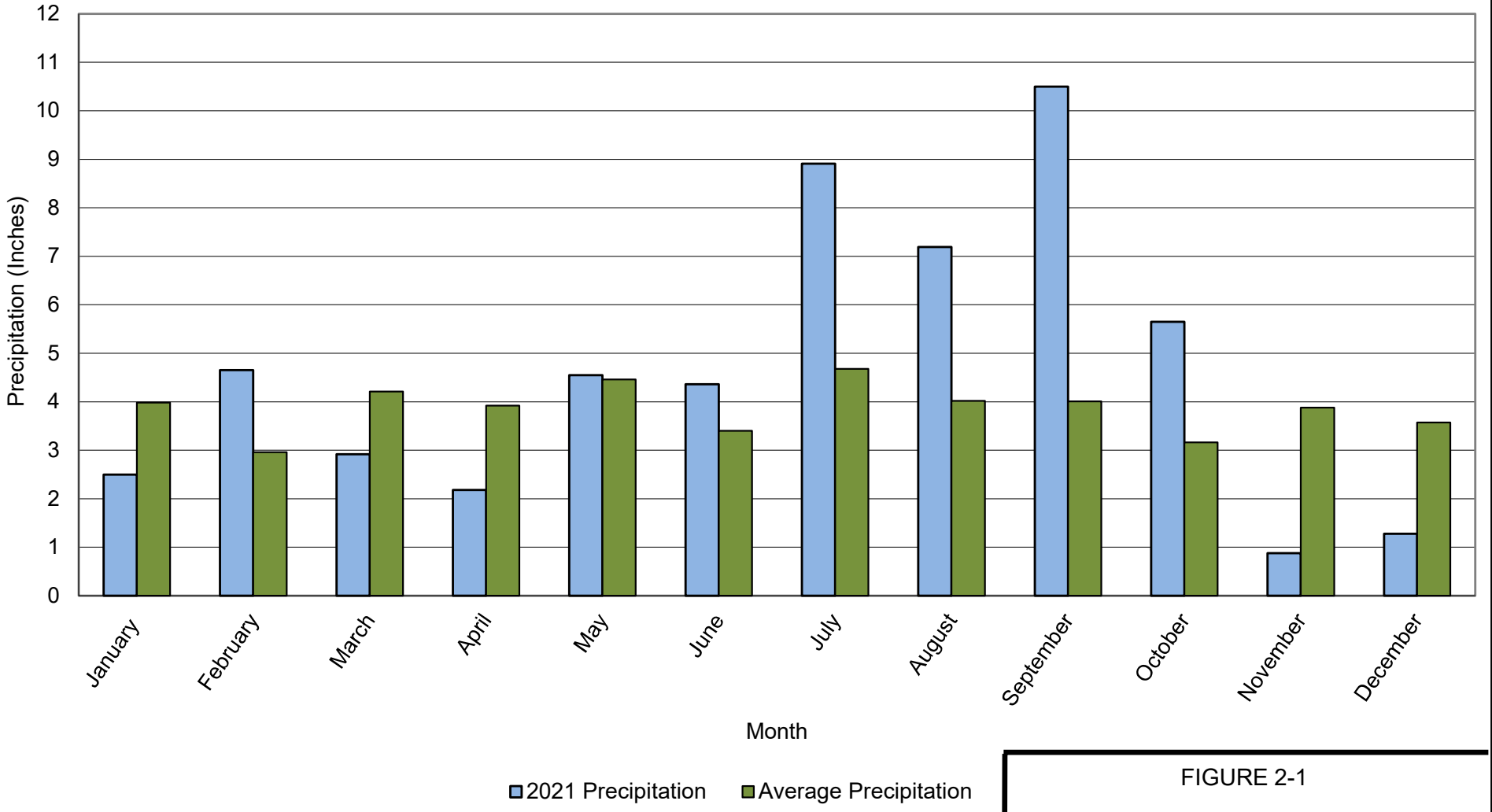


FIGURE 2-1

2021 Monthly Precipitation

Integrated Annual Groundwater Performance Report
2021

cornerstone environmental

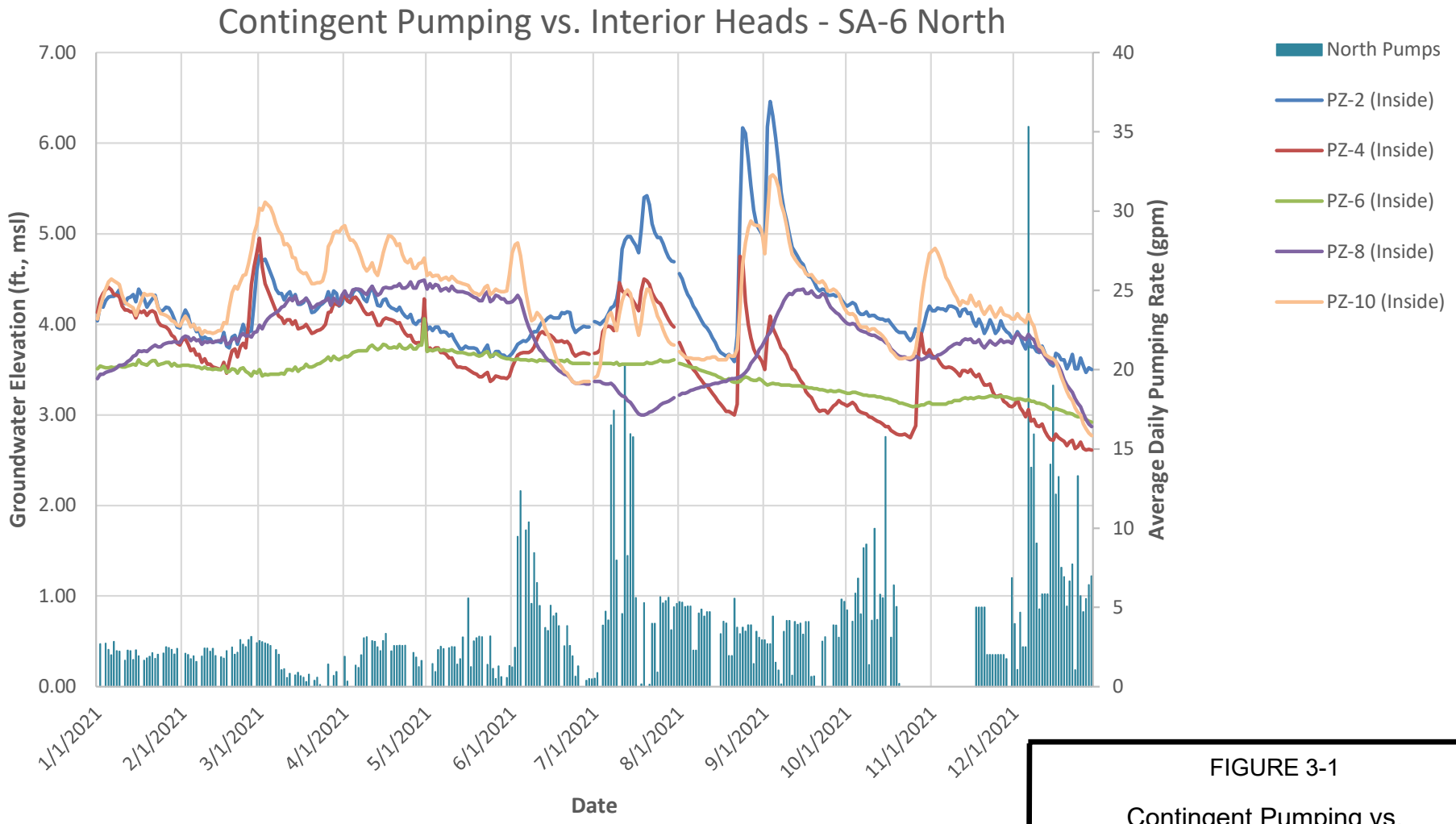
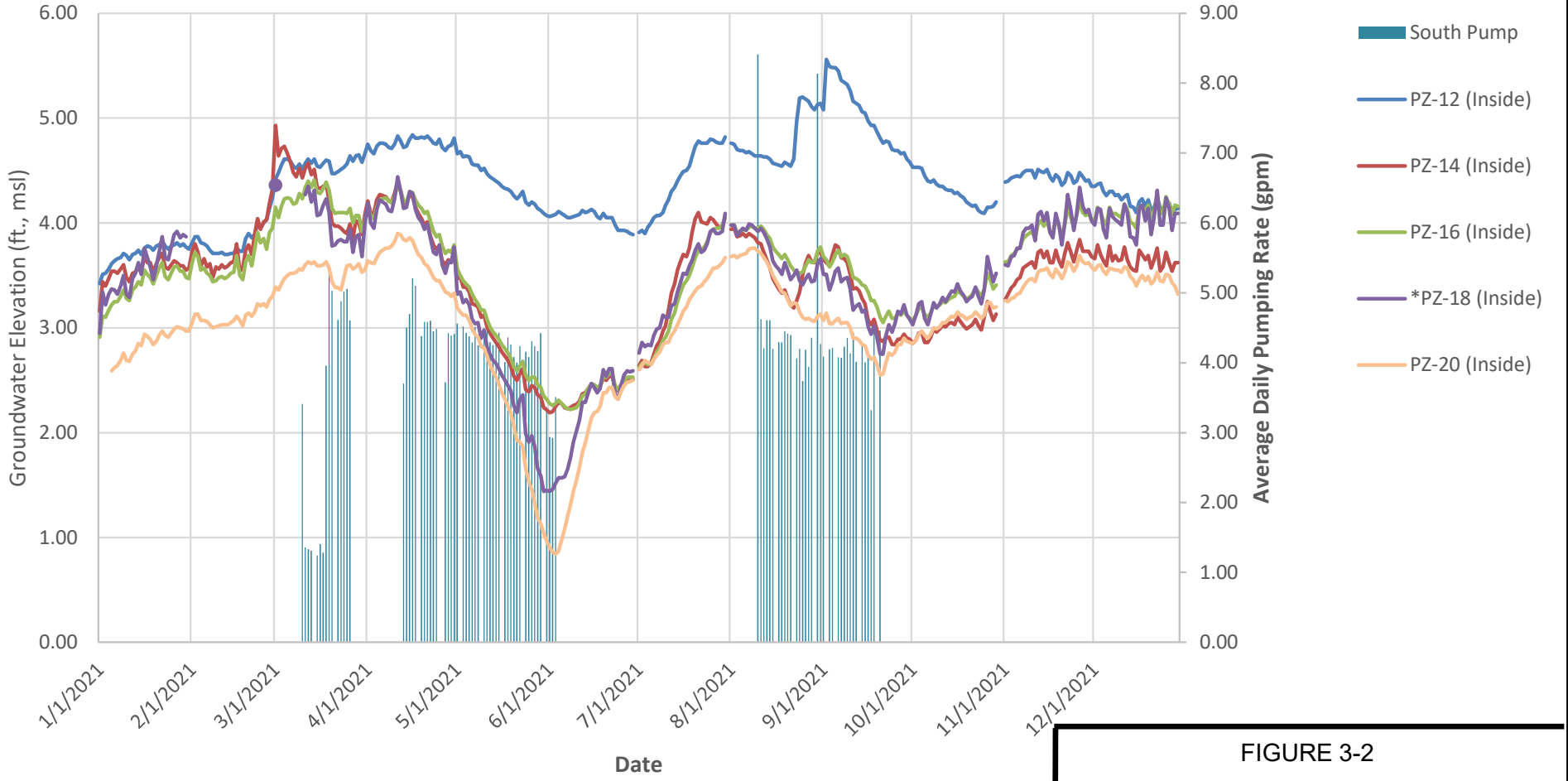


FIGURE 3-1

Contingent Pumping vs.
Interior Heads – SA6 North

Integrated Annual Groundwater Performance Report
2021

cornerstone
environmental



Note:
*PZ-18 datalogger malfunctioned in February. The logger was removed and replaced on March 10, 2021. The manual water level measurement from March 1, 2021 was 4.36 ft msl and is shown on graph.

FIGURE 3-2

Contingent Pumping vs.
Interior Heads - SA6 South

Integrated Annual Groundwater Performance Report
2021

cornerstone
environmental

N

HACKENSACK

RIVER

HACKENSACK

087-PZ-10
087-PZ-09
087-PZ-07
087-PZ-08
115-W6-SO
115-PZ-503
115-W1-SO
087-PZ-05
087-PZ-06
124-PZ-19R
124-PZ-20R
115-PZ-500
115-W3-SO
087-PZ-03
087-PZ-04
115-E5-SO
124-PZ-18
124-PZ-17
115-W5-SO
115-PZ-502
115-E4-SO
087-PZ-02
087-PZ-01
124-PZ-16
124-PZ-15
115-E3-SO
115-PZ-501
115-E1A-SO
124-PZ-14
124-PZ-13
124-PZ-12
124-PZ-11
124-MW-10
124-MW-11
153-MW-A13
153-MW-A15
117-MW-A14
117-MW-A89
117-MW-A85
117-MW-A05
117-MW-A99
117-MW-I4S
154-MW-A5A
154-MW-A06
079-MW-01
079-MW-A2
079-MW-C6
184-MW-04
184-MW-105
184-MW-101
184-MW-05
184-MW-106
184-MW-102
184-MW-103
184-MW-107
184-MW-104
184-MW-108
184-MW-06
090-PZ-05
090-PZ-06
SUMP A
SUMP B

SA-6 North
SA-7
SA-6 South
BARRIER WALL
Site 079
Site 184
Site 090
Site 117
Site 153

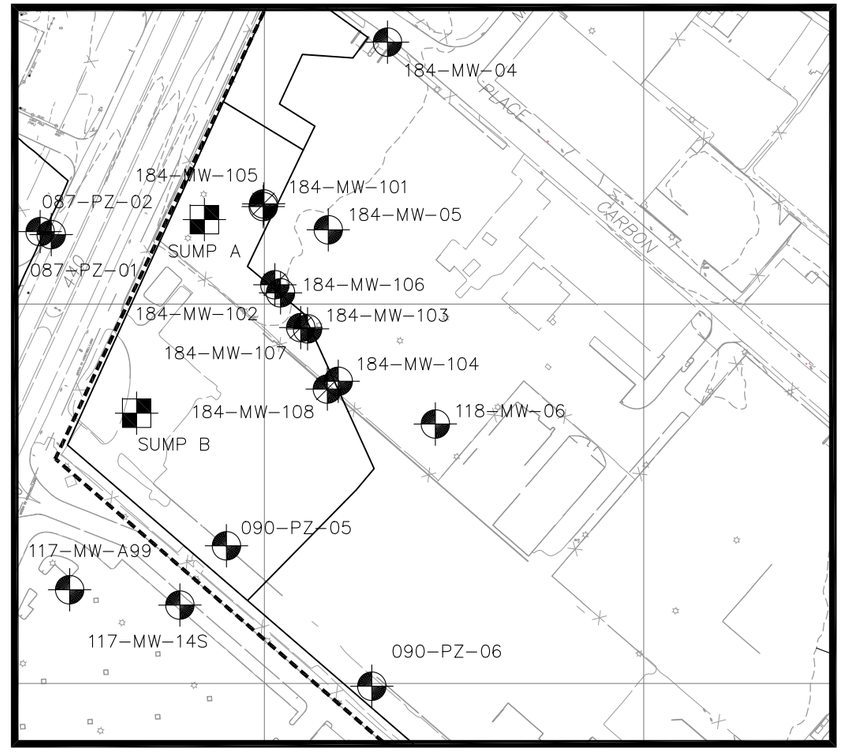
SEE ENLARGED AREA MAP

NOTE: 184-MW-106 WAS REPLACED BY 184-MW-106R (NOT SHOWN) IN AUGUST 2021.

LEGEND:

154-MW-E08 SHALLOW MONITORING WELL

0 400 800
SCALE IN FEET



ENLARGED AREA OF SITE

0 200 400
SCALE IN FEET

cornerstone
A TETRA TECH COMPANY

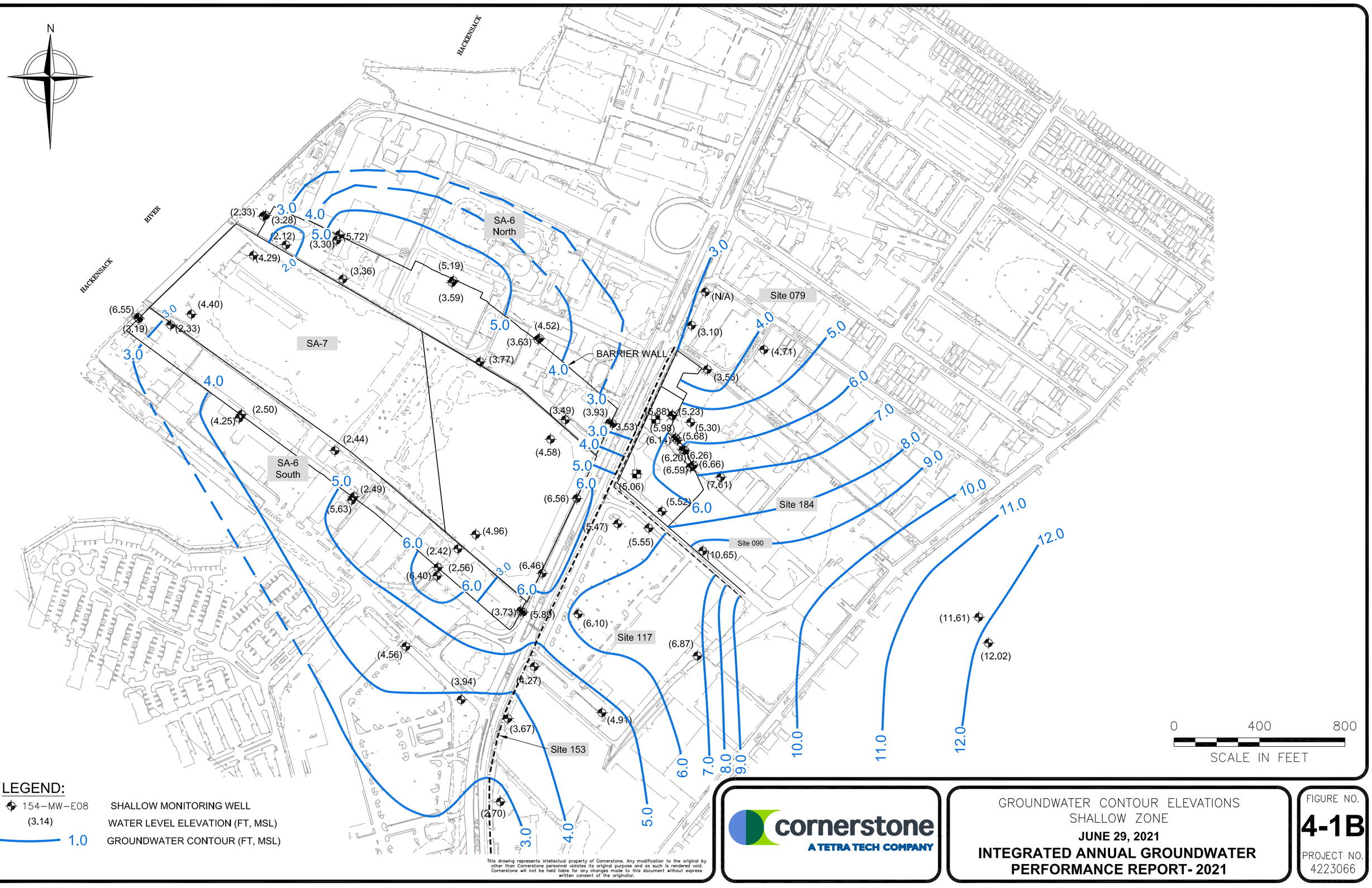
WELL LOCATION PLAN
SHALLOW ZONE
JUNE 29, 2021

INTEGRATED ANNUAL GROUNDWATER PERFORMANCE REPORT- 2021

FIGURE NO.
4-1A

PROJECT NO.
4223066

File: \\TTS625FS2\ceg2\PROJECTS\HONEYWELL\130109 - SA7_PROJECT DRAWINGS\2021-Annual Figures\H15WSF-S-SITE-4_1A.dwg Layout: FIGURE 4-1A User: kristen.thordahl Feb 17, 2022 - 9:12am



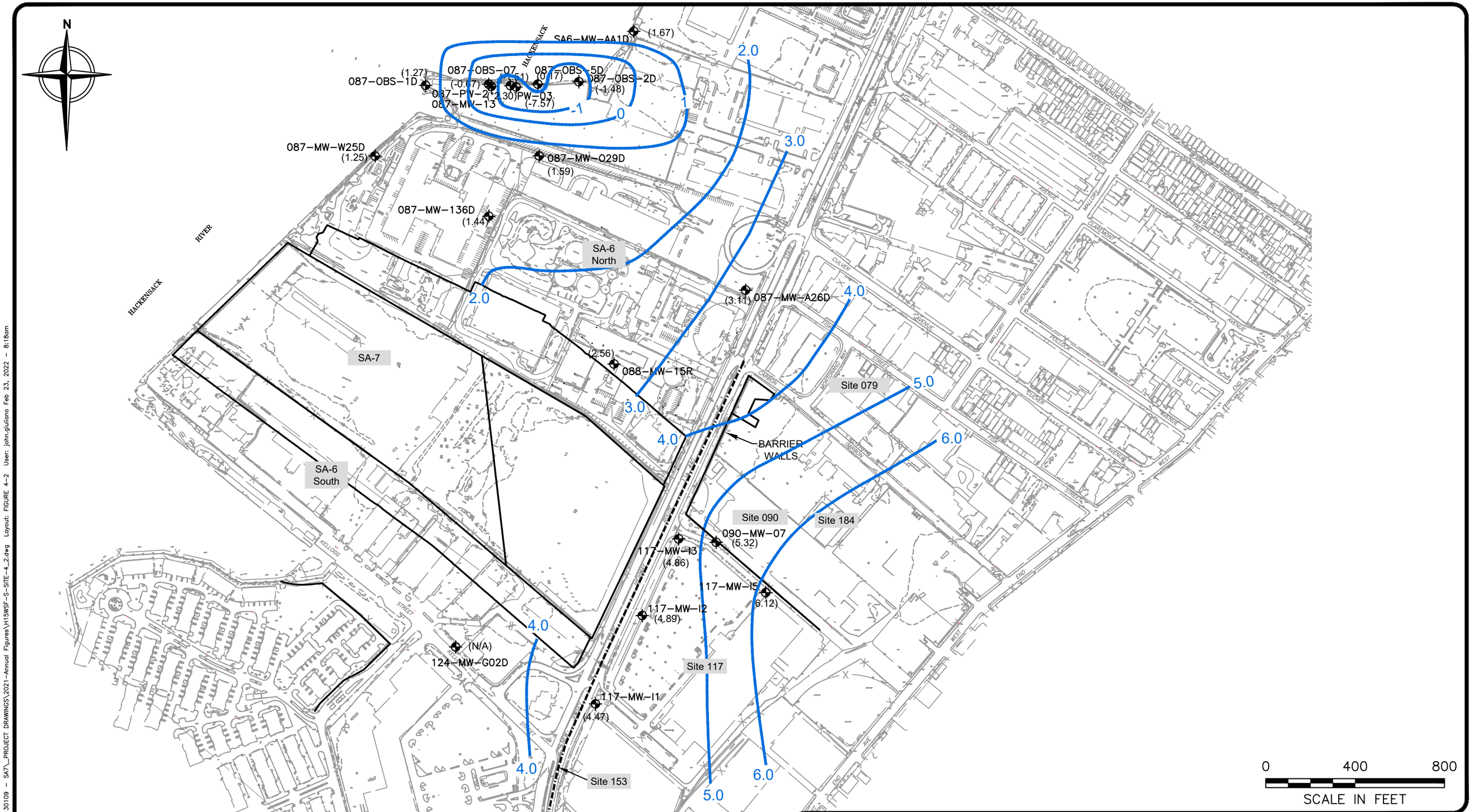
LEGEND:

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

cornerstone
A TETRA TECH COMPANY

GROUNDWATER CONTOUR ELEVATIONS
SHALLOW ZONE
JUNE 29, 2021
INTEGRATED ANNUAL GROUNDWATER PERFORMANCE REPORT- 2021

FIGURE NO.
4-1B
PROJECT NO.
4223066



LEGEND:

087–MW–029D	INTERMEDIATE ZONE MONITORING WELL
(3.45)	WATER LEVEL ELEVATION (FT, MSL)
1.0	GROUNDWATER CONTOUR (FT, MSL)
*	ELEVATION NOT USED IN CONTOURING

