

2023 ANNUAL CCR RULE GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT

McELROY'S RUN COAL COMBUSTION BYPRODUCT DISPOSAL FACILITY

Pleasants Power Station
Pleasants County, West Virginia

Prepared for:

Allegheny Energy Supply Company
A Wholly Owned Subsidiary of FirstEnergy

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Tetra Tech Project No. 212C-SW-00070

January 2024

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1.0 INTRODUCTION

This 2023 Annual Coal Combustion Residuals (CCR) Groundwater Monitoring and Corrective Action Report was prepared by Tetra Tech, Inc. (Tetra Tech) on behalf of Allegheny Energy Supply Company (AESC), for the McElroy's Run Coal Combustion Byproduct Disposal Facility ("CCBDF", "CCR units", or "site") associated with the Pleasants Power Station (hereinafter referred to as the "Station"). The CCR unit and Station are located in Pleasants County, West Virginia. This report was developed to comply with the requirements of § 257.90(e) of the federal CCR Rule (40 CFR, Part 257, Subpart D). In accordance with § 257.90(e)(6), an overview of the current status of the CCR groundwater program at the site is provided in the table below, and discussed in Sections 2.0 through 5.0 of this report:

Status Summary for Reporting Period (January 1 to December 31, 2023)	
Groundwater Monitoring Program in Effect as of January 1, 2023 - 257.90(e)(6)(i)	Assessment Monitoring (Sampling Event AM-10)
Groundwater Monitoring Program in Effect as of December 31, 2023 - 257.90(e)(6)(ii)	Assessment Monitoring (Sampling Event AM-12)
Appendix III SSL's during Reporting Period - 257.90(e)(6)(iii)	n/a – Site in Assessment Monitoring
Appendix IV SSL's during Reporting Period - 257.90(e)(6)(iv)	Arsenic in GW-19, -23, -24, -25, and -26 (Same parameter and same wells as Sampling Events AM-1 through AM-10 with the exception of GW-29 not an SSL in 2023) Molybdenum in GW-20 (Same parameter and same well as Sampling Events AM-7 through AM-10)
Assessment of Corrective Measures - 257.90(e)(6)(iv)	Initiated April 2019 Completed October 2019
Assessment of Corrective Measures Public Meeting - 257.90(e)(6)(iv)	n/a – Selection of Remedy Ongoing
Selection of Remedy - 257.90(e)(6)(v)	On-going, with Semi-Annual Progress Reports prepared for 2023
Corrective Action - 257.90(e)(6)(vi)	n/a - Selection of Remedy Ongoing

1.1 BACKGROUND AND SITE CHARACTERISTICS

CCRs produced at the Station are placed in the CCBDF, which is located approximately one mile east-southeast of the Station. The facility consists of both a wet disposal area (impoundment) and dry disposal area (landfill) developed in the McElroy's Run watershed. Taken together, the landfill and impoundment are regulated under West Virginia Department of Environmental Protection (WVDEP) Solid Waste/National Pollutant Discharge Elimination System (NPDES) Water Pollution Control Permit No. WV0079171 and also under the CCR Rule. A WVDEP groundwater monitoring program for the facility has been in effect since 1994 and a separate CCR Rule groundwater monitoring program was established in 2017. West Virginia State Legislative Rule 33 CSR-1B, which adopts the federal CCR Rule at 40 CFR Part 257, was promulgated on March 1, 2022. WVDEP subsequently issued Administrative Order No. 10076 on July 29, 2022, recognizing the groundwater monitoring program established for the site under the CCR Rule on an interim basis until such time as a major permit modification permanently establishing the CCR Rule monitoring well network as the sole program for the site is approved. A major permit modification application was submitted for WVDEP review on September 9, 2022, and the department issued a draft permit on August 28, 2023, for AESC and public review/comment. As of the end of the reporting period covered herein, a final permit modification has not yet been issued for the CCBDF. As per the CCR Rule, the landfill and impoundment are considered two separate, existing CCR units that share a common boundary (the impoundment dam). As provided by the CCR Rule, a multi-unit groundwater monitoring system has been established for the CCBDF.

The impoundment is situated in the upper portion of the watershed, is unlined, and has been in continuous use since the late 1970s. The landfill is situated in the lower portion of the watershed (adjacent to and overlying the impoundment dam), is lined, and has been in continuous use since the early 1990s. At the current water level, the surface impoundment area is approximately 250 acres. The impoundment dam was constructed with a clay-filled cutoff trench at the upstream toe and with a clay blanket on the upstream face for a low permeability seepage barrier. The downstream portion of the dam was constructed using compacted fly ash and intermittent layers of bottom ash for blanket drains connected to sloping chimney drains that collect and convey seepage to discharge pipes for monitoring. The downstream face of the dam is covered by the landfill facility which WVDEP considers to be a buttress for the dam.

The landfill consists of three primary development stages (I, II, and III in the original WVDEP permit drawings and now referred to as 1, 2, and 3) which are further subdivided into construction

subareas (e.g., Stage 1G, 2A, etc.). At this time, development and disposal operations have only been performed in the Stage 1 and 2 areas while the Stage 3 area remains undeveloped. Up until 2009, all the landfill subareas were constructed with a compacted clay liner system that included an underlying combined groundwater underdrain/leak detection system and overlying leachate collection system. However, since 2009 (in subareas 1G and 2B), a composite geosynthetic liner system (geosynthetic clay liner and geomembrane) has been used which also includes an underlying combined groundwater underdrain/leak detection system and overlying leachate collection system. For all portions of the landfill that overlie the downstream face of the impoundment dam, a bottom ash blanket drain layer has also been installed beneath the liner system. Leachate and contact stormwater runoff from the Stage 1 and 2 disposal areas are managed in Sedimentation Pond Nos. 1 and 2, which are geosynthetic-lined impoundments located immediately down-valley of the future Stage 3 landfill development area.

Groundwater in the CCBDF area occurs primarily within fractured bedrock, principally in the following sandstone units (listed in descending order): the Morgantown sandstone, Grafton sandstone, Jane Lew sandstone, and the Saltsburg sandstone. Groundwater has also been identified in the Ames limestone and Harlem Coal (in association with the Jane Lew sandstone), and, to a lesser extent, the redbed units at the site. Generally, the fine-grained rock units (e.g., redbeds) typically serve as aquitards to limit vertical groundwater migration, while the coarser grained rock units (e.g., sandstones) typically have more well-developed and open fracture systems and are the primary conduits for groundwater migration. The fractured bedrock of multiple sandstone units, including the Morgantown sandstone, Grafton sandstone, Jane Lew sandstone, and Saltsburg sandstone, has been collectively identified as the uppermost aquifer for CCR Rule groundwater monitoring for the combined landfill and impoundment CCR units.

Historic and recent groundwater level data indicate groundwater flow at the CCBDF as being primarily controlled by topography (more important for vertical migration across groundwater flow units along the valley margins near where the units outcrop) with limited, secondary control by orientation (strike and dip) of the rock units (i.e., migration down-dip within a groundwater flow unit). Groundwater is interpreted to generally flow north from the topographically higher areas located to the south of the impoundment, with some flow divergence towards the northwest and to the northeast near the northern boundary of the site. West and northwest of the impoundment dam, topography may be the dominant influence on groundwater flow, as the multiple sandstone units underlying the site are eroded and discontinuous across the valley. Groundwater flow northwest of the dam and under the landfill is in the downstream direction of McElroy's Run toward

the west. Flow in all of the rock units exhibit very little seasonal and temporal fluctuations. Water level data from the current reporting period (2023) were used for contouring groundwater flow patterns at the site. A more detailed discussion of the site's geologic and hydrogeologic characteristics is provided in Section 2.0 of this report.

1.2 REGULATORY BASIS

As required by § 257.90(e) of the CCR Rule, Owners or Operators of existing CCR landfills and surface impoundments were to prepare an initial Annual Groundwater Monitoring and Corrective Action Report ("AGMCA Report") no later than January 31, 2018, and annually thereafter. According to the subject section, "For the preceding calendar year, the annual report must document the status of the groundwater monitoring and corrective action program for the CCR unit, summarize key actions completed, describe any problems encountered, discuss actions to resolve the problems, and project key activities for the upcoming year."

This report has been developed to meet the general requirements above and the specific requirements of §§ 257.90(e)(1) through (6), which include:

- (1) A map, aerial image, or diagram showing the CCR unit and all background (or upgradient) and downgradient monitoring wells, to include the well identification numbers, that are part of the groundwater monitoring program for the CCR unit (see Figures 2-1 and 2-2);
- (2) Identification of any monitoring wells that were installed or decommissioned during the preceding year, along with a narrative description of why those actions were taken (see Section 2.1.1);
- (3) In addition to all the monitoring data obtained under §§ 257.90 through 257.98, a summary including the number of groundwater samples that were collected for analysis for each background and downgradient well, the dates the samples were collected, and whether the sample was required by the detection monitoring or assessment monitoring programs (see Sections 3.0 and 4.0 and Table 3-1);
- (4) A narrative discussion of any transition between monitoring programs (e.g., the date and circumstances for transitioning from detection monitoring to assessment monitoring in addition to identifying the constituent(s) detected at a statistically significant increase over background levels; see Section 2.3);
- (5) Other information required to be included in the annual report as specified in §§ 257.90 through 257.98 (see Sections 4.1 and 5.0 and Tables 4-1, 4-2, and 5-1); and

- (6) A section at the beginning of the annual report that provides an overview of the current status of groundwater monitoring and corrective action programs for the CCR unit. (See Section 1.0).

In addition, the Owner or Operator must place the report in the facility's operating record as required by § 257.105(h)(1), provide notification of the report's availability to the appropriate State Director within 30 days of placement in the operating record as required by § 257.106(h)(1), and place the report on the facility's publicly accessible website, also within 30 days of placing the report in the operating record, as required by § 257.107(h)(1).

1.3 OVERVIEW OF REPORT CONTENTS

Section 1.0 of this report provided an overview of the CCR groundwater program status, CCR unit characteristics, regulatory basis, and a summary of the requirements for CCR Annual Groundwater Monitoring and Corrective Action Reports. Section 2.0 summarizes the status of key actions pertaining to CCR groundwater monitoring and activities completed during 2023 for the CCBDF and plans for the upcoming year. Section 3.0 presents Detection Monitoring (DM) results from groundwater sampling events completed in 2023. Section 4.0 presents Assessment Monitoring (AM) results from groundwater sampling events completed in 2023. Finally, Section 5.0 presents a summary of the Selection of Remedy (SoR) activities that were performed for the CCR units during 2023, including additional Nature and Extent (N&E) of Release characterization activities performed using the new wells installed at the site in 2021 and 2022.

2.0 GENERAL INFORMATION

This section provides an overview of the status of the CCR groundwater monitoring program through 2023 and key activities planned for 2024.

2.1 STATUS OF THE CCR GROUNDWATER MONITORING AND CORRECTIVE ACTION PROGRAM

During calendar year 2023 (January 1st through December 31st), the following key actions were completed with regard to the CCR groundwater monitoring program for the CCBDF.

2.1.1 Groundwater Monitoring Well System

As documented in the facility's previous AGMCA Reports (accessible at <http://ccrdocs.firstenergycorp.com/>), the certified CCR monitoring well network currently consists of three upgradient (background) wells (GW-7, -21, and -22), seven downgradient wells to monitor the northern side of the combined CCR units (GW-9, -19, -20, -23, -24, -25, and -26), and three downgradient wells to monitor the western side of the combined CCR units (GW-27, -28, and -29). There are also three downgradient (GW-30, -31, and -32) and two side-gradient (GW-33A and GW-34) N&E of Release wells installed in 2021 and 2022 as part of ongoing SoR activities at the site. All of these wells are summarized in attached Table 2-1 and shown on attached Figures 2-1 and 2-2. As detailed in the 2020 AGMCA Report, only GW-7 is currently being used for upgradient/background interwell comparisons based on a combination of factors which include: statistical dissimilarity that precludes upgradient well grouping; recurring problems with the availability of sufficient volumes of recoverable water in GW-21; and the slow drop and subsequent stabilization of groundwater levels in some of the CCR network wells installed in 2016 that resulted in a modified interpretation of groundwater flow patterns along the northern boundary of the site. No changes to the certified monitoring well network (i.e., new wells added or existing wells abandoned) occurred during 2023.

