2023 GROUNDWATER MONITORING & CORRECTIVE ACTION REPORT

COAL ASH PONDS
ELMER SMITH STATION
DAVIESS COUNTY
OWENSBORO, KENTUCKY

Prepared For:
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TABLE OF CONTENTS

FIGURES

TABLES

1.0 INTRODUCTION

The United States Environmental Protection Agency (USEPA) issued 40 C.F.R. §257, Subpart D, *Disposal of Coal Combustion Residuals from Electric Utilities* (CCR Rule) on April 17, 2015. The CCR Rule regulates disposal of coal combustion residuals (CCR) in new and active landfills and impoundments. Civil & Environmental Consultants, Inc. (CEC) has been engaged by Owensboro Municipal Utilities (OMU) to prepare the 2023 Groundwater Monitoring and Corrective Action Report for the Coal Ash Ponds (aka the Site) at the Elmer Smith Station (ESS) as required by the CCR Rule. This document summarizes the monitoring activity conducted during 2023, including sampling events and statistical analyses. It is intended that this document will be placed in the facility Operating Record as required by 40 C.F.R. §257.105(h)(1), and posted on the publicly-accessible website as required by 40 C.F.R. §257.107(h)(1).

2.0 SITE OVERVIEW

2.1 BACKGROUND

The former Ash Pond area associated with the Site is less than 10 acres in size and formerly consisted of three separate unlined ash settling basins (Ponds 1, 2, and 3). A Site location map and a Site and vicinity aerial map showing the location of the Ash Ponds are provided as Figures 1 and 2, respectively. OMU historically operated two coal-fired power generating units at the Site. Power Generation Unit 1 was idled in June 2019, and Power Generation Unit 2 was idled in May 2020. The basins were not used for the disposal of CCR but for the temporary storage of CCR material prior to being excavated and transported off-site for disposal or beneficial re-use. Pond 1 was used for Unit 1 boiler slag; Pond 2 received other ash and water plant blowdown (lime softening sludge), and, Pond 3 received no ash directly and was used for final settling prior to discharge to the adjacent Ohio River under a National Pollutant Discharge Elimination System (NPDES) permit. Other plant discharges, including coal pile runoff, Flue Gas Desulfurization (FGD) blowdown, roof and floor drains, etc. were also conveyed through the ponds. Based on a review of aerial images, topographic contour data from the USGS National Map, Owensboro East Quadrangle, a Site map prepared by others labeled "Structural Fill Finish Grading" dated August 28, 1962[1], and visual observations made by OMU personnel during pond dredging activities, the Ash Ponds appear to be incised in the native soils to a depth of approximately 12 to 15 feet below ground surface (bgs).

CEC assisted OMU with the design and installation of a permanent Groundwater Monitoring System (GMS) to comply with the GMS performance standard contained within the Federal CCR Rule (Section 257.91), as documented in the GMS Certification Report dated October 17, 2017 (CEC, 2017 [1]) and Amended GMS Certification Reports dated March 2019 (CEC, 2019[2]) and October 2021 (CEC, 2021[1]). Prior to the installation of the GMS, groundwater monitoring had not been conducted at the Site.

[1] Drawing No. S-7 "Structural Finish Grading", prepared by Black & Veatch, dated August 28, 1962.

2.2 HYDROGEOLOGIC SETTING

Subsurface conditions encountered at the Site, as evidenced by the soil borings advanced in association with a Preliminary Hydrogeologic Investigation and the permanent GMS wells, are consistent with Quaternary-aged alluvium, and buried outwash (Tazewell age) typically found within the Ohio River Valley[2]. Variable thicknesses of fine-grained silt and clay lenses are interbedded with deposits of coarser-grained, poorly-graded sand beneath a thin veneer of topsoil, crushed stone fill, or other fill material. The near-surface fine-grained deposits are thicker near the Ohio River, and decrease in thickness away from the river towards the southeast, where sand becomes the predominant soil type. A low-permeability clay layer was encountered at depths ranging from 26 to 43 feet bgs, varying in thickness from approximately 1 foot to over 16 feet, with an increasing trend in layer thickness towards the south/southeast. The clay layer is underlain by saturated, coarse-grained deposits that comprise the uppermost aquifer at the Site. Aquifer saturated thickness in the vicinity of the Site ranges from approximately 60 to 100 feet[2]. Based on the depth to groundwater, the depth of the Ash Ponds, and visual observations made during pond dredging activities, it does not appear that groundwater is in direct communication with the Ash Ponds. Refer to the GMS Certification Report (CEC, 2017[1]) for a geologic cross-section and boring logs for the Site.

2.2.1 Hydrogeologic Characteristics

Groundwater occurs within the coarse-grained deposits that constitute the uppermost aquifer at the Site. Depth to water measurements collected from the GMS monitoring well network during the 2023 sampling events ranged from 73.21 feet below top of casing (BTOC) at MW-7 to 48.50 feet BTOC at MW-1. Static groundwater elevations on-site during 2023 ranged from 344.60 feet above mean sea level (AMSL) at MW-8 to 356.70 feet AMSL at MW-3. The normal pool elevation of the adjacent Ohio River in the vicinity of ESS is approximately 358 feet AMSL[3]. Potentiometric data are summarized on Table 1 and shown on Figures 3a through 3i.

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[2] *Geohydrology and Simulation of Ground-Water Flow for the Ohio River Alluvial Aquifer near Owensboro, Northwestern Kentucky.* U.S. Geological Survey Water-Resources Investigation Report 96-4274. 1997. Figure 7.

[3] Ohio River Navigation Charts from Cairo, Illinois to Foster, Kentucky (June 2010). U.S. Army Corps of Engineers, Louisville District. Chart No. 53.

Groundwater elevation measurements obtained during the May 13, 2020 groundwater monitoring event indicated that the groundwater flow direction was to the southeast at an approximate average hydraulic gradient of 0.002, which was consistent with previous findings. This flow direction is contrary to what is typically observed in this type of hydrogeologic setting, where groundwater flow is typically towards the adjacent surface water body, such that this trend of groundwater flow to the southeast was interpreted to be a result of the pumping influence from the 11 nearby water production wells (Figure 2) associated with municipal water production operations at OMU's Cavin Water Treatment Plant, which has a capacity of up to 30 million gallons per day.

Groundwater elevation measurements obtained during the December 2, 2020 groundwater monitoring event and during a confirmatory monitoring event conducted on February 11, 2021, indicated that the groundwater flow direction was to the southwest at an approximate average hydraulic gradient of 0.001. While the gradient appeared to be consistent with prior findings, the flow direction was not and was interpreted to be a result of OMU terminating the operation of the production wells in the vicinity of the Ash Ponds in October 2020. To account for this change in groundwater flow direction and for groundwater passing beneath the limits of the CCR impoundments, an additional GMS well was added in June 2021 to the west of the Ash Ponds (reference Section 3.0). OMU utilizes three new production wells located about 1 mile southwest and downstream of ESS to generate groundwater for treatment and distribution to its drinking water customers.

Groundwater flow patterns observed in 2021 were consistently to the southwest (reference Figures 3c through 3e) with an approximate average hydraulic gradient of 0.001. However, in January 2022, OMU re-activated production wells 49 and 63 at the request of the Kentucky Division of Water as a temporary measure to remedy an unrelated groundwater quality issue being experienced in their drinking water production wells. CEC subsequently observed a change in the groundwater flow direction during both of the groundwater sampling events conducted in 2022, with the potentiometric data indicating the direction of groundwater flow had shifted back to the south/southeast (reference Figures 3f and 3g), and the gradient had increased slightly to between approximately 0.003 and 0.004. OMU re-activated production wells 48 and 50 in February 2023 to supplement the ongoing groundwater extraction efforts from production wells 49 and 63, and CEC continued to observe a south/southeasterly groundwater flow direction during both of the groundwater sampling events conducted in 2023 (reference Figures 3h and 3i) with observed gradients between about 0.005 and 0.007.

Hydraulic conductivity of the uppermost aquifer was not evaluated as part of the GMS installation process; however, based on published scientific reports, the Site is located in an area where horizontal hydraulic conductivity values are estimated to range from approximately 126 to 157 feet per day[4].

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[4]*Geohydrology and Simulation of Ground-Water Flow for the Ohio River Alluvial Aquifer near Owensboro, Northwestern Kentucky.* U.S. Geological Survey Water-Resources Investigation Report 96-4274. 1997. Figure 11.

3.0 GROUNDWATER MONITORING SYSTEM

As noted above in Section 2.2.1, the groundwater pumping at the municipally-operated well field and proximity of the Ash Ponds to the Ohio River created a unique hydrogeologic setting where there was not an ideal location to establish background groundwater quality conditions (i.e., groundwater that does not have the potential to be affected by leakage from a CCR unit). Two monitoring wells (MW-2 and MW-7) were used to establish and monitor background groundwater conditions. While MW-2 has historically been hydraulically upgradient, this was interpreted to be an artificial condition created by the operation of the production wells proximate to the Ash Ponds. MW-7 was selected as a secondary location to represent background conditions based on its hydraulic position and distance from the Ash Ponds. MW-1 and MW-3 have been used to monitor groundwater elevation exclusively since May 2017. Monitoring wells MW-2, MW-4, MW-5, MW-6, MW-7, and MW-8 have been utilized to monitor both groundwater elevation and groundwater quality.

The remainder of the GMS wells were strategically located taking into account the possibility that production well operations may eventually terminate and cause a shift in the groundwater flow direction back towards the Ohio River. With groundwater flow direction being consistently observed in the southerly direction away from the river since 2016, MW-4, MW-5, and MW-6 have been used to monitor water quality of groundwater passing the boundary of the CCR unit. These wells were placed as close as possible to the CCR unit boundary to provide for detection of groundwater contamination in the uppermost aquifer. GMS wells MW-1, MW-2, and MW-3, which have been used as background/upgradient wells (MW-2) and to monitor groundwater elevation (MW-1 and MW-3) were also positioned for use as downgradient monitoring wells in the event that production well pumping operations were to cease for an extended period of time and the groundwater flow direction reverted back towards the Ohio River sometime in the future. Monitoring well MW-8 was installed in December 2018 after molybdenum was quantified at a statistically significant level (SSL) in downgradient monitoring wells MW-5 and MW-6 (reference Section 2.1) in an effort to characterize the nature and extent of the release, as required by §257.95(g)(1).

Monitoring well MW-9 was added in 2021 in response to the shifting groundwater flow direction and a detection of selenium at an SSL in MW-6 that was identified in December 2020.

With the detection of selenium at a statistically significant level (SSL) in MW-6 and, more notably, the changes in groundwater flow direction, OMU decided to reconfigure the GMS network by utilizing MW-8 as a background monitoring well in conjunction with MW-7. MW-1, which had groundwater quality monitoring activities reinstated in June 2021, and MW-2 transitioned to become upgradient GMS wells in 2022, because they are no longer downgradient due to the change in groundwater flow direction. MW-3 will continue to be used for groundwater elevation monitoring only. An additional GMS well (MW-9) was installed in June 2021 to the west of the Ash Ponds, which was downgradient at the time, and subsequently developed and sampled in conjunction with the first 2021 semi-annual Assessment Monitoring sampling event. MW-9 serves to monitor both groundwater elevation and groundwater quality. However, in 2022 and 2023 it was not in a downgradient location and served as an upgradient well based on the revised groundwater flow direction that was observed. Refer to the GMS Certification Reports (CEC, 2017[1], 2019 [2], and 2021[1]) for lithologic descriptions and well construction diagrams.

OMU plans to continue to monitor the groundwater elevations and will evaluate re-classification of the GMS wells (i.e., upgradient versus downgradient) and/or the need for additional GMS wells on an ongoing basis. However, the supplementary monitoring wells that have been installed in response to the observed changes in groundwater flow direction over the course of the groundwater monitoring activities provide sufficient coverage for monitoring the groundwater conditions proximate to the former Ash Ponds for either of the observed primary groundwater flow directions, and as such, OMU does not anticipate the need for additional GMS wells. A summary of the GMS wells is provided in the table below.

CCR RULE GROUNDWATER MONITORING SYSTEM						
Location	**At Installation**	**Relative Location Prior to 2022**	**Relative Location during 2023**	**Well Diameter (in.)**	**Total Depth (ft.-bgs)**	**Screen Length (ft.)**
MW 1	Upgradient	Downgradient	Upgradient	4	57	10
MW-2	Upgradient	Downgradient	Upgradient	4	57	10
MW-3	Upgradient	Upgradient	Upgradient	4	57	10
MW-4	Downgradient	Downgradient	Downgradient	4	59	10
MW-5	Downgradient	Downgradient	Downgradient	4	59	10
MW-6	Downgradient	Downgradient	Downgradient	4	59	10
MW-7	Downgradient	Background	Background	4	72	10
MW-8	Downgradient	Background	Background	4	63	15
MW-9	Downgradient	Downgradient	Upgradient	4	52	10

4.0 CCR RULE SAMPLING PROGRAM PROGRESSION

4.1 BASELINE DATA AND BACKGROUND VALUES

The baseline sampling at ESS was performed between February 2017 and September 2017. The Appendix III background concentration values were determined using an upper prediction limit (UPL) method in accordance with the statistical methodology described in the *Detection Monitoring Statistical Methods Certification* for the Site, dated October 17, 2017 (CEC, 2017[2]). Background UPL values were calculated for each parameter based on the initial eight baseline sampling events conducted at the two background wells to establish background UPL values. The final background UPL values are summarized in the table below:

CCR RULE APPENDIX III BACKGROUND VALUES		
Parameter	**Units**	**UPL Value**
Boron, Total	mg/L	0.33
Calcium, Total	mg/L	139.5
Chloride	mg/L	50
Fluoride	mg/L	NC
pH, laboratory	s.u.	8.01
Sulfate	mg/L	154.3
Total Dissolved Solids	mg/L	950.8

NC = not calculated because constituent was not quantified at concentrations exceeding laboratory detection limit.
mg/L = milligram per liter

Despite the change in direction of groundwater flow leading to one of the original upgradient wells transitioning to a downgradient well, the background values previously determined are still valid. This is because the data was determined to be representative of regional background/unimpacted groundwater when the CCR groundwater monitoring program began in 2017. Based upon multiple changes in groundwater flow direction, MW-2 has occasionally switched from being upgradient to downgradient of the Ash Ponds. As a result, to be conservative and for consistency purposes, MW-2 groundwater quality will be monitored and evaluated assuming it is in a downgradient location, regardless of what the seasonal groundwater flow pattern would indicate for a given sampling event. MW-8, which was originally installed as a downgradient well as part of release characterization efforts due to an SSL observed in MW-5 and MW-6 (molybdenum), transitioned to a background location when the groundwater flow direction shifted to the west/southwest. Due to the varying groundwater flow directions, data collected from MW-8 will also be conservatively evaluated as if MW-8 were a downgradient well moving forward. However, data collected from MW-8 will no longer be evaluated for potential inclusion in the baseline/background dataset. Therefore, the original background determination, inclusive of prior MW-2 data, is still a valid representation of unimpacted groundwater quality.

4.2 SSI DETERMINATION

Statistically Significant Increases (SSIs) for Appendix III parameters were determined within the Detection Monitoring program based upon comparison of the results from the October 2017 Detection Monitoring event to the UPL of the mean concentration detected in the background wells from the eight rounds of baseline monitoring. Based upon the results, one or more SSIs were identified at MW-4, MW-5, and MW-6.