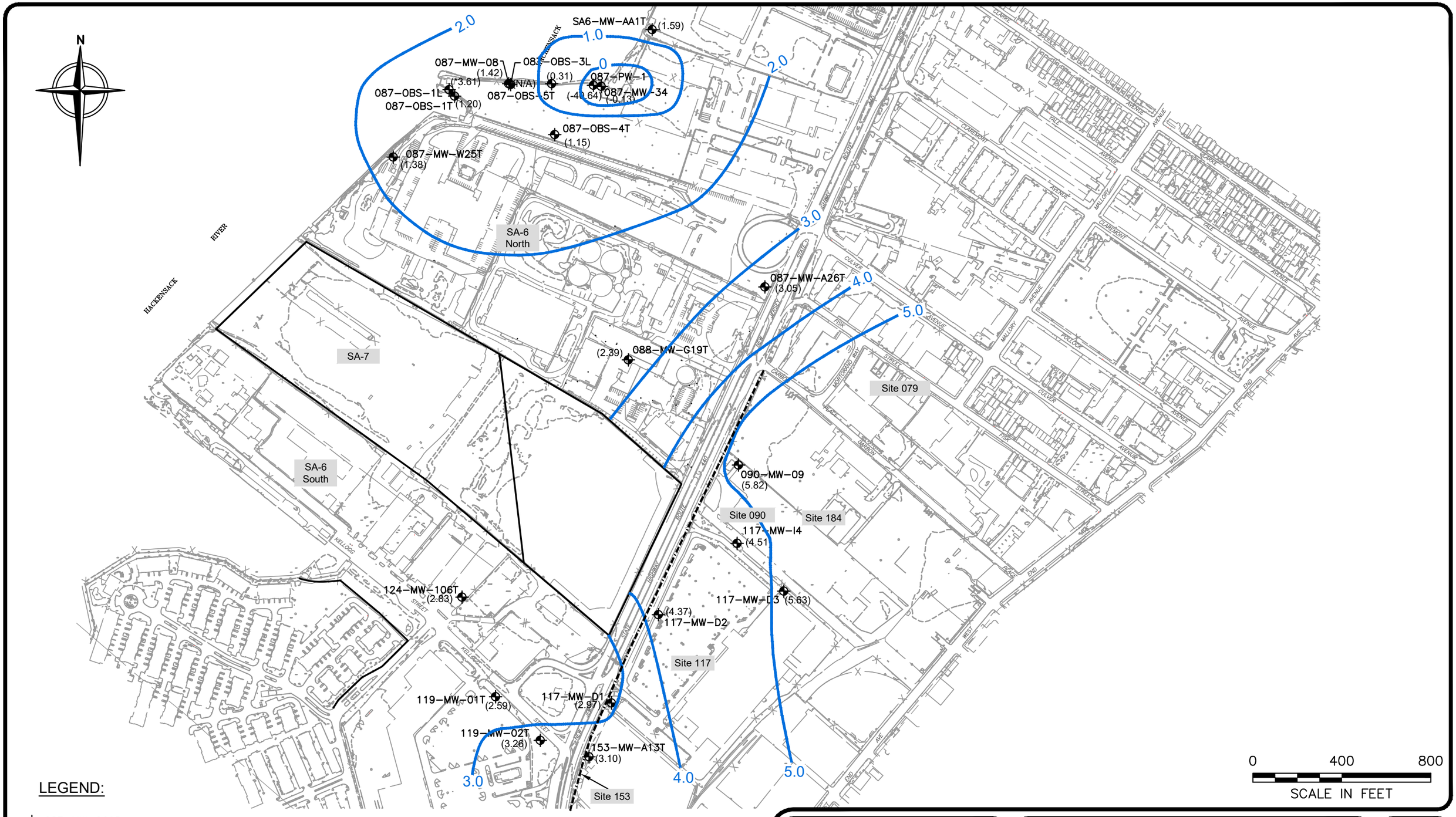
FIGURE REVISED JANUARY 2020

cornerstone
A TETRA TECH COMPANY

GROUNDWATER ELEVATION CONTOURS
INTERMEDIATE ZONE
JUNE 29, 2021
INTEGRATED ANNUAL GROUNDWATER PERFORMANCE REPORT- 2021

FIGURE NO.
4-2
PROJECT NO.
4223066

File: X:\PROJECTS\HONEYWELL\130109 - SA7_PROJECT DRAWINGS\2021-Annual Figures\H15WSF-S-SITE-4_2.dwg Layout: FIGURE 4-2 User: john.giuliano Feb 23, 2022 - 8:18am



LEGEND:

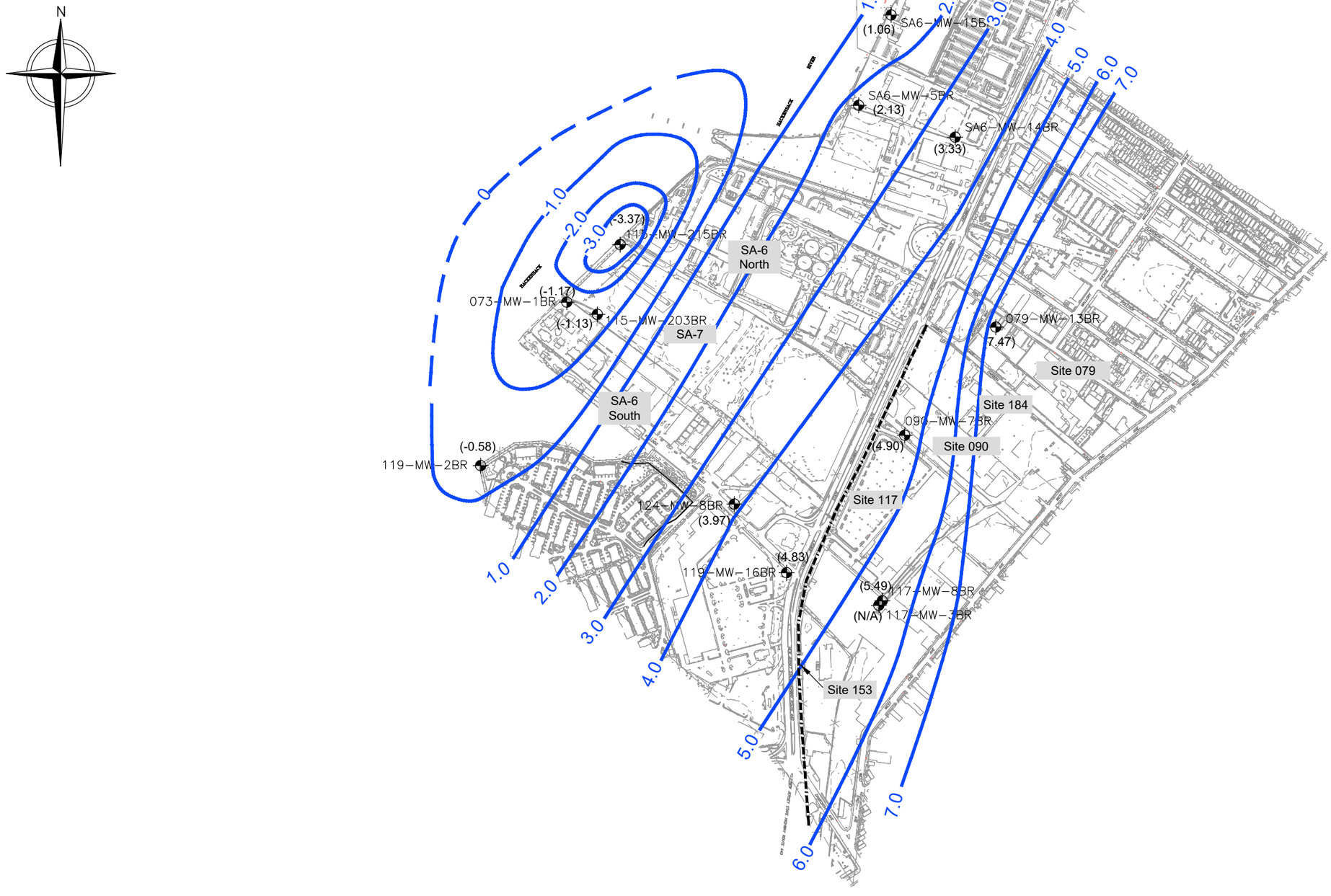
087-MW-029D	DEEP ZONE MONITORING WELL
(2.25)	WATER LEVEL ELEVATION (FT, MSL)
1.0	GROUNDWATER CONTOUR (FT, MSL)
*	VALUE NOT USED IN CONTOURING

cornerstone
A TETRA TECH COMPANY

GROUNDWATER ELEVATION CONTOURS
DEEP ZONE
JUNE 29, 2021
INTEGRATED ANNUAL GROUNDWATER PERFORMANCE REPORT- 2021

FIGURE NO.
4-3
PROJECT NO.
4223066

File: X:\PROJECTS\HONEYWELL\130109 - SA7_PROJECT DRAWINGS\2021-Annual Figures\H15WSF-S-SITE-4_3.dwg Layout: FIGURE 4-3 User: john.giuliano Feb 23, 2022 - 8:19am



LEGEND:

119-MW-11BR	BEDROCK ZONE MONITORING WELL
(5.04)	WATER LEVEL ELEVATION (FT, MSL)
1.0	GROUNDWATER CONTOUR (FT, MSL)
*	VALUE NOT USED IN CONTOURING

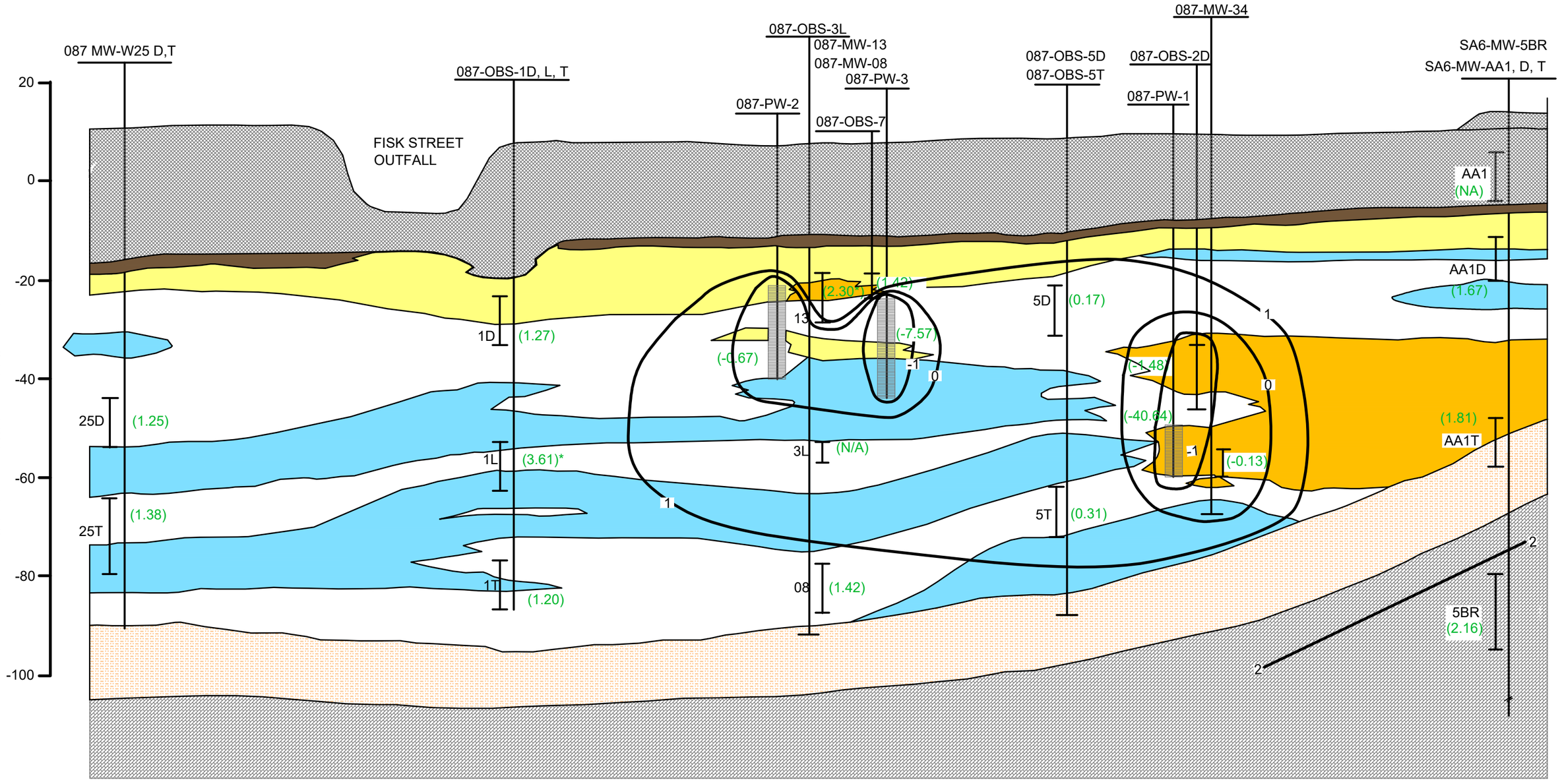
0 750 1500

SCALE IN FEET

cornerstone
A TETRA TECH COMPANY

GROUNDWATER ELEVATION CONTOURS
BEDROCK ZONE
JUNE 29, 2021
INTEGRATED ANNUAL GROUNDWATER PERFORMANCE REPORT- 2021

FIGURE NO.
4-4
PROJECT NO.
4223066



LEGEND:

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

087-MW-W25T — WELL DESIGNATION

GROUND SURFACE

25T — SCREENED INTERVAL

* 087-OBS-1L AND 087-OBS-3L NOT USED IN CONTOURING.

0 100 200

SCALE IN FEET

cornerstone
A TETRA TECH COMPANY

GROUNDWATER ELEVATIONS (FT, MSL)
IN CROSS-SECTION
JUNE 29, 2021
INTEGRATED ANNUAL GROUNDWATER PERFORMANCE REPORT- 2021

FIGURE NO.
4-5
PROJECT NO.
4223066

079–MW–A02
(3.55)

N

4.0

5.0

6.0

7.0

8.0

9.0

(N/A) 184–MW–04

4.0

5.0

(6.10) 184–MW–05

6.0

184–MW–101

184–MW–105 (6.68)
(5.96)

SUMP A
(N/A)

(6.40) 184–MW–106

184–MW–103 (6.89)

184–MW–102 (6.62)

184–MW–107 (6.71)

184–MW–104 (7.34)

184–MW–06
(8.23)

(5.59)
090–MW–09

184–MW–108 (7.22)

8.0

N.J.S.H. ROUTE 440

5.0

SUMP B
(3.67)

5.0

090–PZ–05 (7.78)

(6.05) 090–MW–07

090–PZ–06 (9.39)

6.0

7.0

9.0

(5.89) 117–MW–I4S

117–MW–I5 (6.40)

LEGEND

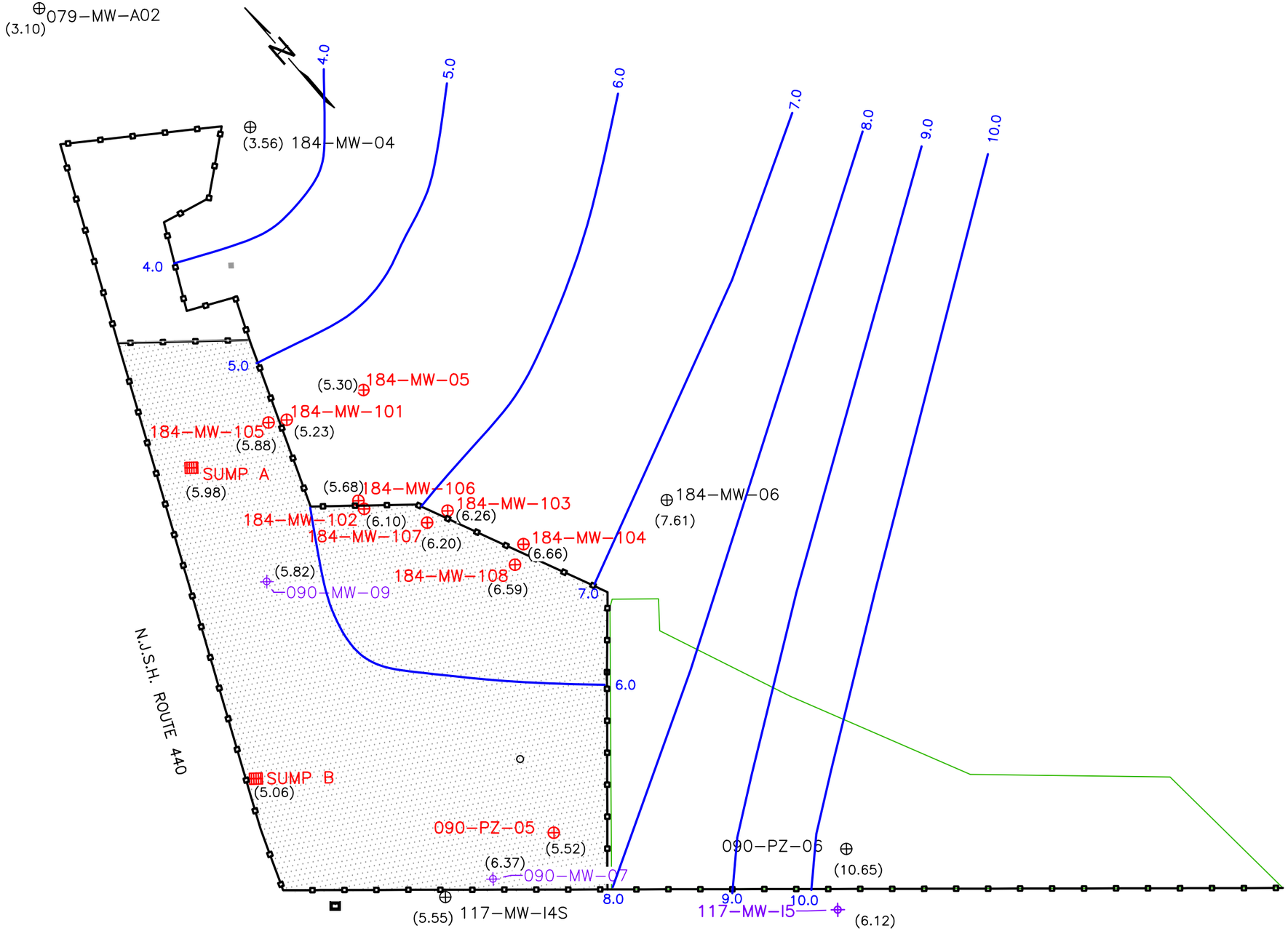
- MONITORING WELL
- PIEZOMETER
- SUMP
- SHEET PILE WALL
- CAP AREA
- SHALLOW MONITORING LOCATION WITH DATA LOGGER INSTALLED
- INDICATES INTERMEDIATE OR DEEP ZONE MONITORING WELL
- GROUNDWATER ELEVATION CONTOUR
- TCE WELLS AS OF MAY 2019 ARE NO LONGER MEASURED

0 100 200
SCALE IN FEET

cornerstone
A TETRA TECH COMPANY

GROUNDWATER ELEVATION CONTOURS (ft.,msl)
MARCH 29, 2021
STUDY AREA 5 - NJCU
INTEGRATED ANNUAL GROUNDWATER PERFORMANCE REPORT- 2021

FIGURE NO.
4-6
PROJECT NO.
4223066



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

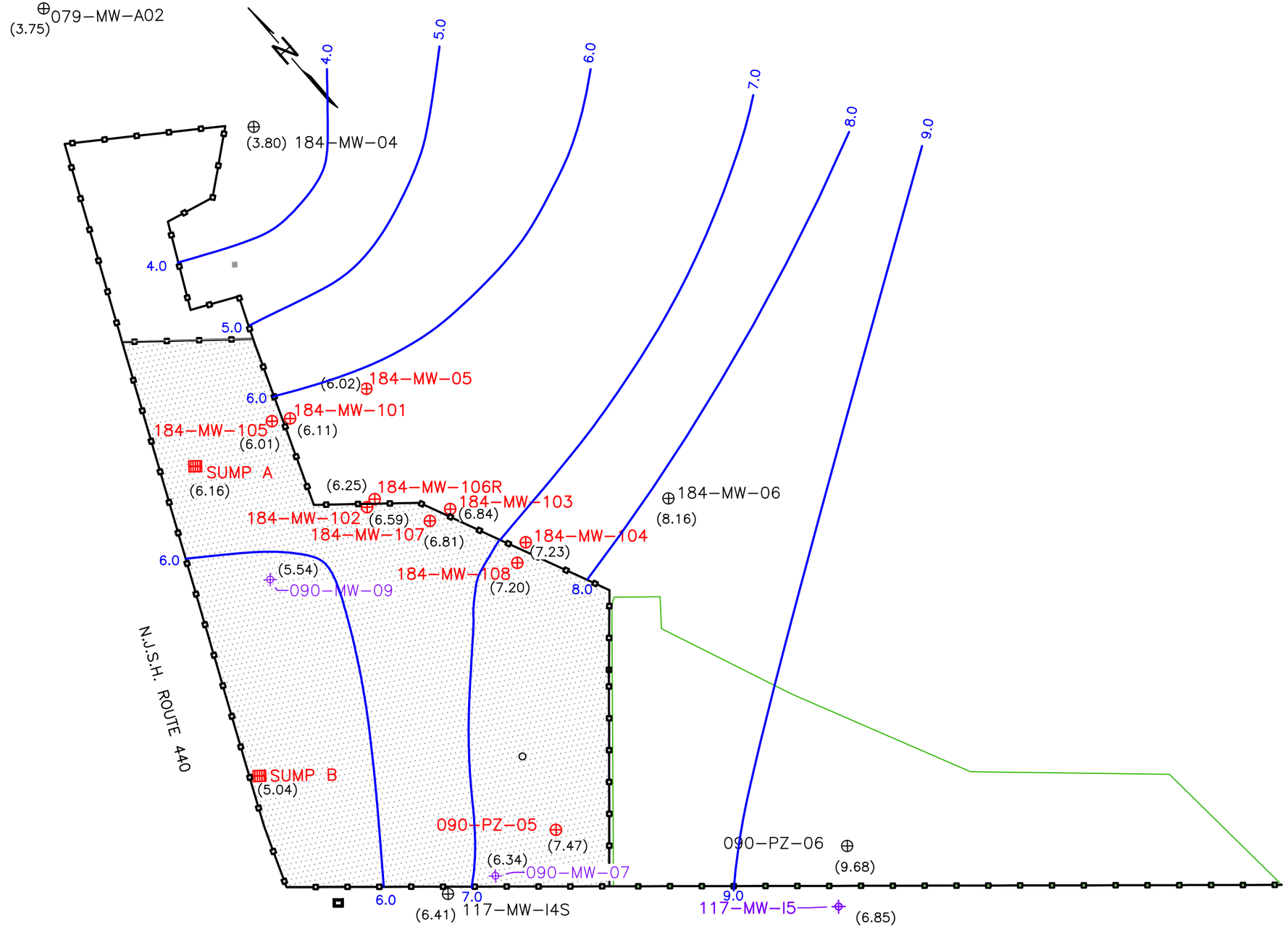
0 100 200

SCALE IN FEET

cornerstone
A TETRA TECH COMPANY

GROUNDWATER ELEVATION CONTOURS (ft.,msl)
JUNE 29, 2021
STUDY AREA 5 - NJCU
INTEGRATED ANNUAL GROUNDWATER PERFORMANCE REPORT- 2021

FIGURE NO.
4-7
PROJECT NO.
4223066



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

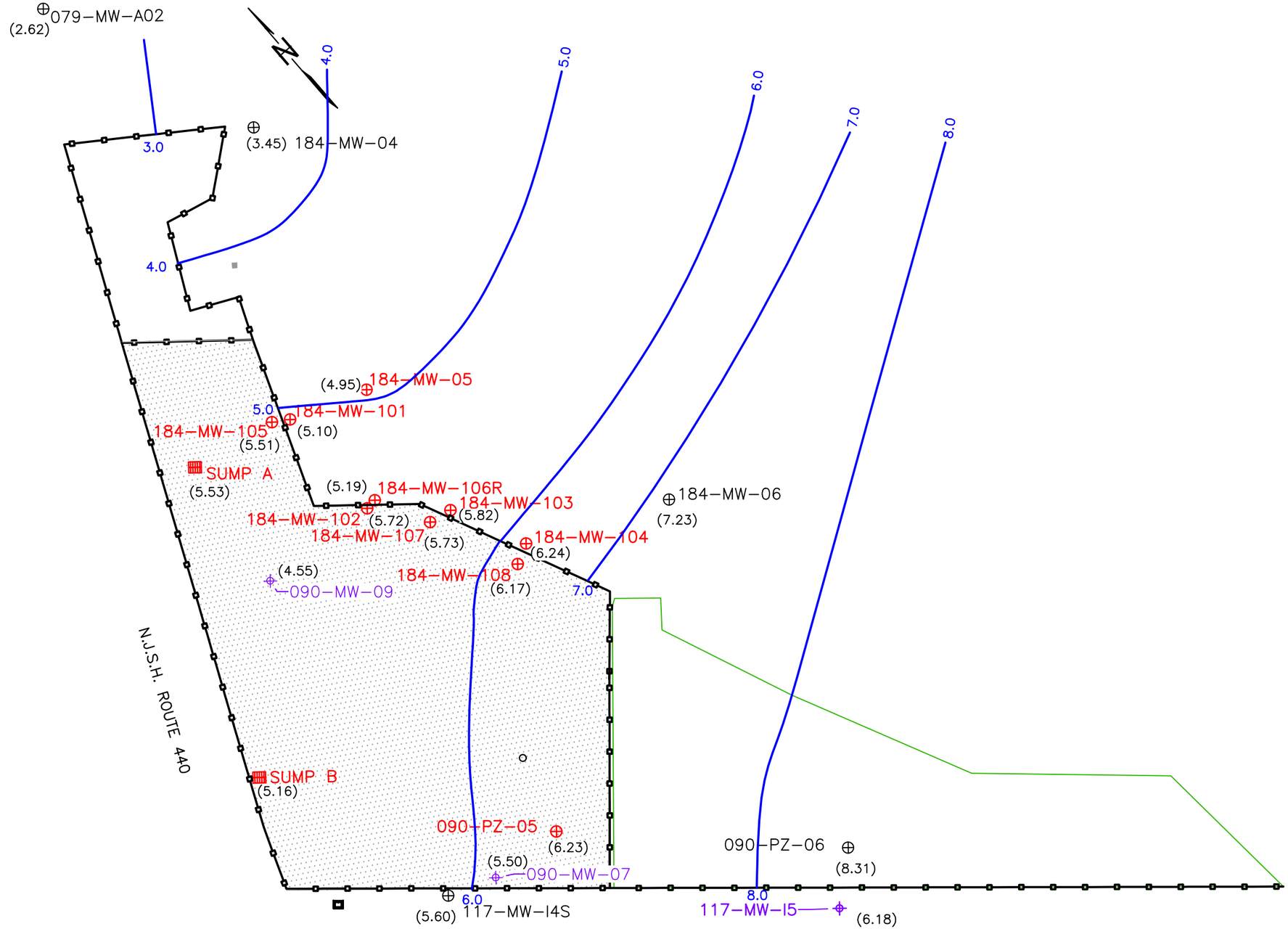
0 100 200

SCALE IN FEET

cornerstone
A TETRA TECH COMPANY

GROUNDWATER ELEVATION CONTOURS (ft.,msl)
SEPTEMBER 29, 2021
STUDY AREA 5 - NJCU
INTEGRATED ANNUAL GROUNDWATER PERFORMANCE REPORT- 2021