2.1.2 Groundwater Monitoring Plan

Consistent with the work performed and summarized in previous AGMCA Reports, the CCR unit's Groundwater Monitoring Plan (GWMP) was followed during all 2023 field sampling and laboratory analysis activities and for statistically evaluating groundwater monitoring data developed from the CCR sampling and analysis program. No changes to the facility's GWMP occurred during 2023.

2.1.3 Background Groundwater Sampling

As documented in the 2017 and 2018 AGMCA Reports, eight independent rounds of background groundwater samples were collected from each CCR monitoring well and each sample was analyzed for all Appendix III and IV parameters prior to initiating the facility's CCR DM program in October 2017. No modifications to this background dataset occurred during 2023.

2.1.4 Statistical Methods

As documented in the 2017 and 2018 AGMCA Reports, the background dataset discussed in Section 2.1.3 of this Report was used to select the appropriate statistical evaluation methods for each CCR groundwater monitoring parameter to identify any Statistically Significant Increases (SSIs) over background concentrations and to determine whether any concentrations were at Statistically Significant Levels (SSLs) above their respective Groundwater Protection Standards (GWPS) established for the site. These statistical methods are available on the facility's publicly accessible website and no changes were made to them during 2023.

2.2 PROBLEMS ENCOUNTERED/RESOLVED

Consistent with previous sampling events, GW-21, GW-23, GW-24, GW-25, and GW-26 were sampled with either HYDRASleeves™ or bailers during both the AM-11 and AM-12 events due to insufficient volumes of recoverable water to allow for sampling using the wells' dedicated bladder pumps. This sampling method resulted in extreme turbidity issues for GW-26 during both AM-11 and AM-12, where the samples were too turbid to register readings on the flow through cell and the samples were noted to be "dark brown/grey in color and extremely turbid" during both events. As with all past sampling events, these four wells also exhibited petroleum impacts (odor and sheen) with wells GW-23 and GW-24 being noted as having "heavy sheen", "strong petroleum odor", and/or "free product" present during both AM-11 and AM-12.

Additionally, during the AM-11 event, GW-22 was also sampled with a HYDRASleeve™ due to the pump being removed for service during AM-9 but not being reinstalled. During AM-12, an attempt was made to sample upgradient well GW-22, however, because the well was inaccessible due to construction in the surrounding area, a sample could not be collected.=

Additionally, while upgradient well GW-21 was unable to be regularly sampled during previous events due to insufficient volumes of recoverable water, it was able to be sampled during AM-11 with HYDRASleeves™ and AM-12 with a bailer. The data obtained from GW-21 during AM-11

and AM-12 will be compiled with the existing GW-21 dataset and used to determine whether or not it is statistically appropriate to group its results with the dataset for upgradient well GW-22.

Lastly, during SoR/N&E of Release sampling on December 13, 2023 (discussed in Section 5.0 of this report), an insufficient volume of recoverable water was available in GW-30 to complete sampling of the well.

Other than the issues discussed above, there were no other significant problems encountered during 2023 with regard to the CCR groundwater monitoring program.

2.3 TRANSITION BETWEEN MONITORING PROGRAMS

As documented in the 2018 AGMCA Report, the CCR units transitioned from DM to AM that year. As part of this transition, all required notifications were issued, appropriate GWPS for Appendix IV parameters were established, and the first two AM sampling events (AM-1 and AM-2) were completed that year. Statistical evaluations of the AM-1, -2, and -3 sampling events were performed and documented in the 2019 AGMCA Report and the data indicated there were SSLs in one or more well comparisons. Based on the parameters for which SSLs were identified, an Appendix IV Alternative Source Demonstration (ASD) was then undertaken but not all of the Appendix IV SSLs that were identified could be attributed to alternative sources. As such, N&E of Release characterization activities and an Assessment of Corrective Measures (ACM) were completed and are documented in the 2019 AGMCA Report. Since that time and throughout 2023, the CCR unit has remained in AM with ongoing SoR activities being performed as discussed in Section 5.0 of this report, which included additional SoR/N&E of Release characterization work.

2.4 KEY ACTIVITIES PLANNED FOR THE UPCOMING YEAR

The following are the key CCR groundwater compliance activities planned for 2024:

- Continue with AM by conducting the semi-annual rounds of sampling and analysis for Appendix III and Appendix IV constituents [per 40 CFR § 257.96(b)] and evaluate the need to update the background data sets and associated Upper Prediction Limits (UPLs).
- Service the bladder pump for GW-22. If the pump cannot be repaired by the vendor and returned to functional status, a new bladder pump will need be purchased for installation and use in GW-22.
- If any new SSLs are identified, provide appropriate notification [per § 257.95(g)] then potentially conduct an Appendix IV ASD [per § 257.95(g)(3)(ii)] to determine if a source other than the CCR units may be causing the new SSLs. Concurrent with undertaking an

Appendix IV ASD, characterize the Nature and Extent of the new Appendix IV release and provide appropriate notification depending on the findings [per §§ 257.95(g)(1) and (2), respectively].

- If any new SSLs are identified and an ASD is either not undertaken, indicates that an alternative source is not responsible for all the new SSLs identified, or is not completed within 90 days of identifying there are new SSLs, then initiate and perform an Assessment of Corrective Measures for the new SSLs in accordance with § 257.96.
- Conduct SoR activities in compliance with § 257.97(a), which states that as soon as feasible after completion of the ACM, select a remedy that, at a minimum, meets the performance standards listed in § 257.97(b) and the evaluation factors listed in § 257.97(c) These activities are currently in progress and include continued sampling of SoR/N&E of Release monitoring wells GW-30, -31, -32, -33A, and -34; evaluating the historic groundwater monitoring dataset for relationships between key parameters affecting arsenic natural attenuation and arsenic concentrations in groundwater; and completing development of the Arsenic Natural Attenuation Evaluation Work Plan. Based on the results obtained from these wells, the need for additional SoR/N&E wells will be evaluated.
- As required by § 257.97(d), specify, as part of the selected remedy, a schedule(s) for implementing and completing remedial activities. The schedule will require the completion of remedial activities within a reasonable period of time taking into consideration the factors set forth in §§ 257.97(d)(1) through (d)(6).
- As required by § 257.97(a), continue preparing semi-annual reports describing the progress in selecting and designing the remedy.
- Should all required SoR activities be completed in 2024, prepare a final report describing the selected remedy. The final report will include a certification from a qualified professional engineer that the remedy selected meets the requirements of the CCR Rule selection criteria and the final report will be placed in the facility's operating record as required by § 257.105(h)(12).
- As required by § 257.96(e), discuss the results of the ACM at least 30 days prior to the final SoR, in a public meeting with interested and affected parties.

3.0 DETECTION MONITORING INFORMATION

3.1 GROUNDWATER ANALYTICAL RESULTS SUMMARY

As noted in Section 2.3, site-wide AM was performed throughout 2023. As part of the AM program, all DM (Appendix III) parameters were also analyzed during each AM sampling event.

The need to statistically evaluate the 2023 Appendix III data to identify SSIs and determine if AM was necessary was precluded by the CCR units already being in AM during all of 2023, so no statistical analysis of the data was necessary. The 2023 Appendix III data that was collected and validated is presented in Table 3-1 with the intent of using it during the next update of the background dataset and associated UPLs, which will help increase the statistical power of future analyses.

4.0 ASSESSMENT MONITORING INFORMATION

4.1 GROUNDWATER ANALYTICAL RESULTS SUMMARY

In accordance with 40 CFR §§ 257.95(b) and (d)(1), the CCR groundwater sampling and analysis program implemented during 2023 consisted of two AM sampling events (AM-11 and AM-12) performed between March 14 and April 4, 2023, and between September 14 and September 21, 2023, respectively. For both AM events, all Appendix III and all Appendix IV constituents were analyzed with the exception of combined radium 226/228 during AM-11, which was inadvertently excluded from the sampling event. However, as documented in the CCR unit's 2019 Appendix IV ASD, multiple lines of evidence (LOE) indicate that elevated concentrations of combined radium 226/228 found in groundwater can be attributed to historical and current oil and gas exploration and production activities that have occurred at the site and, as such, the lack of radium data for AM-11 did not affect the 2023 AM program evaluations for the CCR units. The analyses that were performed exceed the requirements of § 257.95 which only stipulate analyzing for all Appendix IV parameters once per year. Laboratory analysis and subsequent validation of the sample data were completed on August 17, 2023, and January 8, 2024, for AM-11 and AM-12, respectively. Table 3-1 presents the validated analytical results for these events.

Statistical evaluations of 2023 AM data included sampling events AM-11 and AM-12, respectively. All statistical evaluation work was performed in accordance with the certified methods included in both the facility's operating record and the publicly accessible website, and the results were used to determine whether there were any detected Appendix IV parameters at SSLs above the CCR unit's established GWPS. As documented in the 2018 AGMCA Report, site-specific Appendix IV GWPS were established for the CCR units using the higher of the federal Maximum Contaminant Level (MCL) or UPL for each parameter or, for those parameters that do not have MCLs, the higher of the EPA Risk Screening Level (RSL) or the UPL. The site-specific GWPS and the results of the statistical evaluations of AM-11 and AM-12 are presented in Tables 4-1 (northern boundary) and 4-2 (western boundary) and discussed below.

For the northern boundary monitoring wells, results from statistical analysis of the AM-11 and AM-12 data were generally consistent with results of the AM-1 to AM-10 data, including recurring SSLs in multiple downgradient wells for arsenic (GW-19, -23, -24, -25, and -26), barium (GW-23, -24, -25, and -26), lithium (GW-23, -24, -25, and -26), and combined radium 226/228 (GW-23, -24, -25, and -26). As documented in the CCR unit's 2019 Appendix IV ASD, multiple LOE indicate that the elevated concentrations of barium and combined radium 226/228 can be attributed to

historical and current oil and gas exploration and production activities that have occurred at the site, and that a high potential exists that the elevated lithium concentrations are also attributable to these oil and gas activities. During AM-11 there was also a recurring SSL for molybdenum in GW-20 (molybdenum was first identified as a potential SSL in GW-20 during AM-3 and AM-4, but the exceedances were attributed to sample turbidity issues, which was later confirmed by results below the associated GWPS during AM-5 and AM-6). However, recurrence of the molybdenum GWPS exceedances from AM-7 through AM-11, during which all samples had low turbidities, indicates that this parameter is an SSL in GW-20. However, during AM-12, molybdenum concentrations again dropped just below the GWPS (0.1 mg/L) with a measured concentration of 0.09237 mg/L. As such, appropriate notification of the SSL, performing an Appendix IV ASD to determine if a source other than the CCR units may be causing the molybdenum SSLs, and characterizing the N&E of the molybdenum release will be performed in accordance with the associated CCR Rule requirements cited in Section 2.4 of this report.

In addition to the SSLs discussed above, there were also new SSLs identified for beryllium, chromium, cobalt, lead, and mercury during AM-11 and/or AM-12, all of which were limited to GW-26 (i.e., no other downgradient wells at the site exhibited these same SSLs). However, as discussed in Section 2.2, GW-26 was sampled with a HYDRASleeve™ due to low standing water depths, and this sampling method resulted in the samples being extremely turbid. In accordance with the CCR unit's GWMP, in the event that sampling methods other than low-flow pumping are required for a given well, a separate set of field-filtered samples are collected for that well and analyzed for dissolved concentrations to allow for a determination of sample turbidity effects. The tables below present the total and dissolved concentrations for the five new SSL parameters along with the corresponding total to dissolved (T:D) concentration ratios for each event.