Each downgradient monitoring well location had at least one identified SSI. SSIs for boron, calcium, sulfate, and total dissolved solids (TDS) were the most common among the downgradient wells. Below is a tabular summary of the SSIs observed:

SUMMARY OF OBSERVED SSIs AT OMU ESS							
Monitoring Point	Appendix III Parameters						
	Boron	Calcium	Chloride	Fluoride	pH	Sulfate	Total Dissolved Solids (TDS)
MW-4	X	X				X	X
MW-5	X					X	
MW-6	X	X				X	X

X – SSI Determined

4.3 TRANSITION TO ASSESSMENT MONITORING

As a result of the SSI determinations, the Assessment Monitoring Program was initiated in April 2018 for ESS consisting of sampling and analysis for Appendix IV constituents. A notification of the transition into the Assessment Monitoring Program was placed in the facility's Operating Record in accordance with §257.105(h) on January 19, 2018.

4.4 GROUNDWATER PROTECTION STANDARDS

The CCR Rule requires that two Assessment Monitoring events be performed and analytical results obtained before establishing Groundwater Protection Standards (GWPS) for Appendix IV constituents in accordance with Section §257.95(h) of the CCR Rule. The GWPS are then compared to the downgradient Appendix IV concentrations to identify if downgradient concentrations exceed the GWPS at SSLs prompting an Assessment of Corrective Measures.

The GWPS are based on the higher of following three options: (1) the EPA maximum contaminant level (MCL) that has been established under U.S. EPA 40 C.F.R. §141.62 and §141.66 of this title, (2) the health-based value (HBV) outlined in §257.95(h)(2), or (3) the background as determined by either a tolerance interval or prediction interval approach with a 99 percent confidence level/99 percent coverage coefficient (99/99) in accordance with §257.95(h)(3).

Prior to 2021, the UPL was calculated for development of the GWPS. Based upon an external review of the stated statistical plan, CEC concluded that a tolerance level approach was more appropriate for assessment monitoring. Utilizing the upper tolerance limit (UTL) for background concentrations identifies the upper threshold that is likely to be observed in the baseline dataset and is more appropriate for establishing background-based GWPS for assessment monitoring where long-term exposure is of concern (consistent with the methodology for establishing the MCL or other health or risk-based levels as recommended in U.S. EPA's Unified Guidance [USEPA, 2009]). In addition, there are conceptual issues with using the UPL approach in that the GWPS is dependent not only on background, but also on the number of future means or medians, which may not be fixed or known.

In accordance with the options outlined above, the background concentration for each parameter was determined from the UTL using the initial eight baseline sampling events from the two background wells.

GWPS values were established for the Site, consistent with §257.95(d)(2). The table below summarizes background concentrations, MCL values, and health-based values for detected constituents at the Site.

GWPS DETERMINATION FOR OMU ESS					
Appendix IV Constituent	**Units**	**UTL**	**MCL**	**Health-based Value**	**Final GWPS**
Total Metals					
Antimony, Total	mg/L	ND/NC	0.006	--	0.006
Arsenic, Total	mg/L	ND/NC	0.010	--	0.010
Barium, Total	mg/L	0.18	2	--	2
Beryllium, Total	mg/L	0.00091	0.004	--	0.004
Cadmium, Total	mg/L	ND/NC	0.005	--	0.005
Chromium, Total	mg/L	4.1	0.1	--	4.1
Cobalt, Total	mg/L	0.098	--	0.006	0.098
Lead, Total	mg/L	0.015	0.015	0.015	0.015
Lithium, Total	mg/L	ND/NC	--	0.040	0.040
Mercury, Total	mg/L	ND/NC	0.002	--	0.002
Molybdenum, Total	mg/L	ND/NC	--	0.100	0.100
Selenium, Total	mg/L	ND/NC	0.05	--	0.05
Thallium, Total	mg/L	ND/NC	0.002	--	0.002
Non-Metals					
Fluoride	mg/L	1.0	4	--	4
Combined Radium-226/228	pCi/L	9.32	5	--	9.32

Notes:

- ND/NC = constituent was not detected at concentrations exceeding laboratory reporting limits in the background monitoring wells, and therefore the UTPL was not calculated.
- -- = No Value Established

Despite the change from a prediction interval approach to a tolerance interval approach there was no change in the final GWPS for the parameters. The GWPS for four parameters (cadmium, cobalt, combined Radium-226 / Radium-228 and lead) were based upon background levels. CEC determined that these datasets were non-parametric where the UPL or UTL is set equal to the highest observed value. Therefore, for these four parameters the UPL equals the UTL and the GWPS does not change. None of the other GWPS were based upon background.

Despite the variable direction of groundwater flow resulting in one of the original upgradient wells occasionally being considered downgradient (MW-2), the background UTL values determined in 2017 are still valid. This is because the observed groundwater quality was determined to be representative of regional background/unimpacted groundwater quality when the CCR monitoring program was initiated. Even though MW-2 is no longer an appropriate location to continue monitoring regional background, the original determination of unimpacted groundwater quality is still valid.

Due to the issues raised above regarding variation in groundwater flow direction, it is unlikely that the baseline dataset used to determine the UTL will be updated. While background location MW-7 is not interpreted to have been impacted by changes in groundwater flow direction, CEC has determined that expanding the baseline dataset with post-baseline event data from MW-7 will not have an impact on corrective actions or remedy selection/implementation (which has already occurred). While expansion of the baseline dataset is encouraged/allowed under the CCR rule under appropriate conditions (such as determination that original and subsequent datasets are from the same population) it is not required. In this case, due to the unique hydrogeologic conditions created by the active pumping of groundwater from production wells by OMU, CEC determined that there would be no benefit in attempting to expand the baseline data set.

As discussed above, only chromium, cobalt, lead, and combined radium-226 and radium-228 have GWPS based on background, and none of these are driving corrective action activities at the Site. The lower confidence levels (LCL) of the mean for these constituents are several orders of magnitude less than their respective GWPS. Therefore, potential subtle changes from expansion of the dataset will not impact the direction of future site activities. SSLs of molybdenum at MW-5 and MW-6 were the drivers for corrective actions at the Site. Molybdenum was not detected at a concentrations exceeding the reporting limit in the baseline dataset. Therefore, the GWPS is based upon the Health-Based Standard per 40 CFR 257.95(h)(2). Additional data points in the baseline dataset are not expected to change this conclusion.

4.5 STATISTICALLY SIGNIFICANT LEVEL DETERMINATION

The initial SSL determination in 2018 was based on whether or not an exceedance of GWPS occurred for an Appendix IV constituent at a downgradient GMS location in both the initial (April 2018) and resample (June 2018) sampling events.

With the tolerance approach, the GWPS, once determined, should be compared to the LCL (99 percent confidence interval) of the mean (parametric distribution)/median (non-parametric distribution) of the downgradient groundwater results at a given location, and not a single point comparison as done in prior reports. By utilizing the LCL of the mean as a basis of comparison to the GWPS, variability in the dataset is accounted for and exceedances are unlikely to be caused by an individual abnormality in the dataset. This approach is consistent with the development of MCLs and HBVs, which are based upon long-term exposure. The LCL of the mean will be updated after each sampling event to incorporate recent data. The final SSL determination is based on whether or not the newly calculated LCL of the mean for the downgradient data population at each location exceeds the GWPS.

In accordance with the U.S. EPA's *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance* (2009, Unified Guidance), the LCL of the mean is determined based upon a minimum of either four consecutive events for a parametric distribution or three consecutive events for a non-parametric distribution. Ideally, the largest number of data points will be used to establish the LCL of the mean/median to maximize the robustness of the statistical determination. For comparison to standards applicable to long-term exposure, comparison of the LCL of the mean or median as determined above, to the UTL, is the preferred method from the U.S. EPA's Unified Guidance, rather than a single-point comparison to the UPL (identical to Detection Monitoring). There were no changes in the SSL determination based upon the switch to comparison of the LCL of the mean to the GWPS.

Based on the analytical results, utilizing the original UPL, one constituent (molybdenum) was detected at an SSL at two locations (MW-5 and MW-6). Comparison of the LCL of the mean to the GWPS (utilizing the tolerance interval approach) did not change this determination. A summary of the constituents quantified at an SSL are summarized below:

Downgradient GMS Location	Appendix IV Parameters														
	Antimony, Total	**Arsenic, Total**	**Barium, Total**	**Beryllium, Total**	**Cadmium, Total**	**Chromium, Total**	**Cobalt, Total**	**Lead, Total**	**Lithium, Total**	**Mercury, Total**	**Molybdenum, Total**	**Selenium, Total**	**Thallium, Total**	**Fluoride**	**Combined Radium 226/228**
MW-5											X				
MW-6											X				

X – SSL Determined

In accordance with §257.105(h), a notification was placed into the facility's Operating Record on October 31, 2018, and annually thereafter, indicating that an SSL had been observed for molybdenum. The Site will remain in Assessment Monitoring unless the LCL of the mean of the concentrations of constituents in Appendix IV reduces to a level that is less than the GWPS.

The December 2018 SSL evaluation confirmed the SSL determinations from the April and June 2018 Assessment Monitoring events. As a result of the confirmation of the SSL for molybdenum, the facility was required to perform an Assessment of Corrective Measures (CEC, 2019 [4]) in addition to continuing with the Assessment Monitoring Program.

The source of the observed SSLs in the downgradient GMS wells was determined to be attributable to the Ash Ponds. A Release Characterization was initiated in December 2018, consisting of the installation of one monitoring well (MW-8) in the southwest corner of the ESS property to delineate the extent of the molybdenum impact in groundwater downgradient from the Ash Ponds (Figure 2). Molybdenum has not been quantified at concentrations exceeding laboratory reporting limits in groundwater samples collected from MW-8.

5.0 2023 GROUNDWATER SAMPLING SUMMARY

In accordance with §257.95(b), an annual Assessment Monitoring event was performed on May 18, 2023. Groundwater samples were collected from eight of the GMS sampling locations and submitted to ALS Environmental Laboratory (ALS) in Cincinnati, Ohio for analysis of Appendix III and Appendix IV parameters. The semi-annual Assessment Monitoring event was performed on December 12, 2023, in accordance with §257.95(d)(1), which included sampling of the same eight GMS locations and laboratory analysis for Appendix III parameters and all Appendix IV parameters. An analytical summary for the Assessment Monitoring sampling events is provided in Table 2.

During the December 2023 sampling event, the sample bottles collected for Radium 226/228 at location MW-8 and the duplicate sample were compromised during shipment to the lab resulting in a total loss of sample material. There have been detections of Ra-226 over the past three Assessment Monitoring sampling events and one historic detection of Ra-228 in December 2020 at MW-8, which is a GMS well that is used for monitoring background conditions. The lone detection of Ra-228 was approximately an order of magnitude less than the GWPS (1.14 picocuries per Liter [pCi/L] versus 9.32 pCi/L). The maximum Ra-226 concentration of 1.06 pCi/L observed at MW-8 over the past three events is also less than the GPWS by nearly an order of magnitude. CEC determined that re-mobilizing to collect another sample for total radium analysis was not warranted. An unexpected detection of total radium above the GWPS at MW-8 would not result in a change in the monitoring program nor a requirement to take any additional corrective action beyond that which has already been taken. While the loss of this sample aliquot constitutes a data gap, it will not cause a change in the facility status, which remains in Assessment Monitoring.

A summary of the 2023 sampling events is provided below. The Site remained in the Assessment Monitoring Program throughout 2023.

2023 CCR RULE GROUNDWATER SAMPLING EVENTS		
Location	**May 2023 Event**	**December 2023 Event**
Downgradient Wells		
MW-4	5/18/2023	12/12/2023
MW-5	5/18/2023	12/12/2023
MW-6	5/18/2023	12/12/2023
Background/Upgradient Wells		
MW-1	5/18/2023	12/12/2023
MW-2	5/18/2023	12/12/2023
MW-7	5/18/2023	12/12/2023
MW-8	5/18/2023	12/12/2023
MW-9	5/18/2023	12/12/2023

6.0 STATISTICALLY SIGNIFICANT LEVEL DETERMINATION

6.1 DECEMBER 2022 ANALYTICAL RESULTS

The 2022 Groundwater Monitoring and Corrective Action Report was issued prior to performing the SSL evaluation of the results from the December 2022 sampling event. The conclusions of that evaluation are discussed here.

As noted in Section 2.2.1, groundwater elevation measurements obtained during the December 13, 2022 groundwater monitoring event indicated that the groundwater flow direction was to the south/southeast at an approximate average hydraulic gradient of 0.004, which is consistent with prior findings from sampling events when OMU was actively pumping groundwater from the nearby production wells.

Laboratory analytical results are summarized in Table 2, and the LCL of the mean/median calculations are summarized in Table 3. One constituent (molybdenum) was detected at an SSL in two of the downgradient GMS locations (MW-5 [0.69 mg/L] and MW-6 [1.4 mg/L]), which is consistent with the findings of the prior sampling events. No other Appendix IV constituents were detected at SSLs.

6.2 MAY 2023 ANALYTICAL RESULTS

The analytical results from the May 2023 sampling event were consistent with prior events and reported detections of molybdenum at an SSL in groundwater samples analyzed from both MW-5 and MW-6. The molybdenum concentration reported for MW-5 (1.5 mg/L) was slightly elevated in comparison to the December 2022 result and represents the historic maximum observed molybdenum concentration in the dataset for this location. The molybdenum result reported for the sample collected from MW-6 (1.8 mg/L) was consistent with the reported result in December 2022 and within the concentration range for the prior sampling events. Molybdenum was also quantified in the groundwater sample analyzed from MW-9 at a concentration of 0.043 mg/L, which is consistent with the results reported for the prior sampling events, and the concentration remains less than the GWPS. No other Appendix IV constituents were detected at SSLs. Pursuant to §257.105(h)(8), a notification was placed into the facility's Operating Record on August 17, 2023, indicating that an SSL had been observed for molybdenum at MW-5 and MW-6. Laboratory analytical results from the May 2023 sampling event are summarized in Table 2, and the LCL of the mean/median calculations are summarized in Table 4.

6.3 DECEMBER 2023 ANALYTICAL RESULTS

Statistical analysis of the laboratory data obtained from the December 2023 will be performed within 90 days of receiving the laboratory results to evaluate whether or not constituents are present at SSLs, consistent with §257.95(g).

7.0 REMEDY SELECTION

As noted in Section 4.5, due to the presence of constituents in groundwater at SSLs, OMU was required to conduct an Assessment of Corrective Measures pursuant to 40 CFR §257.96. CEC prepared the Assessment of Corrective Measures report, dated May 29, 2019 (CEC, 2019[4]), evaluating various corrective measures options, including: monitored natural attenuation, waste excavation and disposal, in-situ remediation, capping, operation of a pump and treat groundwater remediation system, and installation of a groundwater cut-off wall with respect to the requirements of §257.97(b)(1) through (5) and §257.97 (c)(1) through (4) and two primary corrective measures objectives:

- Reduce leaching of CCR chemicals of concern (COCs) from the coal ash impoundments via infiltration of surface water and inundation of groundwater, which appears to be the primary source of the observed groundwater impacts; and,
- Monitor performance of the selected corrective measure through continued sampling of the GMS wells to demonstrate compliance with the GWPS.

A copy of the Assessment of Corrective Measures report is available on the publicly-accessible website.

Due to the COVID-19 pandemic and the restrictions on public mass gatherings in Kentucky, a public meeting to discuss the remedy selection was unable to be held in 2020. Therefore, OMU prepared semi-annual progress reports pursuant to §257.105(h)(12) to document the progress in selecting the remedy. Copies of these reports are also available on the publicly-accessible website.