FIGURE NO.
4-8
PROJECT NO.
4223066



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

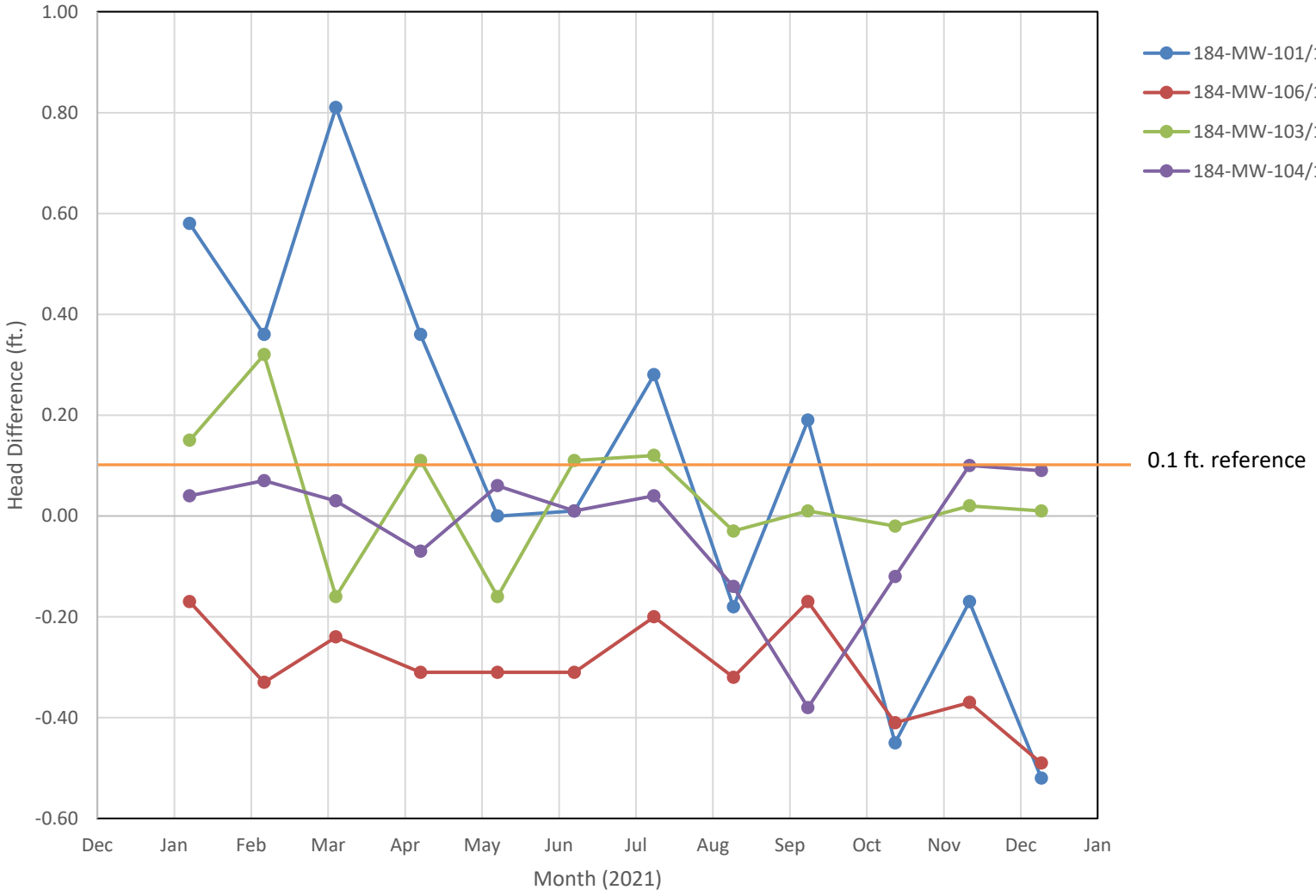
0 100 200

SCALE IN FEET

cornerstone
A TETRA TECH COMPANY

GROUNDWATER ELEVATION CONTOURS (ft.,msl)
DECEMBER 28, 2021
STUDY AREA 5 - NJCU
INTEGRATED ANNUAL GROUNDWATER PERFORMANCE REPORT- 2021

FIGURE NO.
4-9
PROJECT NO.
4223066



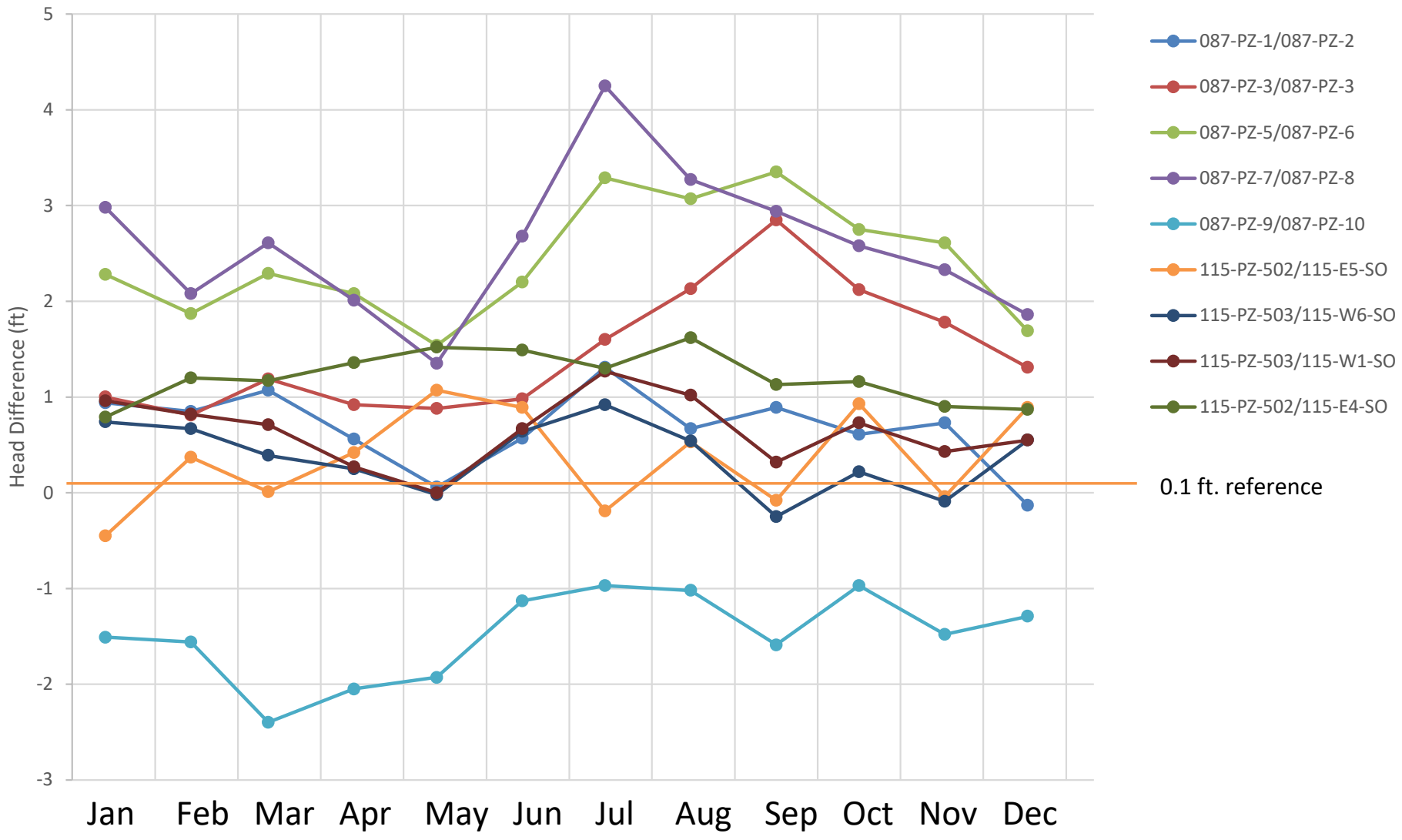
Note:
Positive head difference = inward gradient
Negative head difference = outward gradient

cornerstone
A TETRA TECH COMPANY

Integrated Annual Groundwater Performance Report 2021

Monthly Average Head Differences Across NJCU Barrier Wall

Figure 4-10



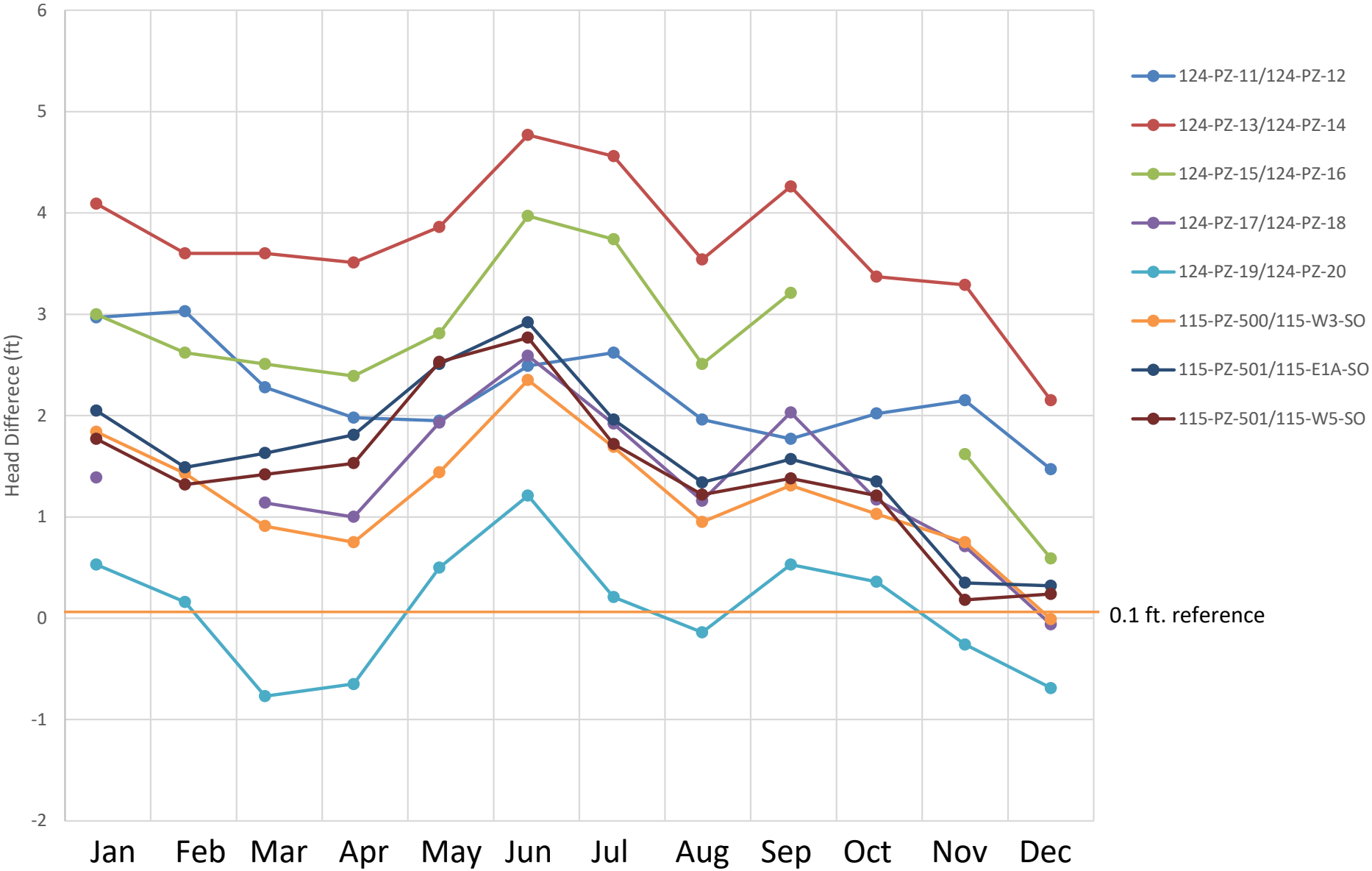
Note:
Positive head difference = inward gradient
Negative head difference = outward gradient

cornerstone
A TETRA TECH COMPANY

Integrated Annual Groundwater Performance Report 2021

Monthly Average Head Differences Across SA-6 North Barrier Wall

Figure 4-11



Note:
Positive head difference = inward gradient
Negative head difference = outward gradient
Data for PZ-15 unavailable for October due to construction activities.
Data for PZ-18 unavailable for February due to logger failure.