GW-26 (AM-11)					
	Beryllium	Chromium	Cobalt	Lead	Mercury
Total	0.00918	0.082251	0.033174	0.04163	<0.000163
Dissolved	<0.00044	<0.009	<0.00095	<0.0022	<0.000163
T:D Ratio	20.9	9.1	34.9	18.9	1.0

Note: All concentrations reported above are in mg/L.

GW-26 (AM-12)					
	Beryllium	Chromium	Cobalt	Lead	Mercury
Total	0.030801	0.550911	0.300142	0.315654	0.0935
Dissolved	<0.0044	<0.09	<0.0095	<0.022	<0.00815
T:D Ratio	7.0	6.1	31.6	14.3	11.5

Note: All concentrations reported above are in mg/L.

Looking at this data it is seen that the T:D ratios are very high for all five parameters, with the exception of Mercury during AM-11, and are indicative of significant turbidity effects on the measured beryllium, chromium, cobalt, lead, and mercury concentrations in the well. Although lithium was determined during the Appendix IV ASD to likely be attributable to oil and gas activities, turbidity is also a contributing factor in GW-26 with lithium total to dissolved ratios of 10.5 and 8.8 for AM-11 and AM-12, respectively.

For the western boundary monitoring wells, results from statistical analysis of the AM-11 and AM-12 data for GW-27 and GW-28 were generally consistent with results of the AM-1 to AM-10 data with no SSLs. Arsenic concentrations in GW-29, which had been at SSLs above the GWPS (0.1 mg/L) from AM-1 to AM-9 before falling to just below the GWPS in AM-10, continued to be below the GWPS during AM-11 and AM-12. There was a recurring SSL in GW-29 during AM-11 and AM-12 for lithium that was first identified during both AM-7 and AM-8 and continued during AM-9 and AM-10. After a first-time GWPS exceedance for combined radium 226/228 was identified in GW-27 during AM-8, combined radium 226/228 was below its respective GWPS during AM-9 through AM-12. As documented in the CCR unit’s 2019 Appendix IV ASD, multiple LOE indicate that the elevated concentrations of combined radium 226/228 can be attributed to historical and current oil and gas exploration and production activities that have occurred at the site, and that a high potential exists that the elevated lithium concentrations are also attributable to these oil and gas activities.

Taking into account the ASD exclusions for barium, combined radium 226/228, and lithium, the turbidity issues with GW-26 resulting in elevated metals concentrations, and the data presented in Tables 4-1 and 4-2, arsenic and molybdenum were the only Appendix IV constituents detected at SSLs above their respective GWPS under the CCR units’ AM program during the reporting period, and arsenic currently remains the only parameter that is the focus of ongoing SoR activities for the CCR units as discussed in Section 5.0 of this report. During the next reporting

period an ASD will be prepared that evaluates the molybdenum SSLs and follows up on the previous lithium ASD work to substantiate that historical and current oil and gas exploration and extraction activities at the site are the likely source of elevated lithium concentrations.

5.0 SELECTION OF REMEDY

As previously noted in Section 2.3 of this report, throughout 2023 the CCR unit remained in AM with ongoing SoR activities being performed. As detailed in the CCR units' 2019 ACM Report, the evaluation of viable remediation technologies for addressing arsenic in groundwater at the site determined that Monitored Natural Attenuation (MNA), combined with source control by the eventual installation of a final cover system on the CCR units, ranked highest among the evaluated options. Therefore, the 2023 SoR activities were focused on developing additional information and data to determine if the preferred remedy identified during the ACM meets the performance standards listed in 40 CFR § 257.97(b), while considering the evaluation factors listed in § 257.97(c).

5.1 CURRENT STATUS OF THE SELECTION OF REMEDY PROGRAM

As outlined in the Semi-Annual SoR Progress reporting included as Attachment A of this report, the following activities were performed during the current reporting period to support final remedy selection at the site:

- One round of SoR/N&E of Release characterization sampling (Event 25 / NE-4) for GW-30, GW-31, -32, -33A, and -34 was completed in December 2023. However, due to an insufficient recoverable volume of water, GW-30 could not be sampled. Additionally, due to an issue with the portable low flow pump, GW-34 was sampled using a bailer. The results from NE-4 are presented in Table 5-1 along with laboratory results from the December 2022 SoR/N&E sampling event (Event 22 / NE-3) that had not yet been received at the time the 2022 AGMCA Report was prepared. In addition to arsenic, analyses were performed for all other CCR Rule Appendix III and Appendix IV parameters during NE-4 in order to begin building a background dataset for use when the wells are eventually incorporated into the AM and/or Corrective Action Monitoring network.
- Continued development of a Natural Attenuation Evaluation Work Plan to include evaluating historic concentrations of parameters which can affect the natural attenuation of arsenic (e.g., iron, pH, ORP, etc.) as well as planning the sampling and analysis program that would be associated with future MNA activities.
- Continued a review of candidate technologies with regard to their potential to meet the performance standards listed in § 257.97(b) and the evaluation factors listed in § 257.97(c).

- Assessed March and September 2023 groundwater flow patterns in the monitoring network areas downgradient of the CCR units and confirmed they were consistent with established flow patterns at the site.
- Completed statistical evaluations of the AM-11 and AM-12 analytical data to determine whether there were any detected Appendix IV parameters at SSLs above the CCR unit's established GWPS other than arsenic and those previously determined by the 2019 Appendix IV ASD to be attributable to other sources, with molybdenum identified as an SSL above its respective GWPS in a single well. SSLs for beryllium, chromium, cobalt, lead, and mercury in GW-26 during AM-11 and/or AM-12 are attributable to sample turbidity.

Ongoing and/or new SoR activities that are planned for 2024 have been included in Section 2.4 of this report.

TABLES

TABLE 2-1
CCR RULE GROUNDWATER MONITORING SYSTEM WELL SUMMARY
McELROY's RUN CCB DISPOSAL FACILITY – 2023 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT

Well	Year Installed	Formation Monitored	Ground Surface Elevation (ft MSL)	Total Well Depth (ft bgs)	Monitored Interval (ft bgs)	Monitored Interval (ft MSL)	Casing ID and Material
Certified Upgradient (Background) Monitoring Wells							
GW-7	1994	Grafton SS, Ames LS	918.40	101.2	75.7 – 100.7	817.70 – 842.70	4" - Sch. 40 PVC
GW-21*	2016	Morgantown SS	1033.01	234.2	214.2 – 234.2	798.77 – 818.77	2" - Sch. 40 PVC
GW-22*	2016	Morgantown SS	1045.18	370.2	350.2 – 370.2	675.02 – 695.02	2.5" - Sch. 80 PVC
Certified Downgradient Monitoring Wells							
GW-9	1994	Ames LS, Jane Lew SS, Pittsburgh RB	797.42	177.7	137.2 – 177.2	620.22 – 660.22	4" - Sch. 40 PVC
GW-19	1995	Birmingham RB, Grafton SS, Ames LS	920.64	238.9	198.9 – 238.9	681.74 – 721.74	2" - Sch. 40 PVC
GW-20	1995	Lower Clarksburg RB	923.00	150.5	100.5 – 150.5	772.50 – 822.50	2" - Sch. 40 PVC
GW-23	2016	Grafton SS	974.40	392.9	372.9 – 392.9	581.53 – 601.53	2.5" - Sch. 80 PVC
GW-24	2016	Grafton SS	941.55	271.1	251.1 – 271.1	670.50 – 690.50	2" - Sch. 40 PVC
GW-25	2016	Grafton SS	1006.22	303.7	283.7 – 303.7	702.53 – 722.53	2" - Sch. 40 PVC
GW-26	2016	Grafton SS	984.16	288.2	268.2 – 288.2	695.95 – 715.95	2" - Sch. 40 PVC
GW-27	2016	Saltsburg SS	675.30	48.3	38.3 – 48.3	626.96 – 636.96	2" - Sch. 40 PVC
GW-28	2016	Saltsburg SS	801.95	175.6	165.6 – 175.6	626.38 – 636.38	2" - Sch. 40 PVC
GW-29	2016	Grafton SS	928.49	166.0	156.0 – 166.0	762.45 – 772.45	2" - Sch. 40 PVC
Nature & Extent of Release Characterization Wells**							
GW-30**	2022	Grafton SS	733.80	114.0	86.0 – 114.0	619.80 – 647.80	4" - Sch. 40 PVC
GW-31**	2021	Grafton SS	1044.68	360.0	333.0 – 361.0	683.68 – 711.68	4" - Sch. 80 PVC
GW-32**	2021	Grafton SS	918.64	424.0	398.0 – 426.0	492.64 – 520.64	4" - Sch. 80 PVC
GW-33A**	2021	Morgantown SS	1052.42	467.0	432.0 – 467.0	585.42 – 620.42	4" - Sch. 80 PVC
GW-34**	2021	Grafton SS	1043.68	543.5	515.0 – 548.0	495.68 – 528.68	4" - Sch. 80 PVC

Notes: SS = sandstone LS = limestone RB = red beds MSL = mean sea level bgs = below ground surface ID = inside diameter PVC = polyvinyl chloride

* = Currently used only for water level measurements

** = Not currently part of certified monitoring network but may transition to use as Corrective Action Monitoring wells and/or be incorporated as new Assessment Monitoring wells in the certified monitoring well network