A public meeting was held on July 26, 2021, and after allowing for a 30-day period after the meeting for public comments and/or questions in accordance with §257.96(e), the final remedy was selected, and the Remedy Selection Report (CEC 2021 [2]) was placed into the facility Operating Record in October 2021. After evaluation of the available options, OMU decided to proceed with excavation and off-site disposition of the CCR within the Ash Ponds (clean closure) as the remedy. Monitored natural attenuation will also be conducted to evaluate the performance of the applied corrective measure. The preliminary approach for implementing this remedy was originally outlined in the Initial and Post Closure Plan for the facility prepared by OMU and dated October 17, 2016 (revised October 19, 2017). This option provides protection of human health and the environment and a high level of confidence that further releases of COCs from the Ash Ponds will not occur. The monitored natural attenuation will serve to monitor the performance of the excavation remedy. An option for pumping and treatment of groundwater was also retained in a backup capacity in the event that the selected remedy does not perform as expected.

OMU completed CCR removal efforts within the Ash Ponds in December 2021. Progress was documented by both OMU and CEC after reaching key milestones in the implementation of the remedy. CCR was removed via excavation equipment and allowed to dry on-site prior to being transported off-site for disposal or beneficial re-use. A Closure by Removal Certification dated May 19, 2022, documenting the CCR removal efforts and summarizing the closure activities was prepared by CEC in accordance with §257.102(f) and placed into the facility's Operating Record.

CEC also assisted OMU with updates to the facility's Closure and Post-Closure Plan dated October 17, 2016 (revised October 19, 2017). Revision No. 2 of the Closure and Post-Closure Plan was issued on October 14, 2022 and was placed into the Operating Record.

8.0 PLANNED ACTIVITIES FOR 2024

This section discusses the groundwater monitoring and reporting activities anticipated for ESS in 2024. All dates are tentative and subject to change.

January 2024:

- Enter the *2023 Annual Groundwater Monitoring and Corrective Action Report* into the facility's Operating Record.

February 2024:

- Evaluate analytical data from the December 2023 Assessment Monitoring sampling event against GWPS.

March 2024:

- Post the *2023 Annual Groundwater Monitoring and Corrective Action Report* and the Clean Closure Certification to the public internet site and notify KDEP.

May 2024:

- The first semi-annual groundwater monitoring event in 2024 will be conducted. Assessment Monitoring samples (i.e., Appendix III and IV) will be collected during the event.

August 2024:

- Appendix IV sample results collected in May 2024 will be evaluated for an SSL over background.

November 2024:

- The second semi-annual groundwater monitoring event in 2023 will be conducted. Assessment Monitoring samples (i.e., Appendix III and IV) will be collected during the event. Note SSLs for the November 2024 Assessment Monitoring event, if any, will be determined by January 2025.

December 2024:

- Preparation of the 2024 Annual Groundwater Monitoring and Corrective Action Report will begin.

9.0 RECORDKEEPING REQUIREMENTS

In accordance with §257.105(h) this document has been placed in OMU's Operating Record. A copy will also be placed on the publicly accessible website, and a notification will be submitted to the KDEP to comply with §257.107(h) and §257.106(h) of the CCR Rule.

10.0 REFERENCES

CEC, 2017(1). CCR Rule Groundwater Monitoring Certification Coal Ash Ponds, Elmer Smith Station, Owensboro, Kentucky, Prepared For: Owensboro Municipal Utilities, Owensboro, Kentucky, Prepared by Civil & Environmental Consultants, Inc., Pittsburgh, Pennsylvania, CEC Project 164-014, October 2017.

CEC, 2017(2). Detection Monitoring Statistical Methods Certification, Coal Ash Ponds, Elmer Smith Station, Owensboro, Kentucky, Prepared For: Owensboro Municipal Utilities, Owensboro, Kentucky, Prepared by Civil & Environmental Consultants, Inc., Pittsburgh, Pennsylvania, CEC Project 164-014, October 2017.

CEC, 2019(1). 2018 Groundwater Monitoring and Corrective Action Report, Coal Ash Ponds, Elmer Smith Station, Owensboro, Kentucky, Prepared For: Owensboro Municipal Utilities, Owensboro, Kentucky, Prepared by Civil & Environmental Consultants, Inc., Pittsburgh, Pennsylvania, CEC Project 164-014, January 2019.

CEC, 2019(2). CCR Rule Groundwater Monitoring Certification Amendment Coal Ash Ponds, Elmer Smith Station, Owensboro, Kentucky, Prepared For: Owensboro Municipal Utilities, Owensboro, Kentucky, Prepared by Civil & Environmental Consultants, Inc., Pittsburgh, Pennsylvania, CEC Project 164-014, March 2019.

CEC, 2019(3). Amended Detection Monitoring Statistical Methods Certification, Coal Ash Ponds, Elmer Smith Station, Owensboro, Kentucky, Prepared For: Owensboro Municipal Utilities, Owensboro, Kentucky, Prepared by Civil & Environmental Consultants, Inc., Pittsburgh, Pennsylvania, CEC Project 164-014, March 2019.

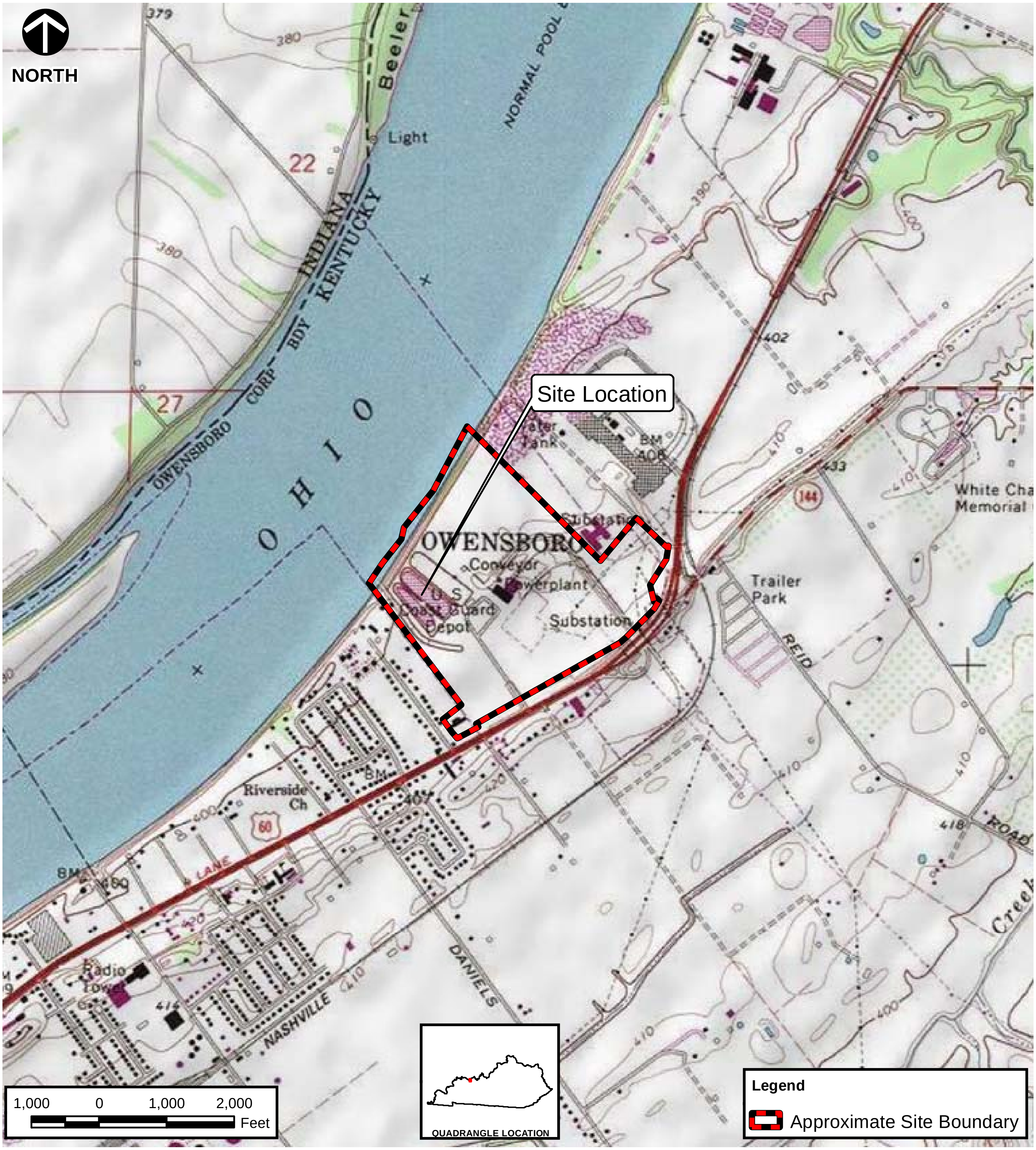
CEC, 2019(4). Assessment of Corrective Measures, Coal Ash Ponds, Elmer Smith Station, Owensboro, Kentucky, Prepared For: Owensboro Municipal Utilities, Owensboro, Kentucky, Prepared by Civil & Environmental Consultants, Inc., Pittsburgh, Pennsylvania, CEC Project 164-106, May 2019.

CEC, 2021(1). CCR Rule Groundwater Monitoring Certification Amendment No. 2 Coal Ash Ponds, Elmer Smith Station, Owensboro, Kentucky, Prepared For: Owensboro Municipal Utilities, Owensboro, Kentucky, Prepared by Civil & Environmental Consultants, Inc., Pittsburgh, Pennsylvania, CEC Project 164-014, October 2021.

CEC, 2021(2). Remedy Selection Report Coal Ash Ponds, Elmer Smith Station, Owensboro, Kentucky, Prepared For: Owensboro Municipal Utilities, Owensboro, Kentucky, Prepared by Civil & Environmental Consultants, Inc., Pittsburgh, Pennsylvania, CEC Project 164-014, October 27, 2021.

USEPA, 2009. Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities – Unified Guidance. EPA 530-R-09-007. U.S. Environmental Protection Agency, Office of Resource Conservation and Recovery Program Implementation and Information Division. March 2009.

FIGURES



SOURCE: PORTION OF THE USGS 7.5-MINUTE SERIES TOPOGRAPHIC QUADRANGLE MAP - OWENSBORO EAST, KY - 1983

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OWENSBORO MUNICIPAL UTILITIES
ELMER SMITH STATION ASH PONDS
OWENSBORO, DAVIESS COUNTY, KY

SITE LOCATION MAP

DRAWN BY:	MGN	CHECKED BY:	HTW	APPROVED BY:	HTW*	FIGURE NO: 1
DATE:	JANUARY 07, 2021	DWG SCALE:	1 " = 2,000 '	PROJECT NO:	164-014.0028	

Signature on File *

\\SVR-CINCI\Projects\2016\164-014\-GIS\Maps\Task 0028 - GWMCA Report 2020\FIG1 164014 EN28 SLM.mxd - 1/7/2021 - 10:52:32 AM (mnemecek)

SOURCE: CITY OF OWENSBORO GIS SERVER; IMAGE DATE: 2023.

Legend

- Approximate Site Boundary
- GMS Monitoring Well
- OMU Production Well (active)
- OMU Production Well (idle)

PROJECT LOCATION

200 0 200 400 Feet

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OWENSBORO MUNICIPAL UTILITIES
ELMER SMITH STATION ASH PONDS
OWENSBORO, DAVIESS COUNTY, KY

SITE & VICINITY AERIAL MAP
WITH WELL LOCATIONS

DRAWN BY: MGN	CHECKED BY: MGN	APPROVED BY: HTW*	FIGURE NO: 2
DATE: JAN 10, 2024	SCALE: 1 " = 400 '	PROJECT NO: 164-014	

Signature on File *

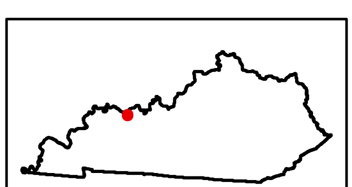
\\svr-fs-pit\projects\2016\164-014\GIS\Maps\Task 0038 - GWMCA Report_2023\164014_EN38_S&VAM_FIG2.mxd - 1/10/2024 - 3:49:48 PM (mmemecek)

NOTE: THE WATER LEVELS PRESENTED HEREIN ARE APPLICABLE TO THE LOCATION AND TIME OF MEASUREMENT. WATER LEVELS MAY FLUCTUATE THROUGH TIME. POTENTIOMETRIC CONTOURS GENERATED FROM THIS DATA ARE CONSTRUCTED BY INTERPOLATION BETWEEN POINTS OF KNOWN STATIC WATER LEVEL ELEVATIONS AND USING KNOWLEDGE OF SPECIFIC SITE CONDITIONS. ACTUALSTATIC WATER LEVELS AT LOCATIONS BETWEEN THE MONITORING POINTS MAY DIFFER FROM THOSE DEPICTED.

SOURCE: CITY OF OWENSBORO GIS SERVER; IMAGE DATE: 2019

Legend

- Approximate Site Boundary
- OMU Municipal Production Well
- Equipotential Line
- GMS Monitoring Well (MW-1 / 579.45 — Groundwater Elevation (feet above mean sea level))



200 0 200 400 Feet

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OWENSBORO MUNICIPAL UTILITIES
ELMER SMITH STATION ASH PONDS
OWENSBORO, DAVIESS COUNTY, KY

POTENTIOMETRIC SURFACE MAP
MAY 13, 2020

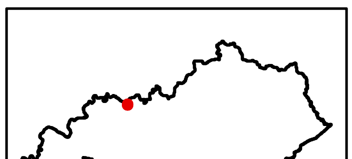
DRAWN BY: MGN	CHECKED BY: MGN	APPROVED BY: HTW*	FIGURE NO:
DATE: JAN 29, 2021	SCALE: 1 " = 400 '	PROJECT NO: 164-014	3a

Signature on File *

SOURCE: CITY OF OWENSBORO GIS SERVER; IMAGE DATE: 2019

Legend

- Approximate Site Boundary
- OMU Municipal Production Well
- Equipotential Line
- MW-1 GMS Monitoring Well
- 579.45 Groundwater Elevation (feet above mean sea level)



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OWENSBORO MUNICIPAL UTILITIES
ELMER SMITH STATION ASH PONDS
OWENSBORO, DAVIESS COUNTY, KY

POTENTIOMETRIC SURFACE MAP
DECEMBER 2, 2020

DRAWN BY: MGN	CHECKED BY: MGN	APPROVED BY: HTW*	FIGURE NO: 3b
DATE: JAN 29, 2021	SCALE: 1 " = 400 '	PROJECT NO: 164-014	

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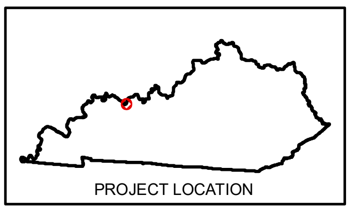
SOURCE: CITY OF OWENSBORO GIS SERVER; IMAGE DATE: 2019

Legend

- Approximate Site Boundary
- OMU Municipal Production Well (Idle)
- MW-1 GMS Monitoring Well
- 579.45 Groundwater Elevation (feet above mean sea level)



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OWENSBORO MUNICIPAL UTILITIES
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OWENSBORO, DAVIESS COUNTY, KY

POTENTIOMETRIC SURFACE MAP
FEBRUARY 11, 2021

DRAWN BY: MGN	CHECKED BY: MGN	APPROVED BY: HTW*	FIGURE NO:
DATE: FEB 01, 2022	SCALE: 1 " = 400 '	PROJECT NO: 164-014	3c

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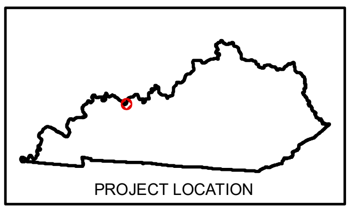
\\svr-fs-pit\projects\2016\164-014\-GIS\Maps\Task 0030 - GWMCA Report_2021\164014_EN30_PSM(02-11-21)_FIG3c.mxd - 2/1/2022 - 10:12:54 AM (mnemecek)