cornerstone
A TETRA TECH COMPANY

Integrated Annual Groundwater Performance Report 2021

Monthly Average Head Differences Across SA-6 South Barrier Wall

Figure 4-12

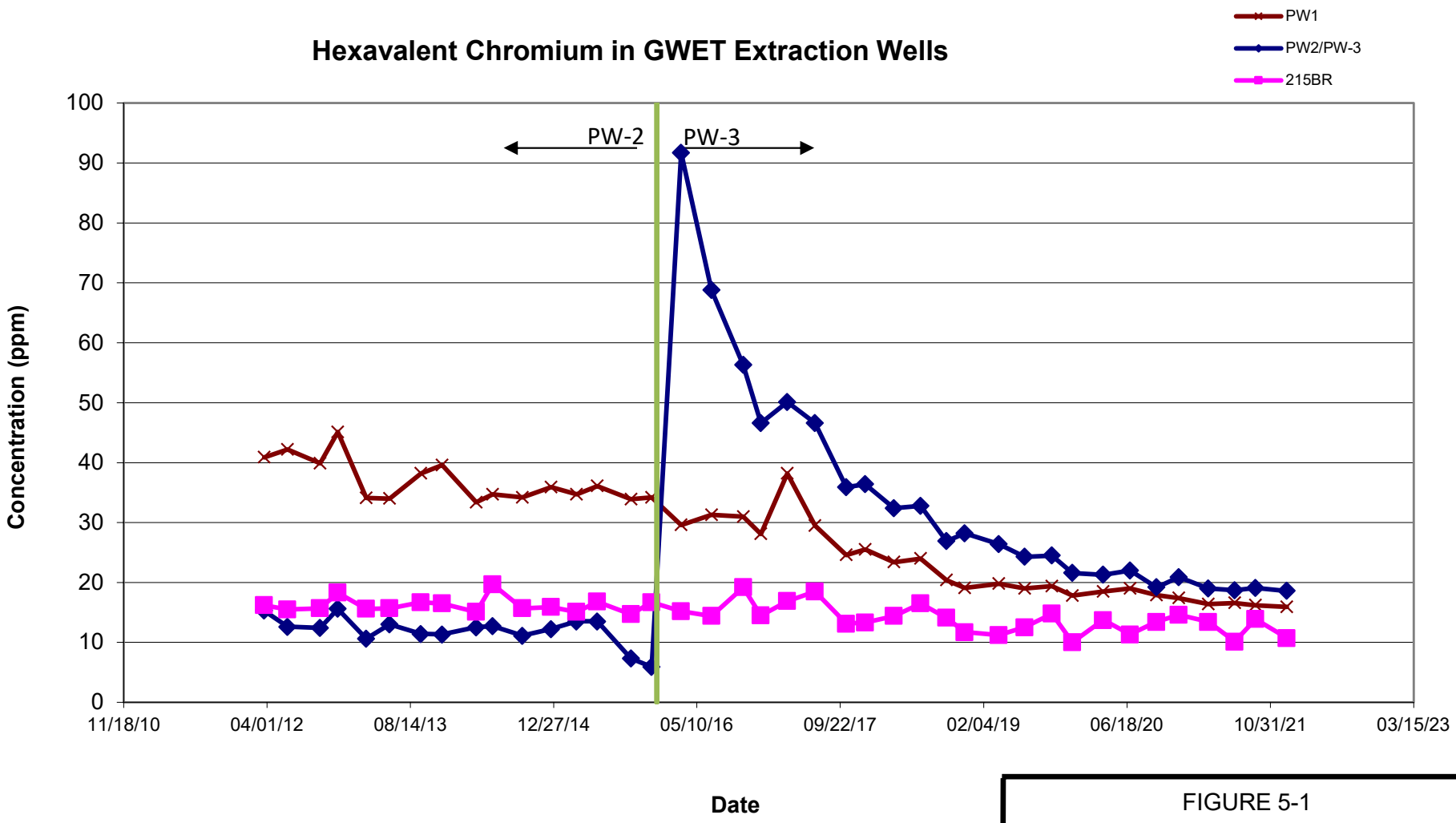


FIGURE 5-1

Hexavalent Chromium Trends in GWET Extraction Wells

Integrated Annual Groundwater Performance Report 2021

cornerstone environmental

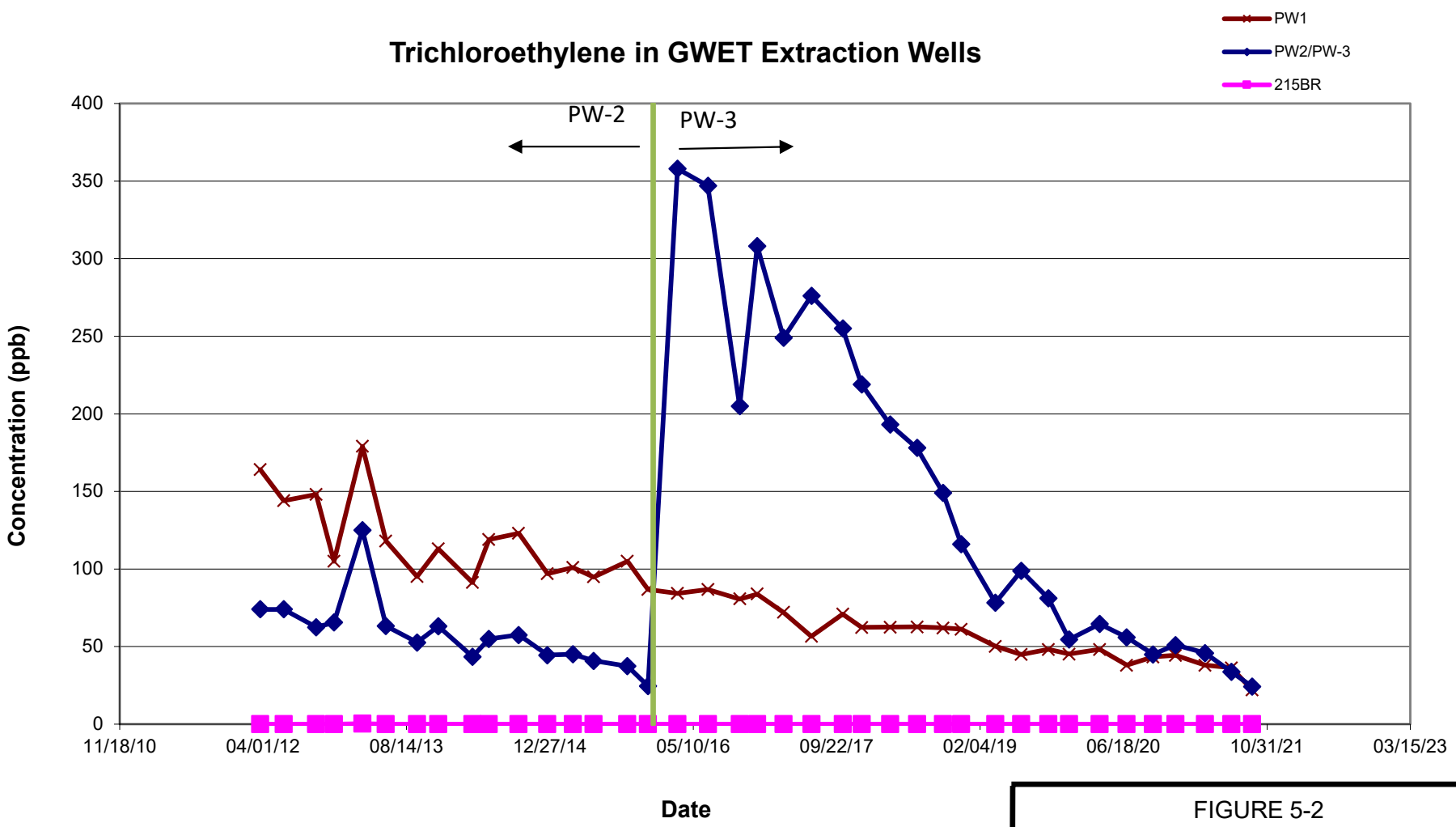


FIGURE 5-2

Trichloroethylene Trends in GWET Extraction Wells

Integrated Annual Groundwater Performance Report 2021

cornerstone environmental

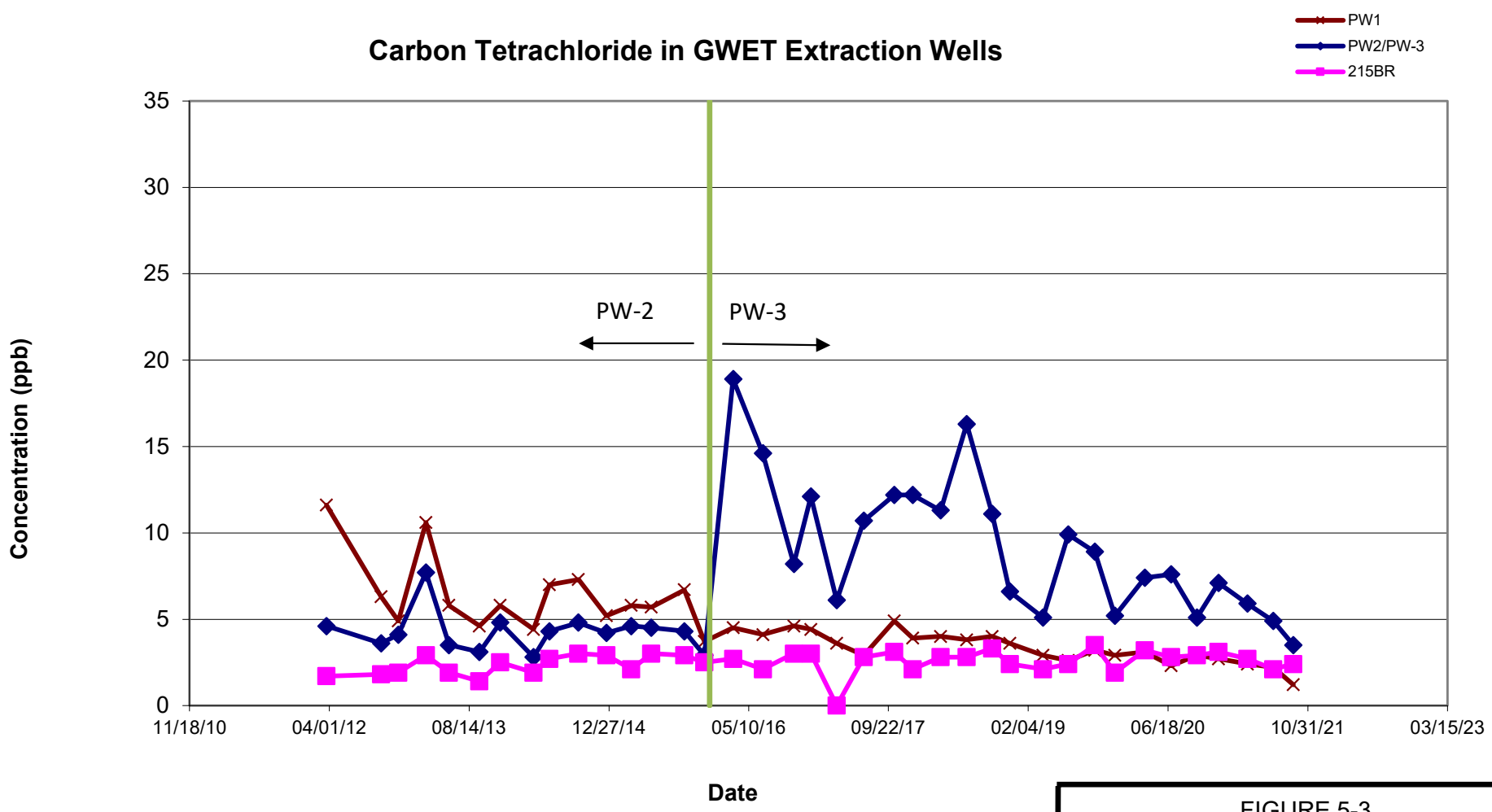
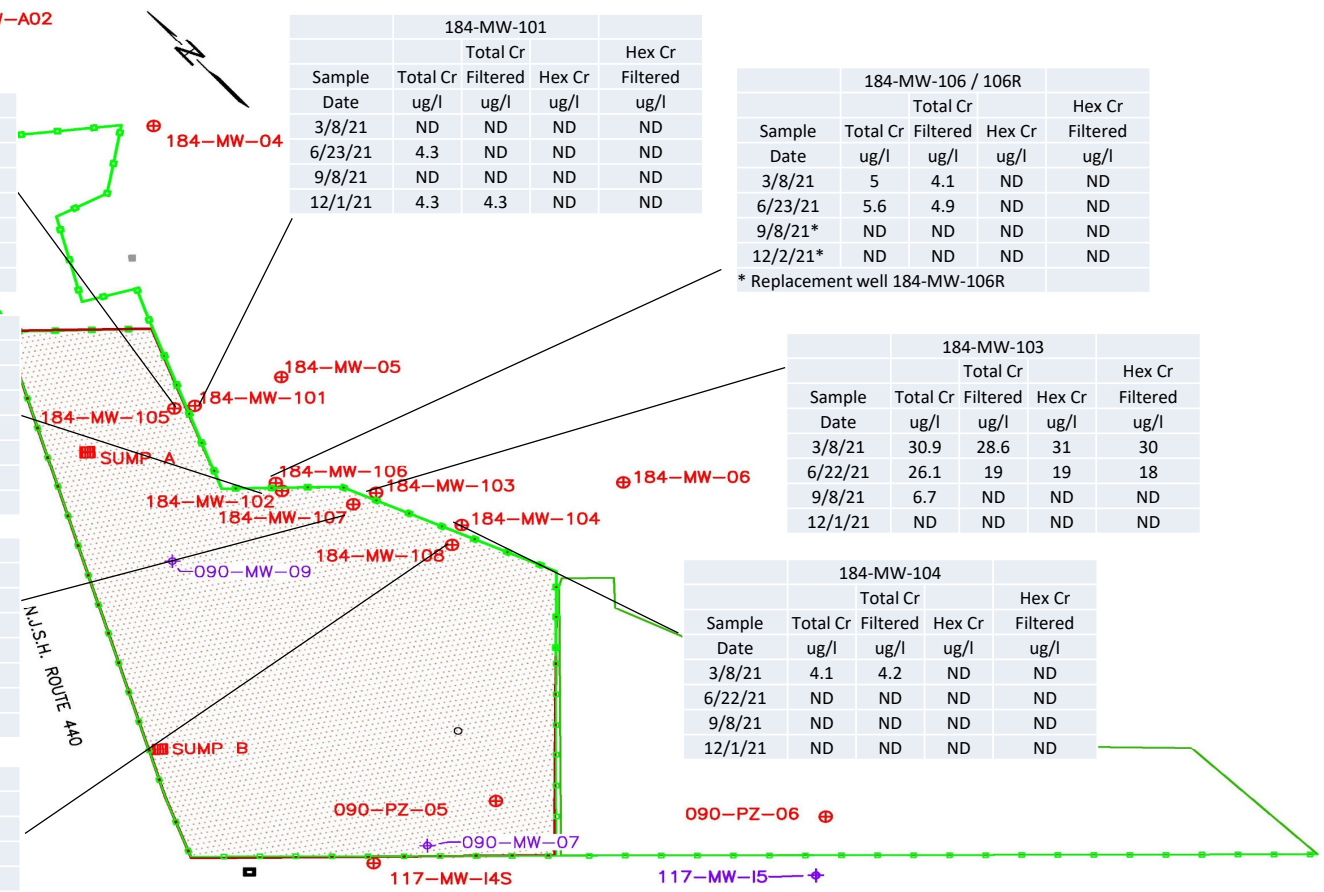


FIGURE 5-3

Carbon Tetrachloride Trends in GWET Extraction Wells

Integrated Annual Groundwater Performance Report 2021

cornerstone environmental



	184-MW-105			
		Total Cr		Hex Cr
Sample	Total Cr	Filtered	Hex Cr	Filtered
Date	ug/l	ug/l	ug/l	ug/l
3/8/21	ND	ND	ND	ND
6/23/21	ND	ND	ND	ND
9/8/21	ND	ND	ND	ND
12/1/21	ND	ND	ND	ND

	184-MW-101			
		Total Cr		Hex Cr
Sample	Total Cr	Filtered	Hex Cr	Filtered
Date	ug/l	ug/l	ug/l	ug/l
3/8/21	ND	ND	ND	ND
6/23/21	4.3	ND	ND	ND
9/8/21	ND	ND	ND	ND
12/1/21	4.3	4.3	ND	ND

	184-MW-106 / 106R			
		Total Cr		Hex Cr
Sample	Total Cr	Filtered	Hex Cr	Filtered
Date	ug/l	ug/l	ug/l	ug/l
3/8/21	5	4.1	ND	ND
6/23/21	5.6	4.9	ND	ND
9/8/21*	ND	ND	ND	ND
12/2/21*	ND	ND	ND	ND
* Replacement well 184-MW-106R				

	184-MW-102			
		Total Cr		Hex Cr
Sample	Total Cr	Filtered	Hex Cr	Filtered
Date	ug/l	ug/l	ug/l	ug/l
3/9/21	4	ND	ND	ND
6/22/21	8.7	5.6	ND	ND
9/8/21	5.7	5	ND	ND
12/2/21	5	4.3	ND	ND

	184-MW-103			
		Total Cr		Hex Cr
Sample	Total Cr	Filtered	Hex Cr	Filtered
Date	ug/l	ug/l	ug/l	ug/l
3/8/21	30.9	28.6	31	30
6/22/21	26.1	19	19	18
9/8/21	6.7	ND	ND	ND
12/1/21	ND	ND	ND	ND

	184-MW-107			
		Total Cr		Hex Cr
Sample	Total Cr	Filtered	Hex Cr	Filtered
Date	ug/l	ug/l	ug/l	ug/l
3/8/21	656	21.1	15	22
6/23/21	ND	ND	ND	ND
9/7/21	18.9	ND	ND	ND
12/1/21	ND	ND	ND	ND

	184-MW-104			
		Total Cr		Hex Cr
Sample	Total Cr	Filtered	Hex Cr	Filtered
Date	ug/l	ug/l	ug/l	ug/l
3/8/21	4.1	4.2	ND	ND
6/22/21	ND	ND	ND	ND
9/8/21	ND	ND	ND	ND
12/1/21	ND	ND	ND	ND

	184-MW-108			
		Total Cr		Hex Cr
Sample	Total Cr	Filtered	Hex Cr	Filtered
Date	ug/l	ug/l	ug/l	ug/l
3/8/21	ND	ND	ND	ND
6/23/21	ND	ND	ND	ND
9/7/21	ND	ND	ND	ND
12/1/21	ND	ND	ND	ND

LEGEND

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

FIGURE 5-4

Groundwater Quality Monitoring Well Results 2021 - NJCU

Integrated Annual Groundwater Performance Report 2021

cornerstone environmental

153-MW-A13

Sample Date	Total Chromium ug/l		Total Chromium ug/l (Filtered)		Hexavalent Chromium ug/l		Hexavalent Chromium ug/l (Filtered)	
1/6/1999	**1830**	J	**207**	J	**1330**	J	**571**	J
7/20/1999	**459**		26		22.2		10	U
4/14/2003	**1050**		**892**		**1110**		**772**	
7/19/2006	**1090**		**133**		**1100**		53	
10/19/2010	**763**		17.2	J	19	J	10	UJ
9/26/2011	**666**		**345**		**530**	J	**230**	J
12/18/2018	65.6		8.0		22		5.5	U
11/21/2019	**1090**		10	U	5.5	UJ	46	J
11/21/2019*	NA		67.2		NA		10	J
11/21/2019DP	**1640**		10	U	5.5	UJ	32	J
11/21/2019DP*	NA		**520**		NA		39	
11/3/2021	22.7		10	U	5.5	UJ	5.5	UJ

153-MW-A15

Sample Date	Total Chromium ug/l		Total Chromium ug/l (Filtered)		Hexavalent Chromium ug/l		Hexavalent Chromium ug/l (Filtered)	
5/26/1999	20.2		13.6		10	U	10	U
7/14/1999	24.9		11.8		10	UJ	10	UJ
4/14/2003	14.1	J	5.0	J	10	U	10	U
7/18/2006	60.7		10	U	50	U	50	U
10/19/2010	**161**		10	UJ	10	UJ	10	UJ
9/23/2011	**71.4**		10.2		5.5	UJ	5.5	UJ
12/18/2018	**128**		**73.6**		5.5	U	5.5	U
11/21/2019	**85**		10	U	5.5	UJ	5.5	UJ
11/21/2019*	NA		12.7		NA		5.5	UJ
11/3/2021	15.4		18.5		5.5	UJ	5.5	UJ
11/3/2021-DP	15.8		19.1		5.5	UJ	5.5	UJ

153-MW-2

Sample Date	Total Chromium ug/l		Total Chromium ug/l (Filtered)		Hexavalent Chromium ug/l		Hexavalent Chromium ug/l (Filtered)	
10/19/2010	4.0	U	4.0	U	5.5	UJ	5.5	UJ
4/26/2011	4.0	U	4.0	U	5.5	UJ	5.5	UJ

117-MW-A89

Sample Date	Total Chromium ug/l		Total Chromium ug/l (Filtered)		Hexavalent Chromium ug/l		Hexavalent Chromium ug/l (Filtered)	
11/11/1997	**1870**		**1790**		**1750**		**1720**	
8/21/1998	**122**		52.6		11.6		10	U
4/15/1999	31.7	J	11.3	J	10	U	10	U
4/17/2003	**457**	J	**401**	J	**416**		**416**	
7/18/2006	**784**		**189**		**550**		**310**	
9/9/2009	**176**		10	U	10	UJ	10	UJ
10/12/2009	30.5		10	U	10	UJ	10	UJ
12/17/2018	**121**		**83.6**		63		51	
11/21/2019	66.2		55.7		32	J	25	J
11/21/2019*	NA		36.7		NA		5.5	U
11/21/2019DP	63.3		49.2		29	J	11	J
11/21/2019DP*	NA		43.9		NA		5.5	U
11/3/2021	**1420**		**1370**		**1,600**		**1,500**	
12/21/2021	**287**		**256**		**280**		**270**	

117-MW-A85

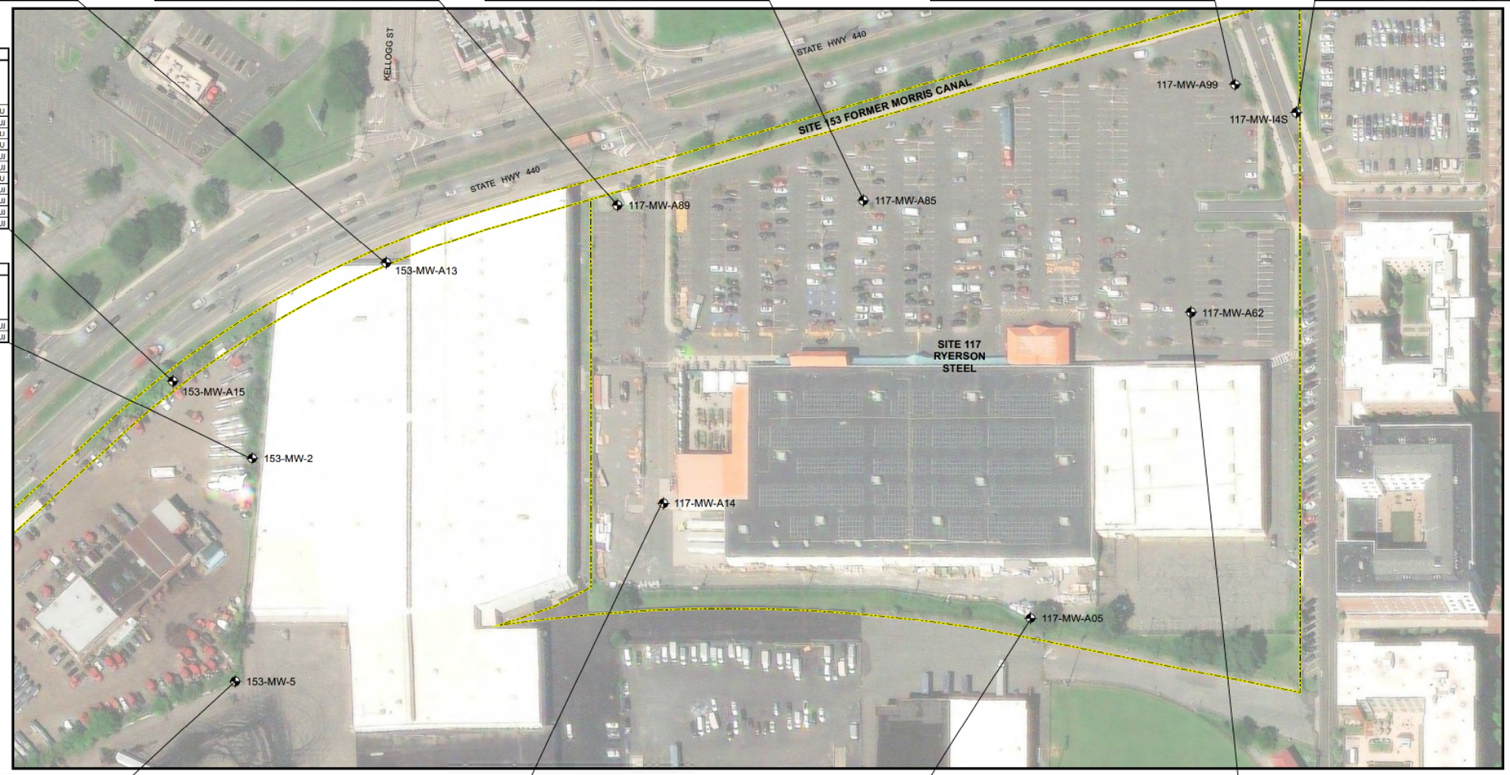
Sample Date	Total Chromium ug/l		Total Chromium ug/l (Filtered)		Hexavalent Chromium ug/l		Hexavalent Chromium ug/l (Filtered)	
11/11/1997	**8970**		**1130**		10	U	20	U
8/20/1998	**14100**		**8720**		10	U	10	U
4/14/1999	**119000**		**29000**		10	UJ	10	UJ
4/18/2003	**3380**	J	**2760**	J	10	U	10	U
7/18/2006	**3640**		**1020**		50	U	50	U
9/9/2009	**186**		**111**		10	UJ	10	UJ
10/12/2009	**89.9**		10	U	10	UJ	10	UJ
12/17/2018	**204**		215	U	5.5	U	5.5	U
11/2/2021	**697**	J	**537**	J	5.5	UJ	5.5	UJ

117-MW-A99

Sample Date	Total Chromium ug/l		Total Chromium ug/l (Filtered)		Hexavalent Chromium ug/l		Hexavalent Chromium ug/l (Filtered)	
11/11/1997	**504**		NA		10	U	NA	
8/19/1998	**130**		17.5		10	U	10	U
4/15/1999	**215**		3	B	10	U	10	U
4/17/2003	**78.4**		**82.4**		10	U	10	U
7/26/2006	**94.3**		10		50	U	50	U
9/9/2009	42.6		10	U	10	UJ	50	UJ
10/12/2009	10.9		10	U	10	UJ	10	UJ
12/17/2018	7.2		4.0	U	5.5	U	5.5	U
11/2/2021	23.7	J	10.0	UJ	5.5	UJ	5.5	UJ

117-MW-I4S

Sample Date	Total Chromium ug/l		Total Chromium ug/l (Filtered)		Hexavalent Chromium ug/l		Hexavalent Chromium ug/l (Filtered)	
10/12/2009	**334000**		**353000**		**328000**	J	**325000**	J
12/17/2018	**122000**		**118000**		**121000**		**171000**	J
11/2/2021	**251000**	J	**249000**	J	**308,000**	J	**400,000**	J



153-MW-5

Sample Date	Total Chromium ug/l		Total Chromium ug/l (Filtered)		Hexavalent Chromium ug/l		Hexavalent Chromium ug/l (Filtered)	
10/19/2010	4.0	U	4.0	U	5.5	UJ	5.5	UJ
4/26/2011	4.0	U	4.0	U	5.5	UJ	5.5	UJ
4/26/2011	4.0	U	4.0	U	5.5	UJ	5.5	UJ

117-MW-A14

Sample Date	Total Chromium ug/l		Total Chromium ug/l (Filtered)		Hexavalent Chromium ug/l		Hexavalent Chromium ug/l (Filtered)	
11/11/1997	**133**		NA		**131**		NA	
8/20/1998	**95.6**		**90**		**83.7**		**86.2**	
4/17/2003	NA		NA		10	U	10	U
7/19/2006	**90.9**		**86**		65		65	
9/9/2009	41.3		17.2		14	J	11	J
10/12/2009	37.6		34.3		28	J	27	J
10/19/2010	40.7		38.9		31	J	21	J
4/26/2011	43.7		43.6		40	J	44	J
12/17/2018	23.1		21.9		9.9		8.8	
11/2/2021	25.1	J	25.4	J	22	J	22	J
11/2/2021DP	30.1	J	24.6	J	22	J	20	J

117-MW-A05

Sample Date	Total Chromium ug/l		Total Chromium ug/l (Filtered)		Hexavalent Chromium ug/l		Hexavalent Chromium ug/l (Filtered)	
11/12/1997	**164**		NA		**151**		NA	
8/20/1998	36.2		39.5		32.4		29.9	
4/17/2003	NA		NA		10	U	10	U
9/9/2009	15.5		10	U	10	UJ	10	UJ
10/12/2009	10	U	10	U	10	UJ	10	UJ
12/17/2018	4.0	U	4.0	U	5.5	U	5.5	U
11/2/2021	10.0	UJ	10.0	UJ	5.5	UJ	5.5	UJ

117-MW-A62

Sample Date	Total Chromium ug/l		Total Chromium ug/l (Filtered)		Hexavalent Chromium ug/l		Hexavalent Chromium ug/l (Filtered)	
11/12/1997	**1810**		22.7		10	UJ	10	UJ
8/19/1998	**108**		9.5	J	10	U	10	U
4/17/2003	**401**	J	37.1	J	10	U	10	U
7/19/2006	**96.3**		10	U	50	UJ	50	UJ
9/9/2009	36.5		10	U	10	UJ	10	UJ
10/12/2009	**1570**		55.1		10	UJ	10	UJ

FIGURE 5-5

Groundwater Quality Monitoring Results - Site 117 and Site 153

Integrated Annual Groundwater Performance Report
2021

cornerstone environmental

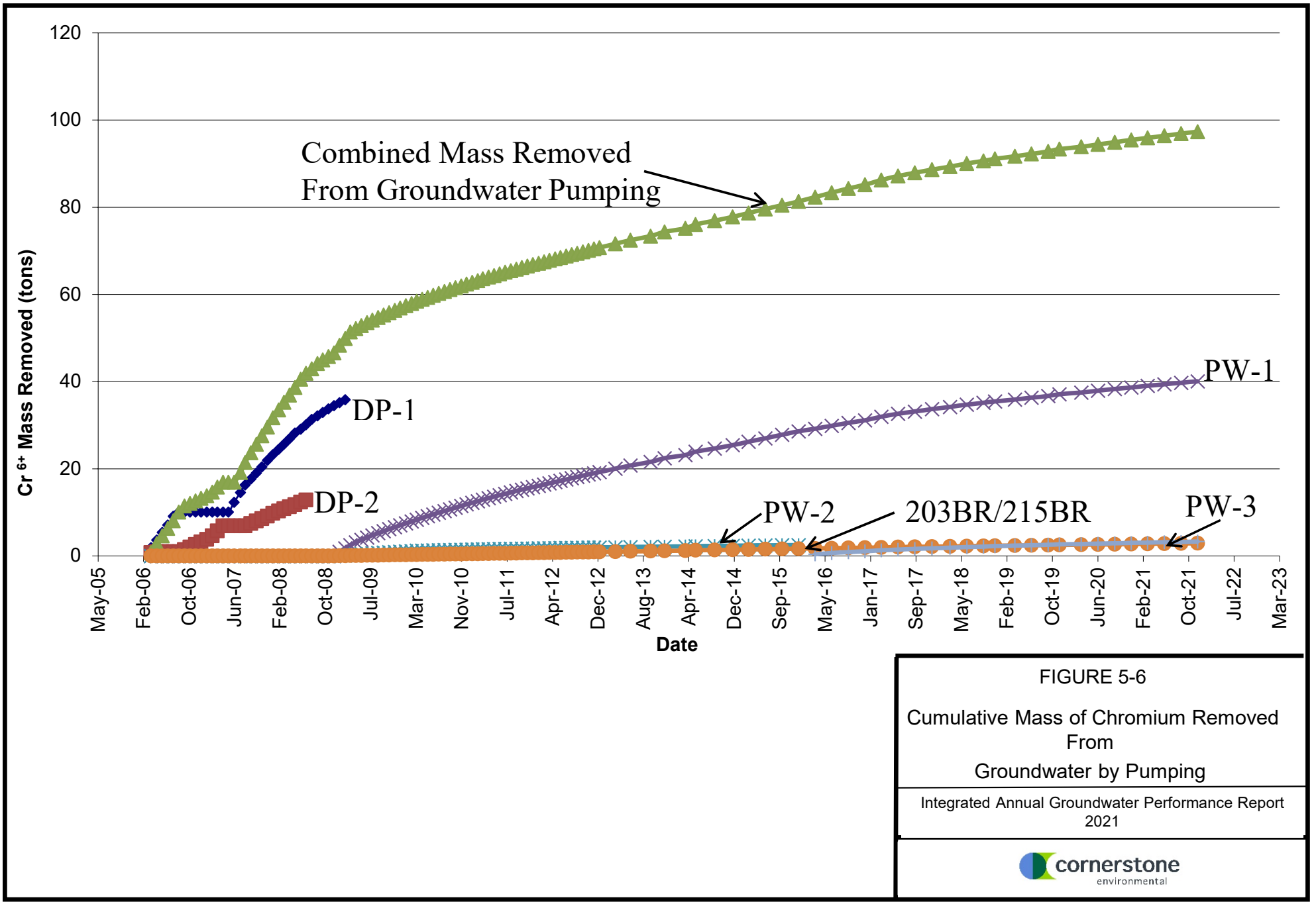


FIGURE 5-6

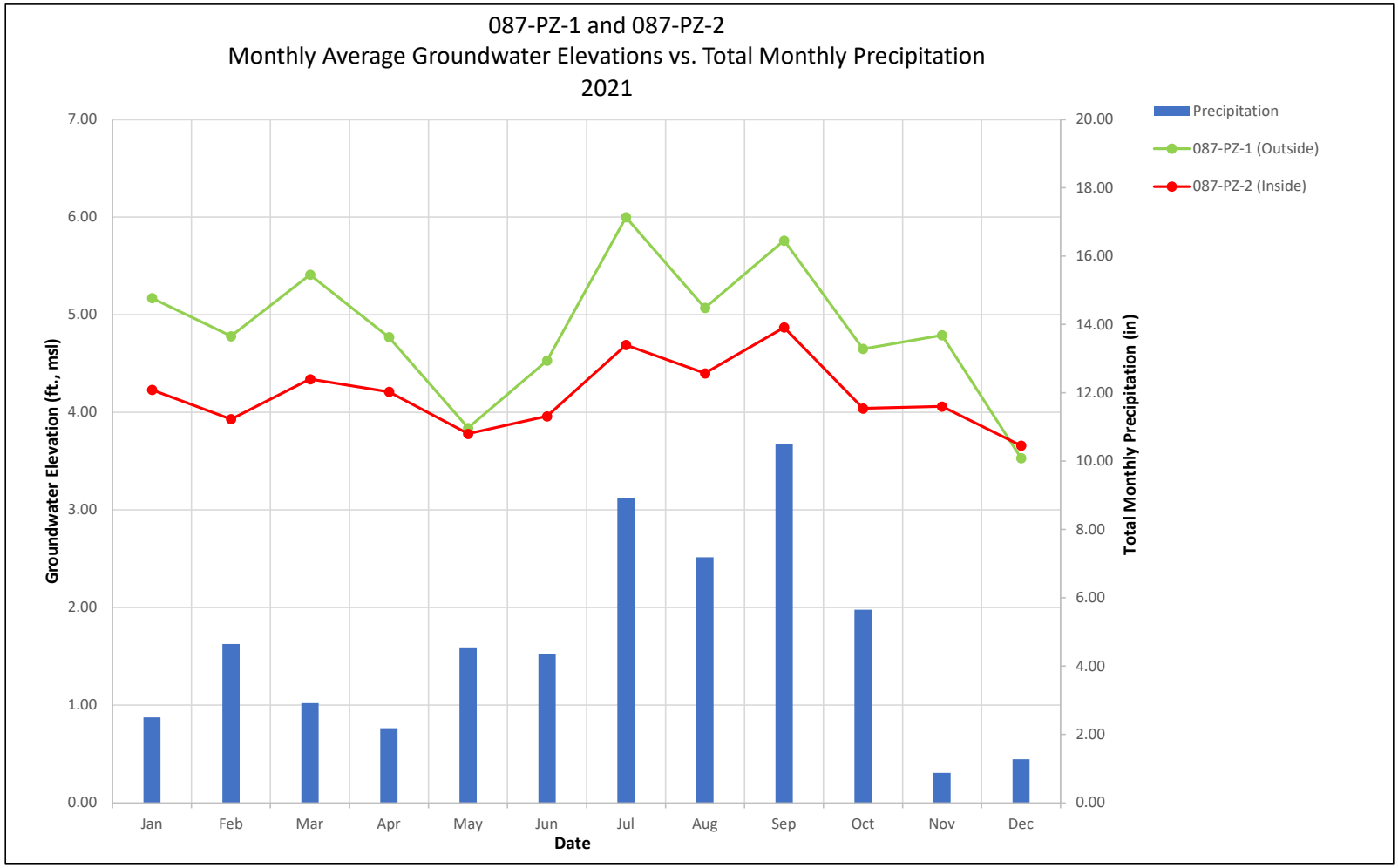
Cumulative Mass of Chromium Removed From Groundwater by Pumping