SAMPLING EVENT NO. ^{2,5}	WELL ID ³	SAMPLE DATE	APPENDIX III (all Chemical Constituents reported as TOTAL RECOVERABLE) ¹							APPENDIX IV (all Chemical Constituents reported as TOTAL RECOVERABLE) ¹															
			BORON METALS	CALCIUM METALS	CHLORIDE MISC	FLUORIDE MISC	PH ⁴ MISC	SULFATE MISC	TDS MISC	ANTIMONY METALS	ARSENIC METALS	BARIUM METALS	BERYLLIUM METALS	CADMIUM METALS	CHROMIUM METALS	COBALT METALS	LEAD METALS	LITHIUM METALS	MERCURY METALS	MOLYBDENUM METALS	SELENIUM METALS	THALLIUM METALS	RADIUM-226 RADIOCHEM	RADIUM-228 RADIOCHEM	
			MG/L	MG/L	MG/L	MG/L	S.U.	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L
23 (AM-11)	GW-7	3/30/2023	0.3522	2.6857	127.8	8.6757	8.30	0.0385 U	1340	0.003 U	0.0008 U	0.078489	0.00022 U	0.001 U	0.0045 U	0.000475 U	0.0011 U	0.023792	0.000163 U	0.00315 U	0.00425 U	0.0004 U	NA	NA	
24 (AM-12)	GW-7	9/20/2023	0.572 U	2.77	123.9	8.1476	8.15	0.0385 U	1410	0.006 U	0.0016 U	0.079904	0.00044 U	0.002 U	0.009 U	0.00095 U	0.0022 U	0.023702	0.000815 UJ	0.0063 U	0.0085 U	0.0008 U	0.1 U	0.711	
23 (AM-11)	GW-9	3/15/2023	0.075 U	5.6064	113.3	1.698	8.12	11.62	1024	0.003 U	0.000961	0.16512	0.00044 U	0.001 U	0.0045 U	0.000475 U	0.0011 U	0.017281	0.000163 U	0.00315 U	0.00425 UJ	0.0004 U	NA	NA	
24 (AM-12)	GW-9	9/19/2023	0.2243 J	6.29	163	2.3864 J+	8.21	14.79 J-	1248	0.003 U	0.000833	0.182396	0.00022 U	0.001 U	0.0045 U	0.000475 U	0.0011 U	0.019297	0.000163 UJ	0.00315 U	0.00425 U	0.0004 U	0.192	0.0453 U	
23 (AM-11)	GW-19	3/16/2023	0.075 U	9.81	608.5	1.9135	7.67	0.0385 U	2600	0.003 U	0.128159	1.43846	0.00044 U	0.001 U	0.0045 U	0.000475 U	0.0011 U	0.017381	0.000163 U	0.00315 U	0.00425 UJ	0.0004 U	NA	NA	
24 (AM-12)	GW-19	9/20/2023	1.14 U	10.034	611.9	1.8643 J+	7.66	0.0497 J	2670	0.006 U	0.130697	1.15559	0.00044 U	0.002 U	0.009 U	0.00095 U	0.0022 U	0.019763	0.00408 U	0.0063 U	0.0085 U	0.0008 U	1.3	0.98	
23 (AM-11)	GW-20	3/28/2023	0.2107	4.6078	520.2	6.218	8.24	30.14	560 J	0.003 U	0.001421	0.214038	0.00022 U	0.001 U	0.0045 U	0.000475 U	0.0011 U	0.018969	0.000163 U	0.102488	0.018755	0.0004 U	NA	NA	
23 (AM-11)	GW-20 (D)	3/28/2023	0.1944 J	4.6244	520.1	6.2188	8.24	30.3	1780 J	0.003 U	0.001918	0.217106	0.00022 U	0.001 U	0.0045 U	0.000475 U	0.0011 U	0.017166	0.000163 U	0.101705	0.017813	0.0004 U	NA	NA	
24 (AM-12)	GW-20	9/19/2023	0.219 J	5.26	506.4	5.8928	8.02	29.82	1966.667	0.003 U	0.002389	0.198608	0.001462	0.001 U	0.0045 U	0.000475 U	0.0011 U	0.01794	0.000163 UJ	0.09237	0.021316	0.0004 U	0.344	0.472 U	
23 (AM-11)	GW-21	3/30/2023	0.2023	12.6844	996.8	1.9893	8.04	149	3100	0.003 U	0.006519	0.211576	0.00022 U	0.001 U	0.0045 U	0.000475 U	0.0011 U	0.020757	0.000163 U	0.178495	0.029805	0.0004 U	NA	NA	
24 (AM-12)	GW-21	9/21/2023	0.572 U	12.994	1030	1.8979 J+	7.93	135.7 J-	3090	0.006 U	0.007272	0.190878	0.00044 U	0.002 U	0.009 U	0.00095 U	0.0022 U	0.022758	0.00408 U	0.166179	0.033876	0.0008 U	6.16	0.85 U	
23 (AM-11)	GW-22	3/15/2023	0.075 U	18.7525	338.7	1.3273	7.23	53.15	1136	0.003 U	0.1412	0.087472	0.00044 U	0.001 U	0.0045 U	0.000475 U	0.0011 U	0.01152	0.000163 U	0.057823	0.00425 UJ	0.0004 U	NA	NA	
24 (AM-12)	GW-22 ⁵	9/21/2023	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
23 (AM-11)	GW-23	3/28/2023	0.1888 J	604.4084	12670	0.025 U	7.11	0.4817	31320	0.006 U	0.037154	16.57181	0.00044 U	0.002 U	0.009 U	0.002787	0.0022 U	0.085333	0.000163 U	0.014288	0.0085 U	0.0008 U	NA	NA	
24 (AM-12)	GW-23	9/19/2023	0.572 U	697	12760	0.025 U	6.81	0.4532 J-	33580	0.012 U	0.042958	15.73577	0.00088 U	0.001 U	0.0045 U	0.002179	0.0044 U	0.100741	0.00408 U	0.0126 U	0.017 U	0.0016 U	27.1 J	82.5 J	
23 (AM-11)	GW-24	3/28/2023	0.1622 J	381.8626	9243	0.025 U	7.08	0.0385 U	22420	0.006 U	0.038787	15.5003	0.00044 U	0.002 U	0.009 U	0.002049	0.0022 U	0.041009	0.000163 U	0.011364	0.0085 U	0.0008 U	NA	NA	
24 (AM-12)	GW-24	9/18/2023	0.3054 J	389	9800	0.025 U	7.13	0.0385 U	23880	0.006 U	0.02637	12.95608	0.00044 U	0.002 U	0.009 U	0.001319	0.0022 U	0.068332	0.00408 U	0.0063 U	0.0085 U	0.0008 U	21.3 J	47.5 J	
23 (AM-11)	GW-25	3/20/2023	0.075 U	369.2516	9114	0.025 U	7.67	0.2093	20460	0.003 U	0.034427	11.77833	0.00044 U	0.001 U	0.009 U	0.000826 J	0.0011 U	0.0634	0.000163 U	0.011974	0.0085 UJ	0.0004 U	NA	NA	
24 (AM-12)	GW-25	9/21/2023	0.572 U	359	8819	0.025 U	7.43	0.0385 UJ	21560	0.006 U	0.036874	8.61694	0.00044 U	0.002 U	0.009 U	0.001761	0.0022 U	0.061685	0.00408 U	0.012628	0.0085 U	0.0008 U	17.6	31	
23 (AM-11)	GW-26	3/20/2023	0.075 U	239.8332	1019	1.2913	8.36	0.4861	10580	0.006 U	0.020176	4.02001	0.00918	0.002 U	0.082251	0.033174	0.04163	0.0614	0.000163 U	0.0063 U	0.0085 UJ	0.0008 U	NA	NA	
24 (AM-12)	GW-26	9/21/2023	1.28	908	1145	1.1969	8.09	0.0875 J	5480	0.06 U	0.13972	8.06706	0.030801	0.02 U	0.550911	0.300142	0.315654	0.43983	0.0935	0.063 U	0.085 U	0.008 U	16.9	13.1 G	
23 (AM-11)	GW-27	3/16/2023	0.075 U	51.2015	126.1	0.2401	7.36	2.4443	588	0.003 U	0.0008 U	1.1324	0.00044 U	0.001 U	0.0045 U	0.000475 U	0.0011 U	0.014116	0.000163 U	0.003344	0.00425 UJ	0.0004 U	NA	NA	
24 (AM-12)	GW-27	9/18/2023	0.1332 J	57.507	125.6	0.3126	7.70	0.0385 UJ	580	0.003 U	0.0008 U	1.04312	0.00022 U	0.001 U	0.0045 U	0.000475 U	0.0011 U	0.016744	0.000163 U	0.004145	0.00425 U	0.0004 U	0.479	1 U	
24 (AM-12)	GW-27 (D)	9/18/2023	0.1145 U	54.98	125.1	0.3108 J+	7.70	3.7892 J	612	0.003 U	0.0008 U	0.955519	0.00022 U	0.001 U	0.0045 U	0.000475 U	0.0011 U	0.016591	0.000163 U	0.003728	0.00425 U	0.0004 U	0.661	1.47 U	
23 (AM-11)	GW-28	4/4/2023	0.2347	6.027	695	2.1546	7.73	0.7832	2300	0.003 U	0.004145	0.268208	0.00022 U	0.001 U	0.0045 U	0.000475 U	0.0011 U	0.02249	0.000163 U	0.035246	0.00425 U	0.0004 U	NA	NA	
24 (AM-12)	GW-28	9/18/2023	0.2151 J	6.35	681.2	2.0951	7.74	0.7195	2360	0.003 U	0.003602	0.253439	0.00022 U	0.001 U	0.0045 U	0.000475 U	0.0011 U	0.023242	0.000163 U	0.034415	0.00425 U	0.0004 U	0.321	1.23 U	
23 (AM-11)	GW-29	4/4/2023	0.3414	12.4829	1021	1.3236	7.80	0.0385 U	3740	0.003 U	0.008907	1.35993	0.00022 U	0.001 U	0.0045 U	0.000475 U	0.0011 U	0.046397	0.000163 U	0.003219	0.00425 U	0.0004 U	NA	NA	
24 (AM-12)	GW-29	9/18/2023	0.3143 J	12.527	1010	1.2778	7.78	1.1265	3880	0.003 U	0.008829	1.27794	0.00022 U	0.001 U	0.0045 U	0.000475 U	0.0011 U	0.04646	0.000163 U	0.012409	0.00425 U	0.0004 U	0.729	1 U	

NOTES:

¹ Lab analyses were completed by Beta Lab and Eurofins Laboratories, Inc., both of which are accredited/certified laboratories: Beta Lab NSF/ISR ISO 9001: Cert. No. 83761-IS8 (Exp. 01-16-24) and Eurofins WVDEP Certificate No. 142, Expiration Date: 1-31-24.

² Sampling Event Nos. 23 and 24 correspond to Assessment Monitoring (AM) sampling events AM-11 and AM-12, respectively.

³ Field duplicate samples that were taken for Quality Control purposes are noted with a (D).

⁴ pH results reported are field sampling measurements as lab pH testing exceeded hold times.

⁵ GW-22 could not be sampled during AM-12 due to surrounding construction access limitations.

NA = Parameter was not analyzed.

NS = Not sampled.

DATA QUALIFIER DEFINITIONS:

The following definitions provide brief explanations of the validation qualifiers assigned to results in the data review process.

- U The analyte was analyzed for, but was not detected at a level greater than or equal to the level of the adjusted method detection limit for sample and method.
- J The analyte was positively identified and the associated numerical value is the approximate concentration of the analyte in the sample (due either to the quality of the data generated because certain quality control criteria were not met, or the concentration of the analyte was below the reporting limit).
- J+ The result is an estimated quantity, but the result may be biased high.
- J- The result is an estimated quantity, but the result may be biased low.
- UJ The analyte was analyzed for, but was not detected. The reported detection limit is approximate and may be inaccurate or imprecise.
- R The sample result (detected) is unusable due to the quality of the data generated because certain criteria were not met. The analyte may or may not be present in sample.
- UR The sample result (nondetected) is unusable due to the quality of the data generated because certain criteria were not met. The analyte may or may not be present in sample.
- G The sample MDC (minimum detectable concentration) is greater than the requested reporting limit.

TABLE 4-1
CCR RULE INTERWELL COMPARISON OF SAMPLING EVENT AM-11 AND -12 APPENDIX IV DATA

Northern Boundary							Event 23 (AM-11)							Event 23 (AM-11) Upgradient Well GW-7	
Parameter	Units	Data Distribution for Upgradient Well GW-7	UPL Type	UPL Value ^{a,b}	Federal MCLs/RSLS	GWPS	Downgradient Wells								
							GW-9	GW-19	GW-20	GW-23	GW-24	GW-25	GW-26		
Antimony	mg/L	Unknown	Poisson	0.00133	0.006	0.006	<0.003	<0.003	<0.003	<0.006	<0.006	<0.003	<0.006	<0.003	U
Arsenic	mg/L	Unknown	Poisson	0.00682	0.01	0.01	0.000961	0.128159	0.0016695	0.037154	0.038787	0.034427	0.020176	<0.0008	U
Barium	mg/L	Log-Normal	Parametric	0.0934	2	2	0.16512	1.43846	0.215572	16.57181	15.5003	11.77833	4.02001	0.078489	
Beryllium	mg/L	Unknown ^c	DQ ^d	NA	0.004	0.004	<0.00044	<0.00044	<0.00022	<0.00044	<0.00044	<0.00044	0.00918	<0.00022	U
Cadmium	mg/L	Unknown ^c	DQ ^d	NA	0.005	0.005	<0.001	<0.001	<0.001	<0.002	<0.002	<0.001	<0.002	<0.001	U
T. Chromium	mg/L	Unknown ^c	DQ ^d	NA	0.1	0.1	<0.0045	<0.0045	<0.0045	<0.009	<0.009	<0.009	0.082251	<0.0045	U
Cobalt	mg/L	Unknown ^c	DQ ^d	NA	0.006	0.006	<0.000475	<0.000475	<0.000475	0.002787	0.002049	0.000826	0.033174	<0.000475	U
Fluoride	mg/L	Normal	Parametric	9.291	4	9.291	1.698	1.9135	6.2184	<0.025	<0.025	<0.025	1.2913	8.6757	
Lead	mg/L	Unknown ^c	DQ ^d	NA	0.015	0.015	<0.0011	<0.0011	<0.0011	<0.0022	<0.0022	<0.0011	0.04163	<0.0011	U
Lithium	mg/L	Normal	Parametric	0.023374	0.04	0.04	0.017281	0.017381	0.0180675	0.085333	0.041009	0.0634	0.0614	0.023792	
Mercury	mg/L	Unknown	Poisson	0.00031	0.002	0.002	<0.000163	<0.000163	<0.000163	<0.000163	<0.000163	<0.000163	<0.000163	<0.000163	U
Molybdenum	mg/L	Log-Normal	Parametric	0.006805	0.1	0.1	<0.00315	<0.00315	0.1020965	0.014288	0.011364	0.011974	<0.0063	<0.00315	U
Selenium	mg/L	Unknown ^c	DQ ^d	NA	0.5	0.5	<0.00425	<0.00425	0.018284	<0.0085	<0.0085	<0.0085	<0.0085	<0.00425	U
Thallium	mg/L	Unknown ^c	DQ ^d	NA	0.002	0.002	<0.0004	<0.0004	<0.0004	<0.0008	<0.0008	<0.0004	<0.0008	<0.0004	U
Sum Ra226+Ra228	pCi/L	Unknown	Poisson	0.58	5	5	NA ^e	NA ^e	NA ^e	NA ^e	NA ^e	NA ^e	NA ^e	NA ^e	

^aPrediction Limits calculated using 5% alpha.