SOURCE: CITY OF OWENSBORO GIS SERVER; IMAGE DATE: 2019

Legend

- Approximate Site Boundary
- OMU Municipal Production Well (Idle)
- Equipotential Line
- MW-1 579.45 GMS Monitoring Well — Groundwater Elevation (feet above mean sea level)



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OWENSBORO MUNICIPAL UTILITIES
ELMER SMITH STATION ASH PONDS
OWENSBORO, DAVIESS COUNTY, KY

POTENTIOMETRIC SURFACE MAP
JUNE 30, 2021

DRAWN BY: MGN	CHECKED BY: MGN	APPROVED BY: HTW*	FIGURE NO:	3d
DATE: FEB 01, 2022	SCALE: 1 " = 400 '	PROJECT NO: 164-014		

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SOURCE: CITY OF OWENSBORO GIS SERVER; IMAGE DATE: 2019

Legend

- Approximate Site Boundary
- OMU Municipal Production Well (Idle)
- MW-1 579.45 GMS Monitoring Well — Groundwater Elevation (feet above mean sea level)

PROJECT LOCATION

200 0 200 400 Feet

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OWENSBORO MUNICIPAL UTILITIES
ELMER SMITH STATION ASH PONDS
OWENSBORO, DAVIESS COUNTY, KY

POTENTIOMETRIC SURFACE MAP
DECEMBER 14, 2021

DRAWN BY: MGN	CHECKED BY: MGN	APPROVED BY: HTW*	FIGURE NO: 3e
DATE: FEB 01, 2022	SCALE: 1 " = 400 '	PROJECT NO: 164-014	

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SOURCE: ESRI WORLD IMAGERY / ARCGIS MAP SERVICE: HTTP://GOTO.ARCGISONLINE.COM/MAPS/WORLD_IMAGERY.
LAST ACCESSED: 1/24/2023 IMAGE DATE: 10/19/2021

Legend

- Approximate Site Boundary
- OMU Production Well (active)
- OMU Production Well (idle)
- GMS Monitoring Well
- MW-1 579.45 Groundwater Elevation (feet above mean sea level)

PROJECT LOCATION

200 0 200 400 Feet

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OWENSBORO MUNICIPAL UTILITIES
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OWENSBORO, DAVIESS COUNTY, KY

POTENTIOMETRIC SURFACE MAP
JUNE 8, 2022

DRAWN BY: MGN	CHECKED BY: MGN	APPROVED BY: HTW*	FIGURE NO: 3f
DATE: JAN 24, 2023	SCALE: 1 " = 400 '	PROJECT NO: 164-014	

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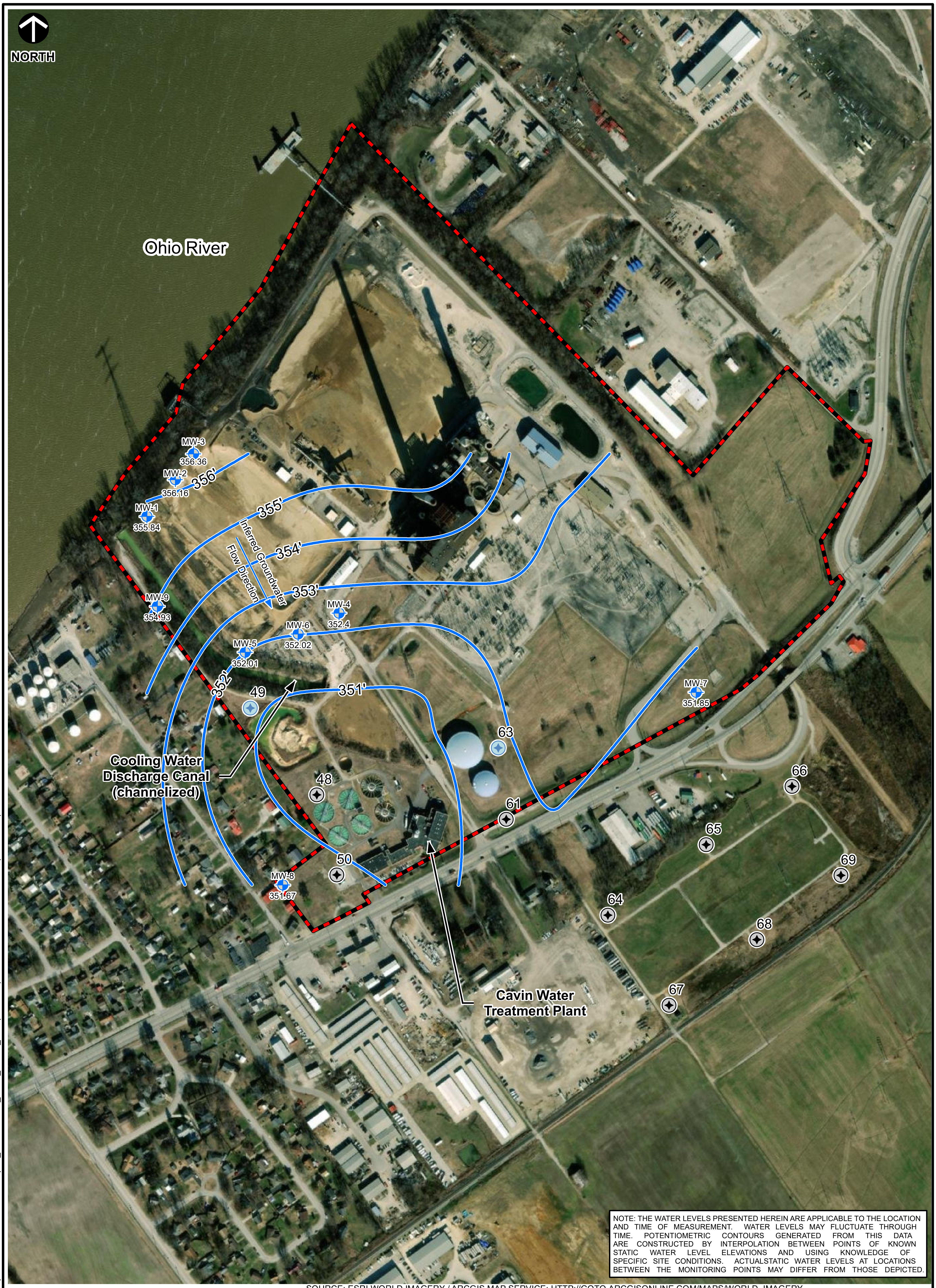

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LAST ACCESSED: 3/24/2023 IMAGE DATE: 10/19/2021

Legend

- Approximate Site Boundary
- OMU Production Well (active)
- OMU Production Well (idle)
- GMS Monitoring Well (MW-1, 579.45 — Groundwater Elevation (feet above mean sea level))

PROJECT LOCATION

200 0 200 400 Feet

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OWENSBORO MUNICIPAL UTILITIES
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POTENTIOMETRIC SURFACE MAP
DECEMBER 13, 2022

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DATE: MAR 24, 2023	SCALE: 1 " = 400 '	PROJECT NO: 164-014	

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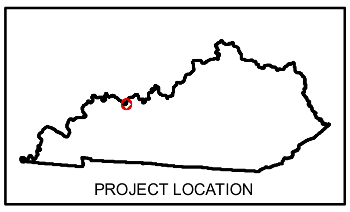
SOURCE: Owensboro ArcGIS REST Service: https://gis.owensboro.org/arcgis/rest/services/AerialPhoto_2023/Aerials_2023_9inch/MapServer
LAST ACCESSED: 3/19/2024 IMAGE DATE: 2023

Legend

- Approximate Site Boundary
- Production Well (Active)
- Production Well (Idle)
- Equipotential Line
- GMS Monitoring Well (MW-1, 579.45 — Groundwater Elevation (feet above mean sea level))



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OWENSBORO MUNICIPAL UTILITIES
ELMER SMITH STATION ASH PONDS
OWENSBORO, DAVIESS COUNTY, KY

POTENTIOMETRIC SURFACE MAP
MAY 18, 2023

DRAWN BY: MGN	CHECKED BY: MGN	APPROVED BY: HTW*	FIGURE NO:
DATE: MAR 19, 2024	SCALE: 1 " = 400 '	PROJECT NO: 164-014	3h

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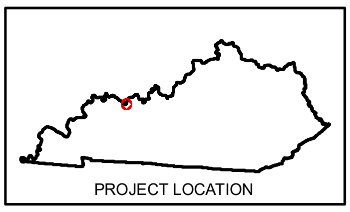
SOURCE: Owensboro ArcGIS REST Service: https://gis.owensboro.org/arcgis/rest/services/AerialPhoto_2023/Aerials_2023_9inch/MapServer.
LAST ACCESSED: 3/19/2024 IMAGE DATE: 2023

Legend

- Approximate Site Boundary
- Production Well (Active)
- Production Well (Idle)
- GMS Monitoring Well (MW-1, 579.45 — Groundwater Elevation (feet above mean sea level))



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OWENSBORO MUNICIPAL UTILITIES
ELMER SMITH STATION ASH PONDS
OWENSBORO, DAVIESS COUNTY, KY

POTENTIOMETRIC SURFACE MAP
DECEMBER 12, 2023

DRAWN BY: MGN	CHECKED BY: MGN	APPROVED BY: HTW*	FIGURE NO:
DATE: MAR 19, 2024	SCALE: 1 " = 400 '	PROJECT NO: 164-014	3i

Signature on File *

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TABLES

TABLE 1
Groundwater Elevation Summary
OMU Elmer Smith Station Ash Ponds
Owensboro, KY
(all measurements are in feet)

Well ID (AKGWA #)	Location Relative to Ash Ponds	Ground Surface Elevation (AMSL)	TOC Elevation (AMSL)	Measurement Date	Depth to Water Measurement (ft BTOC)	Groundwater Elevation (AMSL)
MW-1 (8006-9522)	Upgradient	402.00	404.53	12/8/2016	48.51	356.02
				12/13/2016	48.07	356.46
				2/8/2017	45.69	358.84
				3/8/2017	40.68	363.85
				4/6/2017	43.51	361.02
				5/3/2017	45.91	358.62
				5/15/2017	43.46	361.07
				6/16/2017	49.94	354.59
				6/29/2017	46.72	357.81
				7/13/2017	49.81	354.72
				7/27/2017	49.99	354.54
				8/9/2017	49.15	355.38
				8/23/2017	50.38	354.15
				9/6/2017	50.31	354.22
				9/20/2017	50.04	354.49
				10/10/2017	49.55	354.98
				4/5/2018	34.75	369.78
				6/5/2018	46.61	357.92
				12/12/2018	43.97	360.56
				12/27/2018	35.66	368.87
				5/23/2019	42.30	362.23
				11/7/2019	45.43	359.10
				5/13/2020	38.06	366.47
				12/2/2020	45.65	358.88
				2/11/2021	44.11	360.42
	Downgradient			6/30/2021	45.16	359.37
				12/14/2021	43.94	360.59
	Upgradient			6/8/2022	47.03	357.50
				12/13/2022	48.69	355.84
				5/18/2023	48.50	356.03
				12/12/2023	50.90	353.63
MW-2 (8006-9523)	Downgradient	402.75	405.55	12/8/2016	49.21	356.34
				12/13/2016	48.74	356.81
				2/8/2017	46.29	359.26
				3/8/2017	41.24	364.31
				4/6/2017	44.16	361.39
				5/3/2017	45.48	360.07
				5/15/2017	44.02	361.53
				6/16/2017	50.02	355.53
				6/29/2017	47.17	358.38
				7/13/2017	50.16	355.39
				7/27/2017	50.23	355.32
				8/9/2017	50.75	354.80
				8/23/2017	50.97	354.58
				9/6/2017	50.95	354.60
				9/20/2017	50.69	354.86
				10/10/2017	50.20	355.35
				4/5/2018	35.70	369.85
				6/5/2018	47.22	358.33
				12/12/2018	44.51	361.04
				12/27/2018	36.85	368.70
				5/23/2019	42.94	362.61
				11/7/2019	46.13	359.42
				5/13/2020	38.56	366.99
				12/2/2020	46.24	359.31
				2/11/2021	44.80	360.75
				6/30/2021	45.85	359.70
				12/14/2021	44.70	360.85
	Upgradient			6/8/2022	47.62	357.93
				12/13/2022	49.39	356.16
				5/18/2023	49.10	356.45
				12/12/2023	51.50	354.05

Notes: AMSL = Above Mean Sea Level
TOC = Top of Casing
Ft BTOC = Feet Below Top of Casing

TABLE 1
Groundwater Elevation Summary
OMU Elmer Smith Station Ash Ponds
Owensboro, KY
(all measurements are in feet)

Well ID (AKGWA #)	Location Relative to Ash Ponds	Ground Surface Elevation (AMSL)	TOC Elevation (AMSL)	Measurement Date	Depth to Water Measurement (ft BTOC)	Groundwater Elevation (AMSL)
MW-3 (8006-9524)	Upgradient	403.78	406.39	12/8/2016	49.88	356.51
				12/13/2016	49.43	356.96
				2/8/2017	46.95	359.44
				3/8/2017	41.64	364.75
				4/6/2017	44.56	361.83
				5/3/2017	45.90	360.49
				5/15/2017	44.51	361.88
				6/16/2017	50.06	356.33
				6/29/2017	47.29	359.10
				7/13/2017	50.64	355.75
				7/27/2017	50.69	355.70
				8/9/2017	51.35	355.04
				8/23/2017	51.65	354.74
				9/6/2017	51.43	354.96
				9/20/2017	51.25	355.14
				10/10/2017	50.82	355.57
				4/5/2018	36.10	370.29
				6/5/2018	47.84	358.55
				12/12/2018	45.16	361.23
				12/27/2018	37.61	368.78
				5/23/2019	43.51	362.88
				11/7/2019	46.59	359.80
				5/13/2020	39.32	367.07
				12/2/2020	46.98	359.41
				2/11/2021	45.62	360.77
				6/30/2021	46.68	359.71
				12/14/2021	45.46	360.93
				6/8/2022	48.60	357.79
				12/13/2022	50.03	356.36
				5/18/2023	49.69	356.70
				12/12/2023	52.10	354.29
MW-4 (8006-9525)	Downgradient	406.44	408.02	12/8/2016	54.44	353.58
				12/13/2016	54.06	353.96
				2/8/2017	51.22	356.80
				3/8/2017	52.97	355.05
				4/6/2017	54.99	353.03
				5/3/2017	55.75	352.27
				5/15/2017	53.95	354.07
				6/16/2017	58.65	349.37
				6/29/2017	57.60	350.42
				7/13/2017	58.20	349.82
				7/27/2017	58.73	349.29
				8/9/2017	58.97	349.05
				8/23/2017	59.48	348.54
				9/6/2017	58.73	349.29
				9/20/2017	57.75	350.27
				10/10/2017	57.15	350.87
				4/5/2018	48.85	359.17
				6/5/2018	51.97	356.05
				12/12/2018	50.92	357.10
				12/27/2018	48.87	359.15
				5/23/2019	45.72	362.30
				11/7/2019	49.83	358.19
				5/13/2020	42.30	365.72
				12/2/2020	48.46	359.56
				2/11/2021	46.52	361.50
				6/30/2021	47.01	361.01
				12/14/2021	47.82	360.20
				6/8/2022	51.96	356.06
				12/13/2022	55.62	352.40
				5/18/2023	55.76	352.26
				12/12/2023	59.82	348.20

Notes: AMSL = Above Mean Sea Level
TOC = Top of Casing
Ft BTOC = Feet Below Top of Casing

TABLE 1
Groundwater Elevation Summary
OMU Elmer Smith Station Ash Ponds
Owensboro, KY
(all measurements are in feet)

