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24 August 2023

Illinois Environmental Protection Agency
BOW-Permits #15-CCR Coordinator
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Subject: Fifth Post-Closure Groundwater Monitoring Report
Second Quarter 2023
Grand Tower Energy Center
Closed Coal Combustion Residuals Impoundment
1820 Power Plant Rd
Grand Tower, IL 62942
ERM Project No. 0599247

To Whom It May Concern:

Environmental Resources Management (ERM) is submitting this report which provides the results and findings of the Grand Tower Energy Center (GTEC) quarterly post-closure groundwater sampling and coal combustion residuals (CCR) impoundment inspection event conducted during the second quarter 2023 at the GTEC facility located at 1820 Power Plant Rd, Grand Tower, Illinois (the "Site"). The second quarter groundwater sampling event took place between 26 June and 27 June 2023, and the impoundment inspection event was conducted on 26 June 2023. A Site location map is provided in Figure 1.

The second quarter 2023 groundwater sampling event was performed in accordance with the post-closure groundwater monitoring program presented within the Grand Tower Operating Permit Application submitted to the Illinois Environmental Protection Administration (IEPA) on 28 October 2021, which was modified in accordance with the Consolidated IEPA Comments dated 17 March 2022. The purpose of the sampling event was to continue the initial five-year period of quarterly groundwater monitoring for the evaluation of the concentration and areal distribution of impacts related to the closed CCR impoundment in Site groundwater. The parameters detected in the groundwater are associated with the historical CCR impoundment, which was capped and closed in 2020. The quarterly results include a summary of field activities, laboratory analytical, and documentation of other associated Site activity, as necessary. It should be noted that this is the fifth post-closure sampling event and that a sufficient amount of monitoring data still does not exist to provide an accurate evaluation of post-closure data trends and whether a statistically significant increase or decrease in the data trends exist during the current five-year post-closure monitoring period.

Second quarter 2023 site activities, performed in accordance with the proposed post-closure groundwater monitoring program, the results of which are summarized below, included:

- Inspection of the final cover system of the CCR impoundment;
- Inspection of the groundwater monitoring well array; and
- Groundwater monitoring activity.

QUARTERLY CCR IMPOUNDMENT INSPECTION

During the second quarter of 2023, an inspection of the CCR impoundment cover system and associated features was completed, and the full quarterly inspection report can be found in Appendix A. The woody vegetation (up to 1”diameter) noted to be within the riprap on the north, west, and southern impoundment cap faces during 2022 was treated with herbicide during the first half of 2023. However, a limited amount of live woody vegetation growth continues to be observed within the riprap. No significant degradation or issues were noted associated with the overall CCR impoundment cover system.

QUARTERLY MONITORING WELL INSPECTION AND GAUGING

During the second quarter of 2023, monitoring well inspections were conducted. The monitoring well protectors and casings were inspected for damage and/or signs of settling that might impact the integrity of the surface seals. The inspection tasks also included gauging total depths as well as static groundwater elevations. Both measurements were referenced from the top of casing (TOC) at each of the Site monitoring wells. Total depth and groundwater level measurements were obtained from the monitoring wells using a water level meter with an accuracy of 0.01 foot. The quarterly monitoring well inspection forms can be found in Appendix B. Based upon these measurements, a shallow groundwater contour map for the Site was developed for the second quarter of 2023. The groundwater gradient is primarily from east to west towards the Mississippi River except during times of flooding events that may cause a reverse flow from west to east for a short period of time (Natural Resource Technology, Phase 1 Hydrogeologic Assessment Report, March 2013). Figure 2 shows monitoring well locations with a groundwater contour and groundwater flow direction arrow, groundwater elevations at each monitoring well, and the Mississippi River elevation at the time of groundwater level gauging.

QUARTERLY GROUNDWATER MONITORING

The Groundwater Protection Standards (GWPS) for the Site are those provided in 35 IAC §845.600(a). Assessment of corrective measures began on 16 June 16, 2022 with the commencement of the initial post-closure groundwater sampling event. During the second quarter 2023 sampling event, 12 monitoring wells (APW-01R, APW-02, APW-03, APW-04, APW-05, APW-06D, APW-06S, APW-07, APW-08, APW-09, APW-10D, and APW-10S) were sampled. The monitoring wells were purged prior to sampling using a submersible pump according to United States Environmental Protection Administration (USEPA) low flow purging and sampling procedures (“Low Stress Purging and Sampling Procedure for the Collection of Groundwater Samples from Monitoring Wells” revised September 19, 2017). The pump intake was placed within the screened interval of each monitoring well sampled and stabilization measurements were collected using a calibrated YSI Professional Plus meter during purging activities for the collection of pH, specific conductivity, temperature, dissolved oxygen, and oxidation reduction potential (ORP) readings. Turbidity readings were also collected from each monitoring well using a Hach 2100Q Turbidimeter. Well purging continued until stabilization of each field parameter was achieved according to USEPA guidelines for low-flow sampling. Once the field parameters stabilized, the YSI meter was disconnected, and groundwater samples were collected for analysis using the same dedicated polyethylene tubing that was used to purge the well. Field parameter measurements collected during this sampling event were recorded on field data forms. Copies of the field data forms are included in Appendix C.