^bUpper Prediction Limit used for all parameters.

^cData distribution set to Unknown if all values non-detect in upgradient well.

^dDQ is Double Quantification Rule. If two successive, independent detected values occur, that would be an SSI and also an SSL if > GWPS. However, if value was detected in upgradient well during the same sampling event, would use Poisson PL instead.

^eNot Analyzed

= UPL > Result > MCL/RSLS
 [Green Box] = SSI < GWPS
 [Red Box] = SSI > GWPS
 [Yellow Box] = DQ Parameter with Verification Sampling Needed

Northern Boundary							Event 24 (AM-12)							Event 24 (AM-12) Upgradient Well GW-7	
Parameter	Units	Data Distribution for Upgradient Well GW-7	UPL Type	UPL Value ^{a,b}	Federal MCLs/RSLS	GWPS	Downgradient Wells								
							GW-9	GW-19	GW-20	GW-23	GW-24	GW-25	GW-26		
Antimony	mg/L	Unknown	Poisson	0.00133	0.006	0.006	<0.003	<0.006	<0.003	<0.012	<0.006	<0.006	<0.06	<0.006	U
Arsenic	mg/L	Unknown	Poisson	0.00682	0.01	0.01	0.000833	0.130697	0.002389	0.042958	0.02637	0.036874	0.13972	<0.0016	U
Barium	mg/L	Log-Normal	Parametric	0.0934	2	2	0.182396	1.15559	0.198608	15.73577	12.95608	8.61694	8.06706	0.079904	
Beryllium	mg/L	Unknown ^c	DQ ^d	NA	0.004	0.004	<0.00022	<0.00044	0.001462	<0.00088	<0.00044	<0.00044	0.030801	<0.00044	U
Cadmium	mg/L	Unknown ^c	DQ ^d	NA	0.005	0.005	<0.001	<0.002	<0.001	<0.001	<0.002	<0.002	<0.02	<0.002	U
T. Chromium	mg/L	Unknown ^c	DQ ^d	NA	0.1	0.1	<0.0045	<0.009	<0.0045	<0.0045	<0.009	<0.009	0.550911	<0.009	U
Cobalt	mg/L	Unknown ^c	DQ ^d	NA	0.006	0.006	<0.000475	<0.00095	<0.000475	0.002179	0.001319	0.001761	0.300142	<0.00095	U
Fluoride	mg/L	Normal	Parametric	9.291	4	9.291	2.3864	1.8643	5.8928	<0.025	<0.025	<0.025	1.1969	8.1476	
Lead	mg/L	Unknown ^c	DQ ^d	NA	0.015	0.015	<0.0011	<0.0022	<0.0011	<0.0044	<0.0022	<0.0022	0.315654	<0.0022	U
Lithium	mg/L	Normal	Parametric	0.023374	0.04	0.04	0.019297	0.019763	0.01794	0.100741	0.068332	0.061685	0.43983	0.023702	
Mercury	mg/L	Unknown	Poisson	0.00031	0.002	0.002	<0.000163	<0.00408	<0.000163	<0.00408	<0.00408	<0.00408	0.0935	<0.000815	UJ
Molybdenum	mg/L	Log-Normal	Parametric	0.006805	0.1	0.1	<0.00315	<0.0063	0.09237	<0.0126	<0.0063	0.012628	<0.063	<0.0063	U
Selenium	mg/L	Unknown ^c	DQ ^d	NA	0.5	0.5	<0.00425	<0.0085	0.021316	<0.017	<0.0085	<0.0085	<0.085	<0.0085	U
Thallium	mg/L	Unknown ^c	DQ ^d	NA	0.002	0.002	<0.0004	<0.0008	<0.0004	<0.0016	<0.0008	<0.0008	<0.008	<0.0008	U
Sum Ra226+Ra228	pCi/L	Unknown	Poisson	0.58	5	5	0.2373	2.28	0.816	109.6	68.8	48.6	30	0.811	

^aPrediction Limits calculated using 5% alpha.

^bUpper Prediction Limit used for all parameters.

^cData distribution set to Unknown if all values non-detect in upgradient well.

^dDQ is Double Quantification Rule. If two successive, independent detected values occur, that would be an SSI and also an SSL if > GWPS. However, if value was detected in upgradient well during the same sampling event, would use Poisson PL instead.

= UPL > Result > MCL/RSLS
 [Green Box] = SSI < GWPS
 [Red Box] = SSI > GWPS
 [Yellow Box] = DQ Parameter with Verification Sampling Needed

TABLE 4-2
CCR RULE INTERWELL COMPARISON OF SAMPLING EVENT AM-11 AND -12 APPENDIX IV DATA

Western Boundary							Event 23 (AM-11)							
Parameter	Units	Data Distribution for Upgradient Well GW-7	UPL Type	UPL Value ^{a,b}	Federal MCLs/RSLs	GWPS	Downgradient Wells							
							GW-27	GW-28	GW-29					
Antimony	mg/L	Unknown	Poisson	0.00133	0.006	0.006	<0.003	<0.003	<0.003					
Arsenic	mg/L	Unknown	Poisson	0.00682	0.01	0.01	<0.0008	0.004145	0.008907					
Barium	mg/L	Log-Normal	Parametric	0.0934	2	2	1.1324	0.268208	1.35993					
Beryllium	mg/L	Unknown ^c	DQ ^d	NA	0.004	0.004	<0.00044	<0.00022	<0.00022					
Cadmium	mg/L	Unknown ^c	DQ ^d	NA	0.005	0.005	<0.001	<0.001	<0.001					
T. Chromium	mg/L	Unknown ^c	DQ ^d	NA	0.1	0.1	<0.0045	<0.0045	<0.0045					
Cobalt	mg/L	Unknown ^c	DQ ^d	NA	0.006	0.006	<0.000475	<0.000475	<0.000475					
Fluoride	mg/L	Normal	Parametric	9.291	4	9.291	0.2401	2.1546	1.3236					
Lead	mg/L	Unknown ^c	DQ ^d	NA	0.015	0.015	<0.0011	<0.0011	<0.0011					
Lithium	mg/L	Normal	Parametric	0.023374	0.04	0.04	0.014116	0.02249	0.046397					
Mercury	mg/L	Unknown	Poisson	0.00031	0.002	0.002	<0.000163	<0.000163	<0.000163					
Molybdenum	mg/L	Log-Normal	Parametric	0.006805	0.1	0.1	0.003344	0.035246	0.003219					
Selenium	mg/L	Unknown ^c	DQ ^d	NA	0.05	0.05	<0.00425	<0.00425	<0.00425					
Thallium	mg/L	Unknown ^c	DQ ^d	NA	0.002	0.002	<0.0004	<0.0004	<0.0004					
Sum Ra226+Ra228	pCi/L	Unknown	Poisson	0.58	5	5	NA ^e	NA ^e	NA ^e					

Event 23 (AM-11) Upgradient Well GW-7	
<0.003	U
<0.0008	U
0.078489	
<0.00022	U
<0.001	U
<0.0045	U
<0.000475	U
8.6757	
<0.0011	U
0.023792	
<0.000163	U
<0.00315	U
<0.00425	U
<0.0004	U
NA ^e	




^aPrediction Limits calculated using 5% alpha.

^bUpper Prediction Limit used for all parameters.

^cData distribution set to Unknown if all values non-detect in upgradient well.

^dDQ is Double Quantification Rule. If two successive, independent detected values occur, that would be an SSI and also an SSL if > GWPS. However, if value was detected in upgradient well during the same sampling event, would use Poisson PL instead.

^eNot Analyzed

= UPL > Result > MCL/RSL
 = SSI < GWPS
 = SSI > GWPS
 = DQ Parameter with Verification Sampling Needed

Western Boundary							Event 24 (AM-12)							
Parameter	Units	Data Distribution for Upgradient Well GW-7	UPL Type	UPL Value ^{a,b}	Federal MCLs/RSLs	GWPS	Downgradient Wells							
							GW-27	GW-28	GW-29					
Antimony	mg/L	Unknown	Poisson	0.00133	0.006	0.006	<0.003	<0.003	<0.003					
Arsenic	mg/L	Unknown	Poisson	0.00682	0.01	0.01	<0.0008	0.003602	0.008829					
Barium	mg/L	Log-Normal	Parametric	0.0934	2	2	0.9993195	0.253439	1.27794					
Beryllium	mg/L	Unknown ^c	DQ ^d	NA	0.004	0.004	<0.00022	<0.00022	<0.00022					
Cadmium	mg/L	Unknown ^c	DQ ^d	NA	0.005	0.005	<0.001	<0.001	<0.001					
T. Chromium	mg/L	Unknown ^c	DQ ^d	NA	0.1	0.1	<0.0045	<0.0045	<0.0045					
Cobalt	mg/L	Unknown ^c	DQ ^d	NA	0.006	0.006	<0.000475	<0.000475	<0.000475					
Fluoride	mg/L	Normal	Parametric	9.291	4	9.291	0.3117	2.0951	1.2778					
Lead	mg/L	Unknown ^c	DQ ^d	NA	0.015	0.015	<0.0011	<0.0011	<0.0011					
Lithium	mg/L	Normal	Parametric	0.023374	0.04	0.04	0.0166675	0.023242	0.04646					
Mercury	mg/L	Unknown	Poisson	0.00031	0.002	0.002	<0.000163	<0.000163	<0.000163					
Molybdenum	mg/L	Log-Normal	Parametric	0.006805	0.1	0.1	0.0039365	0.034415	0.012409					
Selenium	mg/L	Unknown ^c	DQ ^d	NA	0.05	0.05	<0.00425	<0.00425	<0.00425					
Thallium	mg/L	Unknown ^c	DQ ^d	NA	0.002	0.002	<0.0004	<0.0004	<0.0004					
Sum Ra226+Ra228	pCi/L	Unknown	Poisson	0.58	5	5	1.805	1.551	1.729					




Event 24 (AM-12) Upgradient Well GW-7	
<0.006	U
<0.0016	U
0.079904	
<0.00044	U
<0.002	U
<0.009	U
<0.00095	U
8.1476	
<0.0022	U
0.023702	
<0.000815	U
<0.0063	U
<0.0085	U
<0.0008	U
0.811	

^aPrediction Limits calculated using 5% alpha.

^bUpper Prediction Limit used for all parameters.

^cData distribution set to Unknown if all values non-detect in upgradient well.

^dDQ is Double Quantification Rule. If two successive, independent detected values occur, that would be an SSI and also an SSL if > GWPS. However, if value was detected in upgradient well during the same sampling event, would use Poisson PL instead.