Well ID (AKGWA #)	Location Relative to Ash Ponds	Ground Surface Elevation (AMSL)	TOC Elevation (AMSL)	Measurement Date	Depth to Water Measurement (ft BTOC)	Groundwater Elevation (AMSL)
MW-5 (8005-9530)	Downgradient	403.56	406.16	6/16/2017	56.37	349.79
				6/29/2017	56.66	349.50
				7/13/2017	56.62	349.54
				7/27/2017	57.03	349.13
				8/9/2017	57.05	349.11
				8/23/2017	57.45	348.71
				9/6/2017	57.11	349.05
				9/20/2017	56.12	350.04
				10/10/2017	55.51	350.65
				4/5/2018	45.14	361.02
				6/5/2018	50.11	356.05
				12/12/2018	49.16	357.00
				12/27/2018	46.58	359.58
				5/23/2019	44.07	362.09
				11/7/2019	47.47	358.69
				5/13/2020	40.50	365.66
				12/2/2020	47.21	358.95
				2/11/2021	45.21	360.95
				6/30/2021	45.99	360.17
				12/14/2021	46.55	359.61
				6/8/2022	50.83	355.33
				12/13/2022	54.15	352.01
				5/18/2023	54.46	351.70
				12/12/2023	58.35	347.81
MW-6 (8006-9531)	Downgradient	405.23	407.35	6/16/2017	57.96	349.39
				6/29/2017	57.40	349.95
				7/13/2017	57.96	349.39
				7/27/2017	58.16	349.19
				8/9/2017	58.55	348.80
				8/23/2017	58.82	348.53
				9/6/2017	58.65	348.70
				9/20/2017	57.41	349.94
				10/10/2017	56.84	350.51
				4/5/2018	46.53	360.82
				6/5/2018	51.56	355.79
				12/12/2018	50.53	356.82
				12/27/2018	48.35	359.00
				5/23/2019	45.30	362.05
				11/7/2019	48.77	358.58
				5/13/2020	41.76	365.59
				12/2/2020	48.07	359.28
				2/11/2021	46.23	361.12
				6/30/2021	46.82	360.53
				12/14/2021	47.56	359.79
				6/8/2022	51.79	355.56
				12/13/2022	55.33	352.02
				5/18/2023	55.69	351.66
				12/12/2023	59.64	347.71
MW-7 (8006-9532)	Background	418.26	421.11	6/16/2017	72.90	348.21
				6/29/2017	73.25	347.86
				7/13/2017	72.87	348.24
				7/27/2017	73.81	347.30
				8/9/2017	74.31	346.80
				8/23/2017	74.31	346.80
				9/6/2017	73.71	347.40
				9/20/2017	73.79	347.32
				10/10/2017	73.70	347.41
				4/5/2018	67.61	353.50
				6/5/2018	69.37	351.74
				12/12/2018	66.12	354.99
				12/27/2018	65.11	356.00
				5/23/2019	61.60	359.51
				11/7/2019	62.83	358.28
				5/13/2020	57.55	363.56
				12/2/2020	60.50	360.61
				2/11/2021	58.86	362.25
				6/30/2021	58.55	362.56
				12/14/2021	59.92	361.19
				6/8/2022	64.43	356.68
				12/13/2022	69.26	351.85
				5/18/2023	69.12	351.99
				12/12/2023	73.21	347.90

Notes: AMSL = Above Mean Sea Level
TOC = Top of Casing
Ft BTOC = Feet Below Top of Casing

TABLE 1
Groundwater Elevation Summary
OMU Elmer Smith Station Ash Ponds
Owensboro, KY
(all measurements are in feet)

Well ID (AKGWA #)	Location Relative to Ash Ponds	Ground Surface Elevation (AMSL)	TOC Elevation (AMSL)	Measurement Date	Depth to Water Measurement (ft BTOC)	Groundwater Elevation (AMSL)
MW-8 (8007-1801)	Background	402.97	405.82	12/27/2018	49.51	356.31
				5/23/2019	46.10	359.72
				11/7/2019	49.00	356.82
				5/13/2020	42.01	363.81
				12/2/2020	47.55	358.27
				2/11/2021	46.00	359.82
				6/30/2021	46.10	359.72
				12/14/2021	47.45	358.37
				6/8/2022	50.54	355.28
				12/13/2022	54.15	351.67
				5/18/2023	57.54	348.28
				12/12/2023	61.22	344.60
MW-9 (8007-1810)	Downgradient	401.78	405.16	6/30/2021	46.10	359.06
				12/14/2021	44.38	360.78
	Upgradient			6/8/2022	47.87	357.29
				12/13/2022	50.23	354.93
				5/18/2023	50.09	355.07
				12/12/2023	53.01	352.15

Notes: AMSL = Above Mean Sea Level
TOC = Top of Casing
Ft BTOC = Feet Below Top of Casing

TABLE 2
Groundwater Analytical Summary - CCR Rule Assessment Monitoring
OMU Elmer Smith Station
Owensboro, KY

		Downgradient		Downgradient			Downgradient		Downgradient		Downgradient			Background		Background		Downgradient	
Sample ID		**MW-1**		**MW-2**			**MW-4**		**MW-5**		**MW-6**			**MW-7**		**MW-8**		**MW-9**	
Collection Date		12/13/2022	5/18/2023	12/13/2022	12/13/2022	5/18/2023	12/13/2022	5/18/2023	12/13/2022	5/18/2023	12/13/2022	5/18/2023	5/18/2023	12/13/2022	5/18/2023	12/13/2022	5/18/2023	12/13/2022	5/18/2023
Total Metals	**Units**																		
Antimony	mg/L	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Arsenic	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Barium	mg/L	**0.015**	**0.018**	**0.02**	**0.02**	**0.022**	**0.032**	**0.029**	**0.055**	**0.086**	**0.046**	**0.038**	**0.038**	**0.1**	**0.098**	**0.12**	**0.14**	**0.025**	**0.028**
Beryllium	mg/L	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Boron	mg/L	**0.16**	**0.065**	**0.3**	**0.25**	**0.068**	**3.1**	**3.0**	**6.2**	**3.1**	**3.7**	**3.2**	**3.3**	**0.073**	**0.042**	**0.097**	**0.11**	**0.61**	**0.41**
Cadmium	mg/L	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Calcium	mg/L	**67**	**56**	**70**	**70**	**79**	**130**	**130**	**120**	**110**	**140**	**120**	**120**	**100**	**100**	**110**	**110**	**89**	**80**
Chromium	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	**0.0098**	**0.0062**	**0.027**	<0.0050	<0.0050	**0.077**	<0.0050	<0.0050	**0.024**	**0.044**	<0.0050	<0.0050	<0.0050	<0.0050
Cobalt	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Lead	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Lithium	mg/L	<0.010	<0.010	<0.00020	<0.010	<0.010	<0.010	<0.010	**0.027**	**0.031**	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Mercury	mg/L	<0.00020	<0.00020	<0.010	<0.00020	<0.00020	<0.00020	<0.00020	**<0.00020**	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Molybdenum	mg/L	**0.0058**	<0.0050	**0.015**	**0.014**	**0.0083**	**0.019**	**0.050**	**0.69**	**1.5**	**1.4**	**1.8**	**1.9**	<0.0050	<0.0050	<0.0050	<0.0050	**0.031**	**0.043**
Selenium	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	**0.054**	**0.052**	**0.028**	**0.034**	**0.036**	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Thallium	mg/L	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Anions																			
Chloride	mg/L	**22**	**19**	**19**	**19**	**17**	**25**	**28**	**26**	**12**	**24**	**24**	**23**	**56**	**69**	**51**	**61**	**20**	**27**
Fluoride	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	**2.3**	**2.4**	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Sulfate	mg/L	**15**	**37**	**11**	**12**	**35**	**230**	**240**	**320**	**130**	**280**	**210**	**210**	**66**	**64**	**62**	**69**	**53**	**49**
Radium																			
Radium-226	pCi/L	**0.830 (+/0.376)**	**1.10 (+/-0.632)**	**0.621 (+/-0.333)**	**0.841 (+/-0.380)**	<0.416 (+/-0.348)	<0.407 (+/-0.206)	**0.961 (+/-0.607)**	NA	<0.580 (+/-0.388)	**0.807 (+/-0.446)**	<0.488 (+/-0.215)	<0.648 (+/-0.438)	**0.697 (+/-0.426)**	**2.64 (+/-0.921)**	**1.06 (+/-0.423)**	**0.995 (+/-0.663)**	**0.586 (+/-0.347)**	<0.564 (+/-0.388)
Radium-228	pCi/L	<0.607 (+/0.368)	<0.655 (+/0.399)	**1.31 (+/-0.492)**	<0.887 (+/-0.515)	<0.807 (+/-0.407)	<0.623 (+/-0.330)	<0.487 (+/-0.271)	NA	<0.441 (+/-0.246)	<0.689 (+/-0.366)	<0.438 (+/-0.270)	<0.930 (+/-0.437)	<0.836 (+/-0.497)	<0.726 (+/-0.458)	<0.741 (+/-0.464)	<0.857 (+/-0.463)	<0.655 (+/0.419)	<0.597 (+/-0.226)
pH																			
pH	s.u.	**7.7**	**8.0**	**7.5**	**7.6**	**7.9**	**7.4**	**7.7**	**7.7**	**7.8**	**7.3**	**8.1**	**8.1**	**7.1**	**7.8**	**7.0**	**7.8**	**7.3**	**8.0**
Total Dissolved Solids																			
Total Dissolved Solids	mg/L	**300**	**250**	**280**	**290**	**600**	**720**	**710**	**720**	**460**	**650**	**580**	**580**	**500**	**500**	**510**	**500**	**380**	**360**
Turbidity																			
Turbidity	n.t.u.	**0.14**	**0.77**	**0.12**	**0.14**	**1.7**	**5.70**	**3.4**	**0.57**	**1.2**	**7.7**	**1.3**	**1.4**	**3.0**	**2.7**	**1.4**	**2.4**	**5**	**0.70**

[green] = Appendix III constituent (fluoride is included on both Appendix III & IV lists)
[tan] = Appendix IV constituent (fluoride is included on both Appendix III & IV lists)
Bold indicates result detected above laboratory reporting limit
1.8 = Appendix IV constituent quantified at Statistically Significant Level (exceeding Groundwater Protection Standard)
NA = Not analyzed for this constituent
12/12/2018 = Blind duplicate sample

Table Reviewed By: CMN

TABLE 2
Groundwater Analytical Summary - CCR Rule Assessment Monitoring
OMU Elmer Smith Station
Owensboro, KY

			Baseline Monitoring Period (Upgradient)				Downgradient				
Sample ID		**Groundwater**	**MW-1**								
Collection Date		**Protection Standard**	2/8/2017	3/8/2017	4/6/2017	5/3/2017	6/30/2021	12/14/2021	6/8/2022	12/13/2022	5/18/2023
Total Metals	**Units**										
Antimony	mg/L	0.006	<0.0060	<0.0060	<0.0060	<0.0060	<0.0050	NA	<0.0050	<0.0020	<0.0020
Arsenic	mg/L	0.010	<0.010	<0.010	<0.010	<0.010	<0.0050	NA	<0.0050	<0.0050	<0.0050
Barium	mg/L	2	<0.10	<0.10	<0.10	<0.10	**0.4**	**0.035**	**0.014**	**0.015**	**0.018**
Beryllium	mg/L	0.004	<0.00040	<0.00040	<0.00040	<0.00040	<0.0020	NA	<0.0020	<0.0020	<0.0020
Boron	mg/L	0.330	<0.10	<0.10	<0.10	<0.10	**8.8**	**8.4**	**0.13**	**0.16**	**0.065**
Cadmium	mg/L	0.005	<0.0050	<0.0050	<0.0050	<0.0050	<0.0020	NA	<0.0020	<0.0020	<0.0020
Calcium	mg/L	139.35	**56**	**63**	**58**	**61**	**180**	**180**	**54**	**67**	**56**
Chromium	mg/L	4.10	<0.020	<0.020	<0.020	<0.020	<0.0050	NA	<0.0050	<0.0050	<0.0050
Cobalt	mg/L	0.098	<0.0040	<0.0040	<0.0040	<0.0040	<0.0050	NA	<0.0050	<0.0050	<0.0050
Iron	mg/L	NA	<0.20	**0.76**	<0.20	<0.20	<0.080	<0.080	<0.080	<0.080	<0.080
Lead	mg/L	0.015	<0.015	<0.015	<0.015	<0.015	<0.0050	NA	<0.0050	<0.0050	<0.0050
Lithium	mg/L	0.040	<0.10	<0.10	<0.10	<0.10	<0.010	<0.010	<0.010	<0.010	<0.010
Mercury	mg/L	0.002	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00020	<0.00020	<0.00020	<0.00020
Molybdenum	mg/L	0.10	<0.10	<0.10	<0.10	<0.10	<0.0050	**0.0059**	**0.0071**	**0.0058**	<0.0050
Selenium	mg/L	0.050	<0.030	<0.030	<0.030	<0.030	<0.0050	**0.074**	<0.0050	<0.0050	<0.0050
Thallium	mg/L	0.002	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	NA	<0.0050	<0.0020	<0.0020
Anions											
Chloride	mg/L	50.0	**24**	**29**	**26**	**25**	**22**	**9.8**	**19**	**22**	**19**
Fluoride	mg/L	4	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Sulfate	mg/L	154.26	**44**	**21**	**25**	**25**	**450**	**520**	**24**	**15**	**37**
Radium											
Radium-226	pCi/L	9.32	**0.24 (+/-0.13)**	**0.16 (+/-0.11)**	**0.34 (+/-0.19)**	<0.17 (+/-0.11)	<0.85 (+/-0.5)	**0.29 (+/-0.2)**	<0.24 (+/-0.13)	**0.830 (+/0.376)**	**1.10 (+/-0.632)**
Radium-228	pCi/L		<0.94 (+/-0.38)	<0.63 (+/-0.29)	<0.98 (+/-0.44)	<0.98 (+/-0.44)	**0.91 (+/-0.47)**	<0.9 (+/-0.49)	<0.78 (+/-0.4)	<0.607 (+/0.368)	<0.655 (+/0.399)
pH											
pH	s.u.	8.01	**7.0**	**7.5**	**7.4**	**7.5**	**7.4**	**7.4**	**7.5**	**7.7**	**8.0**
Total Dissolved Solids											
Total Dissolved Solids	mg/L	950.8	**320**	**310**	**480**	**320**	**1,100**	**1,000**	**270**	**300**	**250**
Turbidity											
Turbidity	n.t.u.	NA	**0.42**	**0.27**	**0.4**	**0.27**	**0.57**	**0.82**	**0.85**	**0.14**	**0.77**

= Appendix III constituent (fluoride is included on both Appendix III & IV lists)
= Appendix IV constituent (fluoride is included on both Appendix III & IV lists)
Bold indicates result detected above laboratory reporting limit
NA = Not analyzed for this constituent

Table Reviewed By: CMN

TABLE 2
Groundwater Analytical Summary - CCR Rule Assessment Monitoring
OMU Elmer Smith Station
Owensboro, KY