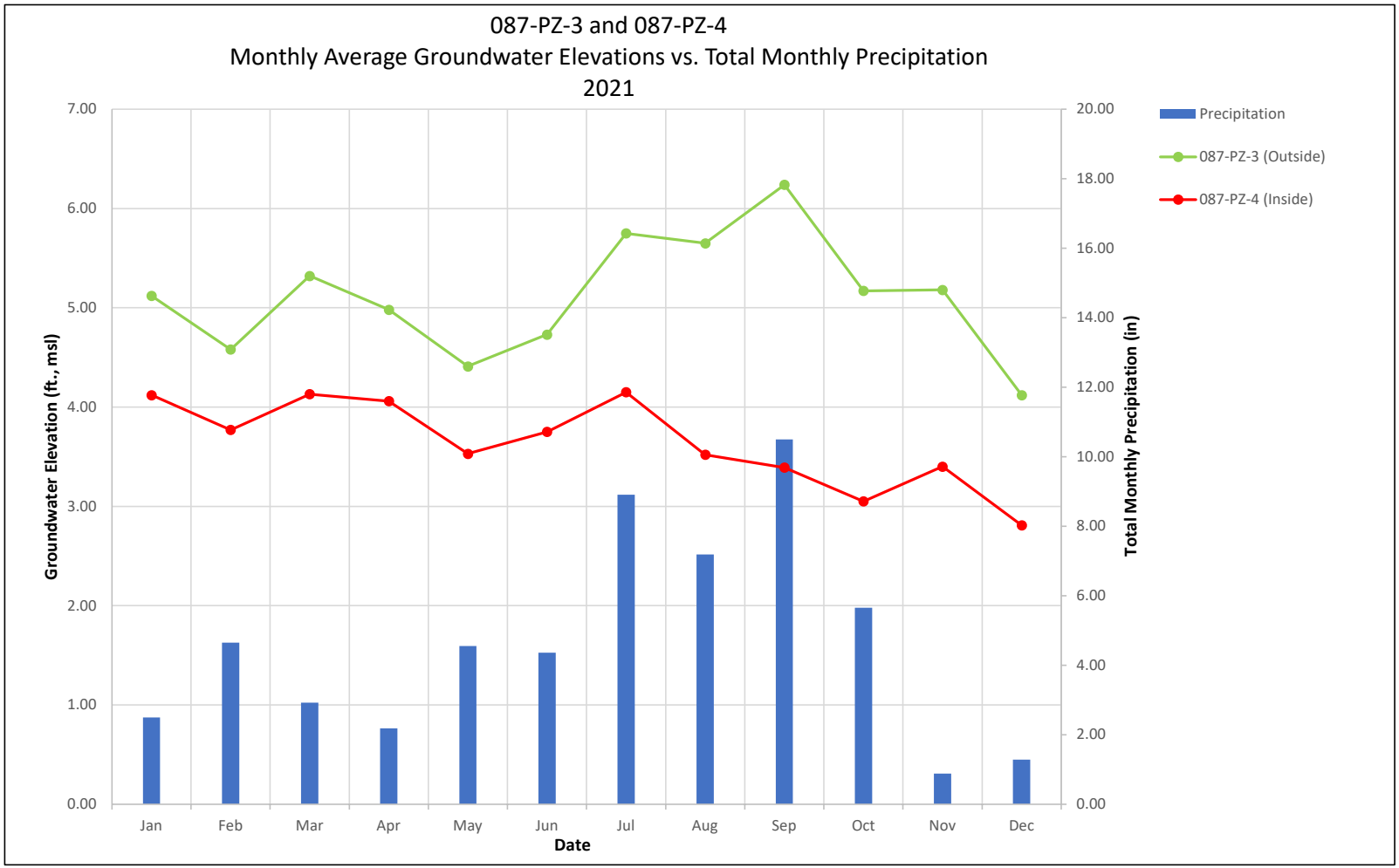
Integrated Annual Groundwater Performance Report 2021

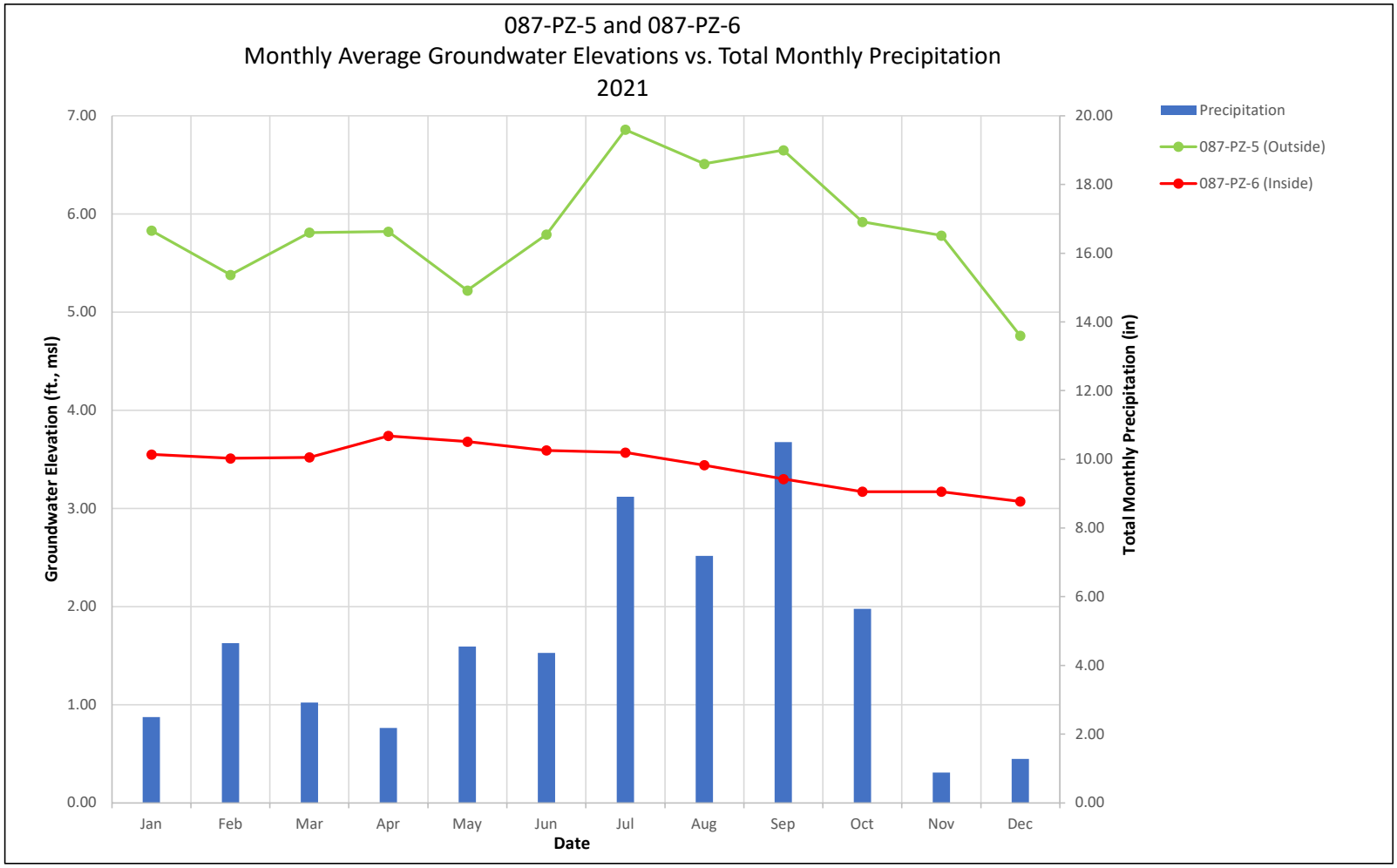
cornerstone environmental

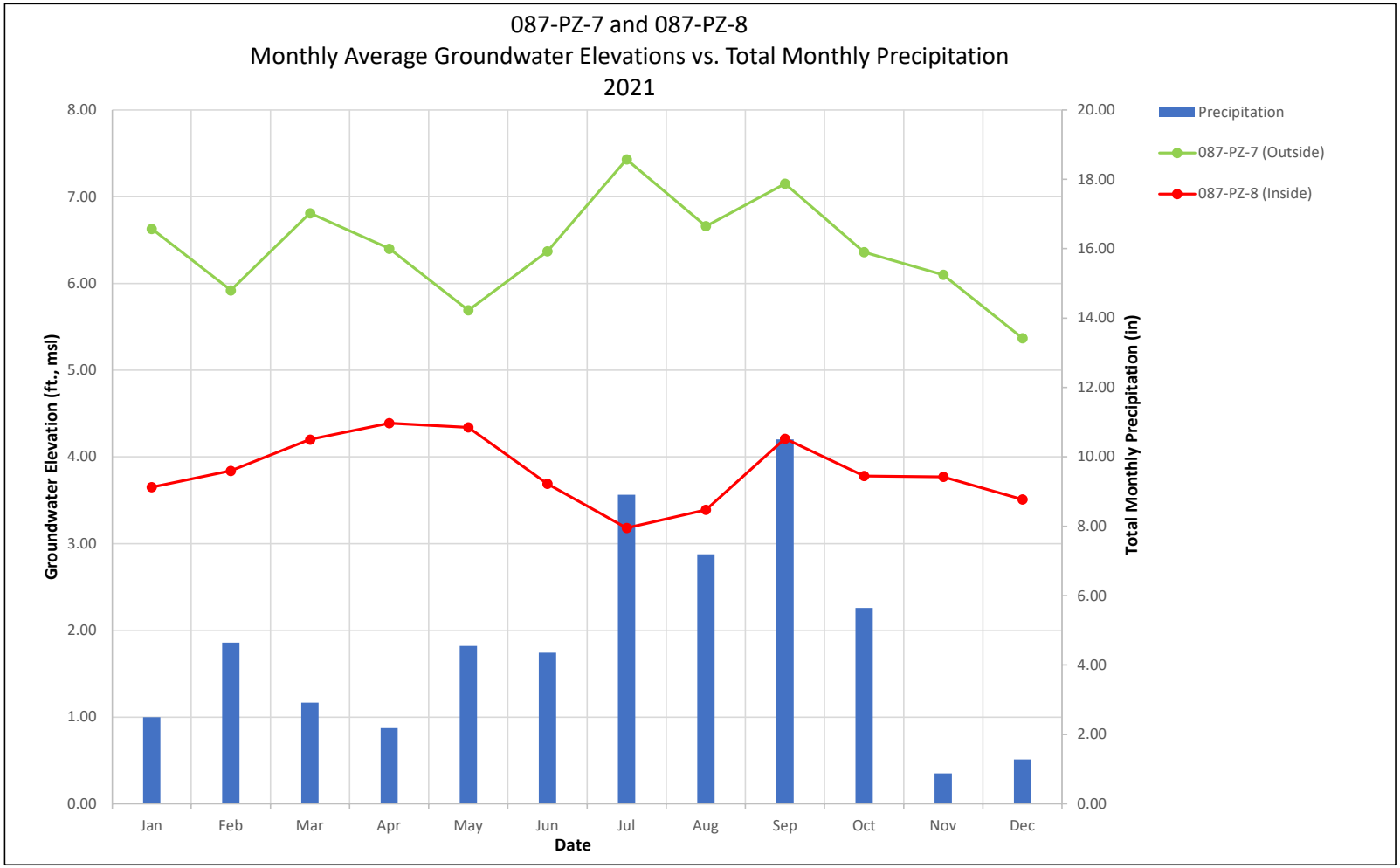
APPENDIX A

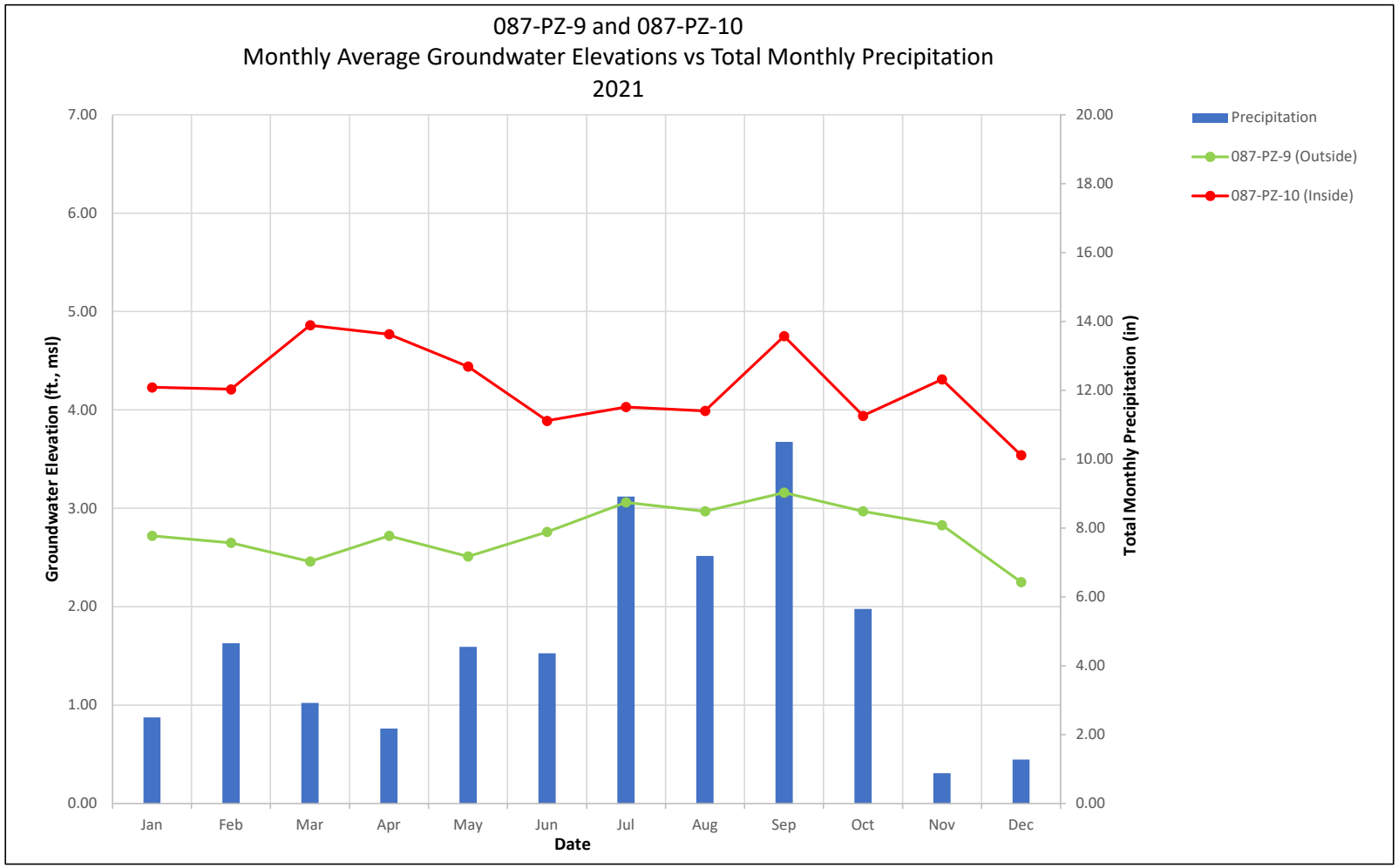
HYDROGRAPHS OF AVERAGE MONTHLY HEADS FROM SA-6 AND SA-7

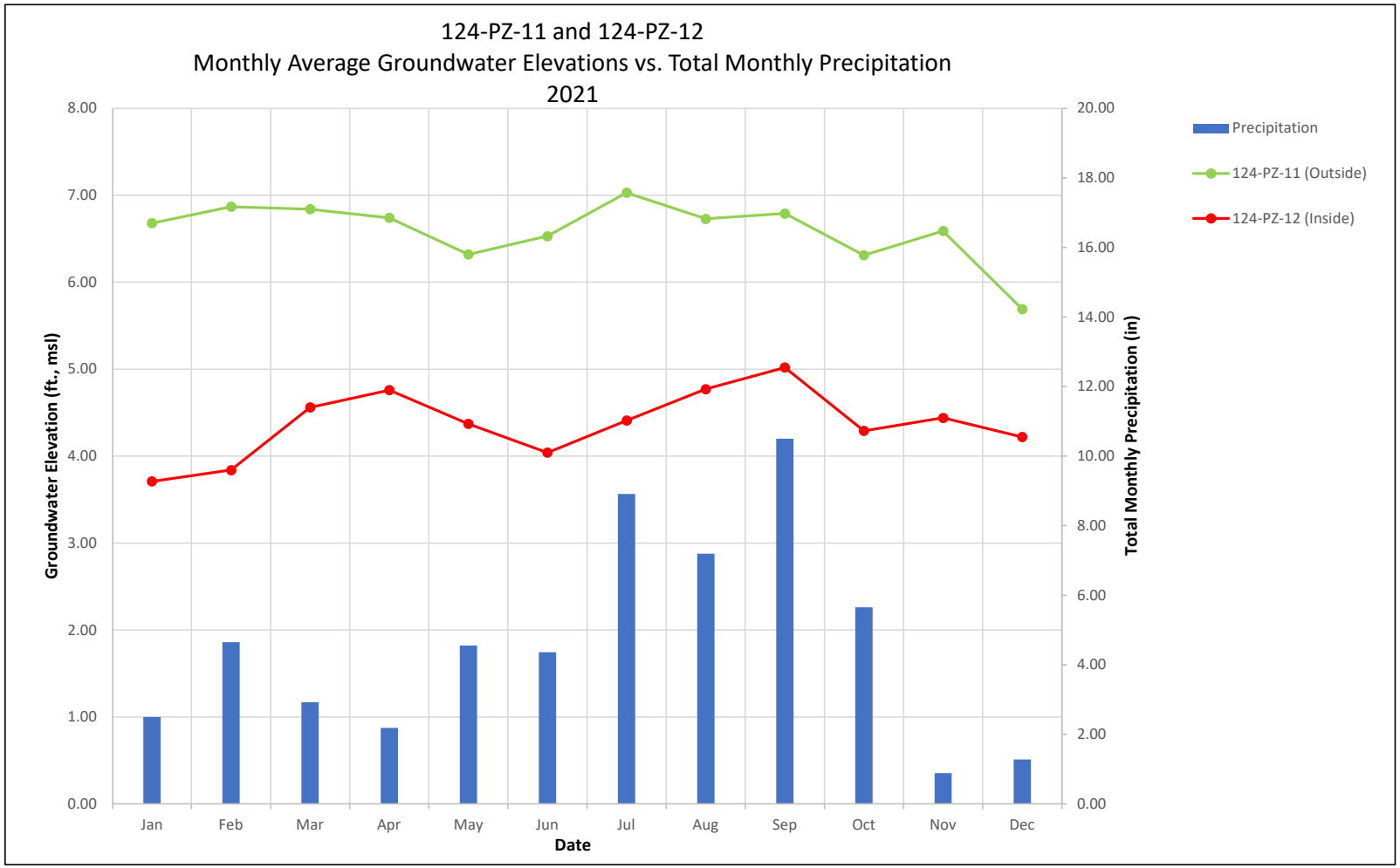

087-PZ-1 and 087-PZ-2
Monthly Average Groundwater Elevations vs. Total Monthly Precipitation
2021
Groundwater Elevation (ft., msl)
Total Monthly Precipitation (in)
Date
Precipitation
087-PZ-1 (Outside)
087-PZ-2 (Inside)
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
20.00
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

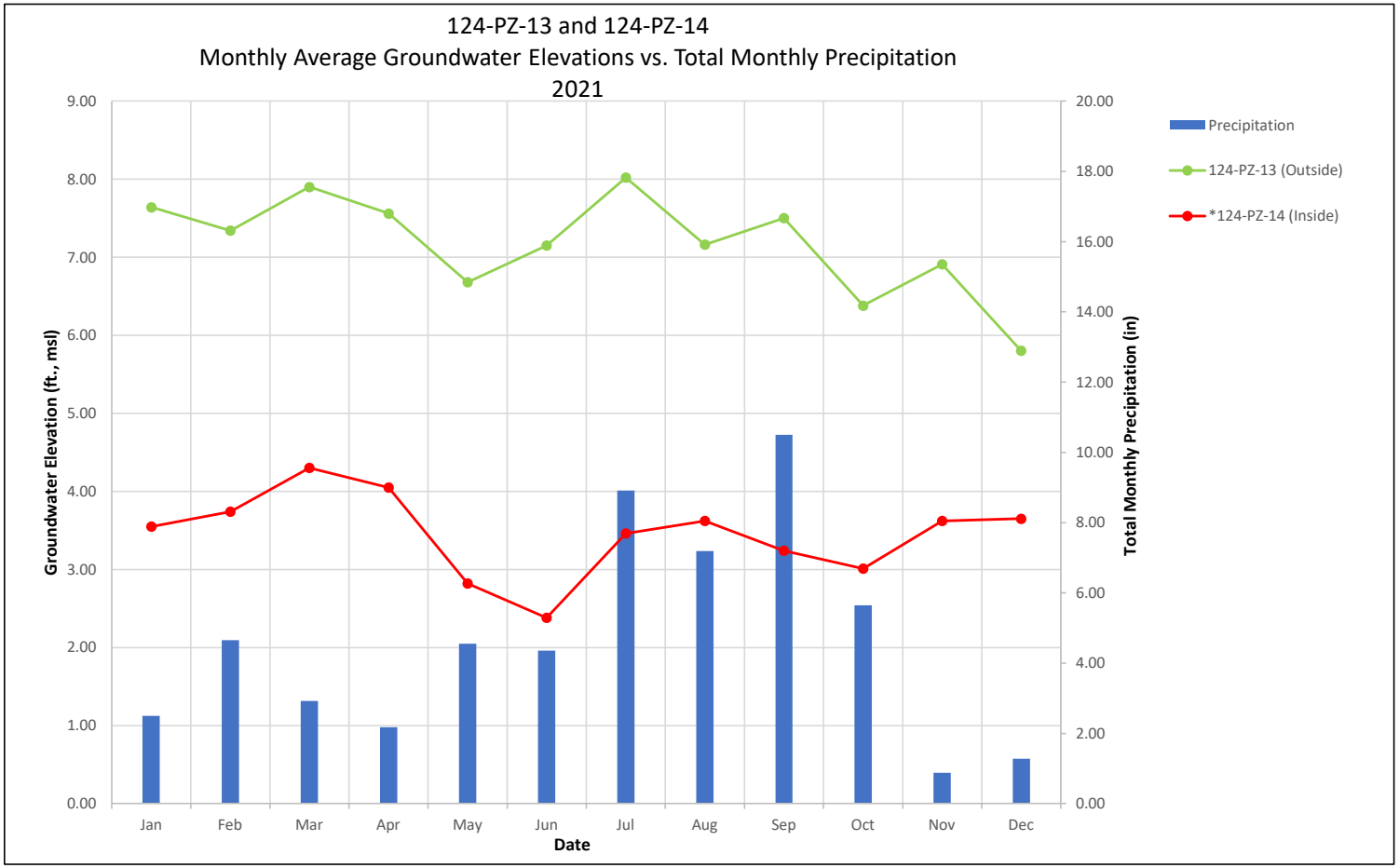

087-PZ-3 and 087-PZ-4
Monthly Average Groundwater Elevations vs. Total Monthly Precipitation
2021
Groundwater Elevation (ft., msl)
Total Monthly Precipitation (in)
Date
Precipitation
087-PZ-3 (Outside)
087-PZ-4 (Inside)
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
20.00
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