= UPL > Result > MCL/RSL
 = SSI < GWPS
 = SSI > GWPS
 = DQ Parameter with Verification Sampling Needed

SAMPLING EVENT NO. ²	WELL ID ³	SAMPLE DATE	APPENDIX III (all Chemical Constituents reported as TOTAL RECOVERABLE) ¹							APPENDIX IV (all Chemical Constituents reported as TOTAL RECOVERABLE) ¹															
			BORON METALS MG/L	CALCIUM METALS MG/L	CHLORIDE MISC MG/L	FLUORIDE MISC MG/L	PH ⁴ MISC S.U.	SULFATE MISC MG/L	TDS MISC MG/L	ANTIMONY METALS MG/L	ARSENIC METALS MG/L	BARIIUM METALS MG/L	BERYLLIUM METALS MG/L	CADMIUM METALS MG/L	CHROMIUM METALS MG/L	COBALT METALS MG/L	LEAD METALS MG/L	LITHIUM METALS MG/L	MERCURY METALS MG/L	MOLYBDENUM METALS MG/L	SELENIUM METALS MG/L	THALLIUM METALS MG/L	RADIUM-226 RADIOCHEM PCI/L	RADIUM-228 RADIOCHEM PCI/L	
			22 (NE-3)	GW-30 ⁵	12/28/2022	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
25 (NE-4)	GW-30 ⁵	12/13/2023	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
22 (NE-3)	GW-31	12/29/2022	NA	31.2776	NA	NA	7.42	NA	1995	NA	0.013288	0.606751	NA	NA	NA	NA	0.01363	NA	NA	NA	NA	NA	NA	NA	NA
25 (NE-4)	GW-31	12/13/2023	1.14 U	41.004	947.9	0.7662	7.29	0.0881 J	2606.667	0.017 U	0.012683 J	1.02424	0.0009 U	0.0012 U	0.00963 U	0.0012 U	0.00135 U	0.012681 J	0.000163 U	0.0033 U	0.0189 U	0.0006 U	0.740	1.75	
25 (NE-4)	GW-31 (D)	12/13/2023	1.14 U	41.07	972.5	0.7636	7.29	0.0385 U	2504	0.017 U	0.013205 J	1.01465	0.0009 U	0.0012 U	0.00963 U	0.0012 U	0.00135 U	0.012647 J	0.000163 U	0.0033 U	0.0189 U	0.0006 U	1.13	1.03	
22 (NE-3)	GW-32	12/29/2022	NA	636.3733	NA	NA	7.12	NA	26440	NA	0.012318	8.8661	NA	NA	NA	NA	0.160974	NA	NA	NA	NA	NA	NA	NA	
25 (NE-4)	GW-32	12/14/2023	1.14 U	207	4824	0.025 U	7.19	0.186 J	11660	0.017 U	0.010259 J	2.96528	0.0009 U	0.0012 U	0.00963 U	0.0012 U	0.00135 U	0.098588	0.000163 U	0.0033 U	0.0189 U	0.0006 U	6.73	9.43	
22 (NE-3)	GW-33A	12/30/2022	NA	174.3422	NA	NA	7.47	NA	10800	NA	0.113761	2.10141	NA	NA	NA	NA	0.10467	NA	NA	NA	NA	NA	NA	NA	
25 (NE-4)	GW-33A	12/14/2023	1.14 U	26.302	1313	1.5337	7.67	95.01	3720	0.017 U	0.238606	0.2227 J	0.0009 U	0.0012 U	0.00963 U	0.0012 U	0.00135 U	0.035503	0.000163 U	0.043486 J	0.021464 J	0.0006 U	0.794	0.737 U	
22 (NE-3)	GW-34	12/28/2022	NA	37.3234	NA	NA	6.33	NA	3193.333	NA	0.02177	0.259874	NA	NA	NA	NA	0.025557	NA	NA	NA	NA	NA	NA	NA	
25 (NE-4)	GW-34	12/13/2023	1.14 U	26.639	1636	2.1626	7.57	139.8	4340	0.017 U	0.012503 J	0.149983 J	0.0009 U	0.0012 U	0.00963 U	0.0012 U	0.00135 U	0.037161	0.000163 U	0.11542	0.0189 U	0.0006 U	0.264 U	0.987	

NOTES:

¹ Lab analyses were completed by Beta Lab and Eurofins/TestAmerica Laboratories, Inc., both of which are accredited/certified laboratories: Beta Lab NSF/ISR ISO 9001: Cert. No. 83761-IS8 (Exp. 01-16-24) and Eurofins/TestAmerica WVDEP Certificate No. 142, Expiration Date: 1-31-24.

² Event Nos. 22 and 25 correspond to Nature and Extent (N&E) sampling events NE-3 and NE-4, respectively.

³ Field duplicate samples that were taken for Quality Control purposes are noted with a (D).

⁴ pH results reported are field sampling measurements as lab pH testing exceeded hold times.

⁵ GW-30 not sampled during NE-3 or NE-4 due to insufficient volume of recoverable water in well.

NA = Parameter was not analyzed.

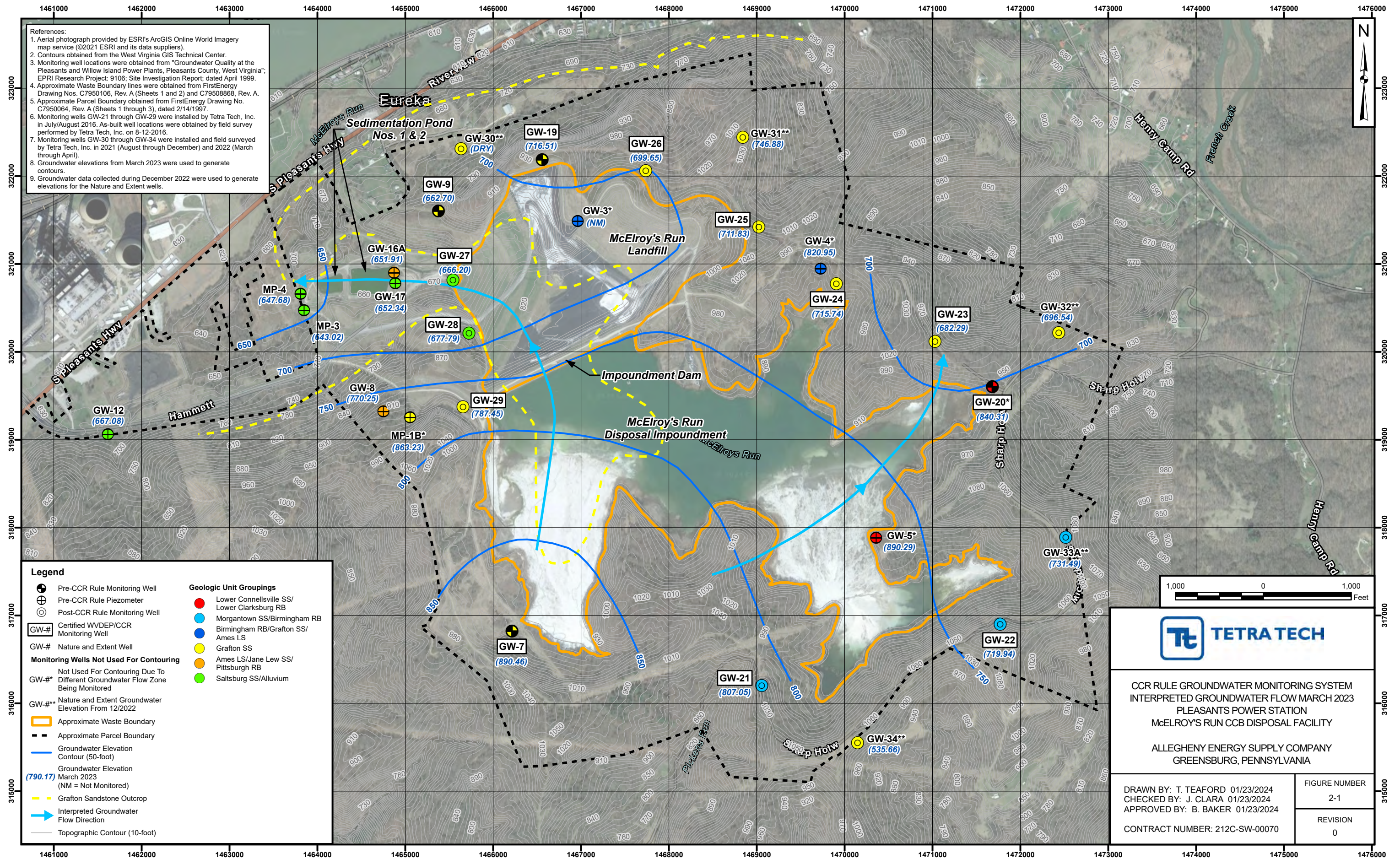
NS = Not sampled.

DATA QUALIFIER DEFINITIONS:

The following definitions provide brief explanations of the validation qualifiers assigned to results in the data review process.

- D Sample dilution performed.
- JD The analyte was positively identified, but the concentration is estimated and falls between the Method Detection Limit and Reporting Limit for a diluted sample.
- UD The analyte was analyzed for, but was not detected for a diluted sample.
- G The minimum detectable concentration of the sample is greater than the requested reporting limit.
- U The analyte was analyzed for, but was not detected at a level greater than or equal to the level of the adjusted method detection limit for sample and method.
- J The analyte was positively identified and the associated numerical value is the approximate concentration of the analyte in the sample (due either to the quality of the data generated because certain quality control criteria were not met, or the concentration of the analyte was below the reporting limit).
- J+ The result is an estimated quantity, but the result may be biased high.
- J- The result is an estimated quantity, but the result may be biased low.
- UJ The analyte was analyzed for, but was not detected. The reported detection limit is approximate and may be inaccurate or imprecise.
- R The sample result (detected) is unusable due to the quality of the data generated because certain criteria were not met. The analyte may or may not be present in sample.
- UR The sample result (nondetected) is unusable due to the quality of the data generated because certain criteria were not met. The analyte may or may not be present in sample.

FIGURES



- References:
1. Aerial photograph provided by ESRI's ArcGIS Online World Imagery map service (©2021 ESRI and its data suppliers).
 2. Contours obtained from the West Virginia GIS Technical Center.
 3. Monitoring well locations were obtained from "Groundwater Quality at the Pleasants and Willow Island Power Plants, Pleasants County, West Virginia"; EPRI Research Project: 9106; Site Investigation Report; dated April 1999.
 4. Approximate Waste Boundary lines were obtained from FirstEnergy Drawing Nos. C7950106, Rev. A (Sheets 1 and 2) and C79508868, Rev. A, C7950064, Rev. A (Sheets 1 through 3), dated 2/14/1997.
 5. Approximate Parcel Boundary obtained from FirstEnergy Drawing No. C7950064, Rev. A (Sheets 1 through 3), dated 2/14/1997.
 6. Monitoring wells GW-21 through GW-29 were installed by Tetra Tech, Inc. in July/August 2016. As-built well locations were obtained by field survey performed by Tetra Tech, Inc. on 8-12-2016.
 7. Monitoring wells GW-30 through GW-34 were installed and field surveyed by Tetra Tech, Inc. in 2021 (August through December) and 2022 (March through April).
 8. Groundwater elevations from March 2023 were used to generate contours.
 9. Groundwater data collected during December 2022 were used to generate elevations for the Nature and Extent wells.