			Upgradient/Background								Downgradient					
Sample ID		**Groundwater**	**MW-2**													
Collection Date		**Protection Standard**	4/5/2018	6/5/2018	12/12/2018	12/12/2018	5/23/2019	11/7/2019	5/13/2020	12/2/2020	6/30/2021	12/14/2021	6/8/2022	12/13/2022	12/13/2022	5/18/2023
Total Metals	**Units**															
Antimony	mg/L	0.006	<0.0060	NA	NA	NA	<0.0060	NA	<0.0050	NA	<0.0050	NA	<0.0050	<0.0020	<0.0020	<0.0020
Arsenic	mg/L	0.010	<0.010	NA	NA	NA	<0.010	NA	<0.0050	NA	<0.0050	NA	<0.0050	<0.0050	<0.0050	<0.0050
Barium	mg/L	2	<0.10	<0.10	<0.10	<0.10	<0.10	**0.062**	**0.019**	**0.067**	**0.041**	**0.026**	**0.014**	**0.02**	**0.02**	**0.022**
Beryllium	mg/L	0.004	<0.00040	NA	NA	NA	<0.00040	NA	<0.0020	NA	<0.0020	NA	<0.0020	<0.0020	<0.0020	<0.0020
Boron	mg/L	0.330	NA	<0.10	**0.11**	0.14	<0.10	**17**	**0.36**	**17**	**7.0**	**3.4**	**0.1**	**0.3**	**0.25**	**0.068**
Cadmium	mg/L	0.005	<0.0050	NA	NA	NA	<0.0050	NA	<0.0020	NA	<0.0020	NA	<0.0020	<0.0020	<0.0020	<0.0020
Calcium	mg/L	139.35	NA	**53**	**100**	**100**	**70**	**250**	**71**	**210**	**140**	**110**	**52**	**70**	**70**	**79**
Chromium	mg/L	4.10	<0.020	<0.020	<0.020	<0.020	<0.020	<0.0050	<0.0050	NA	<0.0050	NA	<0.0050	<0.0050	<0.0050	**0.0098**
Cobalt	mg/L	0.098	<0.0040	NA	NA	NA	<0.0040	<0.0050	<0.0050	NA	<0.0050	NA	<0.0050	<0.0050	<0.0050	<0.0050
Iron	mg/L	NA	<0.20	<0.20	<0.20	<0.20	<0.20	NA	<0.080	<0.080	<0.080	<0.080	<0.080	<0.080	<0.080	**0.093**
Lead	mg/L	0.015	<0.015	NA	NA	NA	<0.015	NA	<0.0050	NA	<0.0050	NA	<0.0050	<0.0050	<0.0050	<0.0050
Lithium	mg/L	0.040	<0.10	NA	NA	NA	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.010	<0.010	<0.00020	<0.010	<0.010
Mercury	mg/L	0.002	<0.00020	NA	NA	NA	<0.00020	NA	<0.00020	NA	<0.00020	NA	<0.00020	<0.010	<0.00020	<0.00020
Molybdenum	mg/L	0.10	<0.10	<0.10	<0.10	<0.10	<0.10	**0.011**	**0.0077**	**0.0078**	**0.012**	**0.72**	**0.032**	**0.015**	**0.014**	**0.0083**
Selenium	mg/L	0.050	<0.030	NA	NA	NA	<0.030	**0.017**	<0.0050	**0.057**	**0.048**	**0.035**	<0.0050	<0.0050	<0.0050	<0.0050
Thallium	mg/L	0.002	<0.0050	NA	NA	NA	<0.0020	NA	<0.0050	NA	<0.0050	NA	<0.0050	<0.0020	<0.0020	<0.0020
Anions																
Chloride	mg/L	50.0	NA	**18**	**18**	**18**	**16**	**45**	**15**	**45**	**14**	**12**	**20**	**19**	**19**	**17**
Fluoride	mg/L	4	<2.0	**0.30**	<2.0	<2.0	<2.0	<0.20	<0.20	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Sulfate	mg/L	154.26	NA	**36**	**19**	**19**	**56**	**570**	**43**	**510**	**380**	**200**	**31**	**11**	**12**	**35**
Radium																
Radium-226	pCi/L	9.32	<0.25 (+/-0.13)	<0.193 (+/-0.098)	<0.28 (+/-0.17)	<0.25 (+/-0.15)	<0.34 (+/-0.18)	NA	**0.31 (+/-0.23)**	<0.38 (+/-0.22)	<0.66 (+/-0.32)	<0.29 (+/-0.2)	<0.31 (+/-0.22)	**0.621 (+/-0.333)**	**0.841 (+/-0.380)**	<0.416 (+/-0.348)
Radium-228	pCi/L		<0.94 (+/-0.4)	NA	<0.84 (+/-0.42)	<0.81 (+/-0.41)	<0.79 (+/-0.36)	NA	<0.71 (+/-0.35)	**0.98 (+/-0.44)**	<1.01 (+/-0.47)	<0.86 (+/-0.45)	<0.73 (+/-0.35)	**1.31 (+/-0.492)**	<0.887 (+/-0.515)	<0.807 (+/-0.407)
pH																
pH	s.u.	8.01	NA	**7.7**	**7.6**	**6.1**	**7.8**	**6.9**	**7.6**	**7.6**	**7.6**	**7.5**	**7.5**	**7.5**	**7.6**	**7.9**
Total Dissolved Solids																
Total Dissolved Solids	mg/L	950.8	NA	**260**	**420**	**420**	**330**	**1,400**	**300**	**1,500**	**990**	**590**	**290**	**280**	**290**	**600**
Turbidity																
Turbidity	n.t.u.	NA	**0.11**	**0.26**	**0.23**	**0.05**	**0.09**	**0.14**	**0.07**	**0.05**	**0.14**	**0.17**	**0.34**	**0.12**	**0.14**	**1.7**

Bold indicates result detected above laboratory reporting limit
12/12/2018
NA = Not analyzed for this constituent

Table Reviewed By: CMN

TABLE 2
Groundwater Analytical Summary - CCR Rule Assessment Monitoring
OMU Elmer Smith Station
Owensboro, KY

			Downgradient														
Sample ID		**Groundwater**	MW-4														
Collection Date		**Protection Standard**	4/5/2018	6/5/2018	6/5/2018	12/12/2018	5/23/2019	11/7/2019	5/13/2020	5/13/2020	12/2/2020	6/30/2021	12/14/2021	6/8/2022	6/8/2022	12/13/2022	5/18/2023
Total Metals	**Units**																
Antimony	mg/L	0.006	<0.0060	NA	NA	NA	<0.0060	NA	<0.0050	<0.0050	NA	<0.0050	NA	<0.0050	<0.0050	<0.0020	<0.0020
Arsenic	mg/L	0.010	<0.010	NA	NA	NA	<0.010	NA	<0.0050	<0.0050	NA	<0.0050	NA	<0.0050	<0.0050	<0.0050	<0.0050
Barium	mg/L	2	<0.10	<0.10	<0.10	<0.10	<0.10	**0.045**	**0.024**	**0.024**	**0.020**	**0.018**	**0.019**	**0.017**	**0.017**	**0.032**	**0.029**
Beryllium	mg/L	0.004	<0.00040	NA	NA	NA	<0.00040	NA	<0.0020	<0.0020	NA	<0.0020	NA	<0.0020	<0.0020	<0.0020	<0.0020
Boron	mg/L	0.330	NA	**11**	**10**	**5.6**	**9.8**	**13**	**4.6**	**4.6**	**1.5**	**0.87**	**0.69**	**0.34**	**0.34**	**3.1**	**3.0**
Cadmium	mg/L	0.005	<0.0050	NA	NA	NA	<0.0050	NA	<0.0020	<0.0020	NA	<0.0020	NA	<0.0020	<0.0020	<0.0020	<0.0020
Calcium	mg/L	139.35	NA	**180**	**180**	**100**	**200**	**200**	**110**	**110**	**83**	**83**	**84**	**68**	**67**	**130**	**130**
Chromium	mg/L	4.10	<0.020	<0.020	<0.020	<0.020	<0.020	<0.0050	<0.0050	<0.0050	NA	<0.0050	NA	<0.0050	<0.0050	**0.0062**	**0.027**
Cobalt	mg/L	0.098	<0.0040	NA	NA	NA	<0.0040	<0.0050	<0.0050	<0.0050	NA	<0.0050	NA	<0.0050	<0.0050	<0.0050	<0.0050
Iron	mg/L	NA	**0.24**	**0.75**	**0.76**	<0.20	<0.20	NA	**0.099**	**0.13**	**0.12**	<0.080	<0.080	**0.14**	**0.13**	**0.22**	**0.19**
Lead	mg/L	0.015	<0.015	NA	NA	NA	<0.015	NA	<0.0050	<0.0050	NA	<0.0050	NA	<0.0050	<0.0050	<0.0050	<0.0050
Lithium	mg/L	0.040	<0.10	NA	NA	NA	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Mercury	mg/L	0.002	<0.00020	NA	NA	NA	<0.00020	NA	<0.00020	<0.00020	NA	<0.00020	NA	**0.00026**	**0.00024**	<0.00020	<0.00020
Molybdenum	mg/L	0.10	<0.10	<0.10	<0.10	<0.10	<0.10	**0.0085**	**0.0093**	**0.0094**	**0.02**	**0.023**	**0.022**	**0.026**	**0.025**	**0.019**	**0.050**
Selenium	mg/L	0.050	<0.030	NA	NA	NA	<0.030	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Thallium	mg/L	0.002	<0.0050	NA	NA	NA	<0.0020	NA	<0.0050	<0.0050	NA	<0.0050	NA	<0.0050	<0.0050	<0.0020	<0.0020
Anions																	
Chloride	mg/L	50.0	NA	**37**	**37**	**27**	**200**	**44**	**35**	**35**	**19**	**12**	**12**	**20**	**20**	**25**	**28**
Fluoride	mg/L	4	<2.0	<0.50	<0.50	<2.0	<2.0	<0.20	<0.20	<0.20	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Sulfate	mg/L	154.26	NA	**370**	**370**	**140**	**730**	**500**	**200**	**200**	**72**	**39**	**48**	**53**	**52**	**230**	**240**
Radium																	
Radium-226	pCi/L	9.32	**0.49 (+/-0.23)**	**0.32 (+/-0.18)**	**0.32 (+/-0.17)**	<0.23 (+/-0.15)	<0.39 (+/-0.28)	NA	<0.27 (+/-0.15)	<0.3 (+/-0.24)	<0.44 (+/-0.29)	<0.75 (+/-0.39)	<0.3 (+/-0.16)	<0.21 (+/-0.17)	<0.21 (+/-0.12)	<0.407 (+/-0.206)	**0.961 (+/-0.607)**
Radium-228	pCi/L		<0.98 (+/-0.48)	NA	NA	<0.82 (+/-0.39)	<0.81 (+/- 0.4)	NA	<0.75 (+/-0.36)	<0.73 (+/-0.32)	<0.77 (+/-0.36)	<0.79 (+/-0.4)	**0.95 (+/-0.49)**	<0.79 (+/-0.37)	**0.93 (+/-0.48)**	<0.623 (+/-0.330)	<0.487 (+/-0.271)
pH																	
pH	s.u.	8.01	NA	**7.5**	**7.4**	**7.8**	**7.2**	**6.8**	**7.3**	**7.4**	**7.5**	**7.6**	**7.4**	**7.8**	**7.9**	**7.4**	**7.7**
Total Dissolved Solids																	
Total Dissolved Solids	mg/L	950.8	NA	**1,100**	**1,100**	**570**	**1,300**	**1,300**	**690**	**680**	**450**	**480**	**590**	**430**	**410**	**720**	**710**
Turbidity																	
Turbidity	n.t.u.	NA	**2.2**	**11**	**11**	**0.96**	**0.4**	**1.2**	**1.9**	**1.9**	**0.9**	**0.39**	**0.36**	**1.90**	**2.20**	**5.70**	**3.4**

= Appendix III constituent (fluoride is included on both Appendix III & IV lists)
= Appendix IV constituent (fluoride is included on both Appendix III & IV lists)
Bold indicates result detected above laboratory reporting limit
12/12/2018 = Blind duplicate sample
NA = Not analyzed for this constituent

Table Reviewed By: CMN

TABLE 2
Groundwater Analytical Summary - CCR Rule Assessment Monitoring
OMU Elmer Smith Station
Owensboro, KY

Sample ID		Groundwater	Downgradient												
			MW-5												
Collection Date		Protection Standard	4/5/2018	6/5/2018	12/12/2018	5/23/2019	11/7/2019	5/13/2020	12/2/2020	6/30/2021	12/14/2021	12/14/2021	6/8/2022	12/13/2022	5/18/2023
Total Metals	**Units**														
Antimony	mg/L	0.006	<0.0060	NA	NA	<0.0060	NA	<0.0050	NA	<0.0050	NA	NA	<0.0050	<0.0020	<0.0020
Arsenic	mg/L	0.010	<0.010	NA	NA	<0.010	NA	<0.0050	NA	<0.0050	NA	NA	<0.0050	<0.0050	<0.0050
Barium	mg/L	2	**0.11**	**0.12**	<0.10	<0.10	**0.074**	**0.095**	**0.049**	**0.052**	**0.069**	**0.068**	**0.053**	**0.055**	**0.086**
Beryllium	mg/L	0.004	<0.00040	NA	NA	<0.00040	NA	<0.0020	NA	<0.0020	NA	NA	<0.0020	<0.0020	<0.0020
Boron	mg/L	0.330	NA	**12**	**10**	**12**	**13**	**11**	**8.2**	**6.9**	**11**	**10**	**8.0**	**6.2**	**3.1**
Cadmium	mg/L	0.005	<0.0050	NA	NA	<0.0050	NA	<0.0020	NA	<0.0020	NA	NA	<0.0020	<0.0020	<0.0020
Calcium	mg/L	139.35	NA	**150**	**120**	**130**	**130**	**220**	**110**	**120**	**160**	**160**	**120**	**120**	**110**
Chromium	mg/L	4.10	<0.020	<0.020	<0.020	<0.020	<0.0050	<0.0050	NA	<0.0050	NA	NA	<0.0050	<0.0050	<0.0050
Cobalt	mg/L	0.098	<0.0040	NA	NA	<0.0040	<0.0050	<0.0050	NA	<0.0050	NA	NA	<0.0050	<0.0050	<0.0050
Iron	mg/L	NA	<0.20	<0.20	<0.20	<0.20	NA	<0.080	<0.080	<0.080	<0.080	<0.080	<0.080	<0.080	<0.080
Lead	mg/L	0.015	<0.015	NA	NA	<0.015	NA	<0.0050	NA	<0.0050	NA	NA	<0.0050	<0.0050	<0.0050
Lithium	mg/L	0.040	<0.10	NA	NA	**0.019**	**0.02**	**0.019**	**0.019**	**0.013**	**0.02**	**0.019**	**0.021**	**0.027**	**0.031**
Mercury	mg/L	0.002	<0.00020	NA	NA	<0.00020	NA	<0.00020	NA	<0.00020	NA	NA	**0.00028**	**<0.00020**	<0.00020
Molybdenum	mg/L	0.10	**0.34**	**0.41**	**0.36**	**0.5**	**0.85**	**0.52**	**0.67**	**0.88**	**0.91**	**0.90**	**0.64**	**0.69**	**1.5**
Selenium	mg/L	0.050	<0.030	NA	NA	<0.030	**0.019**	**0.031**	**0.025**	**0.033**	**0.037**	**0.037**	**0.064**	**0.054**	**0.052**
Thallium	mg/L	0.002	<0.0050	NA	NA	<0.0020	NA	<0.0050	NA	<0.0050	NA	NA	<0.0050	<0.0020	<0.0020
Anions															
Chloride	mg/L	50.0	NA	**62**	**49**	**70**	**38**	**110**	**37**	**37**	**26**	**26**	**26**	**26**	**12**
Fluoride	mg/L	4	**2.3**	**1.9**	<2.0	**2.2**	**2.2**	**2.2**	**2.1**	**2.2**	<2.0	<2.0	**2.1**	**2.3**	**2.4**
Sulfate	mg/L	154.26	NA	**390**	**260**	**330**	**340**	**600**	**260**	**310**	**470**	**460**	**310**	**320**	**130**
Radium															
Radium-226	pCi/L	9.32	<0.13 (+/-0.11)	**0.2 (+/-0.13)**	<0.61 (+/-0.35)	<0.36 (+/-0.23)	NA	<0.41 (+/-0.22)	<0.24 (+/-0.17)	<0.50 (+/-0.29)	<0.23 (+/-0.15)	<0.37 (+/-0.23)	<0.21 (+/-0.11)	NA	<0.580 (+/-0.388)
Radium-228	pCi/L		<1.01 (+/-0.45)	NA	<0.76 (+/-0.36)	<0.78 (+/-0.38)	NA	<0.75 (+/-0.39)	<0.7 (+/-0.37)	<0.79 (+/-0.36)	<0.84 (+/-0.45)	<0.75 (+/-0.35)	<0.86 (+/-0.43)	NA	<0.441 (+/-0.246)
pH															
pH	s.u.	8.01	NA	**7.5**	**8.0**	**7.6**	**7.9**	**7.4**	**7.6**	**7.6**	**7.6**	**7.4**	**7.6**	**7.7**	**7.8**
Total Dissolved Solids															
Total Dissolved Solids	mg/L	950.8	NA	**1,200**	**840**	**1,100**	**940**	**1,600**	**840**	**880**	**970**	**990**	**890**	**720**	**460**
Turbidity															
Turbidity	n.t.u.	NA	**0.38**	**1.1**	**0.8**	**0.06**	**0.15**	**0.18**	**0.29**	**0.18**	**0.23**	**0.27**	**0.28**	**0.57**	**1.2**