The groundwater samples collected were placed in laboratory-provided sample containers for analysis by Teklab, Inc. located in Collinsville, IL which is an IEPA-approved laboratory. Samples were transported under chain-of-custody procedures to the laboratory for analytical testing within laboratory provided coolers containing ice. The laboratory analytical report for the second quarter 2023 sampling event is included in Appendix D.

In accordance with the 3 March 2022 draft comments received from the IEPA Groundwater Section associated with the post-closure groundwater monitoring program contained in the Operating Permit Application submitted to the IEPA on 28 October 2021, the IEPA evaluates the efficacy of corrective actions for closed CCR impoundments through the comparison of the groundwater analytical results to the GWPS contained in 35 IAC §845.600. Under 35 IAC §845.600, the following groundwater parameters are to be monitored:

- Antimony
- Arsenic
- Barium
- Beryllium
- Boron
- Cadmium
- Chloride
- Chromium
- Cobalt
- Fluoride
- Lead
- Lithium
- Mercury
- Molybdenum
- pH
- Selenium
- Sulfate
- Thallium
- TDS
- Radium 226/228
- Calcium
- Turbidity

Groundwater Analytical Results

The analytical results for the post-closure groundwater sampling event conducted during the second quarter 2023 are presented in Table 1. During the second quarter 2023 sampling event, the following analytes were detected in the listed wells above the GWPS:

- APW-01R exceeded the GWPS for turbidity.
- APW-02 exceeded the GWPS for sulfate, turbidity, arsenic, boron, calcium, lithium, and molybdenum.
- APW-03 exceeded the GWPS for boron and calcium.
- APW-04 exceeded the GWPS for turbidity.
- APW-05R exceeded the GWPS for turbidity, boron, calcium, lithium, and molybdenum.
- APW-06D exceeded the GWPS for turbidity, arsenic, boron, and calcium.
- APW-6S exceeded the GWPS for boron, calcium, lithium, and molybdenum.
- APW-07 exceeded the GWPS for calcium.
- APW-08 exceeded the GWPS for turbidity.
- APW-09 exceeded the GWPS for turbidity.
- APW-10D exceeded the GWPS for turbidity, calcium, and colbalt.
- APW-10S exceeded the GWPS for turbidity, arsenic, and calcium.

APW-10S, located approximately one half mile south of the closed CCR impoundment, continues to exhibit elevated arsenic concentrations. However, the occurrence of arsenic in this well is not considered to be related to the closed CCR impoundment due to its distance and location hydraulically side gradient in relation to the Site. Additionally, the monitoring wells located between the closed CCR impoundment (APW-03, APW-07, APW-08, and APW-09) and APW-10S do not exhibit arsenic concentration above the GWPS.

The GTEC CCR impoundment is currently in Corrective Action Monitoring (CAM). After at least eight quarterly CAM events have been completed, the groundwater sampling results will be evaluated to determine if statistically significant increases or decreases have occurred after cap and closure occurred in 2020 in accordance with 35 IAC Section §845.640(f). The statistical evaluation of the first eight CAM groundwater sampling events is anticipated to be completed during the first quarter of 2024. In accordance with 35 IAC Section §845.550(a) an Annual Groundwater Monitoring and Corrective Action Report will also be submitted for the preceding calendar year no later than January 31st of 2024.

At the end of the current five-year monitoring and reporting post-closure time frame, a groundwater performance monitoring report will be submitted to IEPA to either demonstrate restoration of groundwater quality to Class I standards or present a continued groundwater monitoring plan for an additional five years. In addition, the results will be compared to the modeled concentrations to evaluate if a decreasing trend, as defined through modeling, is occurring at the predicted rate. Significant changes from the model results will lead to additional calibration and assessment of future expected rates of decrease for the constituents of concern (COCs).

SUMMARY AND CONCLUSIONS

Based upon the results of the second quarter 2023 groundwater sampling event, well inspection, and CCR impoundment inspection, the following observations and conclusions have been made:

- Similar to the groundwater sampling results obtained during the eight pre-closure sampling events in 2017 to 2018, and five post-closure groundwater sampling events, concentrations of COCs above the GWPS continue to be detected at well locations downgradient of the closed CCR impoundment.
- Boron has historically been the key indicator for corrective action and continued monitoring of groundwater at the Site. Incorporating data from the eight rounds of pre-closure groundwater sampling conducted during 2017 and 2018, as well as the five post groundwater monitoring events, boron continues to demonstrate a decreasing trend at APW-04 and APW-05.
- The woody vegetation (up to 1”diameter) noted to be within the riprap on the north, west, and southern impoundment cap faces during 2022 was treated with herbicide during the first half of 2023. No significant degradation or issues were noted associated with the overall CCR impoundment cover system.

If you have any questions, please contact me at (314) 733-4495.

Sincerely,

Alan J. Cork, P.E.
Partner, Engineer

Matt Halley, CHMM
Senior Consultant

Attachments

cc: Mr. John Brodhead, Grand Tower Energy Center (electronic)

FIGURES

TABLES

APPENDIX A SECOND QUARTER 2023 CCR IMPOUNDMENT INSPECTION REPORT

APPENDIX B SECOND QUARTER 2023 GROUNDWATER MONITORING WELL INSPECTION FORMS

APPENDIX C SECOND QUARTER 2023 FIELD DATA FORMS

APPENDIX D SECOND QUARTER 2023 LABORATORY ANALYTICAL REPORT