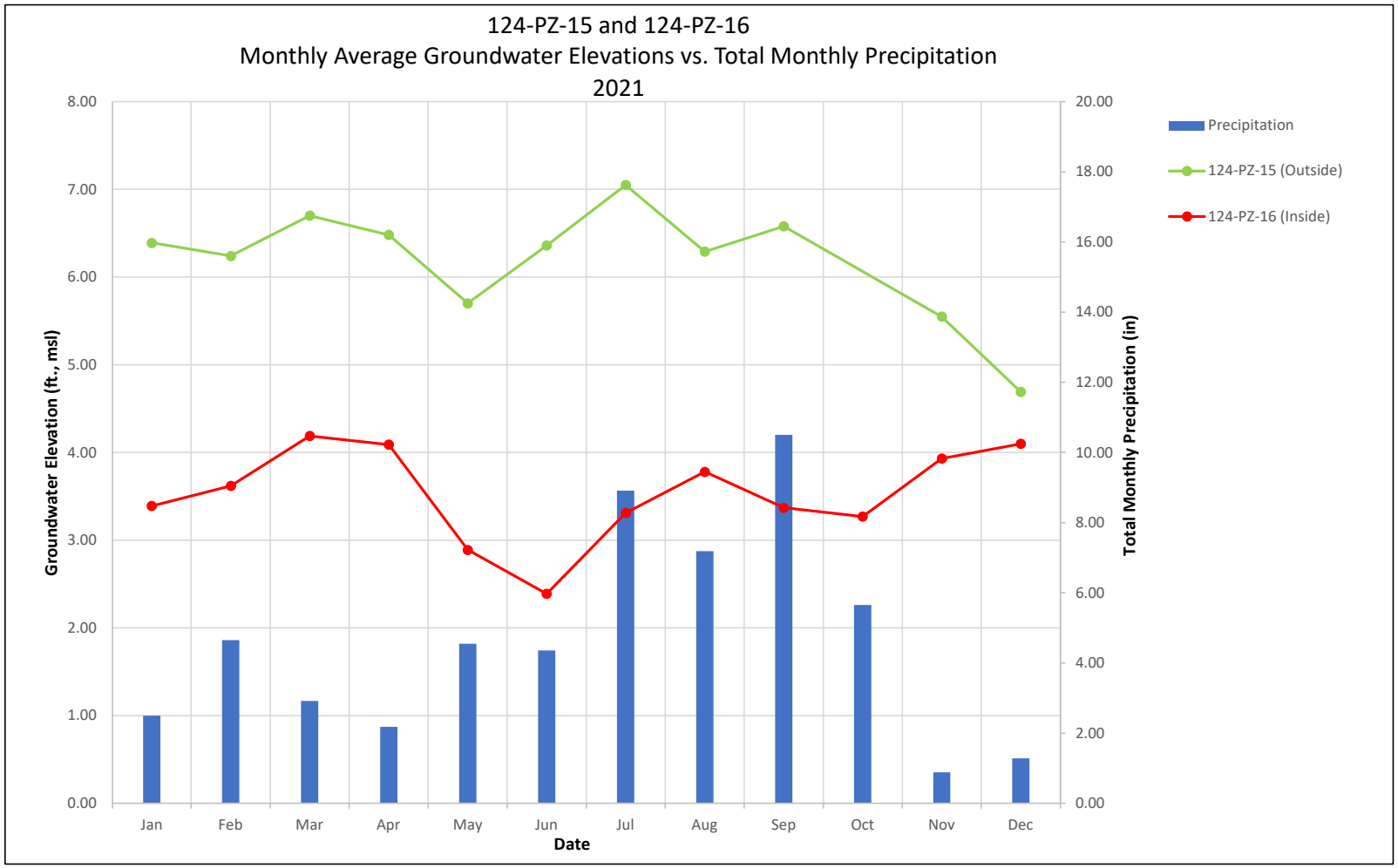

087-PZ-5 and 087-PZ-6
Monthly Average Groundwater Elevations vs. Total Monthly Precipitation
2021
Groundwater Elevation (ft., msl)
Total Monthly Precipitation (in)
Date
Precipitation
087-PZ-5 (Outside)
087-PZ-6 (Inside)
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
20.00
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec


087-PZ-7 and 087-PZ-8
Monthly Average Groundwater Elevations vs. Total Monthly Precipitation
2021
Groundwater Elevation (ft., msl)
Total Monthly Precipitation (in)
Date
Precipitation
087-PZ-7 (Outside)
087-PZ-8 (Inside)
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
20.00
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec


087-PZ-9 and 087-PZ-10
Monthly Average Groundwater Elevations vs Total Monthly Precipitation
2021
Groundwater Elevation (ft., msl)
Total Monthly Precipitation (in)
Date
Precipitation
087-PZ-9 (Outside)
087-PZ-10 (Inside)
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
20.00
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

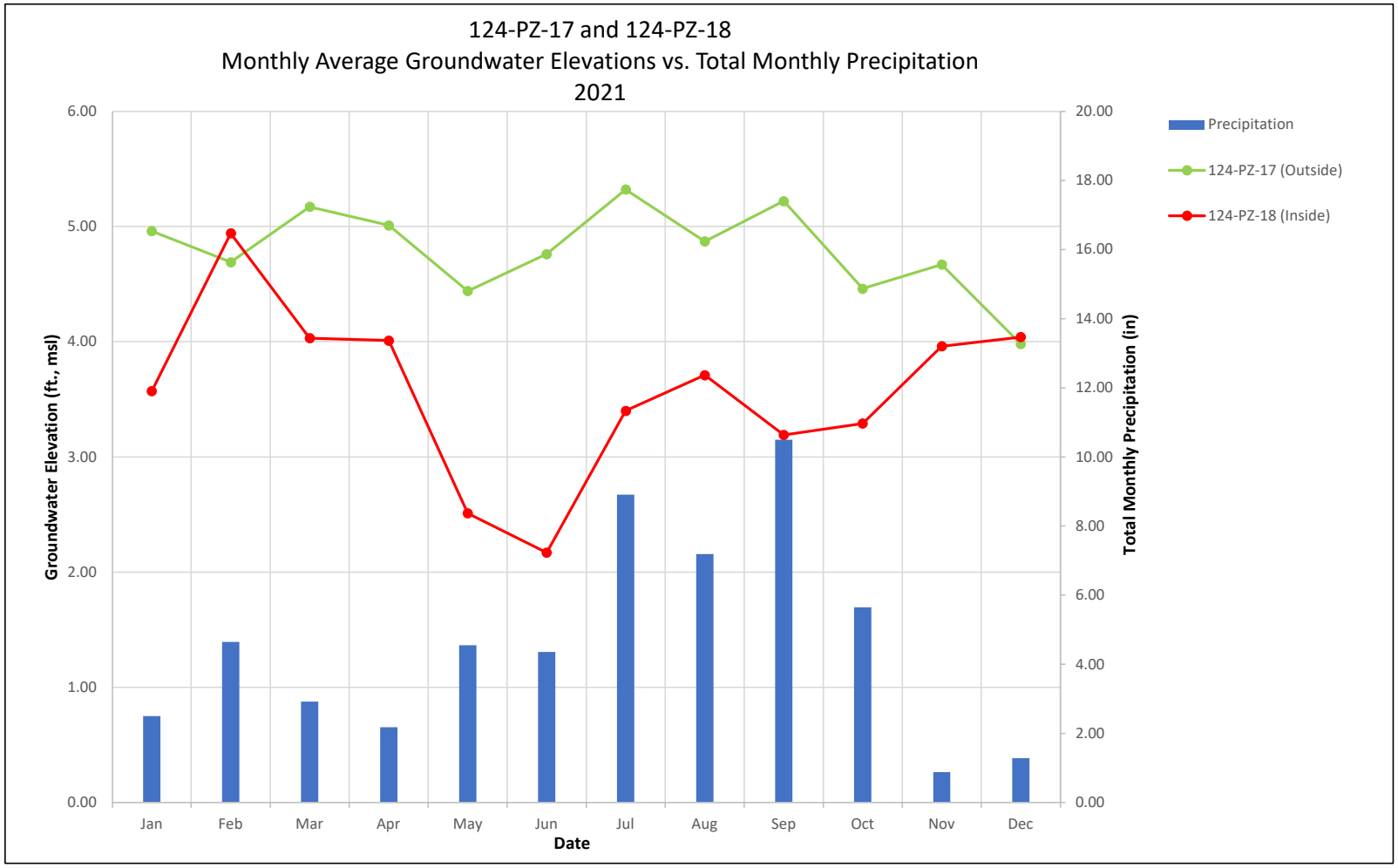

124-PZ-11 and 124-PZ-12
Monthly Average Groundwater Elevations vs. Total Monthly Precipitation
2021
Groundwater Elevation (ft., msl)
Total Monthly Precipitation (in)
Date
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Precipitation
124-PZ-11 (Outside)
124-PZ-12 (Inside)


124-PZ-13 and 124-PZ-14
Monthly Average Groundwater Elevations vs. Total Monthly Precipitation
2021
Groundwater Elevation (ft., msl)
Total Monthly Precipitation (in)
Date
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
0.00
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
9.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
18.00
20.00
Precipitation
124-PZ-13 (Outside)
*124-PZ-14 (Inside)

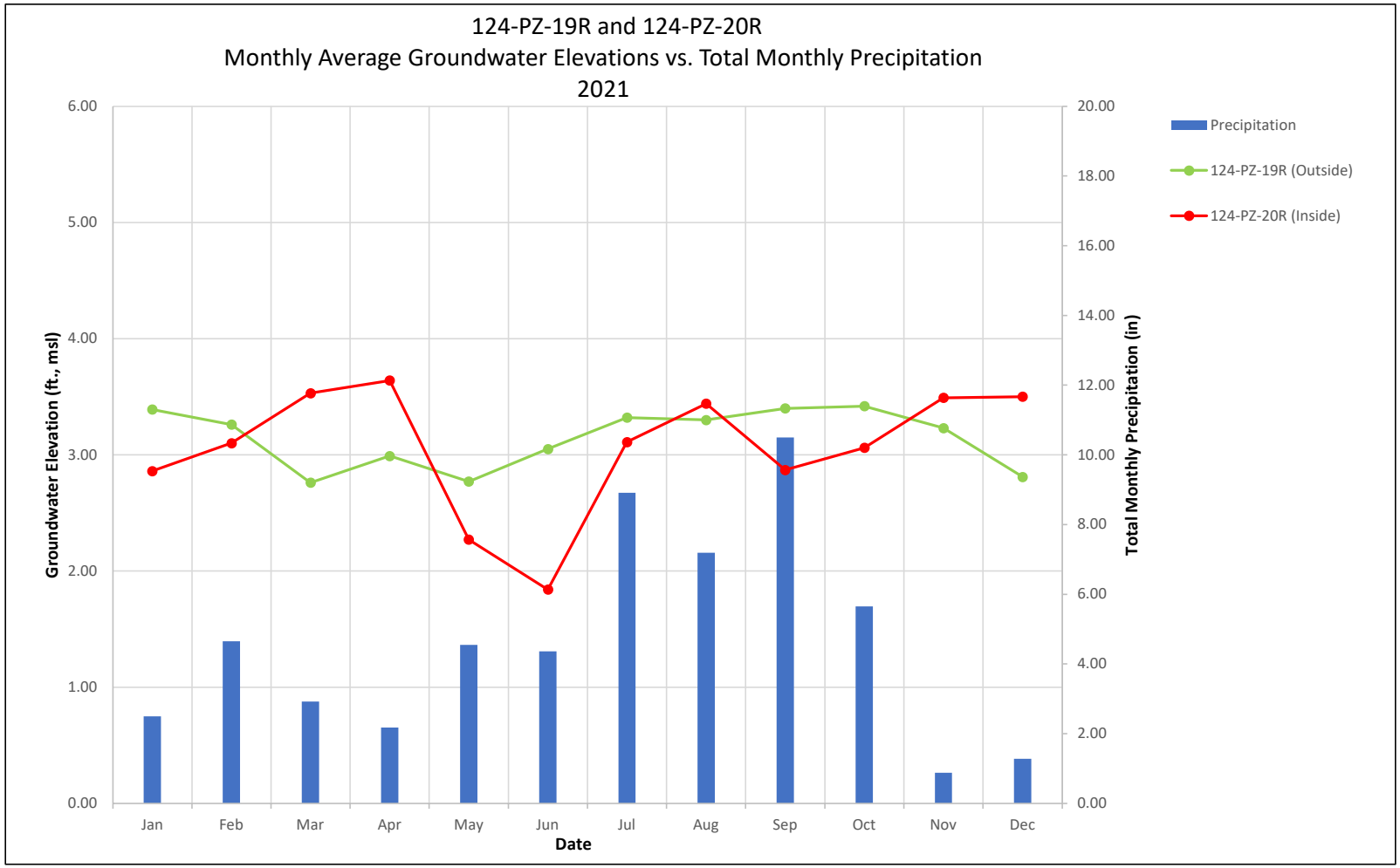


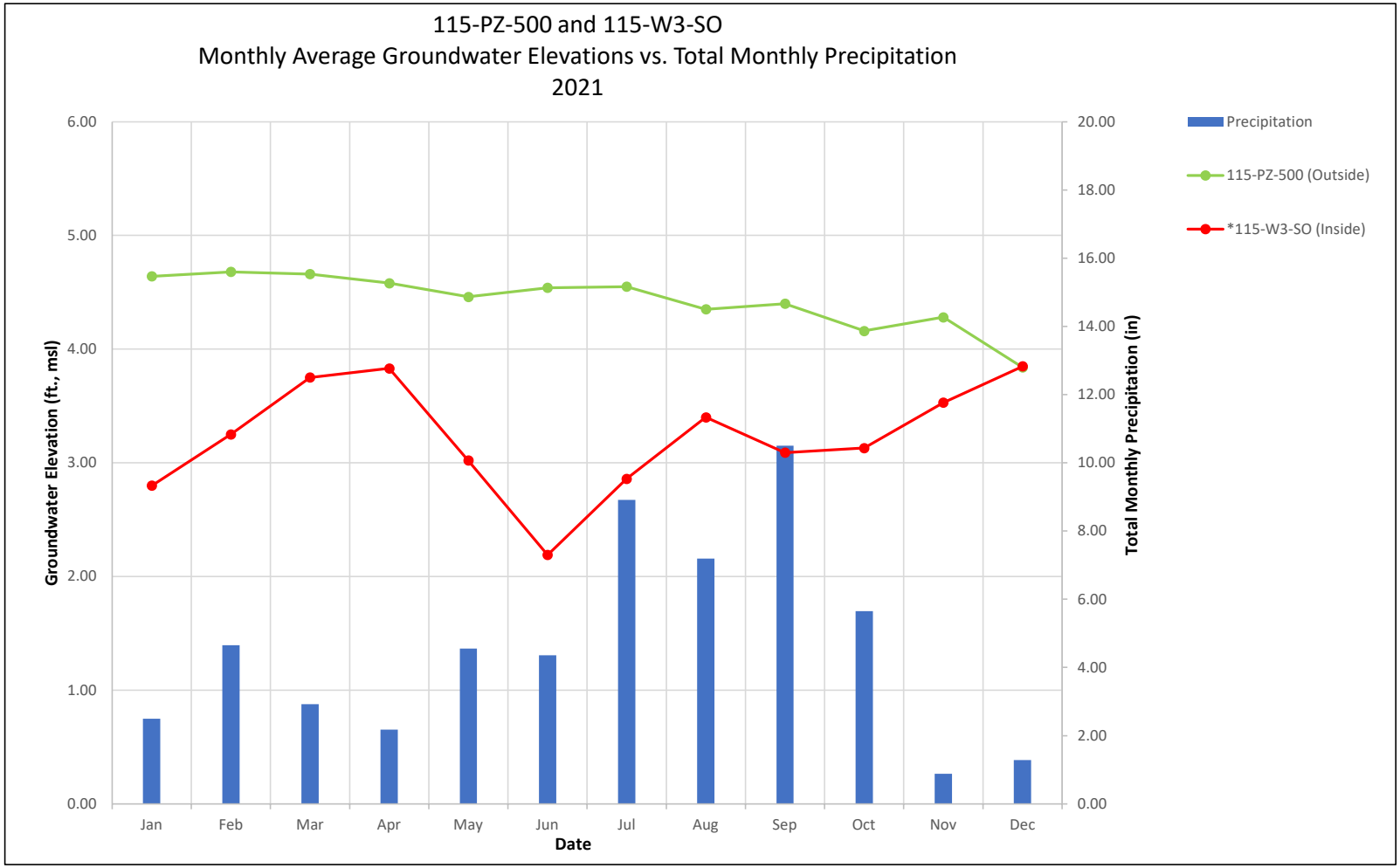
Notes:

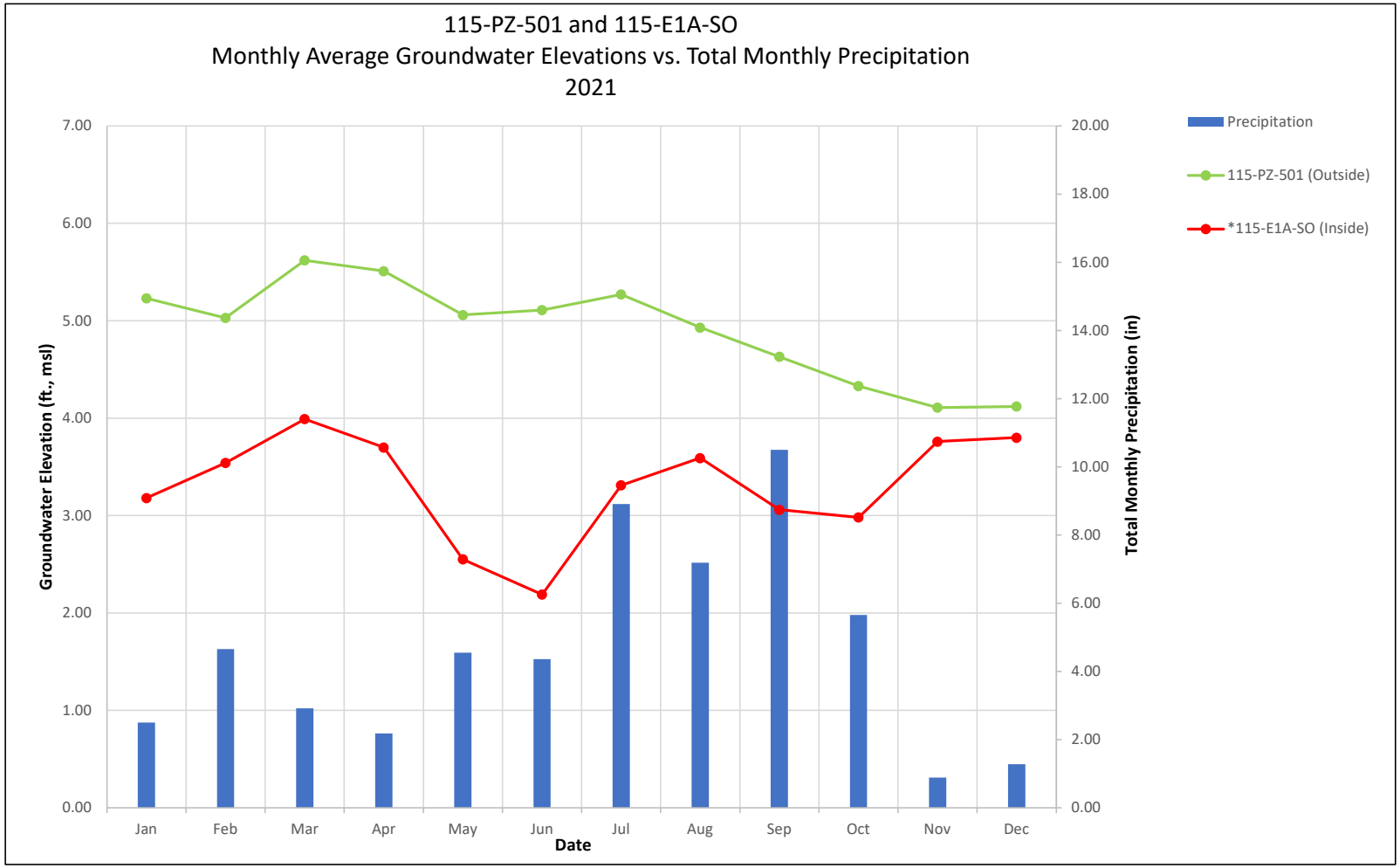
Due to development activties on SA-6 South, logger data for PZ-15 during October was not available.