= Appendix III constituent (fluoride is included on both Appendix III & IV lists)
= Appendix IV constituent (fluoride is included on both Appendix III & IV lists)
Bold indicates result detected above laboratory reporting limit
1.8 = Appendix IV constituent quantified at Statistically Significant Level (exceeding Groundwater Protection Standard)
NA = Not analyzed for this constituent
12/12/2018 = Blind duplicate sample

Table Reviewed By: CMN

TABLE 2
Groundwater Analytical Summary - CCR Rule Assessment Monitoring
OMU Elmer Smith Station
Owensboro, KY

			Downgradient															
Sample ID		**Groundwater**	**MW-6**															
Collection Date		**Protection Standard**	4/5/2018	4/5/2018	6/5/2018	12/12/2018	5/23/2019	5/23/2019	11/7/2019	11/7/2019	5/13/2020	12/2/2020	6/30/2021	12/14/2021	6/8/2022	12/13/2022	5/18/2023	5/18/2023
Total Metals	**Units**																	
Antimony	mg/L	0.006	<0.0060	<0.0060	NA	NA	<0.0060	<0.0060	NA	NA	<0.0050	NA	<0.0050	NA	<0.0050	<0.0020	<0.0020	<0.0020
Arsenic	mg/L	0.010	<0.010	<0.010	NA	NA	<0.010	<0.010	NA	NA	<0.0050	NA	<0.0050	NA	<0.0050	<0.0050	<0.0050	<0.0050
Barium	mg/L	2	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	**0.05**	**0.05**	**0.032**	**0.048**	**0.042**	**0.043**	**0.044**	**0.046**	**0.038**	**0.038**
Beryllium	mg/L	0.004	<0.00040	<0.00040	NA	NA	<0.00040	<0.00040	NA	NA	<0.0020	NA	<0.0020	NA	<0.0020	<0.0020	<0.0020	<0.0020
Boron	mg/L	0.330	NA	NA	**10**	**11**	**9.1**	**9.2**	**13**	**13**	**10**	**10**	**7.5**	**3.7**	**4.0**	**3.7**	**3.2**	**3.3**
Cadmium	mg/L	0.005	<0.0050	<0.0050	NA	NA	<0.0050	<0.0050	NA	NA	<0.0020	NA	<0.0020	NA	<0.0020	<0.0020	<0.0020	<0.0020
Calcium	mg/L	139.35	NA	NA	**180**	**170**	**130**	**130**	**150**	**150**	**110**	**150**	**140**	**130**	**140**	**140**	**120**	**120**
Chromium	mg/L	4.10	**0.021**	**0.020**	<0.020	<0.020	<0.020	<0.020	<0.0050	<0.0050	<0.0050	NA	<0.0050	NA	<0.0050	**0.077**	<0.0050	<0.0050
Cobalt	mg/L	0.098	<0.0040	<0.0040	NA	NA	**0.0063**	**0.006**	<0.0050	<0.0050	<0.0050	NA	<0.0050	NA	<0.0050	<0.0050	<0.0050	<0.0050
Iron	mg/L	NA	<0.20	<0.20	**0.76**	<0.20	<0.20	<0.20	NA	NA	**0.14**	**0.21**	<0.080	<0.080	**0.18**	**0.93**	**<0.080**	<0.080
Lead	mg/L	0.015	<0.015	<0.015	NA	NA	<0.015	<0.015	NA	NA	<0.0050	NA	<0.0050	NA	<0.0050	<0.0050	<0.0050	<0.0050
Lithium	mg/L	0.040	<0.10	<0.10	NA	NA	<0.010	<0.010	<0.0050	<0.0050	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Mercury	mg/L	0.002	<0.00020	<0.00020	NA	NA	<0.00020	<0.00020	NA	NA	<0.00020	NA	<0.00020	NA	**0.00032**	<0.00020	<0.00020	<0.00020
Molybdenum	mg/L	0.10	**1.7**	**1.7**	**1.8**	**2.1**	**1.8**	**1.8**	**2**	**2**	**1.8**	**2.1**	**1.9**	**1.7**	**1.9**	**1.4**	**1.8**	**1.9**
Selenium	mg/L	0.050	<0.030	<0.030	NA	NA	**0.035**	**0.037**	**0.047**	**0.046**	**0.040**	**0.055**	**0.050**	**0.019**	**0.013**	**0.028**	**0.034**	**0.036**
Thallium	mg/L	0.002	<0.0050	<0.0050	NA	NA	<0.0020	<0.0020	NA	NA	<0.0050	NA	<0.0050	NA	<0.0050	<0.0020	<0.0020	<0.0020
Anions																		
Chloride	mg/L	50.0	NA	NA	**37**	**37**	**30**	**29**	**31**	**31**	**25**	**34**	**32**	**24**	**24**	**24**	**24**	**23**
Fluoride	mg/L	4	<2.0	<2.0	<0.50	<2.0	<2.0	<2.0	**0.93**	**0.91**	**1.1**	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Sulfate	mg/L	154.26	NA	NA	**370**	**550**	**450**	**450**	**480**	**460**	**370**	**400**	**390**	**260**	**240**	**280**	**210**	**210**
Radium																		
Radium-226	pCi/L	9.32	<0.19 (+/-0.13)	**0.25 (+/-0.16)**	**0.32 (+/-0.17)**	<0.27 (+/-0.2)	<0.34 (+/-0.19)	<0.47 (+/-0.27)	NA	NA	<0.3 (+/-0.14)	<0.23 (+/-0.16)	<0.70 (+/-0.34)	<0.32 (+/-0.17)	<0.45 (+/-0.24)	**0.807 (+/-0.446)**	<0.488 (+/-0.215)	<0.648 (+/-0.438)
Radium-228	pCi/L		<0.98 (+/-0.45)	<0.98 (+/-0.43)	NA	<0.72 (+/-0.34)	<0.78 (+/-0.38)	<0.78 (+/-0.41)	NA	NA	<0.71 (+/-0.36)	**0.98 (+/-0.45)**	<0.75 (+/-0.38)	<1.01 (+/-0.49)	<0.84 (+/-0.38)	<0.689 (+/-0.366)	<0.438 (+/-0.270)	<0.930 (+/-0.437)
pH																		
pH	s.u.	8.01	NA	NA	**7.4**	**7.8**	**7.4**	**7.5**	**7.4**	**7.0**	**7.4**	**7.5**	**7.6**	**7.3**	**7.2**	**7.3**	**8.1**	**8.1**
Total Dissolved Solids																		
Total Dissolved Solids	mg/L	950.8	NA	NA	**1,100**	**1,100**	**870**	**1,000**	**960**	**960**	**750**	**870**	**880**	**620**	**770**	**650**	**580**	**580**
Turbidity																		
Turbidity	n.t.u.	NA	**3.1**	**2.7**	**11**	**1.5**	**0.75**	**0.57**	**1.6**	**1.6**	**2.1**	**1.3**	**1**	**1.4**	**2.6**	**7.7**	**1.3**	**1.4**

[green box] = Appendix III constituent (fluoride is included on both Appendix III & IV lists)
[yellow box] = Appendix IV constituent (fluoride is included on both Appendix III & IV lists)
Bold indicates result detected above laboratory reporting limit
1.8 = Appendix IV constituent quantified at Statistically Significant Level (exceeding Groundwater Protection Standard)
NA = Not analyzed for this constituent
12/12/2018 = Blind duplicate sample

Table Reviewed By: CMN

TABLE 2
Groundwater Analytical Summary - CCR Rule Assessment Monitoring
OMU Elmer Smith Station
Owensboro, KY

			Downgradient/Background							**Background**				
Sample ID		**Groundwater**	**MW-7**											
Collection Date		**Protection Standard**	4/5/2018	6/5/2018	12/12/2018	5/23/2019	11/7/2019	5/13/2020	12/2/2020	6/30/2021	12/14/2021	6/8/2022	12/13/2022	5/18/2023
Total Metals	**Units**													
Antimony	mg/L	0.006	<0.0060	NA	NA	<0.0060	NA	<0.0050	NA	<0.0050	NA	<0.0050	<0.0020	<0.0020
Arsenic	mg/L	0.010	<0.010	NA	NA	<0.010	NA	<0.0050	NA	<0.0050	NA	<0.0050	<0.0050	<0.0050
Barium	mg/L	2	**0.13**	**0.12**	**0.13**	**0.10**	**0.10**	**0.089**	**0.090**	**0.084**	**0.088**	**0.086**	**0.1**	**0.098**
Beryllium	mg/L	0.004	<0.00040	NA	NA	<0.00040	NA	<0.0020	NA	<0.0020	NA	<0.0020	<0.0020	<0.0020
Boron	mg/L	0.330	NA	<0.10	<0.10	<0.10	**0.11**	**0.15**	**0.067**	**0.082**	**0.029**	**0.066**	**0.073**	**0.042**
Cadmium	mg/L	0.005	<0.0050	NA	NA	<0.0050	NA	<0.0020	NA	<0.0020	NA	<0.0020	<0.0020	<0.0020
Calcium	mg/L	139.35	NA	**100**	**99**	**100**	**97**	**95**	**99**	**98**	**100**	**97**	**100**	**100**
Chromium	mg/L	4.10	<0.020	**0.22**	<0.020	**0.02**	**0.02**	<0.0050	NA	<0.0050	NA	**0.0092**	**0.024**	**0.044**
Cobalt	mg/L	0.098	<0.0040	NA	NA	<0.0040	<0.0050	<0.0050	NA	<0.0050	NA	<0.0050	<0.0050	<0.0050
Iron	mg/L	NA	<0.20	**1.8**	<0.20	**1.1**	NA	**0.21**	**0.21**	**0.091**	**0.120**	**0.140**	**0.46**	**0.32**
Lead	mg/L	0.015	<0.015	NA	NA	<0.015	NA	<0.0050	NA	<0.0050	NA	<0.0050	<0.0050	<0.0050
Lithium	mg/L	0.040	<0.10	NA	NA	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Mercury	mg/L	0.002	<0.00020	NA	NA	<0.00020	NA	<0.00020	NA	<0.00020	NA	<0.00020	<0.00020	<0.00020
Molybdenum	mg/L	0.10	<0.10	<0.10	<0.10	<0.10	<0.0050	<0.0050	<0.0050	<0.0050	**0.005**	<0.0050	<0.0050	<0.0050
Selenium	mg/L	0.050	<0.030	NA	NA	<0.030	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Thallium	mg/L	0.002	<0.0050	NA	NA	<0.0020	NA	<0.0050	NA	<0.0050	NA	<0.0050	<0.0020	<0.0020
Anions														
Chloride	mg/L	50.0	NA	**21**	**19**	**15**	**14**	**16**	**19**	**28**	**28**	**34**	**56**	**69**
Fluoride	mg/L	4	<2.0	**0.22**	<2.0	<2.0	<0.20	<0.20	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Sulfate	mg/L	154.26	NA	**84**	**91**	**92**	**62**	**61**	**55**	**62**	**62**	**58**	**66**	**64**
Radium														
Radium-226	pCi/L	9.32	**0.21 (+/-0.16)**	**0.32 (+/-0.15)**	<0.21 (+/-0.14)	<0.47 (+/-0.27)	NA	<0.25 (+/-0.18)	<0.28 (+/-0.20)	<0.71 (+/-0.39)	<0.35 (+/-0.19)	<0.35 (+/-0.17)	**0.697 (+/-0.426)**	**2.64 (+/-0.921)**
Radium-228	pCi/L		<0.97 (+/-0.48)	NA	<0.73 (+/-0.36)	<0.80 (+/-0.41)	NA	<0.7 (+/-0.32)	<0.82 (+/-0.39)	<0.82 (+/-0.4)	<0.79 (+/-0.37)	<0.81 (+/-0.38)	<0.836 (+/-0.497)	<0.726 (+/-0.458)
pH														
pH	s.u.	8.01	NA	**7.0**	**7.6**	**7.2**	**7.5**	**7.4**	**7.1**	**7.3**	**7.1**	**7.0**	**7.1**	**7.8**
Total Dissolved Solids														
Total Dissolved Solids	mg/L	950.8	NA	**570**	**490**	**500**	**500**	**470**	**370**	**530**	**420**	**500**	**500**	**500**
Turbidity														
Turbidity	n.t.u.	NA	**1.6**	**10**	**0.98**	**8.9**	**5.2**	**1.7**	**0.82**	**0.71**	**2.0**	**2.0**	**3.0**	**2.7**

[green box] = Appendix III constituent (fluoride is included on both Appendix III & IV lists)
[yellow box] = Appendix IV constituent (fluoride is included on both Appendix III & IV lists)
Bold indicates result detected above laboratory reporting limit
NA = Not analyzed for this constituent

Table Reviewed By: CMN

TABLE 2
Groundwater Analytical Summary - CCR Rule Assessment Monitoring
OMU Elmer Smith Station
Owensboro, KY