Legend

- Pre-CCR Rule Monitoring Well
- ⊕ Pre-CCR Rule Piezometer
- Post-CCR Rule Monitoring Well
- GW-# Certified WWD/CCR Monitoring Well
- GW-# Nature and Extent Well
- Monitoring Wells Not Used For Contouring
 - Not Used For Contouring Due To Different Groundwater Flow Zone Being Monitored
 - GW-#* Nature and Extent Groundwater Elevation From 12/2022
- Approximate Waste Boundary
- Approximate Parcel Boundary
- Groundwater Elevation Contour (50-foot)
- Groundwater Elevation March 2023 (NM = Not Monitored)
- Grafton Sandstone Outcrop
- Interpreted Groundwater Flow Direction
- Topographic Contour (10-foot)

Geologic Unit Groupings

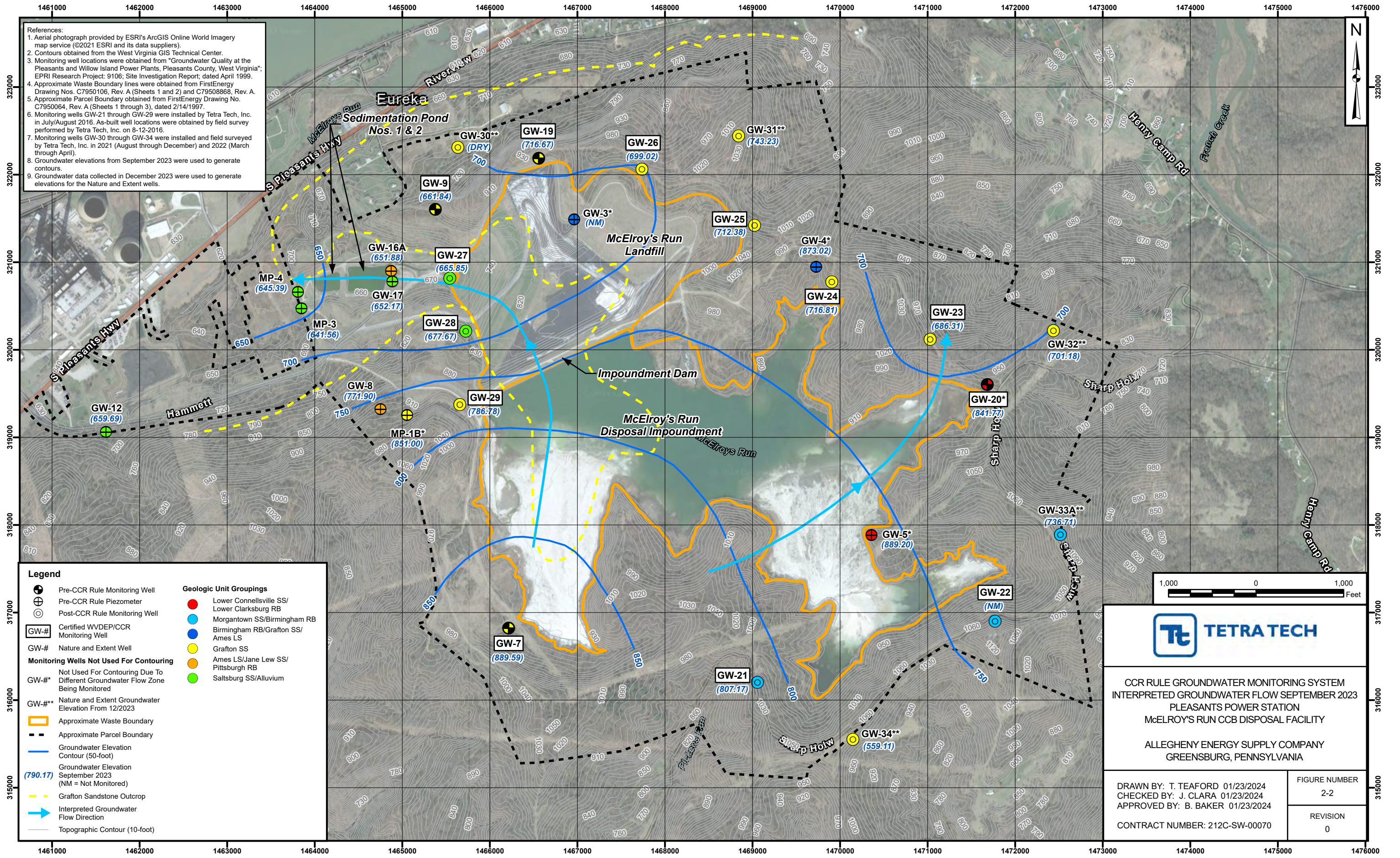
- Lower Connellsville SS/ Lower Clarksburg RB
- Morgantown SS/Birmingham RB
- Birmingham RB/Grafton SS/ Ames LS
- Grafton SS
- Ames LS/Jane Lew SS/ Pittsburgh RB
- Saltsburg SS/Alluvium

TETRA TECH

CCR RULE GROUNDWATER MONITORING SYSTEM
 INTERPRETED GROUNDWATER FLOW MARCH 2023
 PLEASANTS POWER STATION
 McELROY'S RUN CCB DISPOSAL FACILITY

ALLEGHENY ENERGY SUPPLY COMPANY
 GREENSBURG, PENNSYLVANIA

DRAWN BY: T. TEAFORD 01/23/2024	FIGURE NUMBER
CHECKED BY: J. CLARA 01/23/2024	2-1
APPROVED BY: B. BAKER 01/23/2024	REVISION
CONTRACT NUMBER: 212C-SW-00070	0



- References:
1. Aerial photograph provided by ESRI's ArcGIS Online World Imagery map service (©2021 ESRI and its data suppliers).
 2. Contours obtained from the West Virginia GIS Technical Center.
 3. Monitoring well locations were obtained from "Groundwater Quality at the Pleasants and Willow Island Power Plants, Pleasants County, West Virginia"; EPRI Research Project: 9106; Site Investigation Report; dated April 1999.
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 6. Monitoring wells GW-21 through GW-29 were installed by Tetra Tech, Inc. in July/August 2016. As-built well locations were obtained by field survey performed by Tetra Tech, Inc. on 8-12-2016.
 7. Monitoring wells GW-30 through GW-34 were installed and field surveyed by Tetra Tech, Inc. in 2021 (August through December) and 2022 (March through April).
 8. Groundwater elevations from September 2023 were used to generate contours.
 9. Groundwater data collected in December 2023 were used to generate elevations for the Nature and Extent wells.

Legend

- Pre-CCR Rule Monitoring Well
- ⊕ Pre-CCR Rule Piezometer
- Post-CCR Rule Monitoring Well
- GW-# Certified W/DEP/CCR Monitoring Well
- GW-# Nature and Extent Well
- Monitoring Wells Not Used For Contouring
 - GW-#* Not Used For Contouring Due To Different Groundwater Flow Zone Being Monitored
 - GW-#** Nature and Extent Groundwater Elevation From 12/2023
- Orange outline: Approximate Waste Boundary
- Dashed black line: Approximate Parcel Boundary
- Blue line: Groundwater Elevation Contour (50-foot)
- Blue line with number: Groundwater Elevation September 2023 (NM = Not Monitored)
- Yellow dashed line: Grafton Sandstone Outcrop
- Blue arrow: Interpreted Groundwater Flow Direction
- Grey line: Topographic Contour (10-foot)

Geologic Unit Groupings

- Red circle: Lower Connellsville SS/ Lower Clarksburg RB
- Light blue circle: Morgantown SS/Birmingham RB
- Dark blue circle: Birmingham RB/Grafton SS/ Ames LS
- Yellow circle: Grafton SS
- Orange circle: Ames LS/Jane Lew SS/ Pittsburgh RB
- Green circle: Saltsburg SS/Alluvium

1,000 0 1,000 Feet

**CCR RULE GROUNDWATER MONITORING SYSTEM
INTERPRETED GROUNDWATER FLOW SEPTEMBER 2023
PLEASANTS POWER STATION
McELROY'S RUN CCB DISPOSAL FACILITY**

ALLEGHENY ENERGY SUPPLY COMPANY
GREENSBURG, PENNSYLVANIA

DRAWN BY: T. TEAFORD 01/23/2024 CHECKED BY: J. CLARA 01/23/2024 APPROVED BY: B. BAKER 01/23/2024	FIGURE NUMBER 2-2
CONTRACT NUMBER: 212C-SW-00070	REVISION 0

ATTACHMENT A

**SEMI-ANNUAL
SELECTION OF REMEDY (SoR)
PROGRESS REPORT
(Q1 and Q2 2023)**

**McELROY'S RUN COAL COMBUSTION
BYPRODUCT DISPOSAL FACILITY**

Pleasants Power Station
Pleasants County, West Virginia

Prepared for:

Allegheny Energy Supply Company
A Wholly Owned Subsidiary of FirstEnergy

*800 Cabin Hill Drive
Greensburg, PA 15601*

Prepared by:

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Tetra Tech Project No. 212C-SW-00070

July 2023

TABLE OF CONTENTS

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2.0 STATUS OF THE SELECTION OF REMEDY PROGRAM	2
3.0 PLANNED SOR ACTIVITIES	3

1.0 INTRODUCTION

This Semi-Annual Selection of Remedy (SoR) Progress Report was prepared by Tetra Tech, Inc. (Tetra Tech) on behalf of Allegheny Energy Supply Company (AES) for the Coal Combustion Byproduct Disposal Facility (“CCBDF”, “CCR units”, or “site”) associated with the Pleasants Power Station (hereinafter referred to as the “Station”). The CCR units and Station are located near the town of Belmont in Pleasants County, West Virginia. The period covered by this report includes the first two quarters (Q1 and Q2) of calendar year 2023 (January 1st through June 30th).

As per 40 CFR 257.97(a), once a Coal Combustion Residual (CCR) unit has completed an Assessment of Corrective Measures (ACM) and transitions to SoR, “The owner or operator must prepare a semiannual report describing the progress in selecting and designing the remedy.” Accordingly, this report summarizes the progress during the current reporting period in selecting and designing the remedy for addressing arsenic concentrations in groundwater downgradient of the CCR units and also includes a summary of anticipated SoR activities which will be conducted over the next SoR reporting period.

Detailed background information on the CCR units, hydrogeologic site conditions, and CCR monitoring results can be found in various other documents on the CCBDF’s publicly accessible website, the most recent of which being the 2022 Annual CCR Rule Groundwater Monitoring and Corrective Action Report ([McElroy's Run CCB Disposal Facility 2021 Annual GWMCA Report](#)). The following section provides background information as it relates to the SoR at the CCR units.

1.1 Background

Groundwater Assessment Monitoring (AM) conducted at the site in accordance with the federal CCR Rule identified arsenic, barium, lithium, and radium concentrations in certain downgradient CCR monitoring wells which were at Statistically Significant Levels (SSLs) above their corresponding Groundwater Protection Standards (GWPS). Pursuant to 40 CFR 257.95(g)(3)(ii), Tetra Tech performed an Alternative Source Demonstration (ASD) to assess if the Appendix IV SSLs determined for sampling events AM-1, -2, and -3 were attributable to a release from the CCR units or from a demonstrable alternative source(s). The Appendix IV ASD is included as Attachment A of the ACM Report prepared for the Site ([McElroy's Run CCB Disposal Facility 2019 ACM Report](#)) and determined that the barium and radium SSLs could be attributed to historical and current oil and gas exploration and production activities that have occurred at the site; that the source of the lithium SSLs was indeterminate but there is a high potential they are also attributable to oil and gas impacts at the site; and that the arsenic SSLs could not be attributed to

sources other than the CCR units. As such, a transition to Nature and Extent (N&E) of release characterization and ACM for arsenic per 40 CFR 257.96 of the CCR Rule were implemented.

As required by 40 CFR 257.96(c), the ACM conducted by Tetra Tech on behalf of AESC included an analysis of the effectiveness of potential corrective measures in meeting the remedy requirements and objectives as described under 40 CFR 257.97. The ACM Report evaluated the following corrective measures against the criteria referenced in 40 CFR 257.96(c): Source Control, Groundwater Extraction and Treatment, In-Situ Technologies, and Monitored Natural Attenuation (MNA).

Based on the evaluation of viable remediation technologies, MNA, combined with source control by the eventual installation of a final cover system on the CCR units, ranks highest among the evaluated options. In September 2019, pursuant to 40 CFR 257.96(d), the ACM Report was posted in the CCR units' Operating Record, and then subsequently posted to the facility's publicly accessible website on October 16, 2019 ([McElroy's Run CCB Disposal Facility 2019 ACM Report](#)).

1.2 SoR Regulatory Basis

SoR activities must be completed in compliance with 40 CFR 257.97(a), which states that as soon as feasible after completion of the ACM, a remedy must be selected that, at a minimum, meets the performance standards listed in 40 CFR 257.97(b), and considers the evaluation factors listed in 40 CFR 257.97(c).