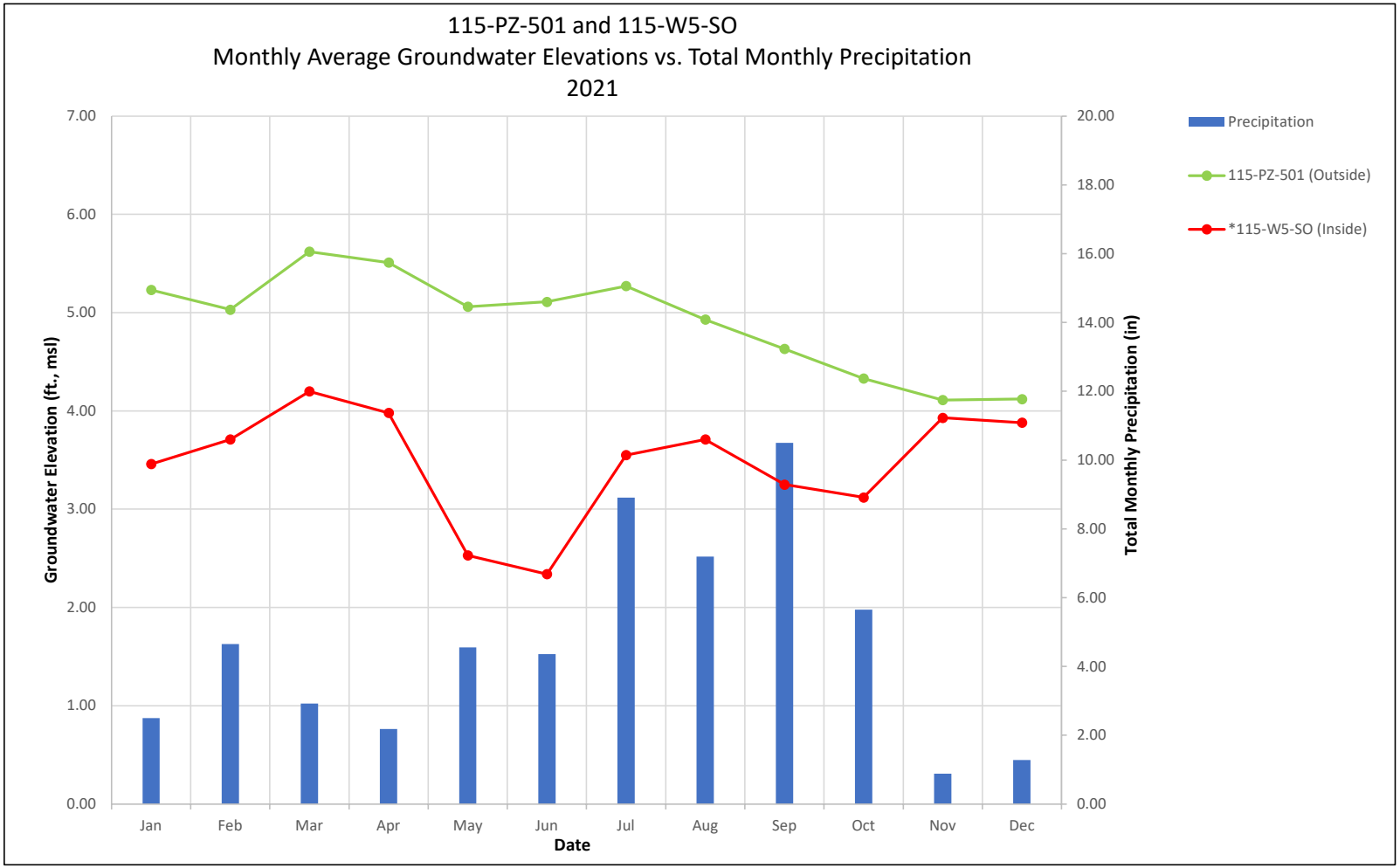


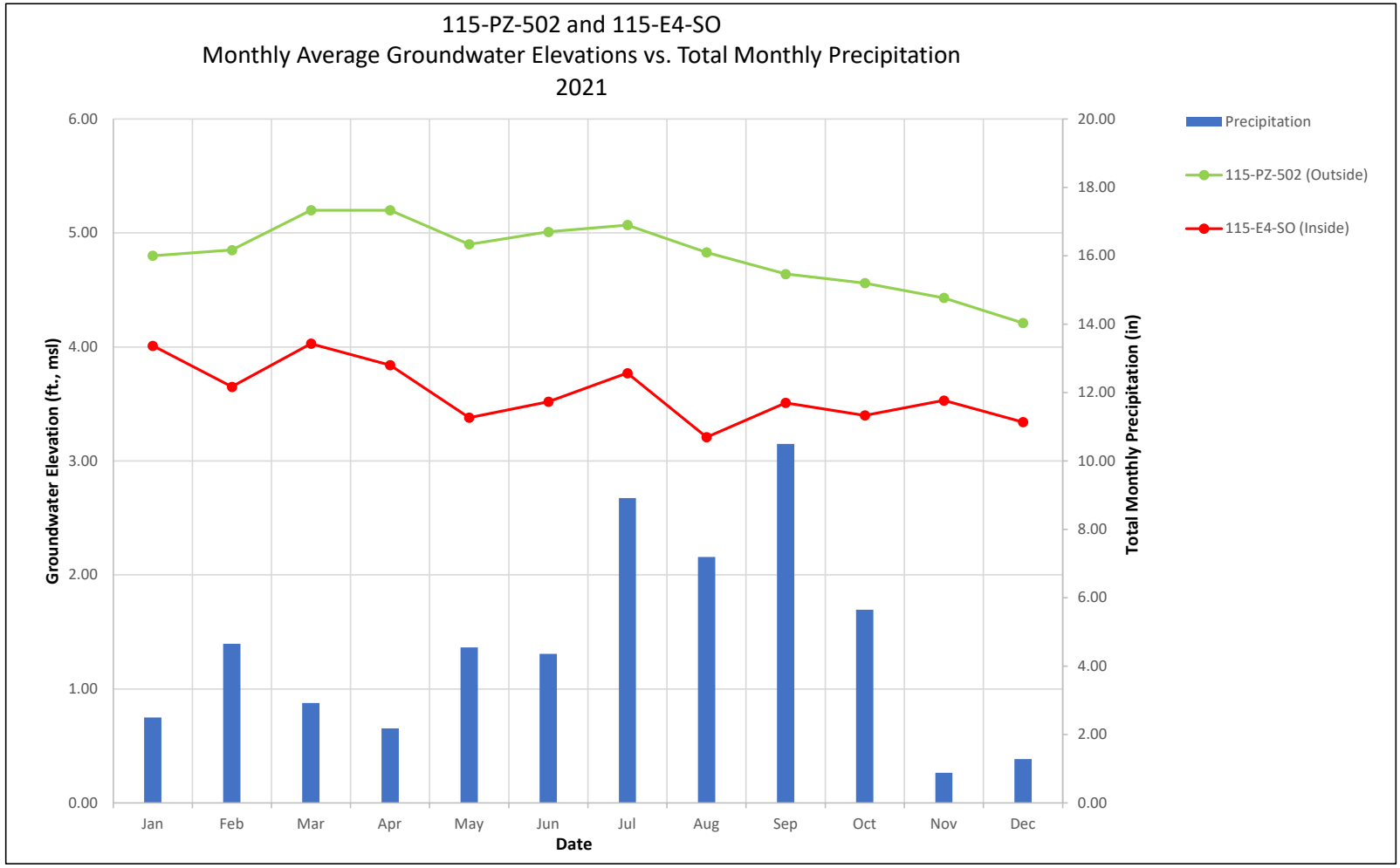
Note:
The February Monthly data submittal noted that the logger data for PZ-18 was suspect. The logger was removed and replaced with a new logger in early March.

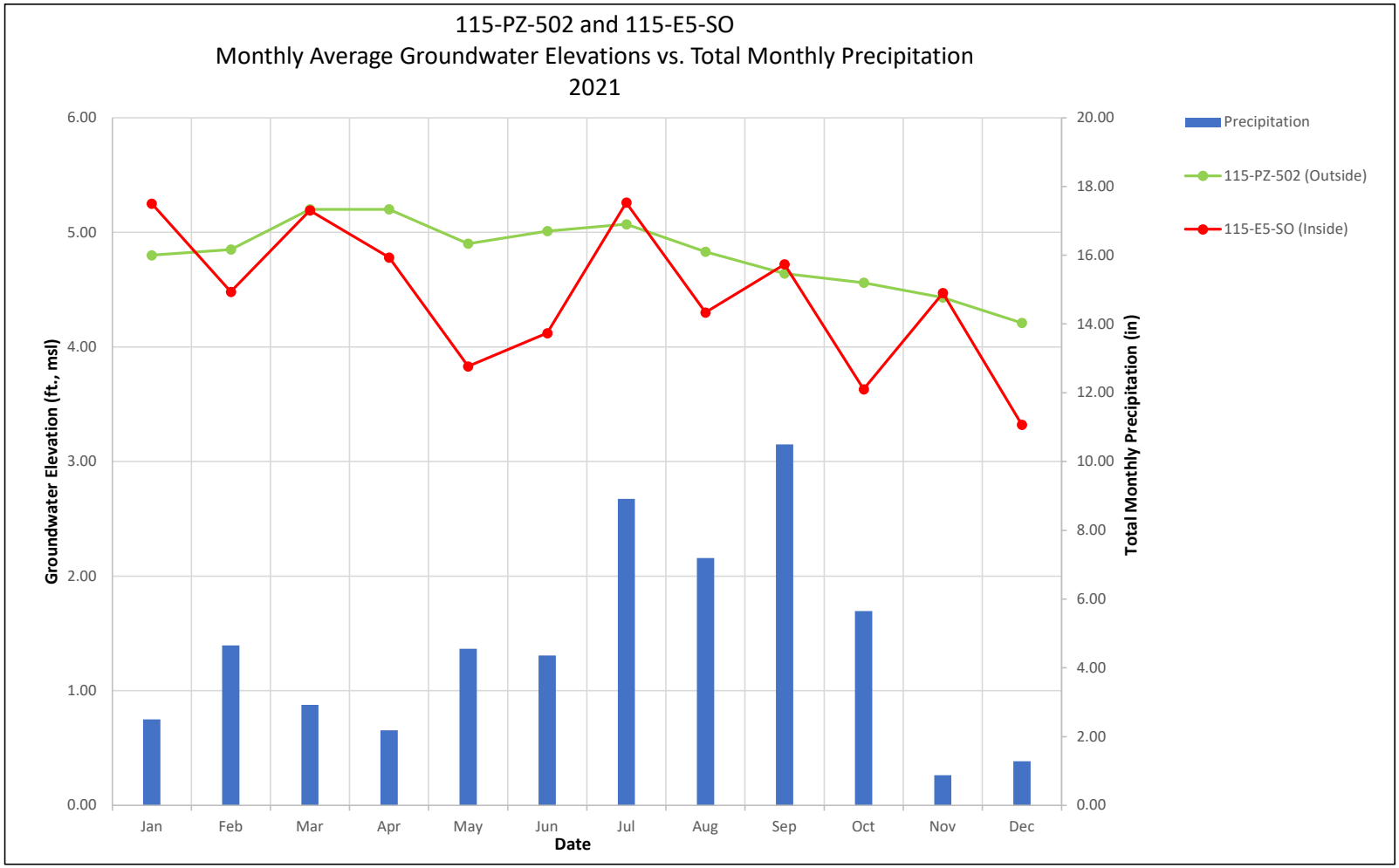

124-PZ-19R and 124-PZ-20R
Monthly Average Groundwater Elevations vs. Total Monthly Precipitation
2021
Groundwater Elevation (ft., msl)
Total Monthly Precipitation (in)
Date
Precipitation
124-PZ-19R (Outside)
124-PZ-20R (Inside)
6.00
5.00
4.00
3.00
2.00
1.00
0.00
20.00
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

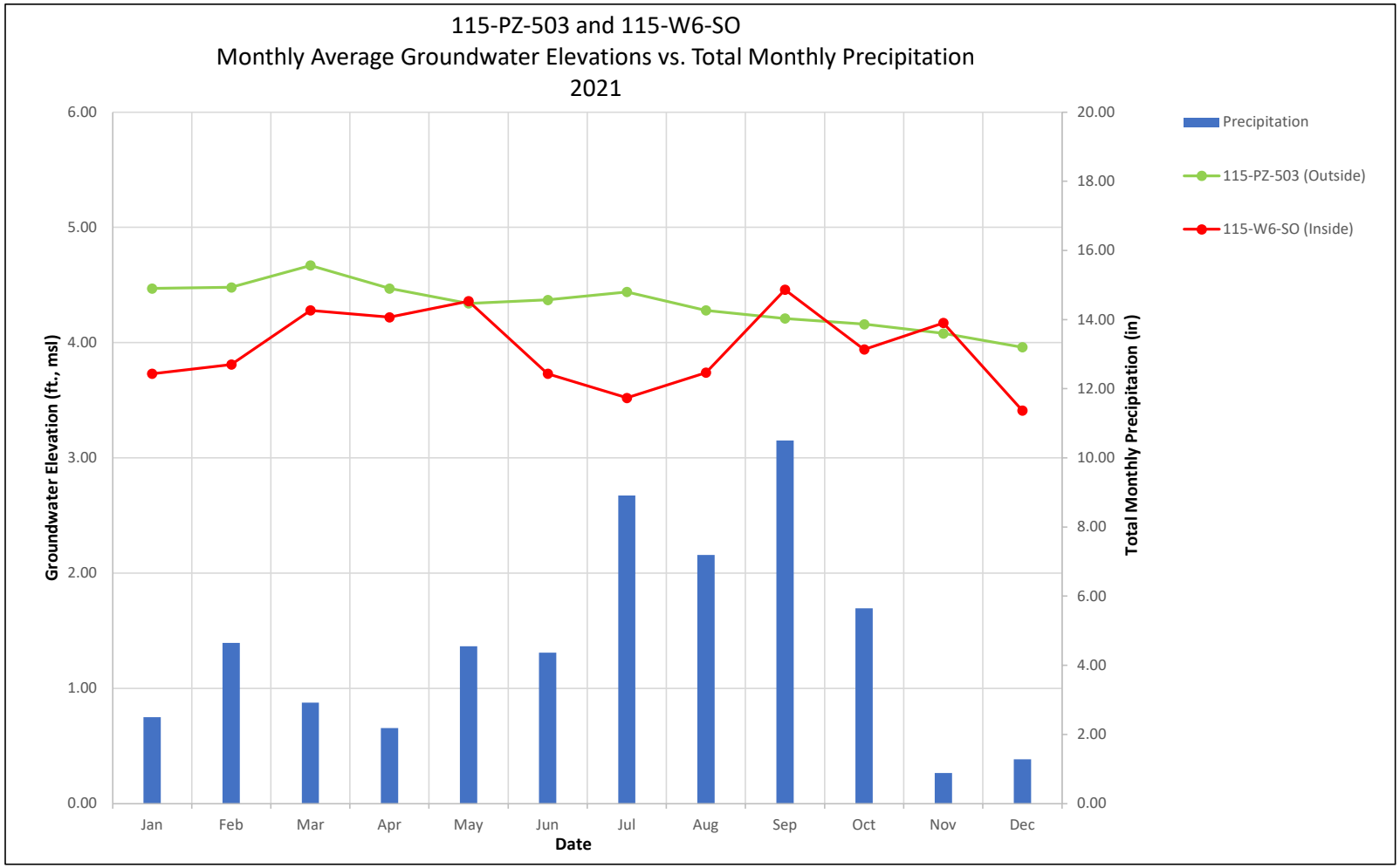

115-PZ-500 and 115-W3-SO
Monthly Average Groundwater Elevations vs. Total Monthly Precipitation
2021
Groundwater Elevation (ft., msl)
Total Monthly Precipitation (in)
Date
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
0.00
1.00
2.00
3.00
4.00
5.00
6.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
18.00
20.00
Precipitation
115-PZ-500 (Outside)
*115-W3-SO (Inside)

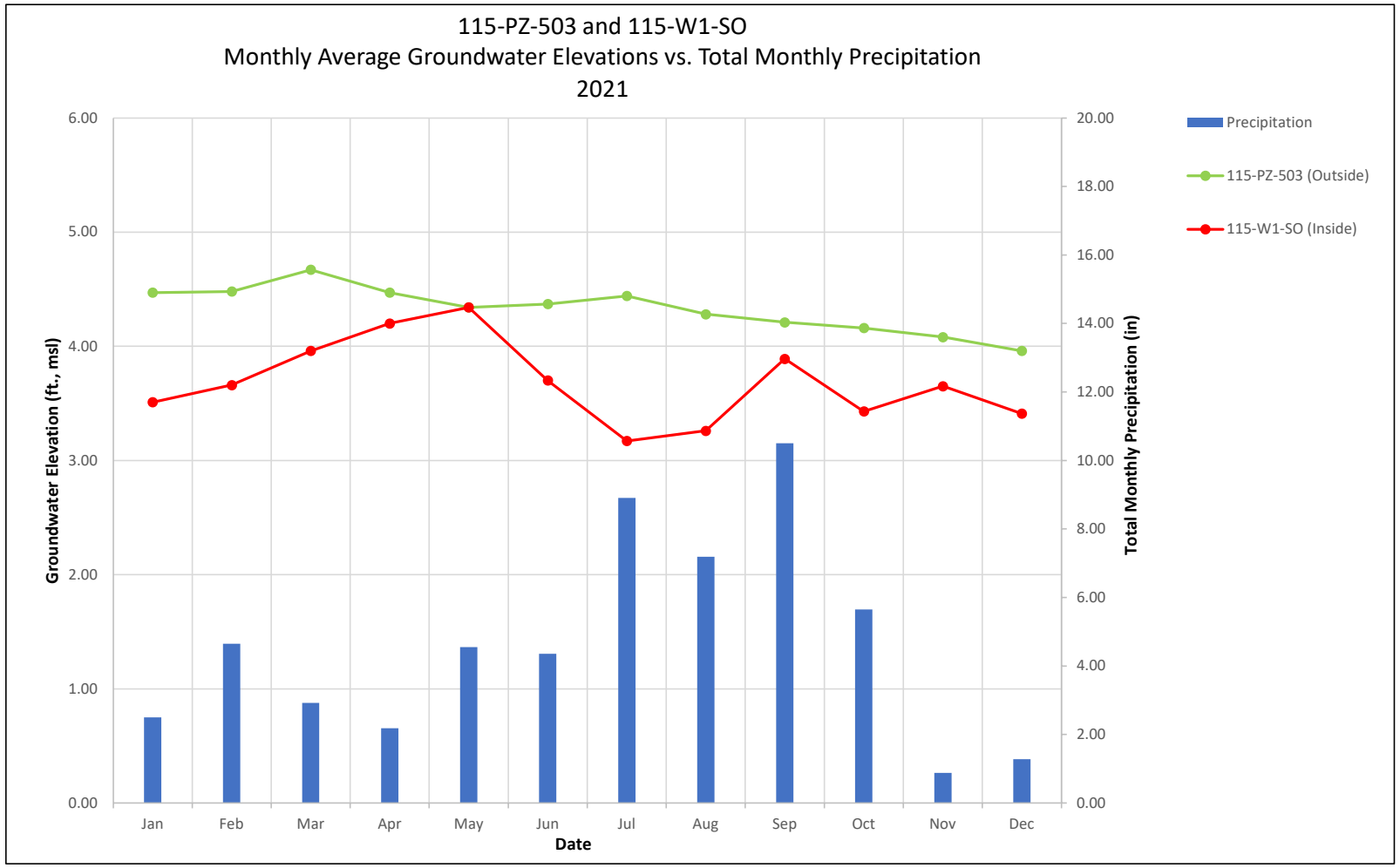

115-PZ-501 and 115-E1A-SO
Monthly Average Groundwater Elevations vs. Total Monthly Precipitation
2021
Groundwater Elevation (ft., msl)
Total Monthly Precipitation (in)
Date
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
0.00
1.00
2.00
3.00
4.00
5.00
6.00
7.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
18.00
20.00
Precipitation
115-PZ-501 (Outside)
*115-E1A-SO (Inside)


115-PZ-501 and 115-W5-SO
Monthly Average Groundwater Elevations vs. Total Monthly Precipitation
2021
Groundwater Elevation (ft., msl)
Total Monthly Precipitation (in)
Date
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Precipitation
115-PZ-501 (Outside)
*115-W5-SO (Inside)


115-PZ-502 and 115-E4-SO
Monthly Average Groundwater Elevations vs. Total Monthly Precipitation
2021
Groundwater Elevation (ft., msl)
Total Monthly Precipitation (in)
Date
Precipitation
115-PZ-502 (Outside)
115-E4-SO (Inside)
6.00
5.00
4.00
3.00
2.00
1.00
0.00
20.00
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

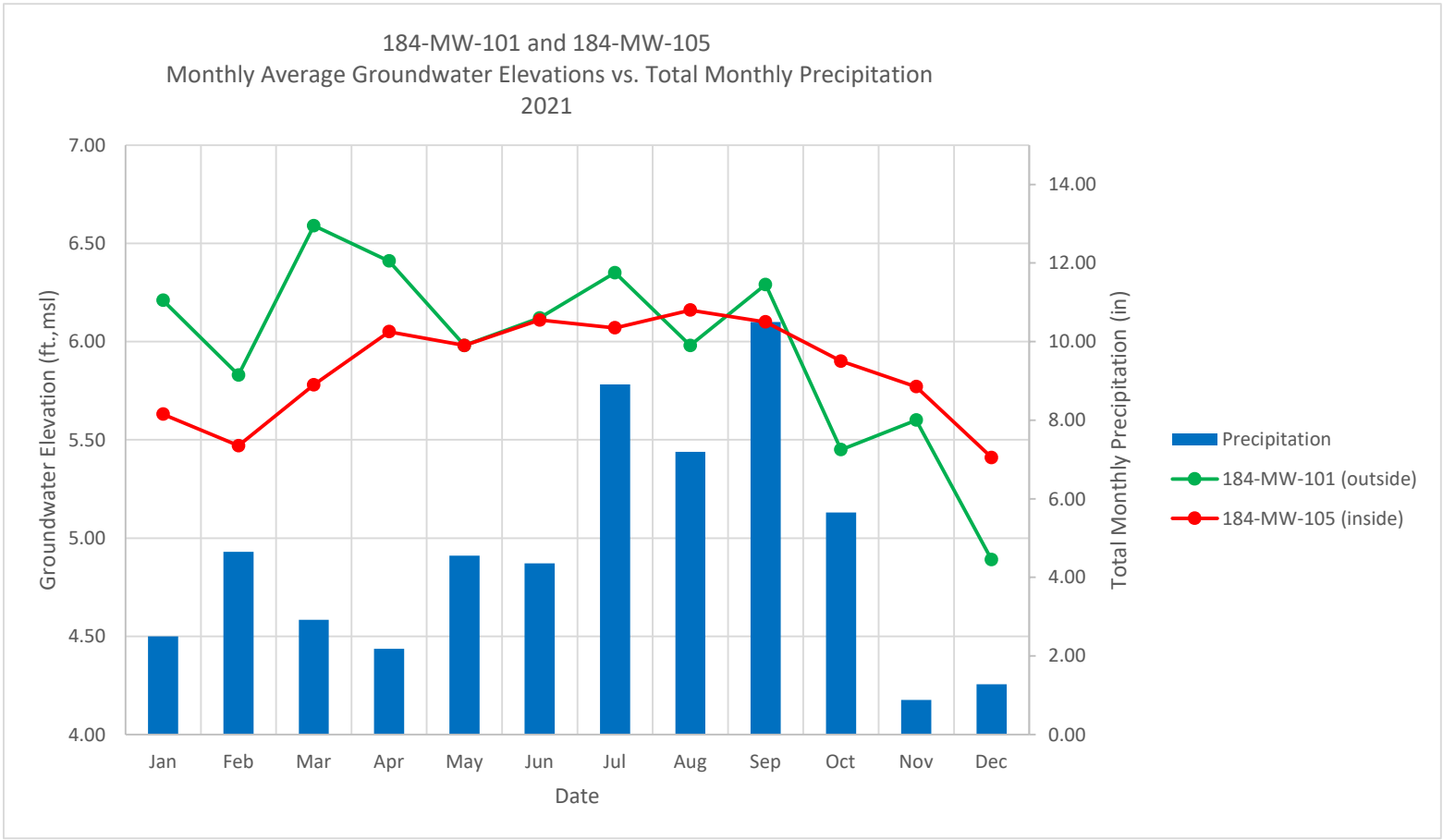

115-PZ-502 and 115-E5-SO
Monthly Average Groundwater Elevations vs. Total Monthly Precipitation
2021
Groundwater Elevation (ft., msl)
Total Monthly Precipitation (in)
Date
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
0.00
1.00
2.00
3.00
4.00
5.00
6.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
18.00
20.00
Precipitation
115-PZ-502 (Outside)
115-E5-SO (Inside)

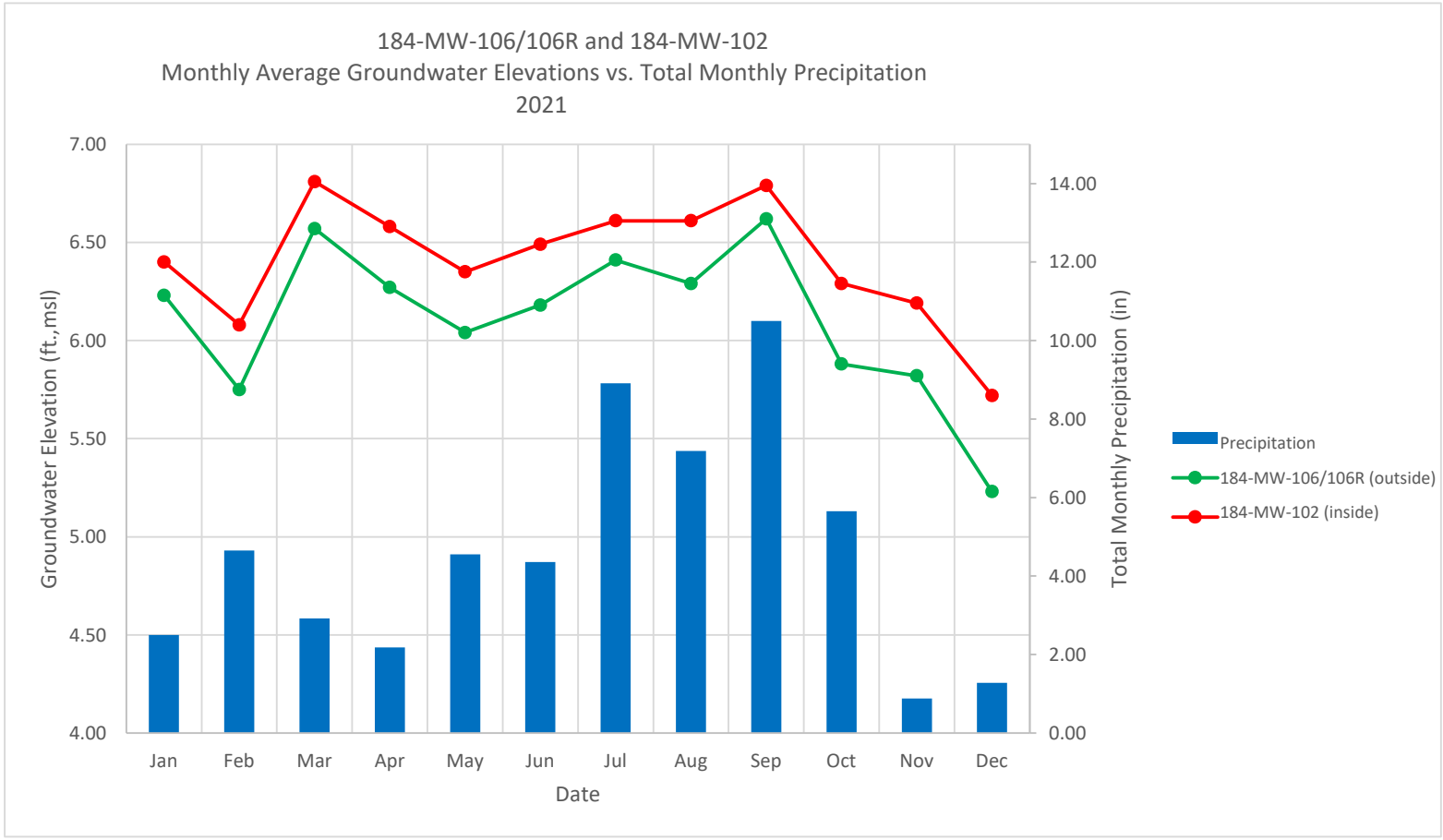

115-PZ-503 and 115-W6-SO
Monthly Average Groundwater Elevations vs. Total Monthly Precipitation
2021
Groundwater Elevation (ft., msl)
Total Monthly Precipitation (in)
Date
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Precipitation
115-PZ-503 (Outside)
115-W6-SO (Inside)