			Downgradient							Background				
Sample ID		**Groundwater**	**MW-8**											
Collection Date		**Protection Standard**	12/27/2018	5/23/2019	11/7/2019	5/13/2020	12/2/2020	12/2/2020	6/30/2021	6/30/2021	12/14/2021	6/8/2022	12/13/2022	5/18/2023
Total Metals	**Units**													
Antimony	mg/L	0.006	<0.0060	<0.0060	NA	<0.0050	NA	NA	<0.0050	<0.0050	NA	<0.0050	<0.0020	<0.0020
Arsenic	mg/L	0.010	<0.010	<0.010	NA	<0.0050	NA	NA	<0.0050	<0.0050	NA	<0.0050	<0.0050	<0.0050
Barium	mg/L	2	**0.13**	**0.12**	**0.17**	**0.094**	**0.095**	**0.094**	**0.091**	**0.092**	**0.10**	**0.11**	**0.12**	**0.14**
Beryllium	mg/L	0.004	<0.00040	<0.00040	NA	<0.0020	NA	NA	<0.0020	<0.0020	NA	<0.0020	<0.0020	<0.0020
Boron	mg/L	0.330	<0.10	<0.10	**0.15**	**0.11**	**0.12**	**0.12**	**0.13**	**0.11**	**0.12**	**0.12**	**0.097**	**0.11**
Cadmium	mg/L	0.005	<0.0050	<0.0050	NA	<0.0020	NA	NA	<0.0020	<0.0020	NA	<0.0020	<0.0020	<0.0020
Calcium	mg/L	139.35	**84**	**98**	**100**	**88**	**88**	**88**	**86**	**87**	**87**	**94**	**110**	**110**
Chromium	mg/L	4.10	<0.020	<0.020	<0.0050	<0.0050	NA	NA	<0.0050	<0.0050	NA	<0.0050	<0.0050	<0.0050
Cobalt	mg/L	0.098	<0.0040	<0.0040	<0.0050	<0.0050	NA	NA	<0.0050	<0.0050	NA	<0.0050	<0.0050	<0.0050
Iron	mg/L	NA	**1.0**	**3.3**	NA	**3.2**	**0.7**	**0.7**	**1.1**	**1.0**	**1.0**	**0.75**	**0.33**	**0.35**
Lead	mg/L	0.015	<0.015	<0.015	NA	<0.0050	NA	NA	<0.0050	<0.0050	NA	<0.0050	<0.0050	<0.0050
Lithium	mg/L	0.040	<0.10	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Mercury	mg/L	0.002	<0.00020	<0.00020	NA	<0.00020	NA	NA	<0.00020	<0.00020	NA	<0.00020	<0.00020	<0.00020
Molybdenum	mg/L	0.10	<0.10	<0.10	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Selenium	mg/L	0.050	<0.030	<0.030	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Thallium	mg/L	0.002	<0.0050	<0.0020	NA	<0.0050	NA	NA	<0.0050	<0.0050	NA	<0.0050	<0.0020	<0.0020
Anions														
Chloride	mg/L	50.0	**24**	**31**	**36**	**31**	**31**	**30**	**31**	**31**	**28**	**32**	**51**	**61**
Fluoride	mg/L	4	<2.0	<2.0	<0.20	<0.20	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Sulfate	mg/L	154.26	**59**	**75**	**69**	**45**	**46**	**45**	**43**	**44**	**42**	**46**	**62**	**69**
Radium														
Radium-226	pCi/L	9.32	<0.28 (+/-0.2)	<0.47 (+/-0.26)	NA	<0.26 (+/-0.16)	<0.25 (+/-0.16)	<0.33 (+/-0.19)	<0.5 (+/-0.33)	<0.52 (+/-0.27)	<0.22 (+/-0.15)	**0.2 (+/-0.14)**	**1.06 (+/-0.423)**	**0.995 (+/-0.663)**
Radium-228	pCi/L		<0.70 (+/-0.33)	<0.80 (+/-0.36)	NA	<0.78 (+/-0.37)	**0.84 (+/-0.41)**	**1.14 (+/-0.47)**	<0.74 (+/-0.39)	<1.02 (+/-0.51)	<0.83 (+/-0.41)	<0.79 (+/-0.38)	<0.741 (+/-0.464)	<0.857 (+/-0.463)
pH														
pH	s.u.	8.01	**7.0**	**7.2**	**7.6**	**7.1**	**7.3**	**7.5**	**7.3**	**7.3**	**7.1**	**7.1**	**7.0**	**7.8**
Total Dissolved Solids														
Total Dissolved Solids	mg/L	950.8	**420**	**510**	**510**	**420**	**410**	**460**	**480**	**460**	**330**	**470**	**510**	**500**
Turbidity														
Turbidity	n.t.u.	NA	**6.7**	**31**	**180**	**20**	**2.4**	**2.2**	**6.7**	**5.0**	**4.1**	**5.3**	**1.4**	**2.4**

= Appendix III constituent (fluoride is included on both Appendix III & IV lists)
= Appendix IV constituent (fluoride is included on both Appendix III & IV lists)
Bold indicates result detected above laboratory reporting limit
NA = Not analyzed for this constituent
12/12/2018 = Blind duplicate sample

Table Reviewed By: CMN

TABLE 2
Groundwater Analytical Summary - CCR Rule Assessment Monitoring
OMU Elmer Smith Station
Owensboro, KY

Sample ID		Groundwater	Downgradient				
			MW-9				
Collection Date		Protection Standard	6/30/2021	12/14/2021	6/8/2022	12/13/2022	5/18/2023
Total Metals	**Units**						
Antimony	mg/L	0.006	<0.0050	NA	<0.0050	<0.0020	<0.0020
Arsenic	mg/L	0.010	<0.0050	NA	<0.0050	<0.0050	<0.0050
Barium	mg/L	2	**0.024**	**0.048**	**0.038**	**0.025**	**0.028**
Beryllium	mg/L	0.004	<0.0020	NA	<0.0020	<0.0020	<0.0020
Boron	mg/L	0.330	**0.12**	**5.7**	**3.9**	**0.61**	**0.41**
Cadmium	mg/L	0.005	<0.0020	NA	<0.0020	<0.0020	<0.0020
Calcium	mg/L	139.35	**97**	**200**	**120**	**89**	**80**
Chromium	mg/L	4.10	<0.0050	NA	<0.0050	<0.0050	<0.0050
Cobalt	mg/L	0.098	<0.0050	NA	<0.0050	<0.0050	<0.0050
Iron	mg/L	NA	**0.26**	**0.094**	**<0.080**	**0.16**	<0.080
Lead	mg/L	0.015	<0.0050	NA	<0.0050	<0.0050	<0.0050
Lithium	mg/L	0.040	<0.010	**0.011**	<0.010	<0.010	<0.010
Mercury	mg/L	0.002	<0.00020	<0.00020	**0.00023**	<0.00020	<0.00020
Molybdenum	mg/L	0.10	**0.033**	**0.036**	**0.04**	**0.031**	**0.043**
Selenium	mg/L	0.050	<0.0050	**0.038**	**0.0089**	<0.0050	<0.0050
Thallium	mg/L	0.002	<0.0050	NA	<0.0050	<0.0020	<0.0020
Anions							
Chloride	mg/L	50.0	**6.2**	**57**	**16**	**20**	**27**
Fluoride	mg/L	4	<2.0	<2.0	<2.0	<2.0	<2.0
Sulfate	mg/L	154.26	**21**	**400**	**140**	**53**	**49**
Radium							
Radium-226	pCi/L	9.32	<0.55(+/-0.36)	<0.37 (+/-0.27)	<0.27 (+/-0.13)	**0.586 (+/-0.347)**	<0.564 (+/-0.388)
Radium-228	pCi/L		<0.77(+/-0.37)	<1.12 (+/-0.53)	<0.78 (+/-0.36)	<0.655 (+/0.419)	<0.597 (+/-0.226)
pH							
pH	s.u.	8.01	**7.6**	**7.2**	**7.2**	**7.3**	**8.0**
Total Dissolved Solids							
Total Dissolved Solids	mg/L	950.8	**380**	**950**	**610**	**380**	**360**
Turbidity							
Turbidity	n.t.u.	NA	**6.1**	**1.8**	**0.65**	**5**	**0.70**

Bold indicates result detected above laboratory reporting limit
NA = Not analyzed for this constituent

Table Reviewed By: CMN

TABLE 2
Groundwater Analytical Summary - CCR Rule Assessment Monitoring
OMU Elmer Smith Station
Owensboro, KY

Sample ID		Groundwater	Equipment Blank											
Collection Date		Protection Standard	4/5/2018	6/5/2018	12/12/2018	5/23/2019	11/7/2019	5/13/2020	12/2/2020	6/30/2021	12/14/2021	6/8/2022	12/13/2022	5/18/2023
Total Metals	**Units**													
Antimony	mg/L	0.006	<0.0060	NA	NA	<0.0060	NA	<0.0050	NA	<0.0050	NA	<0.0050	<0.0020	<0.0020
Arsenic	mg/L	0.010	<0.010	NA	NA	<0.010	NA	<0.0050	NA	<0.0050	NA	<0.0050	<0.0050	<0.0050
Barium	mg/L	2	<0.10	<0.10	<0.10	<0.10	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Beryllium	mg/L	0.004	<0.00040	NA	NA	<0.00040	NA	<0.0020	NA	<0.0050	NA	<0.0050	<0.0020	<0.0020
Boron	mg/L	0.330	NA	<0.10	<0.10	<0.10	**0.1**	<0.020	<0.020	<0.0050	<0.0050	<0.0050	<0.020	<0.020
Cadmium	mg/L	0.005	<0.0050	NA	NA	<0.0050	NA	<0.0020	NA	<0.0050	NA	<0.0050	<0.0020	<0.0020
Calcium	mg/L	139.35	NA	<0.20	**0.36**	<0.20	<0.50	<0.50	<0.50	**1.9**	**4.7**	<0.50	<0.50	<0.50
Chromium	mg/L	4.10	<0.020	<0.020	<0.020	<0.020	<0.0050	<0.0050	NA	<0.0050	NA	<0.0050	<0.0050	<0.0050
Cobalt	mg/L	0.098	<0.0040	NA	NA	<0.0040	<0.0050	<0.0050	NA	<0.0050	NA	<0.0050	<0.0050	<0.0050
Iron	mg/L	NA	<0.20	<0.20	<0.20	<0.20	NA	<0.080	<0.080	<0.080	<0.080	<0.080	<0.080	<0.080
Lead	mg/L	0.015	<0.015	NA	NA	<0.015	NA	<0.0050	NA	<0.0050	NA	<0.0050	<0.0050	<0.0050
Lithium	mg/L	0.040	<0.10	NA	NA	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.010	<0.010	<0.00020	<0.010
Mercury	mg/L	0.002	<0.00020	NA	NA	<0.00020	NA	<0.00020	NA	<0.00020	NA	<0.00020	<0.010	<0.00020
Molybdenum	mg/L	0.10	<0.10	<0.10	<0.10	<0.10	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Selenium	mg/L	0.050	<0.030	NA	NA	<0.030	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Thallium	mg/L	0.002	<0.0050	NA	NA	<0.0020	NA	<0.0050	NA	<0.0050	NA	<0.0050	<0.0020	<0.0020
Anions														
Chloride	mg/L	50.0	NA	<1.0	<2.0	<2.0	<0.20	**0.81**	<2.0	<2.0	<2.0	<2.0	<2.2	<2.2
Fluoride	mg/L	4	<2.0	<0.10	<2.0	<2.0	<0.20	<0.20	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Sulfate	mg/L	154.26	NA	<1.0	<5.0	<5.0	**0.95**	<0.50	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Radium														
Radium-226	pCi/L	9.32	<0.18 (+/-0.11)	<0.16 (+/-0.12)	<0.38 (+/-0.16)	<0.38 (+/-0.21)	NA	<0.37 (+/-0.18)	<0.43 (+/-0.22)	<0.43 (+/-0.23)	<0.25 (+/-0.15)	<0.21 (+/-0.12)	**0.381 (+/-0.226)**	**0.895 (+/-0.511)**
Radium-228	pCi/L		<1.17 (+/-0.54)	NA	<0.7 (+/-0.31)	<0.82 (+/-0.37)	NA	<0.74 (+/-0.34)	<0.73 (+/-0.37)	<0.77 (+/-0.38)	<0.84 (+/-0.42)	**0.93 (+/-0.48)**	<0.709 (+/-0.463)	<1.07 (+/-0.578)
pH														
pH	s.u.	8.01	NA	**6.6**	**7.4**	**7.0**	**5.5**	**5.6**	**5.8**	**6.6**	**6.9**	**7.0**	**6.2**	**7.9**
Total Dissolved Solids														
Total Dissolved Solids	mg/L	950.8	NA	**44**	**30**	<20	**26**	<20	<10	**28**	**81**	<20	<20	<20
Turbidity														
Turbidity	n.t.u.	NA	**0.02**	**0.04**	**0.30**	**<0.010**	**0.07**	**0.02**	**0.01**	**0.16**	**0.01**	**0.09**	**0.11**	**0.030**

= Appendix III constituent (fluoride is included on both Appendix III & IV lists)
= Appendix IV constituent (fluoride is included on both Appendix III & IV lists)
Bold indicates result detected above laboratory reporting limit
NA = Not analyzed for this constituent

Table Reviewed By: CMN

TABLE 3
LCL of the Mean - Groundwater Analytical Data
OMU Elmer Smith Station
Owensboro, KY

February 2017 - December 2022

		Sample IDs						
Parameter	**Units**	**MW-1**	**MW-2**	**MW-4**	**MW-5**	**MW-6**	**MW-8**	**MW-9**
Total Metals								
Antimony	mg/L	NC	NC	NC	NC	NC	NC	NC
Arsenic	mg/L	NC	NC	NC	NC	0.00297	NC	NC
Barium	mg/L	0.0228	0.0341	0.0331	0.0497	0.0449	0.0929	0.0126
Beryllium	mg/L	NC	NC	NC	NC	NC	NC	NC
Cadmium	mg/L	NC	NC	NC	NC	NC	NC	NC
Chromium	mg/L	NC	NC	0.002*	NC	0.0049	NC	NC
Cobalt	mg/L	NC	NC	0.0045	NC	0.0040	0.004*	NC
Lead	mg/L	NC	NC	NC	NC	NC	NC	NC
Lithium	mg/L	NC	NC	NC	0.0239	NC	NC	0.0019
Mercury	mg/L	NC	NC	NC	NC	NC	NC	0.0002
Molybdenum	mg/L	0.004	0.0003*	0.03	0.64	1.91	NC	0.0277
Selenium	mg/L	0.0005*	0.0104	0.006	0.015	0.036	NC	0.0005*
Thallium	mg/L	NC	NC	NC	NC	NC	NC	NC+
Non-Metals								
Combined Radium-226 and Radium-228	pCi/L	0.82*	0.79*	0.80*	0.74*	0.77*	NC	NC
Fluoride	mg/L	NC	NC	NC	1.250	0.670	NC	NC

Notes:

NC = Denotes value was not calculated due to no detections > RL

+ = insufficient number of datapoints to calculate the LCL of the mean (requires 4 or more)

* = The calculated LCL was lower than the method detection limit (MDL) for the given parameter; therefore, the MDL is displayed.

TABLE 4
LCL of the Mean - Groundwater Analytical Data
OMU Elmer Smith Station
Owensboro, KY

February 2017 - May 2023

		Sample IDs						
Parameter	**Units**	**MW-1**	**MW-2**	**MW-4**	**MW-5**	**MW-6**	**MW-8**	**MW-9**
Total Metals								
Antimony	mg/L	NC	NC	NC	NC	NC	NC	NC
Arsenic	mg/L	NC	NC	NC	NC	0.0030	NC	NC
Barium	mg/L	0.0214	0.0329	0.0328	0.0511	0.0443	0.0966	0.0180
Beryllium	mg/L	NC	NC	NC	NC	NC	NC	NC
Cadmium	mg/L	NC	NC	NC	NC	NC	NC	NC
Chromium	mg/L	NC	0.0044	0.0006*	NC	0.005	NC	NC
Cobalt	mg/L	NC	NC	0.004	NC	0.0040	NC	NC
Lead	mg/L	NC	NC	NC	NC	NC	NC	NC
Lithium	mg/L	NC	NC	NC	0.0263	NC	NC	0.003
Mercury	mg/L	NC	NC	0.0002*	0.0002*	0.0002*	NC	0.0002*
Molybdenum	mg/L	0.003	0.000043*	0.030	0.662	1.903	NC	0.029
Selenium	mg/L	0.0006*	0.0097	0.0058	0.0166	0.036	NC	0.0006*
Thallium	mg/L	NC	NC	NC	NC	NC	NC	NC
Non-Metals								
and Radium-228	pCi/L	0.816*	0.760*	0.797*	0.740*	0.771*	NC	NC
Fluoride	mg/L	NC	NC	NC	1.296	0.685	NC	NC

Notes:

NC = Denotes value was not calculated

* = The calculated LCL was lower than the method detection limit (MDL) for the given parameter; therefore, the MDL is displayed.