2.0 CURRENT STATUS OF THE SELECTION OF REMEDY PROGRAM

The following activities have been performed during the current reporting period as part of selecting the remedy at the site:

- Continued AM with a sampling event in March 2023 (AM-11), which included sampling of the site's CCR monitoring well network with analyses for all Appendix III and Appendix IV parameters (except for Radium 226/228) along with targeted general chemistry parameters to assist in evaluating potential natural attenuation impacts.
- Assessed the March 2023 groundwater flow patterns in the monitoring network areas downgradient of the CCR units and found they remained consistent with established flow patterns at the site.
- Received and reviewed laboratory results from the December 2022 sampling of SoR/N&E of Release monitoring wells GW--31, -32, -33A, and -34 (SoR/N&E well GW-30 had an insufficient volume of recoverable water to allow for sampling). The results indicated that downgradient attenuation of arsenic is occurring along the northern

and northeastern sides of the site, with the measured arsenic concentrations in GW-31 and GW-32 being 13.3 and 12.3 ppb, respectively, which are slightly above the GWPS of 10 ppb. However, along the southeastern and southern sides of the site, the sidegradient arsenic concentration in GW-33A and GW-34 were measured at 113.7 and 21.8 ppb, respectively, which exceed the GWPS. In addition to arsenic, analyses were performed for all other CCR Rule Appendix III and Appendix IV parameters in order to continue building a background dataset for use when the wells are eventually incorporated into the AM and/or Corrective Action Monitoring (CAM) network.

- Continued development of a Natural Attenuation Evaluation Work Plan that includes evaluating historic concentrations of parameters which can affect the natural attenuation of arsenic (e.g., iron, pH, ORP, etc.) as well as planning the sampling and analysis program that would be associated with future MNA activities.
- Continued reviewing candidate technologies with regard to their potential to meet the performance standards listed in 40 CFR 257.97(b) and the evaluation factors listed in 40 CFR 257.97(c).

3.0 PLANNED SOR ACTIVITIES

The following activities are planned as part of the ongoing SoR process:

- Complete the second scheduled 2023 AM sampling event at the site (AM-12), along with continued N&E/background sampling of monitoring wells GW-30, -31, -32, -33A, and -34.
- Evaluate the need for installing additional monitoring wells to characterize the nature and extent of arsenic in groundwater in accordance with 40 CFR 257.95(g)(1)(i-iv), including GW-33B which was unsuccessfully attempted in the fall of 2021 due to recurring formation instability issues at depth and the return of significant volumes of natural oil and gas with the borehole cuttings. Install the appropriate number of monitoring wells needed to define the arsenic plume and support an accurate assessment of the selected remedy.
- Continue development of the Arsenic Natural Attenuation Evaluation Work Plan, including a review of the historic groundwater monitoring data set for relationships between key parameters affecting arsenic natural attenuation and arsenic concentrations in groundwater.
- Continue evaluating the candidate technologies identified in the ACM against the performance standards listed in 40 CFR 257.97(b) and the evaluation factors listed in 40 CFR 257.97(c).

- As required by 40 CFR 257.96(e), AESC will discuss the results of the corrective measures assessment at least 30 days prior to the final selection of remedy, in a public meeting.
- Upon completion of all required SoR activities, AESC will prepare a final report describing the selected remedy and how it, at a minimum, meets the performance standards listed in 40 CFR 257.97(b) and considers the evaluation factors listed in 40 CFR 257.97(c).
- As required by 40 CFR 257.97(d), AESC will specify, as part of the selected arsenic remedy, a schedule(s) for implementing and completing remedial activities.

Should the final remedy for the CCR units not be selected during Q3 or Q4 2023, then another Semi-Annual SoR Report will be prepared as required by 40 CFR 257.97(a).

**SEMI-ANNUAL
SELECTION OF REMEDY (SoR)
PROGRESS REPORT
(Q3 and Q4 2023)**

**McELROY'S RUN COAL COMBUSTION
BYPRODUCT DISPOSAL FACILITY**

Pleasants Power Station
Pleasants County, West Virginia

Prepared for:

Allegheny Energy Supply Company
A Wholly Owned Subsidiary of FirstEnergy

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1.0 INTRODUCTION

This Semi-Annual Selection of Remedy (SoR) Progress Report was prepared by Tetra Tech, Inc. (Tetra Tech) on behalf of Allegheny Energy Supply Company (AES) for the Coal Combustion Byproduct Disposal Facility (“CCBDF”, “CCR units”, or “site”) associated with the Pleasants Power Station (hereinafter referred to as the “Station”). The CCR units and Station are located near the town of Belmont in Pleasants County, West Virginia. The period covered by this report includes the last two quarters (Q3 and Q4) of calendar year 2023 (July 1st through December 31st).

As per 40 CFR 257.97(a), once a Coal Combustion Residual (CCR) unit has completed an Assessment of Corrective Measures (ACM) and transitions to SoR, “The owner or operator must prepare a semiannual report describing the progress in selecting and designing the remedy.” Accordingly, this report summarizes the progress during the current reporting period in selecting and designing the remedy for addressing arsenic concentrations in groundwater downgradient of the CCR units and also includes a summary of anticipated SoR activities which will be conducted over the next SoR reporting period.

Detailed background information on the CCR units, hydrogeologic site conditions, and CCR monitoring results can be found in various other documents on the CCBDF’s publicly accessible website, the most recent of which being the 2022 Annual CCR Rule Groundwater Monitoring and Corrective Action Report ([McElroy's Run CCB Disposal Facility 2021 Annual GWMCA Report](#)). The following section provides background information as it relates to the SoR at the CCR units.

1.1 Background

Groundwater Assessment Monitoring (AM) conducted at the site in accordance with the federal CCR Rule identified arsenic, barium, lithium, and radium concentrations in certain downgradient CCR monitoring wells which were at Statistically Significant Levels (SSLs) above their corresponding Groundwater Protection Standards (GWPS). Pursuant to 40 CFR 257.95(g)(3)(ii), Tetra Tech performed an Alternative Source Demonstration (ASD) to assess if the Appendix IV SSLs determined for sampling events AM-1, -2, and -3 were attributable to a release from the CCR units or from a demonstrable alternative source(s). The Appendix IV ASD is included as Attachment A of the ACM Report prepared for the Site ([McElroy's Run CCB Disposal Facility 2019 ACM Report](#)) and determined that the barium and radium SSLs could be attributed to historical and current oil and gas exploration and production activities that have occurred at the site; that the source of the lithium SSLs was indeterminate but there is a high potential they are also attributable to oil and gas impacts at the site; and that the arsenic SSLs could not be attributed to

sources other than the CCR units. As such, a transition to Nature and Extent (N&E) of release characterization and ACM for arsenic per 40 CFR 257.96 of the CCR Rule were implemented.

As required by 40 CFR 257.96(c), the ACM conducted by Tetra Tech on behalf of AESC included an analysis of the effectiveness of potential corrective measures in meeting the remedy requirements and objectives as described under 40 CFR 257.97. The ACM Report evaluated the following corrective measures against the criteria referenced in 40 CFR 257.96(c): Source Control, Groundwater Extraction and Treatment, In-Situ Technologies, and Monitored Natural Attenuation (MNA).

Based on the evaluation of viable remediation technologies, MNA, combined with source control by the eventual installation of a final cover system on the CCR units, ranks highest among the evaluated options. In September 2019, pursuant to 40 CFR 257.96(d), the ACM Report was posted in the CCR units' Operating Record, and then subsequently posted to the facility's publicly accessible website on October 16, 2019 ([McElroy's Run CCB Disposal Facility 2019 ACM Report](#)).

1.2 SoR Regulatory Basis

SoR activities must be completed in compliance with 40 CFR 257.97(a), which states that as soon as feasible after completion of the ACM, a remedy must be selected that, at a minimum, meets the performance standards listed in 40 CFR 257.97(b), and considers the evaluation factors listed in 40 CFR 257.97(c).

2.0 CURRENT STATUS OF THE SELECTION OF REMEDY PROGRAM

The following activities have been performed during the current reporting period as part of selecting the remedy at the site:

- Continued AM with a sampling event in September 2023 (AM-12), which included sampling of the site's CCR monitoring well network with analyses for all Appendix III and Appendix IV parameters along with targeted general chemistry parameters to assist in evaluating potential natural attenuation impacts.
- Assessed the September 2023 groundwater flow patterns in the monitoring network areas downgradient of the CCR units and found they remained consistent with established flow patterns at the site.
- Received and reviewed laboratory results from the December 2023 sampling of SoR/N&E of Release monitoring wells GW-31, -32, -33A, and -34 (SoR/N&E well GW-30 again had an insufficient volume of recoverable water to allow for sampling). The results indicated that downgradient attenuation of arsenic is occurring along the northern and northeastern sides of the site, with the measured arsenic

concentrations in GW-31 and GW-32 being 12.7 and 10.3 ppb, respectively, which are slightly above the GWPS of 10 ppb but lower than the levels measured in those wells during the prior SoR/N&E sampling event. Along the southeastern and southern sides of the site, the sidegradient arsenic concentrations in GW-33A and GW-34 were measured at 238.6 and 12.5 ppb, respectively, which exceed the GWPS. These arsenic concentrations exhibited opposite trends when compared to results from the prior SoR/N&E sampling event, with the GW-33A concentration being two times higher than before while the GW-34 concentration was almost half its previous measured level. In addition to arsenic, analyses were performed for all other CCR Rule Appendix III and Appendix IV parameters in order to continue building a background dataset for use when the wells are eventually incorporated into the AM and/or Corrective Action Monitoring (CAM) network.

- Continued development of a Natural Attenuation Evaluation Work Plan that includes evaluating historic concentrations of parameters which can affect the natural attenuation of arsenic (e.g., iron, pH, ORP, etc.) as well as planning the sampling and analysis program that would be associated with future MNA activities.
- Continued reviewing candidate technologies with regard to their potential to meet the performance standards listed in 40 CFR 257.97(b) and the evaluation factors listed in 40 CFR 257.97(c).

3.0 PLANNED SoR ACTIVITIES

The following activities are planned as part of the ongoing SoR process:

- Complete the first scheduled 2024 AM sampling event at the site (AM-13), along with continued N&E/background sampling of monitoring wells GW-30, -31, -32, -33A, and -34. If GW-30 again yields insufficient water for sampling, evaluate the viability of redeveloping the well.
- Evaluate the need for installing additional monitoring wells to characterize the nature and extent of arsenic in groundwater in accordance with 40 CFR 257.95(g)(1)(i-iv), including GW-33B which was unsuccessfully attempted in the fall of 2021 due to recurring formation instability issues at depth and the return of significant volumes of natural oil and gas with the borehole cuttings. Install the appropriate number of monitoring wells needed to define the arsenic plume and support an accurate assessment of the selected remedy.
- Continue development of the Arsenic Natural Attenuation Evaluation Work Plan, including a review of the historic groundwater monitoring data set for relationships between key parameters affecting arsenic natural attenuation and arsenic concentrations in groundwater.

- Continue evaluating the candidate technologies identified in the ACM against the performance standards listed in 40 CFR 257.97(b) and the evaluation factors listed in 40 CFR 257.97(c).
- As required by 40 CFR 257.96(e), AESC will discuss the results of the corrective measures assessment at least 30 days prior to the final selection of remedy, in a public meeting.
- Upon completion of all required SoR activities, AESC will prepare a final report describing the selected remedy and how it, at a minimum, meets the performance standards listed in 40 CFR 257.97(b) and considers the evaluation factors listed in 40 CFR 257.97(c).
- As required by 40 CFR 257.97(d), AESC will specify, as part of the selected arsenic remedy, a schedule(s) for implementing and completing remedial activities.

Should the final remedy for the CCR units not be selected during Q1 or Q2 2024, then another Semi-Annual SoR Report will be prepared as required by 40 CFR 257.97(a).