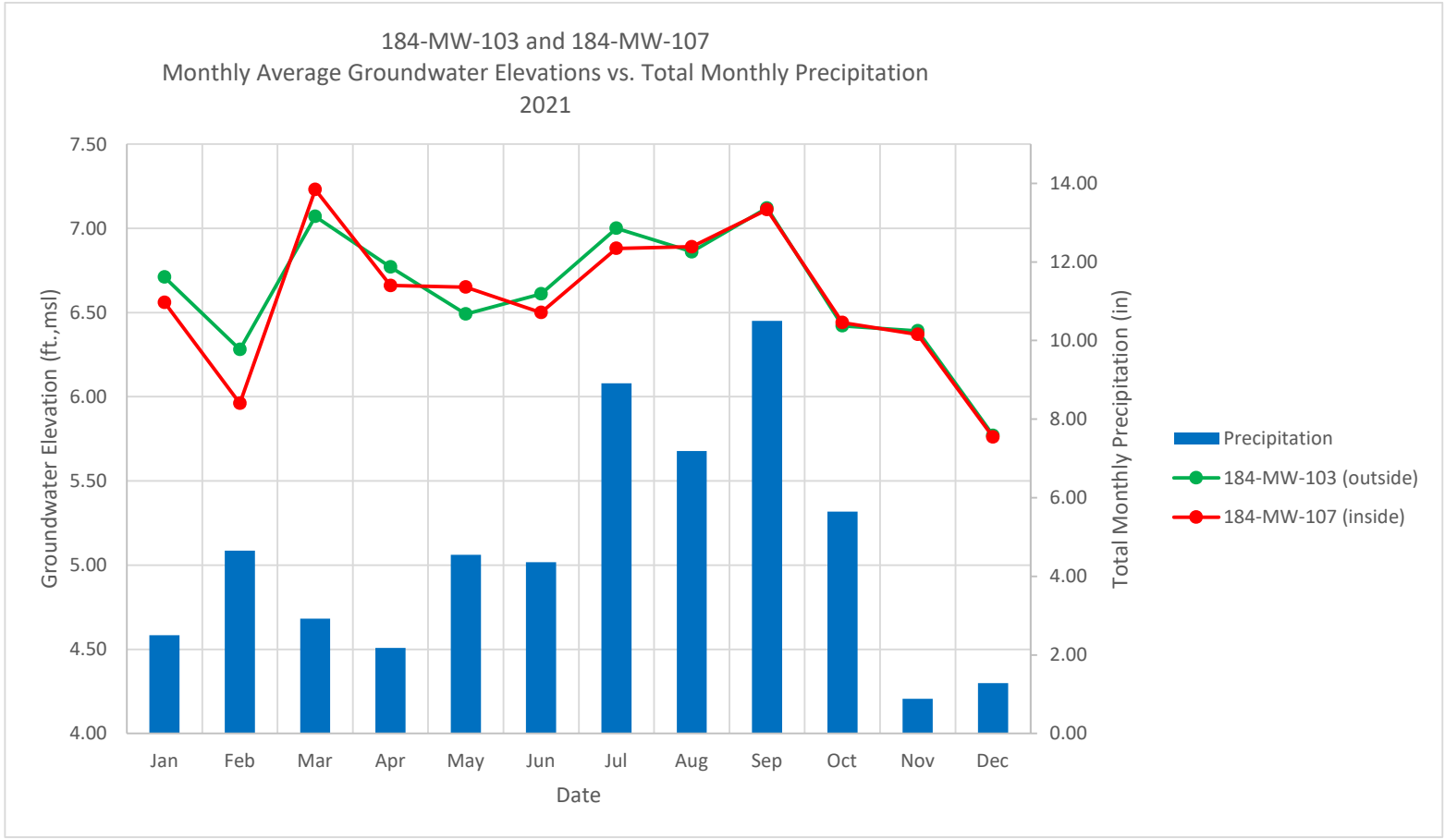

115-PZ-503 and 115-W1-SO
Monthly Average Groundwater Elevations vs. Total Monthly Precipitation
2021
Groundwater Elevation (ft., msl)
Total Monthly Precipitation (in)
Date
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
0.00
1.00
2.00
3.00
4.00
5.00
6.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
18.00
20.00
Precipitation
115-PZ-503 (Outside)
115-W1-SO (Inside)

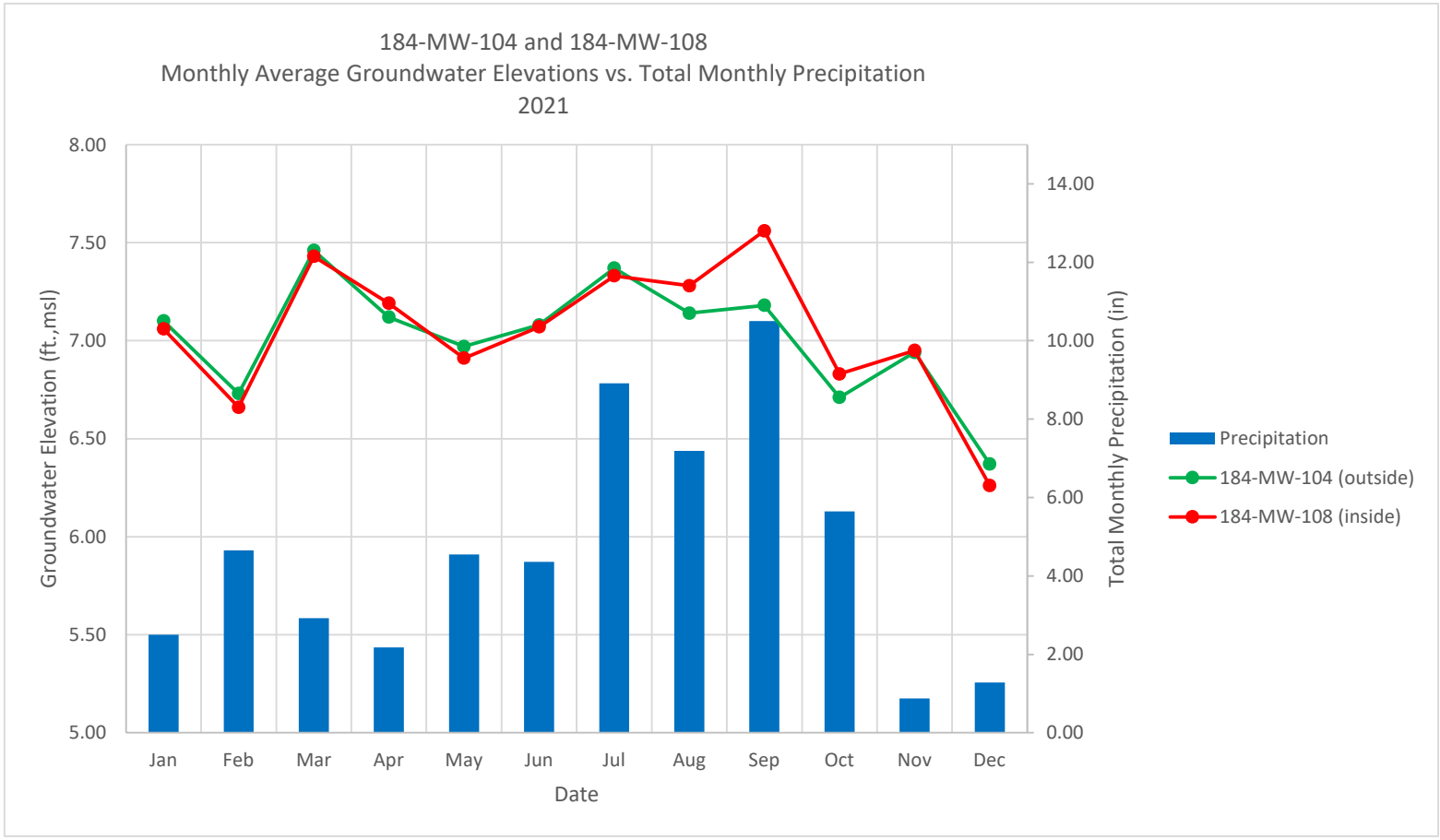
APPENDIX B

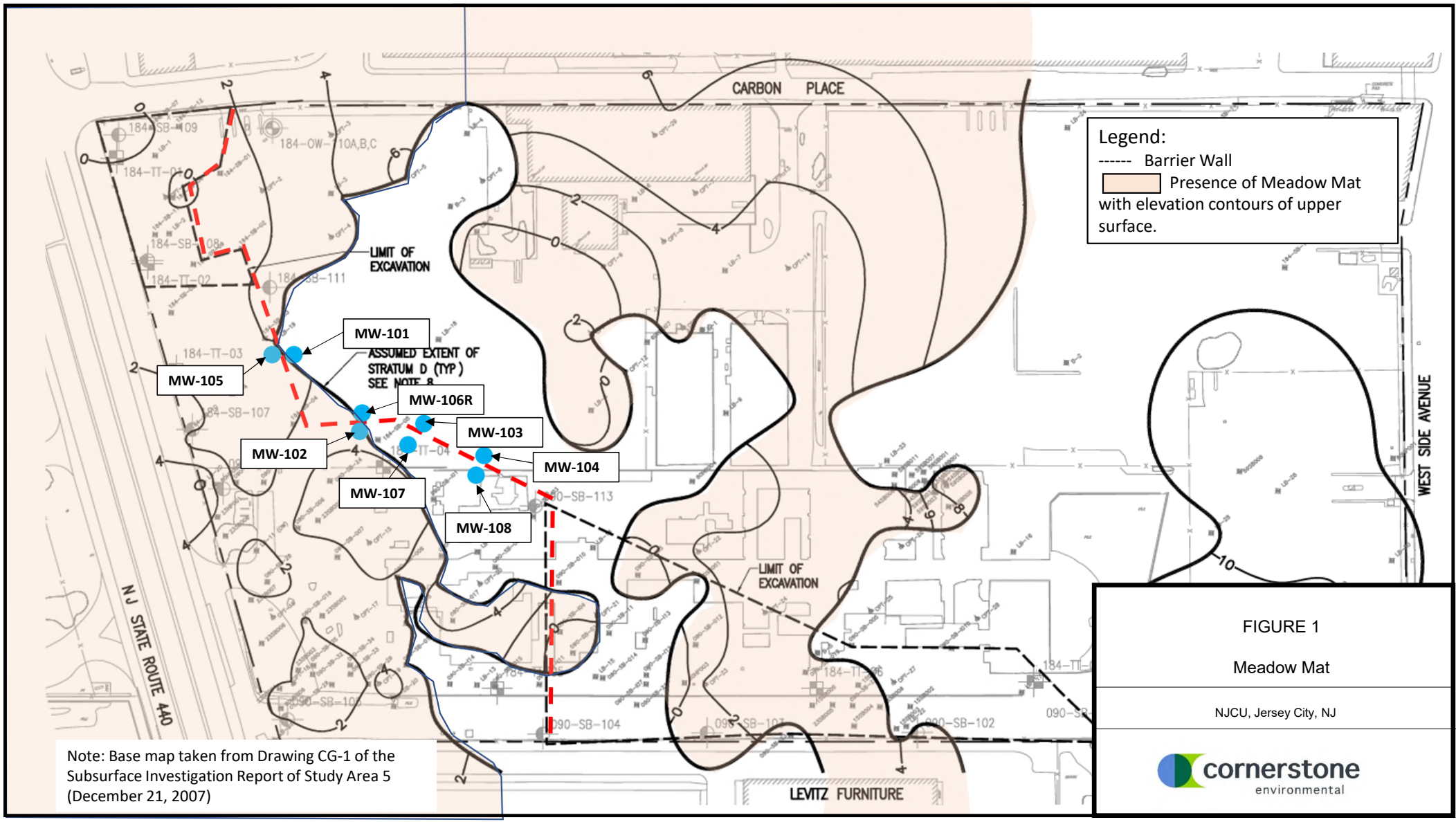
HYDROGRAPHS OF AVERAGE MONTHLY HEADS FROM SA-5 NJCU


184-MW-101 and 184-MW-105
Monthly Average Groundwater Elevations vs. Total Monthly Precipitation
2021
Groundwater Elevation (ft.,msl)
7.00
6.50
6.00
5.50
5.00
4.50
4.00
Total Monthly Precipitation (in)
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Date
Precipitation
184-MW-101 (outside)
184-MW-105 (inside)


184-MW-106/106R and 184-MW-102
Monthly Average Groundwater Elevations vs. Total Monthly Precipitation
2021
Groundwater Elevation (ft.,msl)
7.00
6.50
6.00
5.50
5.00
4.50
4.00
Total Monthly Precipitation (in)
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Date
Precipitation
184-MW-106/106R (outside)
184-MW-102 (inside)

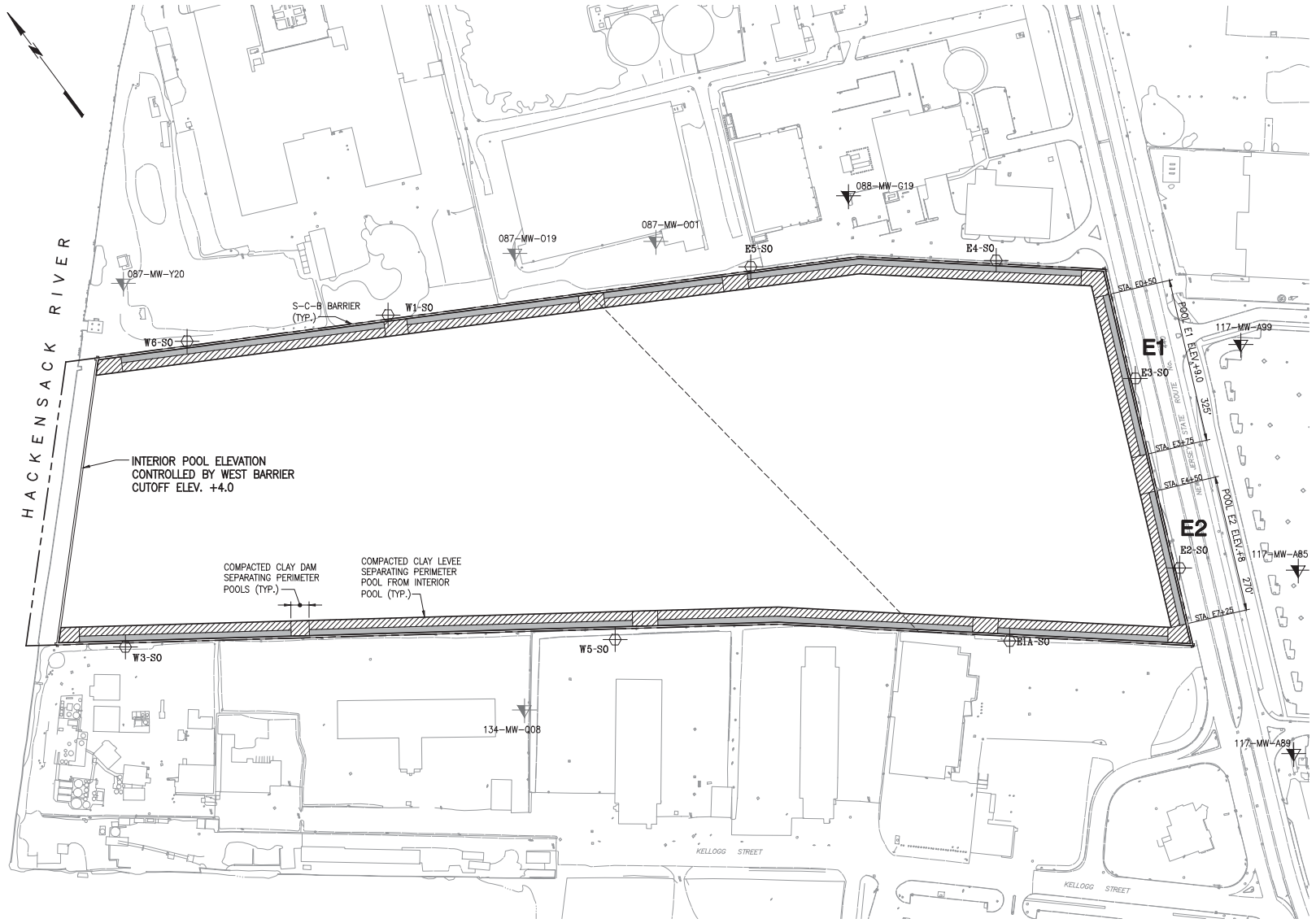

184-MW-103 and 184-MW-107
Monthly Average Groundwater Elevations vs. Total Monthly Precipitation
2021
Groundwater Elevation (ft.,msl)
7.50
7.00
6.50
6.00
5.50
5.00
4.50
4.00
Total Monthly Precipitation (in)
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Date
Precipitation
184-MW-103 (outside)
184-MW-107 (inside)


184-MW-104 and 184-MW-108
Monthly Average Groundwater Elevations vs. Total Monthly Precipitation
2021
Groundwater Elevation (ft.,msl)
8.00
7.50
7.00
6.50
6.00
5.50
5.00
Total Monthly Precipitation (in)
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Date
Precipitation
184-MW-104 (outside)
184-MW-108 (inside)


CARBON PLACE
WEST SIDE AVENUE
NJ STATE ROUTE 440
LEVITZ FURNITURE
LIMIT OF EXCAVATION
LIMIT OF EXCAVATION
ASSUMED EXTENT OF STRATUM D (TYP.) SEE NOTE 8
MW-101
MW-102
MW-103
MW-104
MW-105
MW-106R
MW-107
MW-108
184-SB-109
184-OW-10A,B,C
184-TT-01
184-SB-108
184-TT-02
184-SB-111
184-TT-03
184-SB-107
184-TT-04
090-SB-113
090-SB-104
090-SB-107
090-SB-102
090-SB-103
184-TT-06
Legend:
------ Barrier Wall
Presence of Meadow Mat with elevation contours of upper surface.
Note: Base map taken from Drawing CG-1 of the Subsurface Investigation Report of Study Area 5 (December 21, 2007)
FIGURE 1
Meadow Mat
NJCU, Jersey City, NJ
cornerstone environmental

APPENDIX C

SA-7 EASTERN PERIMETER POOL HYDROGRAPHS



NOTES:

1. 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-SO, 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

GRAPHIC SCALE

100' 50' 0 100' 200'

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

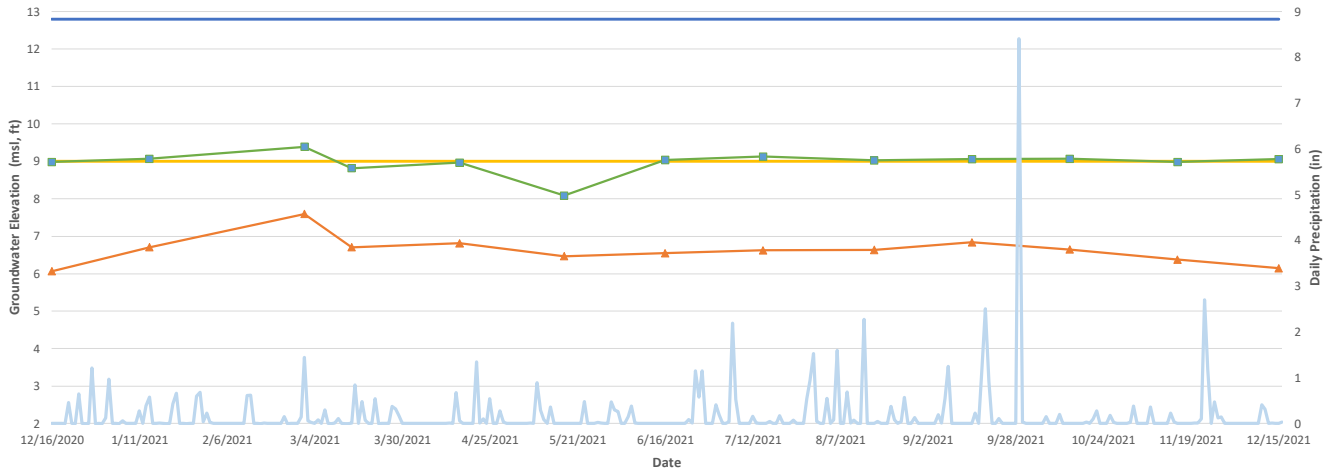
NEW JERSEY

MUESER RUTLEDGE CONSULTING ENGINEERS
14 PENN PLAZA – 225 WEST 34th STREET

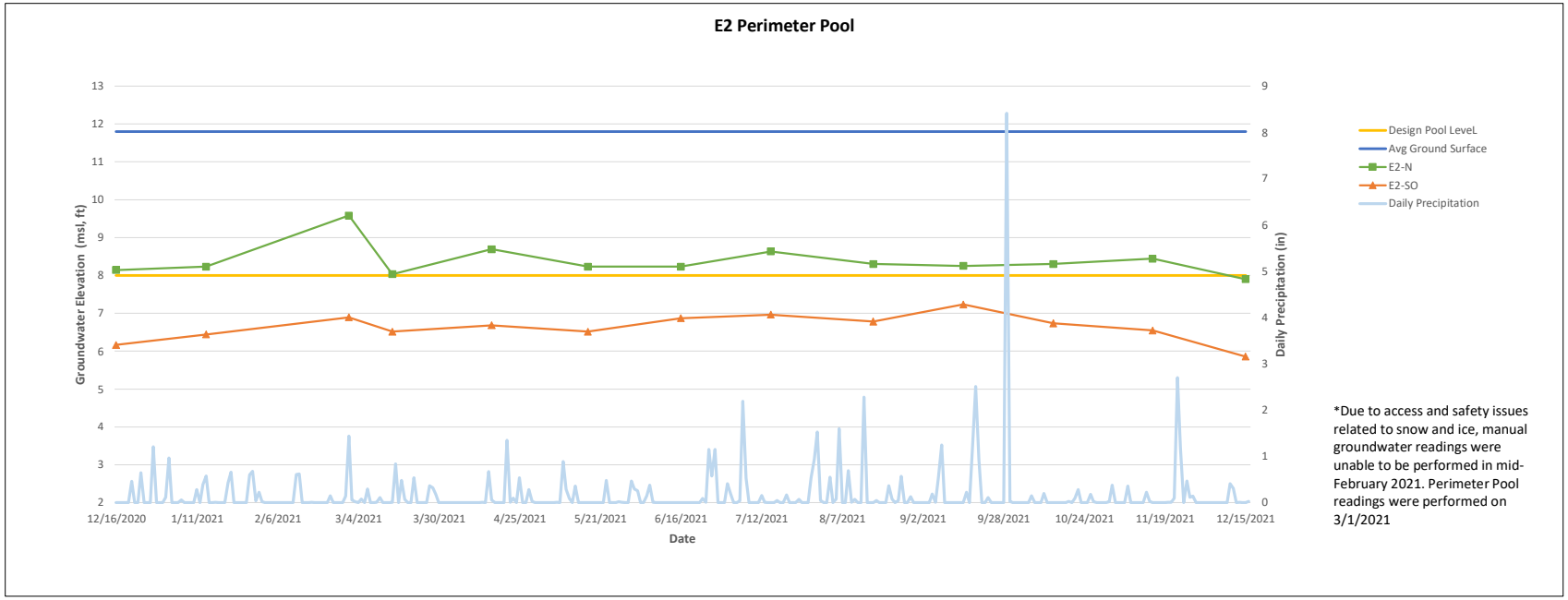
FILE NO. 10210
DRAWING NO. PP-1

Oct 16, 2018 at 11:22am
C:\DWGS\102\10210\Dewatering\PP-1.dwg
bboscaino

E1 Perimeter Pool



*Due to access and safety issues related to snow and ice, manual groundwater readings were unable to be performed in mid-February 2021. Perimeter Pool readings were performed on 3/1/2021



*Due to access and safety issues related to snow and ice, manual groundwater readings were unable to be performed in mid-February 2021. Perimeter Pool readings were performed on 3/1/2021

Table 1 Shallow Groundwater Data		
Date	**E2-SO**	**E3-SO**
12/16/2020	6.16	6.07
1/14/2021	6.44	6.71
3/1/2021*	6.89	7.60
3/15/2021	6.51	6.71
4/16/2021	6.68	6.82
5/17/2021	6.51	6.47
6/16/2021	6.87	6.55
7/15/2021	6.96	6.63
8/17/2021	6.78	6.64
9/15/2021	7.23	6.84
10/14/2021	6.73	6.65
11/15/2021	6.54	6.38
12/15/2021	5.85	6.15

Notes:

* Due to access and safety issues related to snow and ice, manual groundwater readings were unable to be performed in February 2021

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	**527**		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	**80.3**		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	**396**		4	U	6	U	6	U
	3/18/2015	Y	**399**		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	**120**		6.8		5.5	U	5.5	U
	3/31/2016	N	**996**		4	U	5.5	U	5.5	U
	3/31/2016	Y	**707**		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	**91.3**		8	U	5.5	UJ	5.5	UJ
	3/29/2018	Y	**84.1**		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 DUP	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 DUP	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 DUP	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
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 DUP	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 DUP	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 DUP	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 DUP	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

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

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 DUP	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

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